



Productivity: An Essential Determinant for Economic Development & Prosperity

Professor Dr. M. Kamal Uddin *

1.0 Introduction

Productivity performance is crucial to a country's future economic prospects, especially when a lot of countries are facing productivity gap. As the factors of inputs (labor and capital devoted to production) cannot increase indefinitely, productivity gains, which enable an economy to produce more for the same amount of inputs, are the only route to sustainable economic growth in the long run. It follows that monitoring and improving national productivity capability (the supply side of the economy) are important aspects of public policy in many countries.

Productivity is a measure of the output produced per unit of input. Productivity is critically important to a firm since it affects the cost per unit. Productivity gap existing between Bangladesh & other developing countries is big. Production is the total amount of output. Productivity is the output per unit of input. There are various methods of evaluating the performance of economic activities. Such as GDP, per capital, economic growth rates, national income over population. Productivity is one of the broadest and latest indicators of evaluating the performance of economic activity. It indicates the notion between the output of benefits and the input of resources. It may be applicable in an enterprise, in an industry or in the economy as a whole.

The concept of productivity first appeared in European thought at the end of the 18th century with out of industrial revolution. International labour organization at its seventh international conference of labour statisticians held in Geneva in 1919 recommended the methods for compilation of labour productivity statistics. The modern concept of productivity was first put forward by a small group of specialist in the American Bureau of labour statistics just after the Second World War. During 1950's many European and Asian countries established productivity centre on previously. And with the establishment of the Asian Productivity Organization in 1961 productivity measurement and analysis becomes a milestone in economic activities of this area, Bangladesh is one of the member of Asian Productivity Organization (APO).

Used as a ratio of an output volume measure to an input volume measure, productivity is simple as a notion. When it comes to applying it, however, one quickly realizes the

complexity in operationalizing this notion to suit different purposes, especially in a world with data limitations. Consequently, there are different measures of productivity for different purposes, and different estimation approaches and definitions subject to the data used. Generally, national accounts are the basis for productivity estimates, and, in turn, growth accounting with the appropriate choice of index numbers is adopted as estimation approach.

Labor productivity can be measured in a number of ways, depending on the definitions of output and labor input measures. The preferred measure is the basic-price GDP per actual hour worked, which adjusts to allow for different work patterns across countries and across time. However, total actual hours worked cannot be collated for all countries. As workers in high-performing Asian countries tend to work longer hours on average than those in the US, the worker-based labor productivity gaps, in this instance, probably cast the Asian countries in a particularly favorable light. Although being a one-factor or partial-factor productivity measure, interest in labor productivity has never waned due to its simplicity as a concept, its broad availability, and its direct link to per capita GDP performance.

1.1 Efficiency, Effectiveness and Productivity

- Productivity is the integrated effect of efficiency and effectiveness.
- Productivity is a function of (effectiveness, efficiency).
- Efficiency is the ratio of actual output attained and the degree of output expected.

Effectiveness is the degree of accomplishment of objective. Productivity is a combination of both effectiveness and efficiency. Since effectiveness is related to performance while efficiency is related to resource utilization.

2.0 Measuring Productivity

Productivity is generally defined as a ratio between output of benefits and input of resources. It implies how much input resources are required for production of certain amount of output or specially output per unit of input. Productivity can be expressed.

$$\text{Productivity} = \frac{\text{Output Produced Per Period of Time}}{\text{Quantity of Input Used}}$$

2.1 Per-Worker Measure of Labor Productivity

Figure 1 presents the cross-country comparisons of labor productivity levels in 2011 with respect to Bangladesh's data, measured as GDP per worker in US dollars. The countries naturally bundle into groups. On this measure, the US is the leading economy with Asia, Singapore and Hong Kong as close forerunners. The other two Asian Tigers together with

Japan follow at some distance. The position of Bangladesh with respect to labor productivity is at the lowest part, above Nepal, Myanmar and Cambodia.

