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Hossine Sharif, Sajjad

Independent University, Bangladesh

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The Role of Telecommunication over the Economic Development of Bangladesh

Sajjad Hossine Sharif

Independent University, Bangladesh

Abstract: Telecommunication, as gift of modern science is largely different from any other traditional infrastructure. From international market to domestic market, corporate communication to personnel communication, telecommunication is the prime way to maintain the continuous and instantaneous flow of sharing information. From business perspective of economic activities of modern world, through the communication channel telecommunication not only has significant influences over the economy in term of GDP per capita but also serve many people by creating job opportunities. Hence increasing employment rate may also another significant factor to enhance economic development. Investment in infrastructural development and earned revenue may have strong impact on the GDP per capita in an economy. As a result, for the potential role of the telecommunication, a modern world as well as economy without telecommunication cannot be thought for one moment. This paper is a devoted best effort to find the relationship between telecommunication and Bangladesh economic development. To analyze this context more extensively and reliably, this paper fundamentally focuses on the relationship between various variables under the construct of telecommunication and the economic development. To define this construct into more concrete way several multiple simpler variables are implemented such as teledensity, investment in telecommunication industry, revenue contribution percentage of GDP, GDP per capita, employment rate etc through OLS regression models associated with least square method. This paper indicates telecommunication industry has a significant and positive impact over the economic development of Bangladesh.

Keyword: *Telecommunication, GDP, Teledensity, Investment in telecommunication, Revenue percentage of GDP, Employment rate.*

1. Introduction:

The telecommunication industry around the world achieved a dramatic growth of advancement since 1980s. Since then, first the developed countries around the globe began to make improvement in telecommunication technology to maintain a continuous flow of communication which eventually intensifies their economic activities by providing a more developed platform of communication. On the other hand, developing countries also took initiative when it becomes prudentially evident that the role of telecommunication over the economic development is significant. As a part of the initiatives, privatization of telecommunication sector was one of the best effort that was taken by almost every developed and later on by developing counties. As the adoption of telecommunication technology around the world is more than ever Harald and Pantelis (2010) postulated that over the last three decades mobile telecommunication industry has rapidly grown around the world. They also argued that the positive influence of telecommunication technology is more associated with developing countries with a subscription of 3.2 billion as in developed countries the subscription is only 1.4 billion. Gruber and Verboven (2001) argued that impact of the telecommunication investment has significant level of positive impact on the macro economical dimension of a country. Mobile phone penetration is one of the major reasons behind this investment which eventually contribute towards the economic development. Jotischky (2010) argued that telecommunication operators invest in the development of network in Africa which actually ensures the benefit would be enjoyed across the continent. As a mandatory and progressive part of modern telecommunication, internet is becoming a prerequisite in the development for any economy. This argument is also supported by Jensen (2007) by claiming that the fishermen of India are utilizing internet to get the information and location about that market which offers the highest price for their products. As a result, the possibility of positive impact of internet over the economic development is endless. Moreover, internet as a crucial tool of telecommunication technology has significant impact on economic development as bank, stock market, insurance company, mutual fund, corporate offices all of their transaction flow,

accounts and documents largely rely on internet directly. As the role of telecommunication over economic development is worldwide accepted without hesitation, Tella and Ahamefule (2002) claimed that communication tools such as telephones, mobiles, and internet are becoming the prerequisite for economic success and personnel achievement.

This research paper will investigate whether there is any significant relationship really exists between telecommunication and economic development of Bangladesh. To find the answer this paper will analyze 41 years telecommunication and economic data through multiple OLS regression models based on only Bangladesh perspective. It should be noted that with other variables which are not considered in this paper, different established regression models might give different complex findings. Moreover, the telecommunication impact over the economy also depends on the duration of telecommunication industry's presence in a country and the economic status of that country.

