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EFFICIENT UTILIZATION OF RESOURCES IN MANUFACTURING FIRMS

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ABSTRACT

Input-output relationship, marginal productivity and marginal rate of technical substitution provide a useful insight about the potentiality of manufacturing firms. This study analyzes these important issues to describe the optimality in resource utilization of the manufacturing firms in the south-west region of Bangladesh. A translog production function has been estimated to describe the input-output relationship. The study findings indicate that the large scale firms have the opportunity to substitute capital for labor for producing the same level of output. On the other hand, scarcity in capital leads to lower productivity of labor in medium and small firms. Therefore, an increase in capital may lead to an increase in labor productivity as well as output for these small and medium firms. These medium and small firms can remain on the same output level by substituting labor for capital which may facilitate proper utilization of resources. The productive labor force may ensure proper utilization of the capital resources as well as the long run growth.

Keywords: Input-output relation, Manufacturing firms, Capital, Labour, Productivity

INTRODUCTION

The manufacturing sector plays a key role in employment creation, income generation, women empowerment and poverty reduction in Bangladesh. This sector recorded an impressive 7 percent average annual growth over the 1991-2005 period, increasing its share in GDP from 13 percent to 16 percent, compared with just 5 percent average growth in the 1980s (Biesebroeck, 2005). Expansion of the export oriented manufacturing sector is one of the major pathways for Bangladesh to attain the target of Millennium Development Goal (MDG) (Hossain and Papadopoulou, 2010). Poverty reduction, one of the major objectives of MDG, can be achieved through sustainable growth of small and medium scale industries (Bhuiyan *et al.*, 2008). Major revenue generating sectors of Bangladesh such as garments, frozen fish, ship-building, tea processing, and leather

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goods are experiencing rapid growth, enabling them to acquire a significant position in the international market. Thus Bangladesh is now in the process of moving towards the new horizon of export orientation built on its success in industrial development. The contribution of the industrial sector to the economy of Bangladesh has been experiencing an increasingly positive upward trend over the time period. In FY1980-81, the contribution of the industry sector to real GDP was 17 percent which increased to 30 percent in FY 2009-10 (GOB, 2011). However, for the betterment of ever growing population, the sustainability in production level of the sector is required. Resources should be reallocated as per their productivity to minimize the losses. This study considers the manufacturing firms of the south-west region of Bangladesh to evaluate the efficiency in production process. Several studies have been conducted on the manufacturing sector of this region. It is observed that the south-west region of Bangladesh is blessed with manufacturing firms with different features in terms of product, source of input, location, output market, and firm size (Haider and Hasan, 2010). The studies of Haider (2010), Haider (2011), and Ahmed and Haider (2011) examine the business environment and firm performance of the south-west region of Bangladesh. They observe that business environment, such as, easy access to the sources of raw material, better transportation system, access to the output market and financial market have a positive impact on business growth. Ahmed *et al*. (2010) estimate the input-output relationship and the returns to scale on the shrimp processing firms of this region and find that 80 percent of the firms possess decreasing return to scale. Ahmed *et al*. (2010) is the only available study that describes the efficient allocation of resources only for the shrimp processing firms in the south-west region of Bangladesh. Therefore, this study will try to address all types of firms operating in the region to bridge the knowledge gap and evaluate the better input mix for output production.

Kopleman (1986) defines productivity as the ratio of output to input and depicts the relationship between physical output of one or more of the associated physical inputs used in production. He uses single input to measure 'factor productivity' and all the factors to measure 'total factor productivity'. Long-term growth and development across the countries is driven to a large extent by productivity (Easterly and Levine, 2001). It is observed that there is an enormous degree of heterogeneity in productivity across the manufacturing firms even in the same industry (Bartlesman and Doms, 2000; Tybout, 2000). Rao (1994) proposes a productivity competitiveness model consists of government policies, industrial strategies, and management methods particularly for Indian business environment. He also states that continuous up-gradation of technical knowledge, discovery of new ways for productivity improvement and flexible reorganization of skills in new activities is vital for the competitive age. Singh (1990) emphasizes the role of technical knowledge for productivity acceleration of an economy. Moreover, he adds capital-labor ratio, managerial knowledge and resource allocation as the major sources of productivity. Marginal productivity of the factors is also a significant indicator of firm performance. Dewett (2004) defines the marginal product as the additional output that can be produced by employing one more unit of the input while keeping other inputs constant. The production of manufacturing firms in developing

countries is mainly influenced by marginal productivity of labor rather than marginal productivity of capital as these countries are labor abundant (Goldar, 1986; Ahulwalia, 1981; Upender, 1996; Diwan and Gujarati, 1968; Swamy, 1984; Salim and Kilirajan, 1999). Industries in Bangladesh have potentials of achieving allocative efficiency (Hussain, 1991). By estimating marginal productivity of labor and capital, Hossain (1991) explains that allocative efficiency is achievable through appropriate pricing of capital and its proper disbursement among the proprietors.