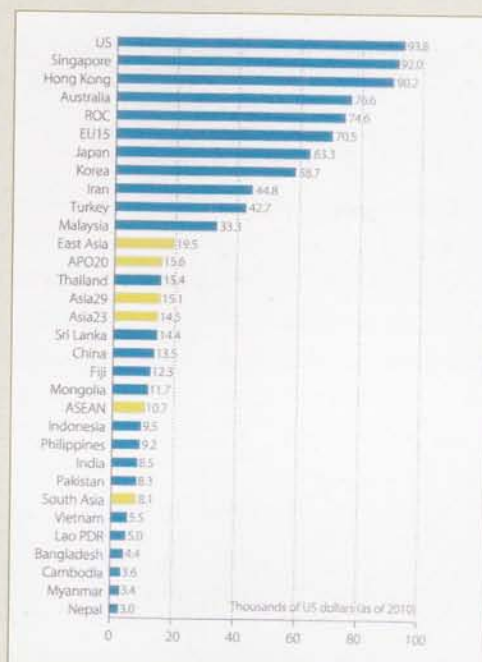


Figure 1 Labor Productivity Level by Per-Worker GDP, 2011

--GDP at constant basic prices per worker, using 2005 PPP, reference year 2010

Source: APO Productivity Database 2013.01.

Table 1: Scenario of Bangladesh: Per-Worker Labor Productivity Levels, 1980, 1990, 2000, 2010, and 2011 -GDP at constant basic prices per worker, using 2005 PPP, reference year 2010

1980		1990		2000		2010		2011	
2.3	6.3%	2.4	4.6%	3.3	4.4%	4.3	4.7%	4.4	4.8%

Unit: Thousands of US dollars (as of 2010).

Source: APO Productivity Database 2013.01.

Table 2: Scenario of Bangladesh: Labor Productivity Growth, 1990-1995, 1995-2000, 2000-2005, and 2005-2011 -Average annual growth rate of GDP at constant basic prices per worker, using 2005 PPP

1990-1995	1995-2000	2000-2005	2005-2011	1990-2000	2000-2011
2.9	3.9	1.9	3.0	3.4	2.4

Unit: Percentage.

Source: APO Productivity Database 2013.01.

