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**Total Labor Force and GDP of
Bangladesh: An analysis in between the
year 2002-2009**

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Analysis Research Paper

Total Labor Force and GDP of Bangladesh: An analysis in between the year 2002-2009 and Establish the theory $GDP=f(LF)$

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Table of Contents

Part A:

1. Title Page	1
2. Abstract of Paper	3
3. Acknowledgement	4
4. Objectives of this analysis study	5
5. Methodology	6

Part B:

6. Definitions of Terms and Introduction	7
6.1. An overview on Bangladesh Economy	8-9
6.2. Analysis part of Labor Force and GDP	10-18
6.3. Correlation Interpretation	17
6.4. Findings of the Analysis	18
6.5. The Theory of Individual LF contribution	19-20
6.6. Findings of the Study	20-21
6.7. Conclusion	21
6.8. Recommendation to Utilize Unemployed LF	22-25

Part C:

7. References	26
8. Feedback and Comments Requesting Page	27

Abstract

In this simple analysis study author took the Data on Labor force and GDP in the years of 2002-2009 of Bangladesh and found the correlation between Labor force and GDP. After analyzing the Data set the correlation coefficient (on overall volume) value is being found that $r=0.96$, that means there is a strong positive relationship between x (Labor Force) and y (GDP). Besides that Correlation coefficient (On Growth Rate) value is being found $r=0.19$, that means LF couldn't influence on GDP properly (all LF were not employed) and also taking into consideration that factors of GDP constant, but still there is a positive relationship between LF and GDP. After that by the theory of Individual Labor Force Contribution in GDP (ILFCin GDP²) it is established that GDP is Proportional to Laborforce [That means $GDP=f(LF)^3$] by analyzing UK⁴ and Bangladesh's ILFCinGDP values between the year 2002-2004. It is seen that the tendency of ILFCinGDP is increasing year by year. That means when LF rise then the GDP also rises. Then author gave some recommendation to increase the GDP by utilizing the LF in the context of Bangladesh also in context of the whole world

² ILFCin GDP= Total GDP in a Year/Total Labor Force in a Year

³ Considering all other factors of GDP constant

⁴ Randomly selected.

Acknowledgement

I am very much thankful to my Teacher, philosopher and mentor Chandan Kumar Sarker(BSc, MSc in Economics from Calcutta University) to show me the right way to do a successful research and for his valuable guideline and advices.

Objectives of this Analysis Study

1. To find out correlation between Labor Force and GDP. by analyzing the data from 2002 to 2009 of Bangladesh.
2. .Establish The Theory of Labor force and GDP i.e $GDP=f(LF)$ by the concept of ILFCinGDP⁵
3. To recommend some policy to Increase the GDP by proper using of Labor force in context of Bangladesh and also whole world.

⁵ ILFCinGDP is a concept of the Authore,Authore tried to related the relation between LF and GDP by this concept.

Methodology

Data on Labor Force and Gross Domestic Product of Bangladesh from the year 2002-2009 are collected from Data Bank of World Bank. All data are secondary Data and collected from reliable sources. Analyze like Correlation of coefficient (On overall volume and Growth Rate) are calculated on the formula of Pearson correlation coefficient.. Data are analyzed only for find out the relation between Labor Force and GDP by Correlation coefficient(r) .Unemployment rate is not in consideration and all the other factors of GDP are constant.

Definitions

Labor Force⁶: In official U.S statistics, that group of people 16 years of age and older who are either employed or unemployed. (P.A Samuelson & W.D Nordhaus, Economics, 19th Edition)

GDP: Gross domestic product (GDP) refers to the market value of all final goods and services produced within a country in a given period. (wikipedia.org)

Introduction

A short overview on Bangladesh⁷: Bangladesh is a South Asian Country besides India. It is small country; area is only 1, 47570 square kilometers but having a huge population 142.319 million people(2011 est.) ranked 9th ,

⁶ Group of People aged 16 years and above

⁷ source: CIA world Fact Book and wikipedia.org

964.42 per square kilometer (9th).HDI rank is 146th in 2011⁸. high poverty rate is in Bangladesh although United Nation has acclaimed Bangladesh for achieving a tremendous progress in Human Development.