Hence, productivity is an important indicator of a firm's performance. Growth in factor productivity refers to the efficient utilization of the industry's resources. Most of the reviewed literature concludes that the major sources of factor productivity growth are the factors associated with business strategies, and the internal and external business environment. Factor productivity facilitates the calculation of marginal rate of technical substitution (MRTS) which represents the allocative efficiency of the firm. The main research questions of this study are as follows:

Research Question 1: How does the firm size influence the resource utilization pattern?

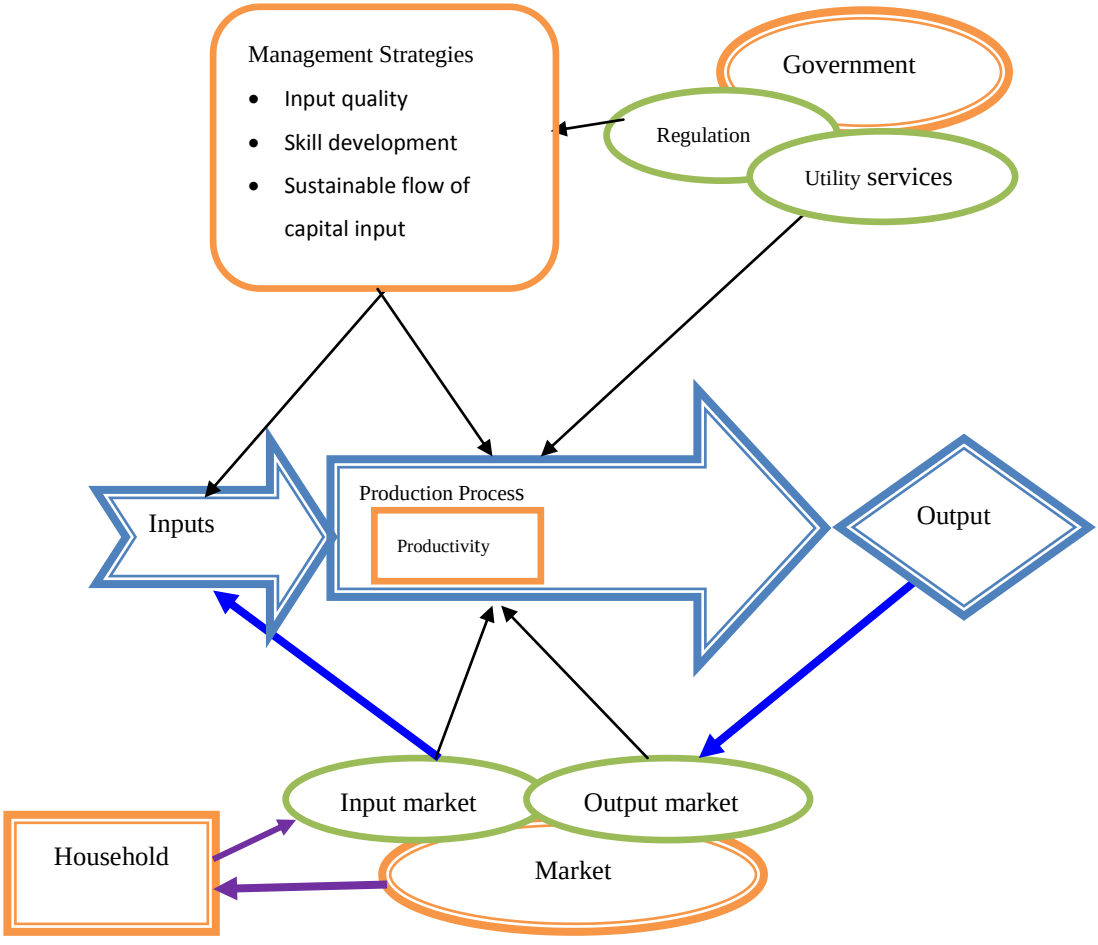
Research question 2: How available resources can be utilized in a cost effective way for the same level of production?