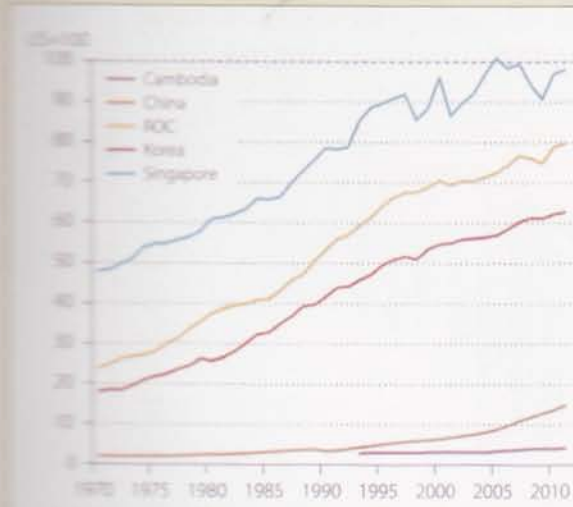


Figure 2.1: Group-C1 Countries

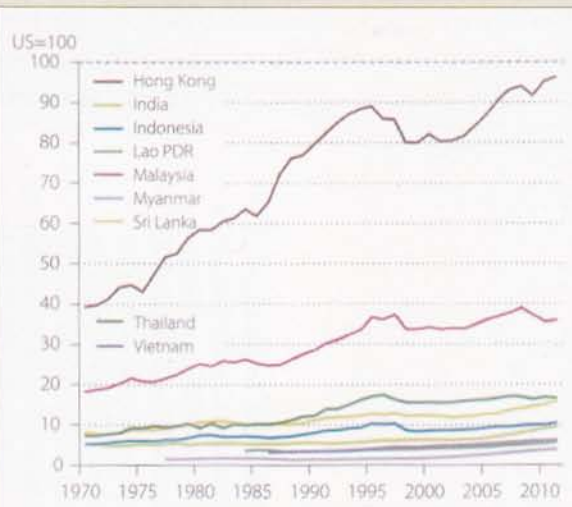


Figure 2.2: Group-C2 Countries

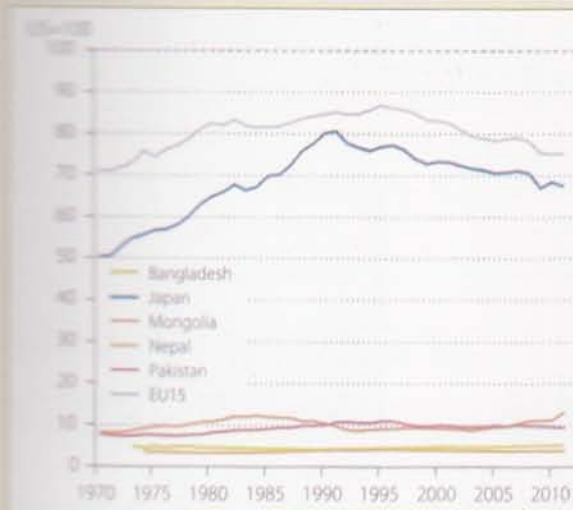


Figure 2.3: Group-C3 Countries



Figure 2.4: Group-C4 Countries

Figure 2 labor Productivity level Relative to the US, 1970-2011 -Indices of GDP at constant basic prices per worker, using 2005 PPP

Source: APO Productivity Database 201 3.01.

2.2 Per-Hour Measure of Labor Productivity

The per-worker-based labor productivity gaps are most likely conservative estimates, since workers in high-performing Asian countries tend to work longer hours than those in the US on average. To adjust for this discrepancy, total hours worked are constructed, although the quality of the estimates may vary considerably across countries. Figure 3 shows how the

productivity gap against the US in 2011 varies depending on which measure of labor productivity is used. The productivity gap with the US widens for all Asian countries when the differences in working hours are taken into account.



Figure 3 Labor Productivity Gap by Per-Worker and Per-Hour GDP Relative to the US, 2011

---GDP at constant basic prices per worker and hour, using 2005 PPP



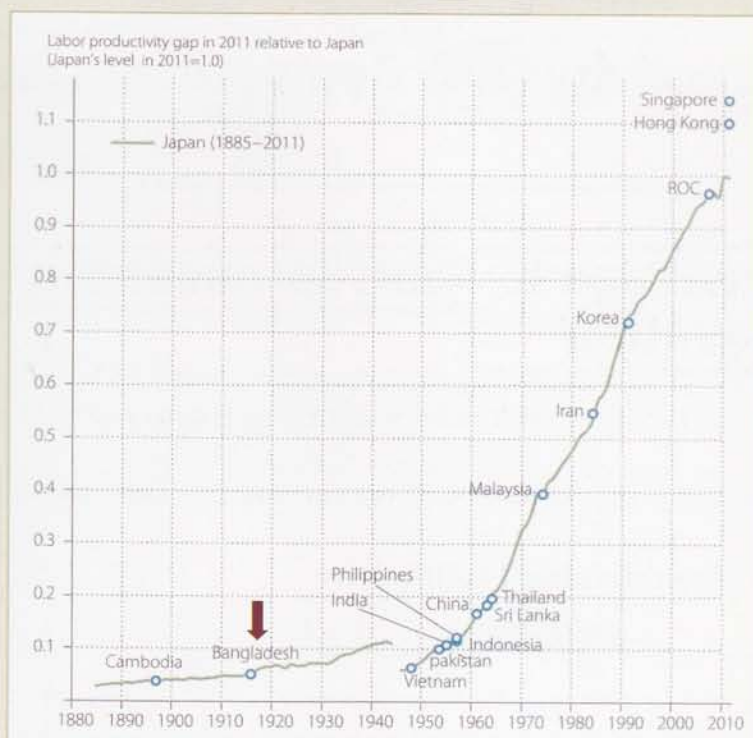


Figure 5 Labor Productivity Trends of Japan during 1885-2011 and levels of Asian Countries in 2011

—GDP at constant basic prices per hour, using 2005 PPP

3.0 Total Factor Productivity

Total factor productivity considers best use of all input and considering all important aspects of output. Labor productivity is only a one-factor or partial-factor productivity measure and does not provide a full perspective of production efficiency. An observation of low labor productivity could suggest production inefficiency, but it could also reflect different capital intensities in the chosen production method under the relative labor-capital price faced by the economy concerned. By observing movements in labor productivity alone, it is not easy to distinguish which is the case. In populous Asian economies, which are relatively abundant in low-skilled labor, production lines may be deliberately organized in a way to utilize this abundant, and hence relatively cheap, resource. It follows that the chosen production method is most likely to be (low-skilled) labor-intensive and with little capital, manifested in low labor productivity. This is why economists analyze TFP, which is GDP per unit of combined inputs, to arrive at a more complete picture of a country's production efficiency.