An Overview on Bangladesh Economy⁹: Bangladesh is Developing country and ranked a third world country .However Bangladesh gradually decreased its dependency on foreign grant and loan from 85%(in 1988) to 2 % (in 2010) for its annual development budget. Its per capita income in 2010 was US\$ 641 compared to the world average of \$8985.Bangladesh Economy is 44th largest economy in the world at US\$257 billion according to World Bank. Some Economic Factors are given Bellow¹⁰.

Item	In Year 2010 (Dollar are as per in 2011)	Remarks
GDP (Purchasing Power Parity)	US\$ 265.7 Billion(est.)	
GDP Real Growth Rate	6.4% (est.)	

⁸ Human Development Report 2011,by UNDP

⁹ Source: CIA World Fact Book and wikipedia.org

¹⁰ Source: CIA World Fact Book

GDP Per Capita	US\$ 1600	
Unemployment Rate	5.1% (est.)	
Population Bellow Poverty Line	31.5% (est.)	
Public Debt	35.4% of GDP (est.)	
Inflation Rate (consumer Prices)	801% (est.)	
Exports	US\$ 19.24 Billion (est.)	
Imports	US\$24.72 Billion (est.)	
Reserve of Foreign Exchange and Gold	\$11.18 billion (31 December 2010 est.)	
Exchange Rate	69.65 (2010 est.)	taka (BDT) per US dollar

Analysis Part of Labor Force and GDP¹¹ (Current US Dollar)

In this part the analysis between Labor Force and Gross Domestic Product of Bangladesh in year 2002-2009 are given and also the Correlation coefficient

Tabular Analysis

Table1: Labor Force and GDP Quantity

Year	Labor Force	In US Million \$	GDP(in Current US\$)¹²	In US Million \$
2002	60,765,813	60.765	47,571,130,271	47571.130
2003	62,457,477	62.457	51,913,661,485	51913.661
2004	64,017,314	64.017	56,560,744,012	56560.744
2005	65,513,221	65.513	60,277,560,976	60277.560

¹¹ Data source: **World Bank Data Bank**

¹² Data are in current U.S. dollars. Dollar figures for GDP are converted from domestic currencies using single year official exchange rates. Data are collected on 20th February 2012. Source: World Bank Data Bank

Year	Labor Force	US Million \$	GDP(in Current US\$)¹³	In US Million \$
2006	66,835,498	66.835	61,901,116,736	61901.116
2007	68,087,284	68.087	68,415,421,373	68415.421
2008	69,312,817	69.312	79,554,350,678	79554.350
2009	70,773,870	70.773	89,359,767,442	89359.767

¹³ Data are in current U.S. dollars. Dollar figures for GDP are converted from domestic currencies using single year official exchange rates. Data are collected on 20th February 2012. Source: World Bank Data Bank

Table 2: Growth Rate of Labor Force and GDP

Year	Labor Force	Growth Rate (X)	GDP(in Current US\$) ¹⁴	Growth Rate ¹⁵ (Y)	Difference between Growth Rate of LF and GDP(X-Y) ¹⁶ (Z)	Elasticity ¹⁷ (Y/X)
2002	60,765,813	n/a	47,571,130,271	n/a		-
2003	62,457,477	2.783	51,913,661,485	9.128	6.345(+GDP)	3.343
2004	64,017,314	2.497	56,560,744,012	8.951	6.454(+GDP)	3.584
2005	65,513,221	2.336	60,277,560,976	6.571	4.235(+GDP)	2.812

¹⁴ Data are in current U.S. dollars. Dollar figures for GDP are converted from domestic currencies using single year official exchange rates. Data are collected on 20th February 2012. Source: World Bank Data Bank

¹⁵ Growth Rate = Actual change/Base year Value * 100 (the difference between two year expressed in percentage)

¹⁶ Difference between Growth Rate in % of LS and GDP are calculated by Large Value-Small value= (+large value) Note That Here Y Value is Large so Z is dominated by Y(indicating by + sign)

¹⁷ Interpretation of elasticity: If value of Elasticity >1, then if variable x change, variable y will be changed positively, that means there is positive relationship between variable x and y.