This research question conceptualizes the firm specific attributes that persuade the use of resources in production process. Resource utilization approach generally differs with firm size. To shade light on this issue, this study categorizes the manufacturing firms into three groups: small, medium and large. This research question is directly related to the allocative efficiency of the manufacturing firms. It emphasizes minimization of the production cost by altering its various production factors while remaining in the same isoquant. It seeks to estimate the Marginal Rate of Technical Substitution (MRTS) to find the solution.

CONCEPTUAL FRAMEWORK

Factor productivity and resource allocation

Productivity is defined as the goods and services produced per unit of labor and capital. The objective of any activity is to attain the goal of productivity, and economics is concerned with how efficiently we achieve that goal. The term 'efficiency' refers to the situation where the cost is minimized and resource utilization is maximized. Efficiency refers to performance in manufacturing firms' measured through factor productivity analysis. A firm's production processes perform under two major business environments: internal and external (Figure-1). Internal environment refers to the management and production process, and external environment consists of the aspects that are beyond the control of the businesses such as Government, market, and household. These environments directly and circuitously affect the productivity of the firm.



Source: Authors' compilation

Figure 1: Business environment

Market is a component of external environment which makes link with the industries to the household. Household plays the dual role in the industrial context. Firstly, it is the source of labor force; and secondly, it is the consumer of the final goods and services. Consequently, it maintains the link with both input and output markets. So the productivity of the firms depends on the consumption demand and input supply of the household. Government is another important component of the business environment. It supplies necessary utility services such as water, gas, electricity and sewerage system to the firms in many cases. Government deals with the firm management imposing business rules and regulation to ensure social benefits and a sustainable business environment. Management and production units are the main components of the internal environment of the business. Management is responsible for input accumulation and output distribution, and the production unit is responsible for producing goods and services. Therefore, both the outer and inner business environments influence the firms' productivity as a whole.

Efficiency and factor substitution

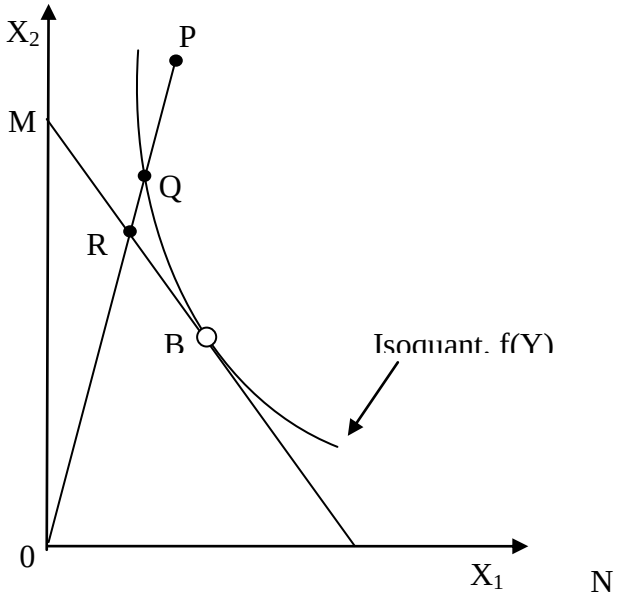


Figure 2: Efficiency and factor substitution

Source: Author's compilation based on Coelli (1996)

Farrell (1957) describes his concept using a simple example of involving a firm producing output Y by using two inputs (X_1, X_2). The Figure-2 represents the corresponding isoquant. The line MN represents the associated isocost line. Suppose, the given firm is using inputs (P) to produce a unit of output (Q). Then the technical inefficiency of the corresponding firm could be represented by distance of QP. In this regard, combination of the inputs could be modified without any reduction of the output. Consider that the firm is producing at point Q and the input price ratio is MN, thus the extra cost to produce a unit of output could be defined by the distance of RQ. As a result, the firm can reduce its production cost by RQ without reducing the quantity of output by producing at point B. This idea holistically can be defined as the allocative efficiency. We can define a firm as efficient both technically and allocatively whenever it produces at point B. This is also termed as economic efficiency. Marginal rate of technical substitution (MRTS) needs to be estimated to know how much one input has to be sacrificed for another to reach at the efficient level of production. MRTS can be defined as the ratio of the marginal productivity of two inputs.