Capital input is a key factor for measuring TFP, and is defined by capital services - the flow of services from productive capital stock, as recommended. The required basis for estimating capital services is the appropriate measures of capital stock.



Figure 6: Productivity and Competitiveness

Ability to adapt quickly to change may be more important than static productivity

4.0 Key Factors Determining Productivity

- Quality of Inputs: Labour trained, equipment updated
- Capital (machinery) Investment: Investment in new capital equipment
- Research and Development: so that both product and processes can be improved
- Management Techniques: Modern management practices such as teamwork, employee involvement, etc
- Legislation: regulatory Restriction will reduce productivity

5.0 Government and Productivity

- Negative Influence: Burden of red tape & legislation restriction
- Positive Influence: To create climate to invest more in people, R&D, management techniques and make better use of input they have got
- Competition: To increase in competition and exposure to market forces
- Financial Incentives: Low tax rate, incentives on export, etc.

6.0 Increasing Productivity

- Cutting Jobs: to reduce size of its workforce
- Motivational Strategies: Motivation through a more participative approach to management, introducing performance-related pay
- Information Communication Tech (ICT): Disappointing effects of It on productivity: 1995-2000 US manuf. Productivity growth slowed down in spite of high investment in IT & computing.. Reason: lack of adapting capability to new system & no training.
- Training: Investment on IT without training, seems to be recipe for disaster
- Investment: Other ways of improving productivity might include investing directly in

capital (machinery). Initial reduction may be mainly due to staff being unfamiliar with new system

- Less investment in training due to fear of Poaching:
- Secretly taking other's skilled employee

7.0 The Best Approach: Increasing Productivity

Best approach depends on types of firms; whether the firm is Capital-Intensive Firm & Labour- Intensive Firm, Service Sector Firm & Manufacturing Firm

- To focus on making the most of labour & capital machinery and develop these over time
- The firm should have flexible & motivated workforce which in turn relies on an open and participatory management approach
- Then other pieces of jigsaw (like effective training) will follow eventually

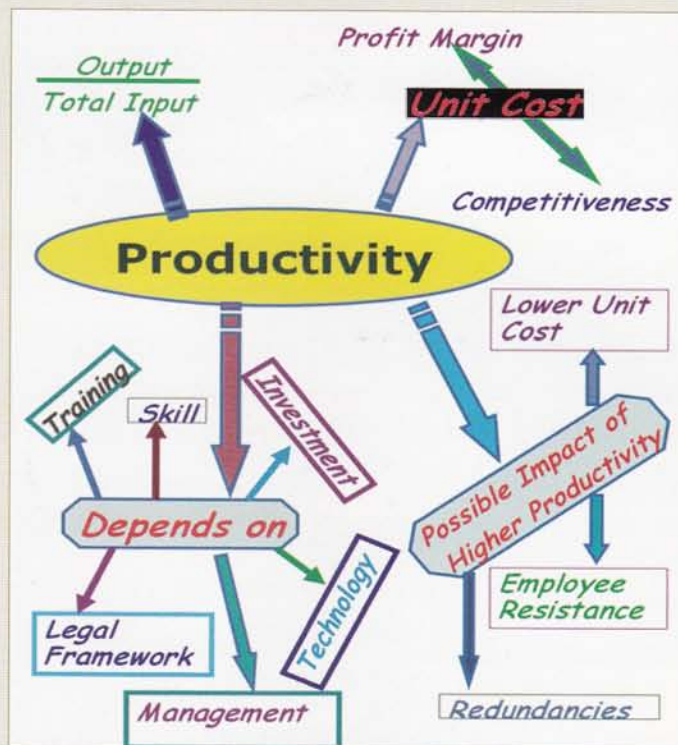


Fig.7 Various Factors of Productivity

8.0 Productivity Scenario in Two Promising Sectors in Bangladesh

8.1 Textile Industrial Sector

The textile industrial development is essential for full blooming of industrialization in Bangladesh. To ensure the development of textile industrial sector in Bangladesh, it is very much essential to increase the productivity of this sector. It is needed to initiate and continue the practice of the productivity development activities in all textile industries of

this sector. For this, it is needed to monitor and register the productivity parametric values and data continuously in a systematic manner and to analyze than on the basis of pragmatic information and data. This is because, by analyzing productivity values and other various parameters associated with the productivity, it is possible to assess an industry realistically and then by knowing pragmatic situation, proper steps can be taken accordingly to augment productivity development.