Year	Labor Force	Growth Rate % (X)	GDP(in Current US\$) ¹⁸	Growth Rate % (Y)	Difference between Growth Rate of LF and GDP(X-Y) ¹⁹ (Z)	Elasticity (Y/X)
2006	66,835,498	2.018	61,901,116,736	2.693	0.675(+GDP)	1.334
2007	68,087,284	1.872	68,415,421,373	10.523	14.482(+GDP)	5.621
2008	69,312,817	1.799	79,554,350,678	16.281	14.482(+GDP)	9.050
2009	70,773,870	2.10	89,359,767,442	12.352	10.252(+GDP)	5.881

¹⁸ Data are in current U.S. dollars. Dollar figures for GDP are converted from domestic currencies using single year official exchange rates. Data are collected on 20th February 2012. Source: World Bank Data Bank

¹⁹ Difference between Difference in % by year of LS and GDP are calculated by Large Value-Small value= (+large value) Note That Here Y Value is Large so Z is dominated by Y (indicating by + sign)

Graphical Representation of Tabular Analysis

Fig 1: Labor Force in the years from 2002 to 2009

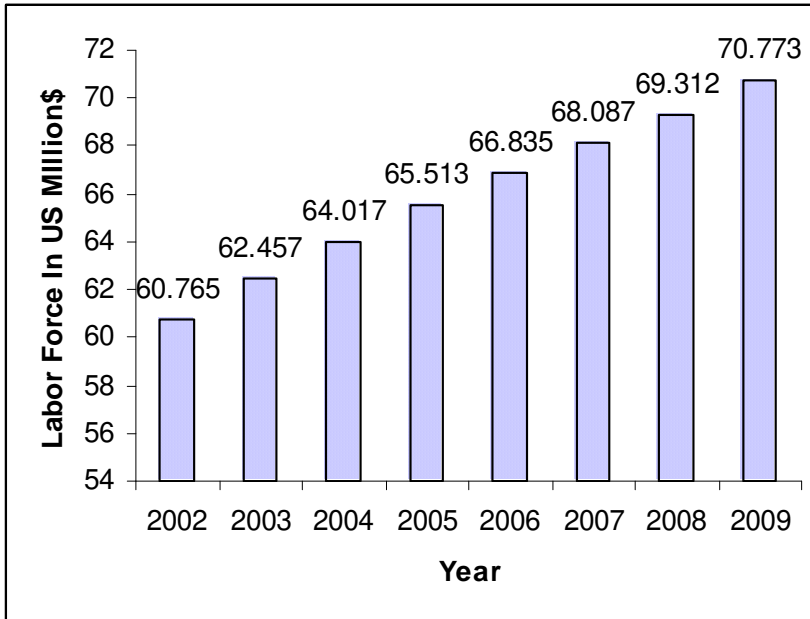


Fig 2: GDP Quantity in the years from 2002 to 2009(US Million Dollar)