2. Literature Review:

The role of telecommunication in the economic development attracted attention of many researchers for many years. Hardly (1980), Lichtenberg (1995), Greenstein and Spillar (1996) and Norton (1992) all of them attempted to examine the telecommunication impact over the economic development and all of them confirmed that there is strong positive relationship exists between telecommunication and economic development of a country. By examining the period of 8 years of 24 countries Azim and Mahmood (2008) found that telecommunication development has a strong positive influence towards the GDP. Kateja and Jha (2008) investigated that there is a casual relationship between the continuous development of telecommunication and economic growth of India. They claimed that telecommunication is extraordinarily different from other infrastructure. As a result, it has positive and compulsory significant influence over the economic development.

As an imperative element of telecommunication, teledensity and its impact over the economy was investigated by conducting a comprehensive study in Iran based on the data from 1960s to 2012, Sadr et al., (2012) found that there is a positive relationship between GDP and telephone density. Jhunjhunwala (2000) revealed that the teledensity in the developing country is low because of the higher cost of providing telecommunication service. In the developed countries more than 90 percent household can easily enjoy the telecommunication service because of their higher purchasing power. Compared to that statistic in India, only 6 percent household has the capability to bear such a higher expenditure for the telecommunication service. On the other hand, Jain and Sridhar (2003) argued that the higher cost of providing telecommunication service to the general people can be significantly reduced in long term by using wireless technologies. In another interesting study, Waverman and Fuss (2005) found that telecommunication have positively significant impact on the growth of an economy. Based on this study another truth is also revealed that the impact of telecommunication on the economic growth in the developing countries is two times larger than developed country. Ross (1999) proved that privatization of telecommunication industry is significantly and positively related to the growth of teledensity which in return has significant impact on the economic development through network expansion and the improvement of the quality of network. Garreau (2008) proved that telecommunication reduces poverty as around the world. He also argued that teledensity has achieved an impressive growth around the globe where number of activated mobile phone is more than 3.3 billion while the total population of the earth is 6.6 billion. Patel et al., (2007) also proved that in China there is rapid growth of mobile phone subscription. In 2003 it was 21 percent while in 2005 it was 38 percent and in 2006 it was 49 percent. The subscription numbers was increased to double percentage within three years.

In an empirical study Shiu and Lam (2007) found that there exists unidirectional causal relationship between telecommunication investment and economic development in those countries which have a lower income level. This result expresses that if the investment in the telecommunication investment is reduced then there is a small or no impact on the growth of the economy. Opposed to the results of this study, based on the data of 45 countries Andrew Hardly (1980) postulated that in the developing countries the impact of telecommunication investment is way more significant than the most developed countries. Allenmen et al., (2002) also argued that telecommunication is accountable for the increasing demand for the input used in the production which eventually also increases the total national output. Sey and Adugu (2008) claimed that mobile phone is the prime form of communication in Ghana. They also argued that in the developing countries investment in the mobile phone sectors has a political as well as economic benefit. This is because cities are centre point for the commercial business, government activities, banks etc which required telecommunication services to link with other parties and offices. Ajboye et al., (2007), Geiger

and Mia (2009), World Bank (2007) found that it is the mobile phone actually creates high paying jobs as well as socio economic development in the developed and developing countries. Based on the research conducted by Horst and Miller (2009), Ito et al., (2005) in Israel they proved that the investment in wireless telecommunication technology has a profound and positive relationship with the economic development. Sullivan (2007), Kaul et al., (2008) and Knight and John (2008) postulated that in Bangladesh the initiation of Grameen village handset (GSM Handset) provided the opportunity to utilize the GSM Handset by accessing by the rural and local women entrepreneur. There is two way benefit of this initiation as the women are empowered and facilitated by the GSM Handset for being entrepreneur that results to make change in the socio-economic structure as well as the profit which is generated by the use of mobile phone can be used in other economic activities.