Survey results of six textile Industries of year (2005-06 to 2007-08) have been analyzed. Base year is 2005-06. Analyses were carried out on the following parameters: Value addition, Labour productivity on value addition, capital productivity, salary/wage ratio on value addition, comparison of cost associated with productivity, competitive labour cost and measurement of profitability.

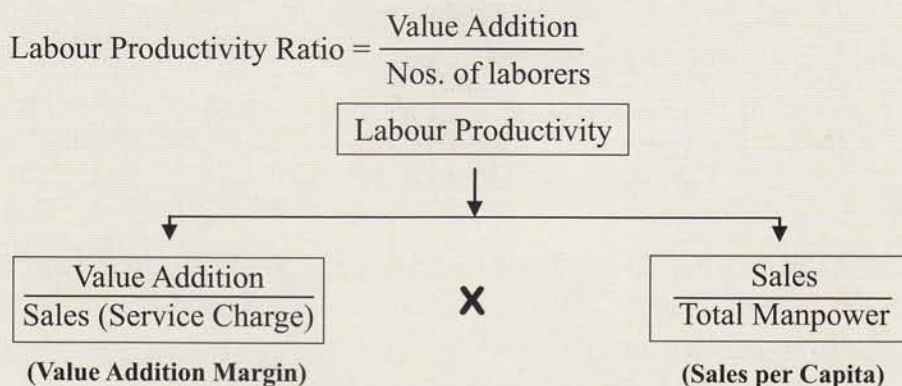
Table 4: Data in Value Addition of Darwani Textile Mills Ltd.

Taka in Lakh

Year	2005-2006	2006-2007	2007-2008
Sales and other income	267.30	278.83	320.89
Raw materials and other expenditures	140.32	130.52	185.62
Value Addition	126.98	148.31	162.27

The above data shows that value addition of 2006-07 has been increased by 16.40% and in 2007-08 by 27.79% w.r.t. 2005-06. Sales income has been increased in 2006-07 & 2007-08 by 4.31% & 20.05% respectively w.r.t. 2005-06. Expenditure has been decreased by 6.98% in 2006-07 and increased by 32.28% in 2007-08 w.r.t. 2005-06.

Figure 8: Labour Productivity Ratio



Labour productivity or value addition per capita reveals the capability of wealth creation of an industry. It is a parameter to measure productivity. Labour productivity is influenced by value addition margin and sales per capita.

Table 5: Labour Productivity Ratio.

Year	2005-2006	2006-2007	2007-2008
Labourer (Nos.)	632	657	668
Value Addition Total Manpower (Taka)	20091.77	22573.82	24291.92
Value Addition Sales (Service Charge) (Taka)	47.50%	53.19%	50.57%
Sales Total Manpower (Taka)	42294.30	42439.88	48037.43

The above data of Table 2 shows that the labour productivity of 2006-07 & 2007-08 have been increased 12.35% & 20.90% respectively w.r.t. 2005-06. Value addition margin of 2006-07 & 2007-08 have been increased by 5.69% & 3.07% respectively w.r.t. 2005-06.

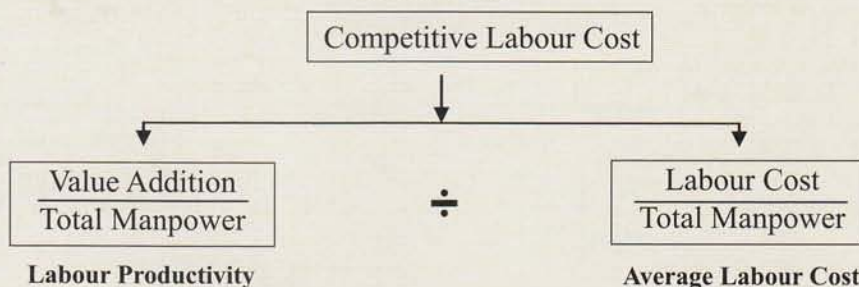
Table 6: Value Addition and Raw Materials, Electricity and other Various Costs with Respect to Sales (Service Charge)

Year	2005-2006	2006-2007	2007-2008
Raw Materials	0.00%	0.00%	0.00%
Electricity and Energy Cost	41.08%	37.99%	38.75%
Non-Industrial Cost	11.41%	8.82%	10.68%
Total Cost	52.50%	46.81%	49.43%
Value Addition	47.50	53.19%	50.57%
Sales	100%	100%	100%

N.B. The Mill ran on the basis of service charge. So cost for raw materials is nil.