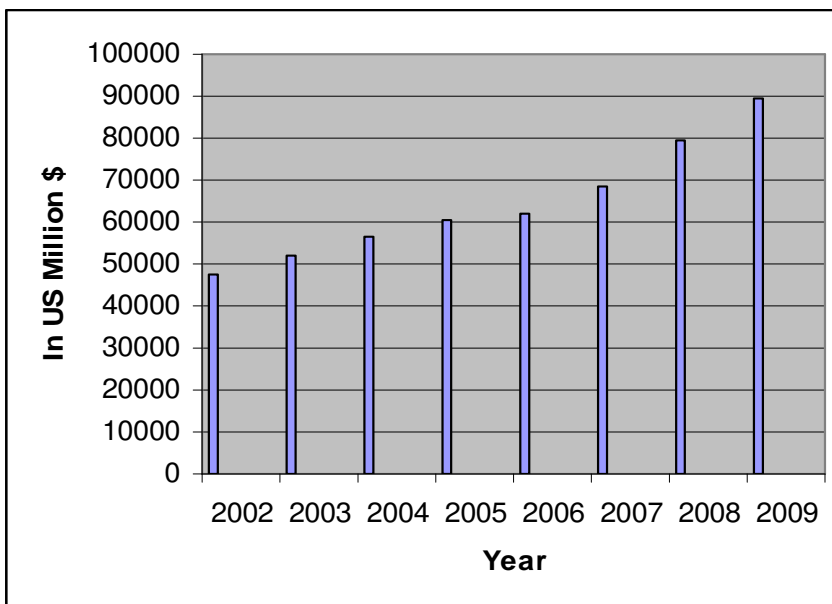
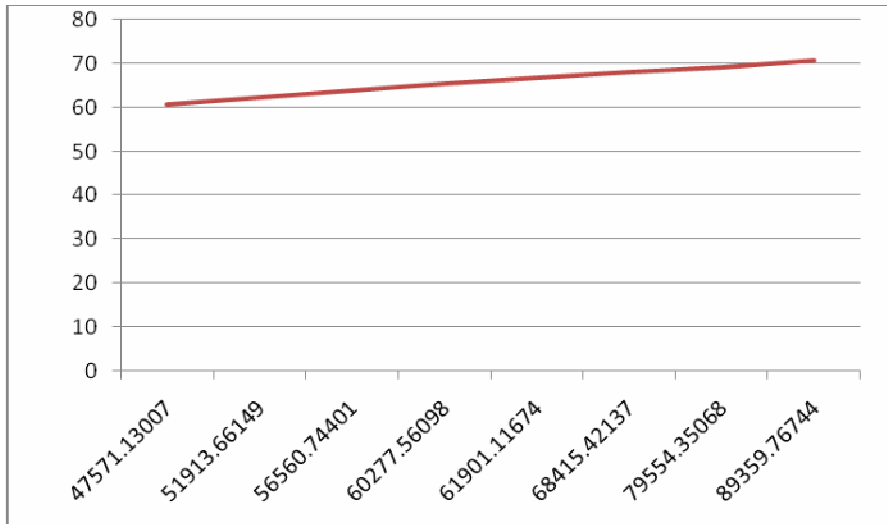
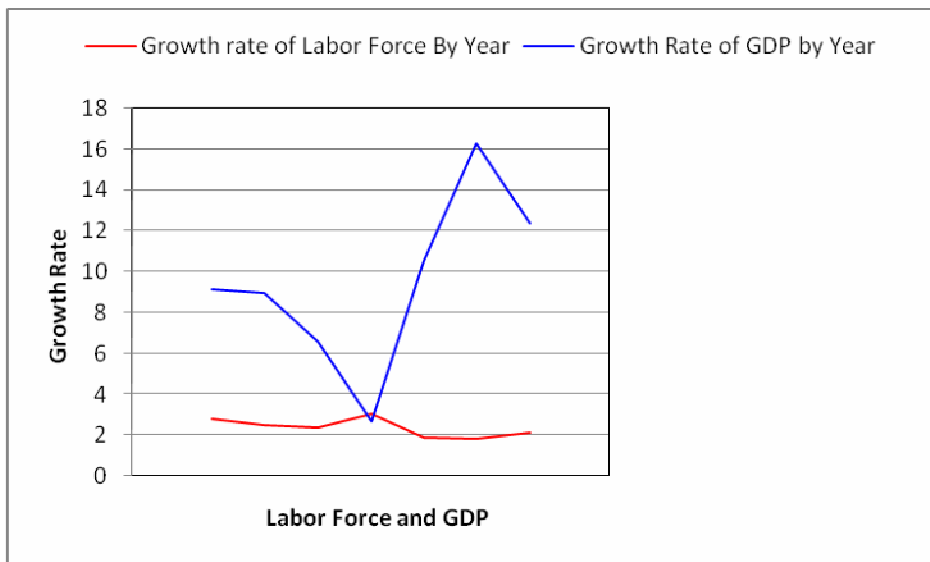