$$MRTS = \frac{Marginal\ Productivity\ of\ X_1}{Marginal\ Productivity\ of\ X_2} \quad (1)$$

Study area and data collection

This study covers the south-west region of Bangladesh, which consists of four districts i.e. Jessore, Satkhira, Khulna and Bagerhat. Haider and Hasan (2010) argue that the geographical characteristics of this region are quite different from other regions of Bangladesh. They observe that these districts have diversity in geography, demography, economy, transport and other characteristics. Thus this region has the potentiality to attract capital investment. This study uses the dataset of Ahmed and Haider (2011) to answer the research questions. A total of 875 manufacturing firms of this region are employing more than 10 employees (Ahmed and Haider, 2011). This list was compiled from the databases of the Bangladesh Bureau of Statistics (BBS), Khulna City Corporation (KCC), Khulna Chamber of Commerce and Industries (KCCI), and various pourashova offices. It also uses private sector manufacturing census data sources, such as, exporters and manufacturers associations. Ahmed and Haider (2011) have collected and constructed a detailed firm level data set of 299 firms, which have been randomly selected from 875 firms of this region. Ahmed and Haider (2011) consider 3 years period (from 2007 to 2009) as the study period. This study considers 141 firms from those 299 firms because of the availability of required information.

Analytical framework

Solow (1956) developed a production function with substitutability between factors of production, modeling output growth as a function of capital, labor, and knowledge. This section of this study attempts to estimate the contribution of factors of production along with efficient allocation of resources. For this, translog production function has been selected where the combined contribution of the factors in production process can be identified. This study attempts to estimate the following function.

$$\ln Y_i = \beta_0 + \sum_i \beta_i \ln X_i + \frac{1}{2}\sum_i \beta_{ii}(\ln X_i)^2 + \sum_{i=1}\sum_{j=1} \beta_{ij} \ln X_i \times \ln X_j + \psi_t T + \sum_d \psi_d D_d + e \quad (2)$$

Where, Y and X denote the output and input respectively. T is the time period, D represents the dummy variables corresponding to the input and output markets. We estimate the production functions of the three types of manufacturing firms i.e. large, medium and small. Here the firm size has been considered on the basis of number of employed labor (L). Large, medium and small firms are defined as $L>100$, $25<L\leq100$, $L\leq25$ respectively following Ahmed and Haider (2011). To estimate the production function, only 141 firms have been considered from the data set of Ahmed and Haider (2011). Among these 141 firms, the number of large, medium and small firms is 77, 39 and 25 respectively. Considering the study period (3 years), the number of observations for regression model becomes 231 (=77*3) for large, 117 (=39*3) for medium and 75 (=25*3) for

small firms. Here the total sale of final product of the firm is considered as the output variable of the production function. The major input factors are capital, labor and energy consumption. Krishnapillai and Thompson (2012) and Ahmed and Haider (2011) also consider these factors as the major explanatory variables for estimating production function in their study.

This study considers the unique unit of measurement for the major input-output variables. The capital is measured from the fixed assets. The value of the fixed assets is obtained by adding present values of buildings and machineries. The labor input is measured by annual paid wages to the labor. Energy input is measured as total cost paid for consumption of energy in production purpose. From a translog production function the elasticity of the production with respect to input X_i may be obtained by the following equation:

$$EP_i = \frac{\partial \ln Y}{\partial \ln X_i} = \alpha_i + \sum_j \beta_{ij} \ln X_j \quad (3)$$

And the marginal product ($\frac{\partial Y}{\partial X_i}$) equal to:

$$MP_i = EP_i \times \frac{Y}{X_i} \quad (4)$$

For calculating the EP_iandMP_i the authors follow Obasi (2005). We can also determine the marginal rate of transformation between two factors of production. The Marginal Rate of Technical Substitution (MRTS) between two factors is equal to:

$$MRTS = \frac{MP_i}{MP_j} \quad (5)$$

RESULT AND DISCUSSION

Summary statistics

Table 1 provides a summary statistics of the input and output variables of this study. The Table 1 shows that yearly average production of the large firms is more than 600 (695-832) million BDT and it increased over the study period. Moreover, the large firms hold the major share of the capital which is more than 1000 (1160-2900) million BDT per firm. During the year 2009 the average amount of capital was 2900 million BDT for large firms. The average production for medium firms was 145 million BDT and for small firms it is near about 50 million BDT in the year 2009. Usually the medium and small firms are far away from the large firms (Table 1). During the year 2009, the

average amount of capital for medium and small firms was 130 and 7 million BDT respectively. The large firms spent about 25 million BDT as wage for the labor whereas this amount is less than 1 million BDT for medium and small firms. Similarly the energy cost is also grater for large firms than others.