Figure 9: Competitive Labour Cost Ratio

$$\text{Competitive Labour Cost Ratio} = \frac{\text{Value Addition}}{\text{Labour Cost}}$$



Competitive labour cost ratio is the ratio of value addition to the salary/wage of total manpower. Thus the ratio reveals the work efficiency and skill of manpower with respect to their salary.

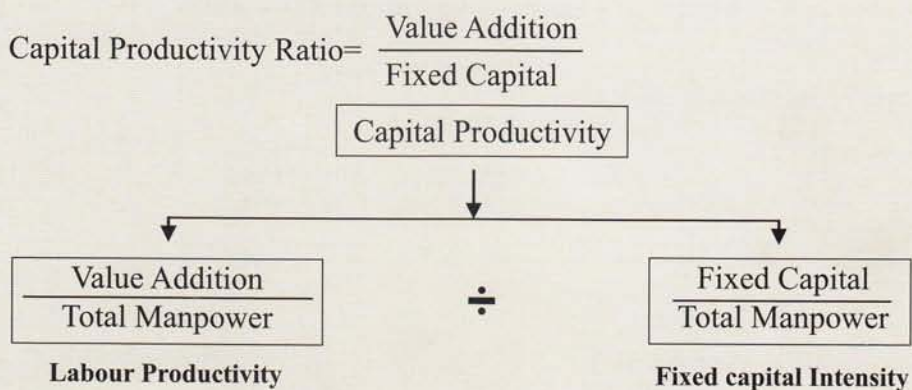
Table 7: Competitive Labour Cost Ratio

Year	2005-2006	2006-2007	2007-2008
Labour Cost (Tk. in lakh)	251.62	213.75	158.48
$\frac{\text{Value Addition}}{\text{Labour Cost}}$ (Taka)	0.50	0.69	1.02
$\frac{\text{Value Addition}}{\text{Total Manpower}}$ (Taka)	20091.77	22573.82	24291.92
$\frac{\text{Labour Cost}}{\text{Total Manpower}}$ (Taka)	39813.29	32534.25	23724.55

Table 8: Data Comparing Labour Cost Associated with Productivity

Year	2005-2006	2006-2007	2007-2008
$\frac{\text{Labour Cost}}{\text{Nos. of Labourers}}$ (Taka)	39813.29	32534.25	23724.55
$\frac{\text{Value Addition}}{\text{Labour Cost}}$ (Taka)	0.50	0.69	1.02
$\frac{\text{Labour Cost}}{\text{Value Addition}} \times 100$	198.16%	144.12%	97.66%

The above data shows that labour cost per person in 2006-07 & 2007-08 have been reduced by 18.28% and 40.41% w.r.t. 2005-06. Labour cost per value addition decreased by 27.27% and 100.4% in 2006-07 & 2007-08 w.r.t. 2005-06.

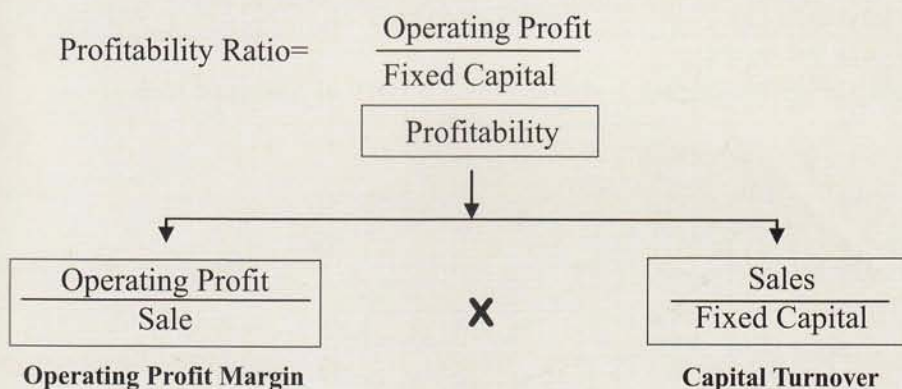
Figure 10: Capital Productivity Ratio

Capital Productivity Ratio (CPR) means degree of use of fixed capital. The CPR depends on labour productivity and fixed capital intensity.