Deloitte (2008) reported revenue of the telecommunication operators has the significant influence over the GDP. Based on the taxation purpose Ovum (2006) also reported that mobile phone industry has contribution of 145 billion RS equivalent to 3.6 billion dollar by providing the taxation revenue towards the government. Again Deloitte also analyzed (based on the six countries: Bangladesh, Pakistan, Malaysia, Thailand, Ukraine and Serbia) and reported that government can captured the revenue directly from the mobile phone operations and services. As a result, mobile phone industry has the contribution of 26% revenue of the collection of total taxes and it rises to 29% if the regulatory fess which is mandatory to operate the business is included. Based on the study conducted in Egypt, Saudi Arabia and India Graber and Venkata (2013) claimed revenue from telecommunication service is the part of two or three percent of total GDP in those countries.

Bardan et al., (2007) argued that broadband internet is the key point of many crucial services as well as a prerequisite of innovation and worldwide growth. As a result accessing to the internet through broadband is the way to construct a knowledge based economy. Czernich et al., (2009) observed that the continuous advancement of internet has significantly positive relationship with the economic growth of all the OCED countries. Another interesting empirical study based on the shadow economy with a panel data of 152 countries over 9 years from 1999 to 2007 conducted by Elgin (2013) and he observed that there is relationship between internet usage and the size of a shadow economy which has influence over the GDP per capita. Nande and Saayam (2005) argued that internet usage has a strong influence over the tourism business of Africa. Weinhold (2004) found that internet is impelling the international trade of economy around the world. Koutroumpis (2013), Holt and Jamison (2009) Cette et al., (2005) Kim and Oh (2004) and Klein (2003) all of these scholars researchers argued that internet increase the number of output for the productivity which has a tremendous effects on the growth of economy. Lechman and Marszk (2015) proved that internet tremendously enhance the investment in the economy by promoting the exchange traded funds (EFT).

Katz and Koutroumpis (2012) observed that telecommunication is one of the most promising sectors for creating job opportunities. Between 2011 and 2012, in Senegal and Mali telecommunication sectors created 8,100 direct jobs and almost 152,000 indirect jobs. Osotimehin et al., (2007) and Stette (1999) explained that in the developed world most of the advanced countries have deregulated the telecommunication sector which actually allows more investment in telecommunication sector which in return enhance the advancement of telecommunication technology, growth in private sector development as well as more employment opportunities. Moreover, form another study based on the Nigeria, Jenny and Isac (2001) postulated that telecommunication is such a blessing which enable the day laborers to call to find job opportunities rather than making a trip worth of USD 40. Moreover, Tella and Adesoye (2007) opined that in Nigeria the mobile operators have tremendous significance in term of generating employment opportunities. The mobile telecommunication industry so far created 10,000 job opportunities where people are directly employed as well as 1,000,000 job opportunities where people are indirectly employed. Again Soyinka (2008) and Ndukwe (2008) opined that GSM business in Nigeria has a great contribution towards the economy in case of GSM card printing, distribution and recharge. These activities save almost 150 million dollars per month as well as provide job opportunities. Klonner and Nolen (2010) explained that the presence of mobile network has the ability to create new markets and services. For an example in South Africa the presence of mobile (GSM) network decrease the unemployment rate significantly. Batziillis et al., (2010) also explained that in Malawi because of the presence of mobile network the participation of female labor is increased.

Ovum (2006) opined that in India telecommunication industry has created 3.6 millions employments directly and indirectly and it is estimated that the growth rate of employment opportunities will be increased by 30 percent per year. By analyzing the data of 6 countries Deloitte (2008) reported that a mobile sector has greater contribution in case of employment. In Pakistan it has so far created 244,000 jobs and in Serbia it has created 36,000 job

opportunities. It also reported that limited employment opportunities are created by the mobile phone operators for themselves but they influence other sectors for jobs creations. Moreover, the jobs which are created in the mobile phone operators are highly paid jobs. The mobile economy GSMA (2014) reported that in 2013 in the Sub-Saharan Africa mobile industry created 2.4 million employments. Most of these jobs include distribution of retails services, selling recharge card and handsets. It proved that mobile network operation has a significant influence over the jobs creation. But it is also true that only 300,000 persons were directly employed by the mobile phone operators which are considered as high paying jobs. Again the mobile economy GSMA (2015) reported that in 2014 worldwide mobile operators created 12.8 million direct employments. Moreover 11.8 million jobs can be defined as indirect jobs. The accumulation of the direct and indirect jobs is 25 millions in 2014. Boateng and Yellen (2010) opined that the diffusion of mobile phone has greater influence over the job market with high paying and high quality jobs both in cities and rural areas.