Production function estimation

Tinbergen (1942) and Solow (1957) have made great contributions to the economic theory through the formulation of productivity measurement in a production function context and linking them to the analysis of economic growth. The results for translog production function estimation are presented in Table 2.

Model for large scale firms

Model 1 of Table 2 reports the results of estimated translog production function for large firms. In this model 44 percent variation in output is explained by the explanatory variables and the model is statistically significant. Among the three major inputs, the coefficients of capital and energy are positive and different from zero at 1 and 10 percent level respectively. Their coefficient of squared terms is also positive and statistically significant at 1 and 5 percent level correspondingly. Thus, these two factors play important role in the production process. The regression model shows that the output of the large scale firms increases for an increase in capital and energy (Table 2).With respect to interaction terms, the coefficient of labor-energy is positive and significant, whereas that of the capital-energy is negative and significant. Therefore labor and energy has a certain relationship which affects the level of output. Conversely, the combination of capital and energy negatively affects the output. Thus, it can be said that, if other things remain the same, for an increase in the combination of labor and energy, the output will increase. This is because capital and other resources can be utilized properly. Moreover, when the capital and energy altogether increases capital remains un-utilized, and hence proportionately the output decreases. The model for large scale firms (Table 2) has been proved as the time invariant model. Change of time does not have any effect on the production. The corresponding coefficients for region dummies are ψ_1 ψ_2 and ψ_3 for Jessore, Khulna and Bagerhat respectively with Satkhira as reference district. As the model shows, holding Satkhira as reference, the coefficients for Jessore, Khulna and Bagerhat are positive and significantly different from zero at 1 percent level. It articulates that for large scale firms, an addition of a firm in Jessore, Khulna and Bagerhat districts leads to production increase with respect to the firms of Satkhira district.

Model for medium scale firms

The estimation results of Translog model for medium firms have been described in Model 2 of Table-2. This model is statistically significant and more than 50 percent variations in output are explained by the explanatory variables. In this model the coefficient for labor is positive and significant. Therefore it can be said that in medium firms, labor input has significant impact other

than the capital and energy inputs on production. The nonlinear parameters (squared terms) for capital, labor and energy are significant at 5, 1 and 10 percent respectively. Only the non linear parameter for labor is negative. The combination of capital and energy is negative and significant at 5 percent level. As the coefficients indicate, the capital and energy individually are not significant factor, but their combination significantly and negatively affects the level of output. The model for medium firms (Table 2) is also irresponsive to the change in time. Among the regional dummy variables only the Bagerhat district is significant with reference to Satkhira district. This result articulates that for medium scale manufacturing firms, if a firm is incepted in Bagerhat district it will get more advantage while compared with firms of Satkhira district.

Model for small scale firms

The model for small scale firms is reported in Model 3 of Table 2. The value of R^2 of the model represents that 77 percent variation in output is explained by the explanatory variables.For small firms, the model shows that all the three major inputs: capital, labor and energy are significantly different from zero at 5, 10 and 5 percent level respectively (Table 2). Here the coefficient of energy is positive. Hence, the energy has positive impacts on output. On the other hand, coefficients of capital and labor are negative and significant. So individually these factors negatively affect the output. For small firms no nonlinear parameters are statistically significant. Only the coefficient for interaction term of capital and labor is statistically significant. Therefore the output in small firms is related with combination of capital and labor. Capital and labor individually negatively affects the output whereas they altogether positively affect the output. Thus increase of the capital labor combination may enhance the productivity of the small firms. The small firms are also time and region invariant.

Optimum input level

Now the question is what would be the optimum point for capital and labor. Basically this is the point where the rate of change of output is zero and beyond that point further increase in inputs lead to increase or decrease in output. This part of the study tries to answer this question. After setting the first order derivative of the equation (2) equal to zero (necessary condition) we get the marginal values for capital and labor for large, medium and small firms. The values are reported in Table 3. These values are estimated from the mean value of the respective inputs of the corresponding firms. At this level of capital and labor, the rate of change in output is zero. Now to test, whether the values are associated with minimum point or maximum point, we need to test the second order condition (the sufficient condition). If the second order condition is positive then further increase in input will lead to an increase in output and vice versa. Table 3 lists the sign of the second order derivative of the production functions for large, medium and small firms with respect to labor and capital. It is found that the second order derivation of capital are positive or greater than zero in all cases, so the estimated values of capital in Table-3 are the minimum point of capital for the respective firms. Further increase in capital will lead to increase in output. Whereas

the values of second order derivative for labor are negative for medium and large firms. So the estimated values (Table 3) for labor input for medium and large firms are the maximum value. Consequently further increase in labor input leads to decrease in output. For small firms both values are associated with minimum point so the firms can increase its output by increasing the labor and capital inputs beyond these points.