Table 9: Capital Productivity Ratio

Year	2005-2006	2006-2007	2007-2008
Fixed Capital (Tk. in lakh)	1823.52	1826.44	1832.27
Value Addition Fixed Capital (Taka)	0.07	0.08	0.09
Value Addition Total Manpower (Taka)	20091.77	22573.82	24291.92
Fixed Capital Total Manpower (Taka)	288531.64	277996.96	27429.92

Table 6 shows that capital productivity ratio of 2006-07 & 2007-08 have been increased by 14.29% and 28.57% w.r.t. 2005-06. Capital productivity of 2006-07 & 2007-08 have been increased by 12.55% and 20.90% w.r.t. 2005-06.

Figure 11: Profitability Ratio

Profitability Ratio is the ratio of operating profit to Fixed Capital. The ratio shows how profitability buildup capital in an organization.

Table 10: Profitability Ratio

Year	2005-2006	2006-2007	2007-2008
Depreciation (Tk. in lakh)	18.19	17.03	16.34
Operating Profit (Tk. in lakh)	-142.83	-82.47	-12.55
Operating Profit Fixed Capital (Taka)	-7.83%	-4.52%	-0.68%
Operating Profit Sales (Taka)	-53.43%	-29.58%	-3.91%
Sales Fixed Capital (Taka)	0.15	0.15	0.18

The Table 10 shows that operating Profit Margin is lowest in 2005-06.

8.2 Pharmaceutical Industry

Survey results of five pharmaceutical Industries of year 2006-07 to 2009-10 have been analyzed. Base year is 2006-07. Analyses were carried out on the following parameters: Value addition, Labour productivity on value addition, capital productivity, salary/wage ratio on value addition, comparison of cost associated with productivity, competitive labour cost and measurement of profitability.

Table 11: Comparative Data on Value Addition of Selected Industries

(Taka in Lakh)

Name of Organizations	Year				Average
	2006-07	2007-08	2008-09	2009-10	
Reneta Ltd.	9433.00	11132.00	13402.00	16797.00	12691.00
Beximco Pharmaceutical Ltd.	19024.00	16875.00	22105.00	32139.00	22535.75
Ibn Sina Pharmaceutical Ltd.	6855.19	8875.19	10767.61	13438.85	9984.21
Orion Infusion Ltd.	1421.14	1848.17	1722.34	1699.98	1672.78
Becon Pharmaceutical Ltd.	652.23	1712.75	3012.41	4684.05	2515.33

Table 12: Comparative Data on Labour Productivity of Selected Industries

[Labour Productivity=Value Addition/Total manpower]

(Taka in Lakh)

Name of Organizations	Year				Average
	2006-07	2007-08	2008-09	2009-10	
Reneta Ltd.	5.91	6.45	6.06	6.29	6.19
Beximco Pharmaceutical Ltd.	7.92	7.07	9.57	12.79	9.34
Ibn Sina Pharmaceutical Ltd.	5.89	6.15	4.89	6.11	5.76
Orion Infusion Ltd.	1.90	2.14	1.92	1.86	1.95
Becon Pharmaceutical Ltd.	0.58	1.54	2.72	4.33	2.29

Table 13: Comparative Data on Capital Productivity of Selected Industries

[Capital Productivity=Value Addition/Total Capital]

(Taka in Lakh)

Name of Organizations	Year				Average
	2006-07	2007-08	2008-09	2009-10	
Reneta Ltd.	1.29	1.01	0.85	0.79	0.91
Beximco Pharmaceutical Ltd.	0.22	0.19	0.19	0.25	0.21
Ibn Sina Pharmaceutical Ltd.	3.13	3.44	3.23	3.10	3.21
Orion Infusion Ltd.	0.52	0.73	0.43	0.43	0.51
Becon Pharmaceutical Ltd.	0.04	0.09	0.11	0.19	0.12

Table 14: Percentage of Profit with Respect to Value Addition

[Percentage of Profit=(Profit/Value Addition × 100)]

Name of Organizations	Year				Average
	2006-07	2007-08	2008-09	2009-10	
Reneta Ltd.	15.35%	8.39%	(7.63)%	20.21%	9.36%
Beximco Pharmaceutical Ltd.	50.58%	42.57%	48.46%	54.47%	43.99%
Ibn Sina Pharmaceutical Ltd.	71.57%	71.79%	70.74%	70.63%	71.08%
Orion Infusion Ltd.	(35.72)%	(26.37)%	(41.44)%	(55.89)%	(39.74)%
Becon Pharmaceutical Ltd.	63.96%	32.40%	27.19%	36.10%	39.91%