Fig 3: Relation between LF and GDP



In the above figure, x axis is dominating GDP in US Million \$ and y axis Dominating LF in Million.

Fig 4: Relation between Growth Rate of LF and GDP



The growth rate changes of GDP and LF are not flow with same direction(like when Growth rate of LF rise then Growth Rate of GDP are not rise) because the Data consider all factors of GDP but here we only consider LF influence on GDP, that's why the Growth rate pattern are not in same type.

Correlation between Labor Force and GDP (on overall volume): Labor

force data are in Million quantities and GDP are in US Million Dollar

Labor Force(x)	GDP(y)	$x_i - \bar{x}$ (A)	$y_i - \bar{y}$ (B)	$(x_i - \bar{x})(y_i - \bar{y})$ (C)=A*B	$(x_i - \bar{x})^2$ (D)=(A) ²	$(y_i - \bar{y})^2$ (E)=(B) ²
60.765	47571.13	5.204875	16873.09238	87822.33668	27.09072	284701246
62.457	51913.661	3.512875	12530.56138	44018.29579	12.34029	157014968
64.017	56560.774	1.952875	7883.448375	15395.38925	3.813721	62148758.3
65.513	60277.56	0.456875	4166.662375	1903.643873	0.208735	17361075.3
66.835	61901.116	0.865125	2543.106375	2200.104903	0.748441	6467390.03
68.087	68415.421	2.117125	3971.198625	8407.523889	4.482218	15770418.5
69.312	79554.35	3.342125	15110.12763	50499.93529	11.1698	228315957
70.773	89359.767	4.803125	24915.54463	119672.4753	23.07001	620784364
Total	527.759	515553.779		325519.4951	82.92394	1392564178
Mean	65.969875	64444.22238				

Here, Mean of x = $\sum x_i / 8$

$$= 65.969$$

Mean of y = $\sum y_i / 8$

$$= 64444.222$$

$$r = \frac{\sum C}{\sqrt{(\sum D * \sum E)^{20}}}$$

$$= \frac{325519.495}{339817.008}$$

$$= 0.957$$

=.96(Strong Positive Relation)

²⁰ r is refers to correlations coefficient, which mentioned in the methodology part.

Correlation Interpretation²¹: So. $r=0.96$ which is Positive and very near to +1, so there is a strong Positive relationship between variable X(Labor Force) and GDP(Y) in between year of 2002 to 2009 in Bangladesh.

Correlation between LF and GDP (Growth Rate):

Growth Rate of LF	Growth Rate of GDP	$x_i - \bar{x}$ (A)	$y_i - \bar{y}$ (B)	$(x_i - \bar{x})(y_i - \bar{y})$ (C)	$(x_i - \bar{x})^2$ (D)	$(y_i - \bar{y})^2$ (E)
2.783	9.12	0.582286	-57.371	33.4063137	0.339057	3291.432
2.497	8.951	2.497	0.54771	1.36764257	6.235009	0.299991
2.336	6.571	2.336	6.571	15.349856	5.456896	43.17804
2.018	2.693	2.018	2.693	5.434474	4.072324	7.252249
1.872	10.523	1.872	10.523	19.699056	3.504384	110.7335
1.799	16.281	1.799	16.281	29.289519	3.236401	265.071
2.1	12.352	2.1	12.352	25.9392	4.41	
Total	15.405					
Mean	2.200714286	9.498714286		60.9381487	27.25407	3717.966