Efficient allocation of resource

The term productivity indicates the production of output from a certain amount of input. Input-output ratio represents the firm productivity as well as the firm performance. On the other hand, factor substitution is the process of substituting the costly inputs to relatively cheaper inputs to produce the same level of output for ensuring the efficient utilization of resources by the firms. A sensible mixture of inputs can achieve a sustainable level of production. Marginal productivity of labor and capital from the production function can provide a useful insight about their allocative efficiency of the firm (Ahmed *et al.*, 2010). Dewett and Chad (1946) describe that for attaining maximum efficiency of resource allocation, it is required constant shifting and reallocation of resources between different uses and changes in production technique. In this section of the study the authors tried to describe the marginal productivity of the labor and capital as well as their efficient allocation. Table-4 describes the marginal productivity of the labor and capital and marginal rate of technical substitution (MRTS) of labor to capital for different type of firms.

Large firm

Table-4 illustrates that labor and capital both are inelastic in large firms. This result indicates that percentage change in output is less proportionate than the percentage change in inputs. More specifically, 1 percent increase in labor leads 0.33 percent increase in output. Similarly, 1 percent increase in capital leads to 0.30 percent increase in output. The estimated marginal productivity of labor (MP_L) and capital (MP_K) for large firms shows that an investment of an additional one taka in labor returns about 0.44 taka. Conversely, an investment of an additional one taka as capital returns 0.31 taka. Therefore, labor is much more productive than capital. MRTS for labor to capital is 1.41 which implies that 1 unit of labor is 1.41 time more productive than 1 additional unit of capital. Thus, the firm can give up 1.41 unit of capital by using additional 1 unit of labor and can remain on the same production level.

Medium firm

The estimated elasticity and marginal productivity of labor and capital for the medium firm is showed in Table 4. For medium firm, both labor and capital are inelastic. Thus the percentage change in output is less proportionate than the percentage change in inputs. The marginal productivity of capital is higher than the marginal productivity of labor indicating that, an investment of additional 1 taka for labor returns about 0.17 taka as output (Table 4). Similarly, an investment of additional 1 taka as capital returns 0.47 taka. Nevertheless, capital is much more

productive than labor in medium firms. Here, MRTS for labor to capital is 0.36 which implies that the firm can give up 0.36 unit of capital by using additional 1 unit of labor and can remain on the same production level. The scenario of medium firms is different from large firms because the marginal productivity of labor is higher than the capital in large firm, whereas in medium firms the marginal productivity of labor is much lower than that of capital. This is because labor is unskilled and untrained (Ahmed *et al*., 2010), so the labor cannot add much value to the output. Results reported in Table 4 indicate that medium firms have proportionately greater amount of labor than capital. So, holding labor input constant, any increase in capital can increase the productivity of labor as well as the total output.

Small firm

Same as the medium firms, the small firms have higher capital productivity than labor. The MRTS for labor to capital is 0.22 which indicates that the firm can give up 0.22 unit of capital by using additional 1 unit of labor and can remain on the same production level. Small firms are also facing the scarcity of capital with respect to labor. If they can increase the capital, their labor productivity as well as the total output will also increase. According to the IMF (2005), small and medium firms in Bangladesh are typically labor intensive with relatively low capital intensity. The findings of this study support IMF (2005) as this country abounds with labor input whereas it is suffering from capital scarcity.