Table 15: Comparative Data on the Ratio of Productivity Relevant Expenditures to Manpower of Selected Industries

[Per Capita Labour Cost=Salary & Wage/Total Manpower]

(Taka in Lakh)

Name of Organizations	Year				Average
	2006-07	2007-08	2008-09	2009-10	
Reneta Ltd.	1.98	2.13	1.92	1.98	1.99
Beximco Pharmaceutical Ltd.	2.05	2.22	2.56	2.70	2.38
Ibn Sina Pharmaceutical Ltd.	1.44	1.49	1.25	1.59	1.44
Orion Infusion Ltd.	1.90	2.15	1.92	1.86	1.95
Becon Pharmaceutical Ltd.	0.23	0.50	0.63	0.67	0.51

Table 16: Competitive Labour Cost Ratio of the Selected Industries

[Competitive Labour Cost=Value Addition/Labour Cost]

Name of Organizations	Year				Average
	2006-07	2007-08	2008-09	2009-10	
Reneta Ltd.	2.98	3.02	3.14	3.16	3.19
Beximco Pharmaceutical Ltd.	3.86	3.19	3.74	4.74	3.93
Ibn Sina Pharmaceutical Ltd.	4.06	4.10	3.89	3.82	3.94
Orion Infusion Ltd.	2.27	2.28	1.79	1.58	1.92
Becon Pharmaceutical Ltd.	2.51	3.08	4.27	6.24	4.43

9.0 Recommendations

Although TFP more accurately measures how efficiently an economy utilizes its factor inputs, labor productivity and its drivers are of interest not least because of the close link to GDP per capita. Within the same growth accounting framework, average labour productivity growth at the aggregate level can be broken down into effects of capital deepening (as measured by the capital input per hour worked), which reflect the capital-labour substitution, and of TFP. In other words, these factors are key in fostering labour productivity. So measures are to be taken to augment these factors for the growth of labour productivity.

In the enterprise/firm level, the following measures are generally to be taken to enhance the productivity:

1. Efforts & measures are to be taken so that productivity can be raised and proliferated continuously in the industry. For this purpose, the management personnel of the industry must be fully conversant possessing appropriate knowledge about the necessity of productivity. At the same time, the CBA or labour association / organization and the employees of the industry must be fully aware about the inevitability and benefits of productivity and they should be persuaded and motivated so that they participate in the programs and activities pertaining to the development of productivity.
2. After measuring productivity parameters in regular intervals, the hurdles and hindrances in the way of productivity enhancement to be identified and measures to be taken to mitigate these hurdles.
3. In order to conduct productivity enhancement activities in a well planned manner, 'Productivity Development Cell' to be formed in all factories and industries. The activities and action plan of this cell can be as follows:
 - a) To measure productivity of the industry on monthly or yearly basis.
 - b) To identify the hindrances of productivity development and to take measures how these hurdles can be removed.
 - c) Monthly meeting to be arranged to undertake & implement various programs pertaining to productivity enhancement.
 - d) In order to augment awareness about the productivity among the officers, employees and workers, training programs, workshops, seminar, symposium and focus group discussion meetings (FGD) to be arranged regularly.
 - e) It is needed to ensure higher efficiency, capability and quality of machinery & various facilities of the industry for productivity enhancement.
 - f) To observe productivity month one time per year.

- g) To ensure appropriate use of raw materials, energy and manpower to the highest level.
- h) To ensure reduction of production cost and make it as low as possible.
- i) In order to increase productivity, good relationship among the management, employees and workers to be ensured.

Experience of different countries suggests that capital deepening is an accompanying process of rapid economic development. Labour productivity growth can be decomposed into contributions from capital deepening and TFP growth. Capital deepening should raise labour productivity, all other things being equal, generally explaining 50% of it. So measures to be taken in Bangladesh to go for more rapid capital deepening for rapid economic development. On the other hand, concerted effort to be undertaken to increase capital intensity at the subsequent stages specially in the thrust sectors of the country.

* Director (Head)
Institute of Appropriate Technology
Bangladesh University of Engineering and Technology (BUET)
Dhaka-1000

Productivity depends on Service Quality