Here, Mean of $x = \sum x_i / 7$

Mean of $y = \sum y_i / 7$

Correlation coefficient = $\sum C / \sqrt{(\sum D * \sum E)}$

= 0.191 (Positive Relationship)

²¹ If $r=+1$ there is a perfect relationship between variables, if $r=-1$ there is a negative relationship between the variables, if $r=0$ there is no relationship between variables, if $r=$ positive value and very near to +1 (above .50 but less than 1) there is a strong positive relationship between variables and if $r=$ negative value and near to -1 there is a negative relationship between the variables.

Correlation Interpretation(Growth Rate): Due to take consideration of GDP's all factor constant that's why by this Correlation coefficient we get $r=0.19$, that means only positive relationship between LF and GDP. Before we got $r=.96$ and now we got $r=0.19$ because LF not fully (all LF are not employed) and not alone influence the GDP, but still we can see that there is a positive relationship between LF and GDP i.e. when LF rise then GDP obviously rise.

Findings of the Analysis: so. We can see that the $r(\text{overall volume})=0.96$ and $r=.19(\text{on growth Rate})$ it refers a strong positive relationship and positive relationship accordingly between Labor Force and GDP and so after the analyzed the Data in 2002-2009 of Bangladesh, GDP (considering all other factors constant) is influenced by Labor Force that mean if labor force rised than the GDP also rise and other hand if any reason the Labor Force decline in future than the GDP of Bangladesh will also decline.

The theory of GDP is Proportional to Labor Force(considering all othre factors of GDP constant):

I can reach this hypothesis that $GDP = f(\text{Labor Force})$, that means if Labor force rises than the GDP will also rise. A simple example of that theory is given bellow by a new theory that Individual Labor Force Contribution in GDP.

$ILFC \text{ in } GDP^{22} = \text{Total GDP} / \text{Total Labor Force}$

Table 3: LF and GDP Data from 2002-2004

	Bangladesh		United Kingdom	
Year	LF	GDP(in current US\$)	LF	GDP
2002	60,765813	47,571,130,071	29,602052	1,612,056,354,916
2003	62,457,477	51,913,661,485	29,856500	1,860,809,795,918
2004	64,017,314	56,560,744,012	30,090722	2,202,490,021,605

Analysis ILFC in GDP of Bangladesh:

²² ILFC is a concept by the Author

ILFC in GDP of 2002= $47571130071/60765813 = 782.86$ US \$

ILFC in GDP of 2003= $51913661485/62457477 = 831.18$ US \$

ILFC in GDP of 2004= $56560744012/64017314 = 883.52$ US \$

Analysis ILFC in GDP of United Kingdom:

ILFC in GDP of 2002= $1,612,056,354,916/29,602052 = 54457.588$ US \$

ILFC in GDP of 2003= $1,860,809,795,918/29,856500 = 62325.11$ US \$

ILFC in GDP of 2004= $2,202,490,021,605/30,090722 = 73194.987$ US \$

So, we can see here that the both countries' a Individual Contribution increases year by year with the same flow of Increasing LF. That means an Increasing amount Labor Forces Labor contributed more in GDP. so, we can establish this equation that **GDP is Proportional to LF.**

Findings of this analysis Based Paper: After analyzing the Data of LF and GDP in the years 2002-2009 of Bangladesh we got $r=.95$ that refers that there is a strong positive relationship between LF and GDP. Besides that Correlation coefficient (On Growth Rate) value is being found $r=0.19$, that means LF couldn't influence on GDP properly (all LF were no employed) and also taking into consideration that factors of GDP constant, but still there is a positive relationship between LF and GDP. So, at last the analysis we can establish this hypothesis that there is a positive relationship between LF and GDP between. Derived this result by getting the

values of ILFCinGDP of UK and Bangladesh of the years 2002-2004 we can see that $GDP=f(LF)$, i.e. considering all the factors of GDP constant if LF rise then GDP rise and also if LF declines then GDP also declines.