Concluding remarks

Input-output relationship, optimum level of input, marginal productivity and marginal rate of technical substitution are the widely used indicators for measuring firm performance of the manufacturing firms as well as the agricultural farms. These indicators give a useful insight about the growth and sustainability of the production unit. This study has been conducted on the manufacturing firms of the South-West region of Bangladesh. The study findings indicate that the large scale firms have the opportunity to substitute capital input for labor to produce the same level of output. On the other hand, as large firms are having higher labor productivity, so further increases in labor leads to an increase in capital productivity as well as the output. The marginal productivity of labor in medium and small firms is lower than that of capital. Scarcity in capital leads to lower productivity of labor. So, an increase in capital may lead to an increase in labor productivity as well as output for medium and small firms. These firms can remain on the same output level by substituting labor for capital. The manufacturing firms should concentrate on technical innovation to ensure long run growth. A firm must achieve optimum productivity for maintaining the current growth as well as fostering positive growth. Labor productivity is the vital factor in this regard. Factors such as intensive training, performance incentives, profit sharing, and safe and secured work place could influence labor productivity. The productive labor force may ensure proper utilization of the capital resources as well as the long run growth.

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Appendix

Table 1: Summary statistics of the variable

(Values in Average Million BDT)

Firm Type	Year	Output	Capital	Labor	Energy cost	Observation (N)
Large Firm	2009	832	2900	25.10	21.50	77
	2008	720	1160	10.80	9.61	
	2007	695	1170	20.50	9.09	
Medium Firm	2009	145	130	0.29	0.61	39
	2008	132	112	0.22	0.58	
	2007	126	101	0.20	0.55	
Small Firm	2009	53.30	7.07	0.06	0.13	25
	2008	46.50	6.37	0.05	0.11	
	2007	36.90	6.12	0.05	0.11	

Source: Author's compilation based on data set of Ahmed and Haider (2011)

Table 2: Production function estimation

Variable		Model 1 Large Firms	Model 2 Medium Firms	Model 3 Small Firms
Capital	β_1	3.08*** (0.81)	0.42 (2.04)	-4.52** (2.04)
Labour	β_2	-0.40 (0.76)	16.76*** (4.97)	-5.59* (5.07)
Energy	β_3	1.95* (1.06)	2.43 (2.30)	8.53** (4.88)
$(Capital)^2$	β_{11}	0.23*** (0.05)	0.20** (0.13)	0.29 (0.21)
$(Labour)^2$	β_{22}	-0.06 (0.05)	-1.08*** (0.43)	0.39 (0.63)
$(Energy)^2$	β_{33}	0.25** (0.09)	0.31* (0.19)	0.16 (0.67)
Capital*Labour	β_{12}	-0.06 (0.04)	-0.02 (0.24)	0.49* (0.30)
Capital*Energy	β_{13}	-0.41*** (0.06)	-0.25** (0.12)	-0.36 (0.24)
Labour*Energy	β_{23}	0.16*** (0.05)	-0.20 (0.26)	-0.50 (0.36)
Time	Ψ_t	0.06 (0.07)	-0.03 (0.13)	0.15 (0.13)
Jessore	Ψ_1	3.53*** (0.56)	0.47 (0.71)	-0.37 (0.72)
Khulna	Ψ_2	3.34*** (0.55)	0.21 (0.69)	-0.46 (0.75)
Bagerhat	Ψ_3	3.78*** (0.06)	1.30* (0.73)	-----
Constant		-29.33** (9.54)	-11.90*** (33.57)	24.27 (30.45)
F		13.43	9.41	21.68

Variable	Model 1 Large Firms	Model 2 Medium Firms	Model 3 Small Firms
R^2	0.44	0.54	0.77
N	231	117	75

Source: Author's compilation based on data set of Ahmed and Haider (2011). Standard errors in parentheses.For Dummy variables 'Satkhira' has been considered as reference. * significant at 10%; ** significant at 5%; *** significant at 1% level.

Table 3: Maximum level of inputs

Firm Type	$\frac{dy}{dx} = 0$		$\frac{d^2y}{dx^2}$	
	Capital (In million BDT)	Labour (In million BDT)	Capital	Labour
Large	37.13	4.54	+	–
Medium	2.81	0.39	+	–
Small	0.10	0.03	+	+

Source: Author's compilation based on data set of Ahmed and Haider (2011)

Table 4: Marginal productivity and technical substitution of the factors

Model	Elasticity of Labour (EP_L)	Elasticity of Capital (EP_k)	Marginal Productivity of Labour (MP_L)	Marginal Productivity of Capital (MP_K)	$MRTS_{LK}$
Large Firm	0.33	0.30	0.44	0.31	1.41
Medium Firm	0.12	0.46	0.17	0.47	0.36
Small Firm	0.15	0.92	0.21	0.95	0.22

Source: Authors' compilation based on data set of Ahmed and Haider (2011)