Conclusion: There is a positive relationship between LF and GDP in Bangladesh after analyzed the data of the years 2002-2009, so can build this hypothesis that there was a positive relationship, also in today and in future will be. In the theory part (at page 18) we saw that the $GDP=f(LF)$, this hypothesis is not only true for Bangladesh which this study shown but also for the others country in the world. Every country's economy experience this theory. So, it depends on the countries how they can utilize LF for more GDP, here are some tips or steps to gain more GDP by proper using of LF .

Recommendation:

Some recommendation for the better utilization of LF in context of whole world:-

- Create employment opportunities especially for the teen age people who turned 16 and more. (in Bangladesh people work after turned 18 on an average but in developed country teenage people start working at the age of 16), so if we utilize a huge portion of total population consisting this age group 16-20 we can get more benefit, but this age group people find difficulties to work with the adult People because they are very tender in mind, in experience, in knowledge. So, they should work in any specific place where all the people are in same age group (but not the Administration), then they will give proper labor efficiency. some example of specific working places for the 16-20/22 age group people are given below:-

- ✓ **Special Academic Help centre** for Academic Purpose for the Students (any students can come but the centre will run by our age group (16-20/22) people. This Academic Help Centre will give solution for academic difficulties with Math, English or any other Hard subjects, solution for depression regarding success in School/life (it really works, tender age people can understand better of their age

people, and give some advices to overcome the problem by the succesfull teenage personalities).Factors regarding this type of centre:-

Location: Can be located in all state/province/District in a Country, also in remote rural area where talented young people can help the village students.

Financing: This centre will be finaced by the Sate government (Principal Government).

Fess to Getting hel from this centre: No fess for the students.

Wage for the Centre's employees: wage will be varied, Head of the authority will get more and all other teenage employees will get the same wage.

Working Hour: Teenage people can work here by sift system, every shift will be long as 3 Hours, Staring time of centre is 8 AM and Closing hour 8 PM, so there are 4 shifts.

- ✓ **Especiall Large Book shops** for the students where our age group²³ can work by the same shifting, wage system what discussed very early in this section.

²³ 16-20/20 age Group Labor Force

- ✓ **Especial Training centre for our age group** to train them for enter into a professional working environment where they will work with the adult people.

Training Centre for Fresh Graduate: The graduate faces the most difficulties to find jobs and they remain unemployed some time due to lack of job opportunities, experience etc. so, some especial Training Centre can be established to train them for utilizing this age group (generally 20-28, depends on country, higher study duration) LF.

Some Recommendation for proper utilization of LF in the context of Bangladesh:

- ✓ All the recommendation given above²⁴ can also be followed in Bangladesh
- ✓ In generally people do work after the age of 18-20, so they waste their valuable Labor efficient age without work, so should be trained to get some specific jobs.
- ✓ The unemployment rate is very high in bangladesh, 5%²⁵ (2011 est.) that means 3.77 million of people are unemployed out of 75.42 million Labor force. Government should give some employment opportunity otherwise

²⁴ Recommendations stated in the section of Recommendation in context of thw world

²⁵ Data Source: Wikipedia.org

Valuable Labor Efficiency Hour of an Individual will be lost that can not be regainable. Some employment opportunity possibilities by government are given below:

- Especial Training and Help centre regarding employment, career guideline and Psychological Counselling for the Unemployed People so that the unemployed people don't give up their hope (sometimes commit suicide under social pressure), utilize their unemployed time by self-employment etc.

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I hope that researchers and Economists all over world would get some of benefit by studing this paper. If any of them get some knowledge through my paper then my work will be succeded.

I hope that researchers will give feedback and comments on my research paper so that I can make good reports in future. Please give feedback and comments in given address:

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Thanks to studied my Paper.