Greenstein and Spiller (1995) observed that investment in the telecommunication infrastructure has a significant positive association with growth of employment rate in the United States. According to the Jamaican Ministry of Trade and Industry (2004), investment in telecommunication industry can boost the economy than any other sector. In Jamaica, the tourism sector which is considered as one of the largest business sector, contribute only 6 percent to the GDP with 200,000 employments. Compared to the tourism industry, the telecommunication industry also contributes to the economy by 6 percent with only 15,000 employments. Alleman et al., (2002) opined that investment in the telecommunication sector has a positive impact on the economy. It reduces the cost of production which enhances revenue. As a result, it eventually increases the employment rate of an economy. Ehsun (2011) observed that in Ghana investment in telecommunication increases the teledensity by expanding network which is one of the major reasons behind millions of new employments. In this way the productivity of Ghana increased but in other way the labor force is also becoming skilled. Aker and Mitbi (2010) claimed that in Kenya because of the investment in the mobile network the employment rate is increased by 130 percent from 2003 to 2007. Klonner and Nolen (2008) assessed that the presence of the mobile network is tremendously successful to create the formal or informal job opportunities in South Africa. The employment is increased by 15 percentages which the larger percentage rely on women employment.

Ding and Haynes (2003) argued that in developing countries telecommunication is a technological blessing as the telecommunication industry generates revenue by itself which enables the industry to create job opportunities. Zhara and Mahmud (2014) postulated that it is obvious that a telecommunication sector has an impact on the direct employment. But the larger effect relies on creating the indirect job opportunities with an establishment of call centers, customer cares, retail shops etc.

By using data of various municipalities of Germany through a simple OLS regression Czernich (2014) investigated that internet and unemployment has a negative relationship. Crandall et al., (2006) found that in USA employment of private sector is strongly and positively associated with broadband internet. Thru (2005) also reported that if the broadband penetration increased by 1 percent, employment rate also increased by 0.2 or 0.3 percent in per year. Because of the broadband internet penetration, in nonfarm private sector there will be 300,000 new jobs created which also indicates the broadband internet is more positively associated with private industry such as manufacturing, finance, education etc. Moreover, Deloitte (2012) reported that growth of internet subscription is accountable for 190,000 people to be employed in Australia. In another interesting study Mckinsey argued that internet is a powerful force that creates job opportunities. Though it makes some jobs abortive but the net amount of employment opportunities is increased by the internet subscriptions. Moreover, from a detail analysis conducted on the French economy Mckinsey opined that internet is accountable for destroying almost 500,000 jobs in last 15 years but it also accountable for creating 1.2 million new jobs. This result indicates internet generates 2.4 new jobs for each of jobs destroyed by internet subscription. Donner and Marsden (2011) explained that with the rapidly increased internet subscriptions the digital literacy is also increased. As a result, the high quality jobs which are listed online can be accessed and applied through internet.

By considering the above all discussions, arguments and counterarguments, this paper is primarily focused on the relationship between telecommunication and economic development. It should be noted that in various previous studies there found positive relationship between telecommunication and economic development such as Sridhar and Sridhar (2007) argued "*Development of ICT including telecommunication sector and their derived services provide significant benefits to the economy.*" As a result this research fundamentally focuses on Bangladesh telecommunication sector as prime subject to investigate and explore the relationship between telecommunication

and economic development in the light of previous research paper findings about the telecommunication role over the economic development.

3. Methodology:

With purpose of determining the relationship between telecommunication and economic development of Bangladesh this research paper intends to offer answering the following prime question.

1. Is there any significant relationship between telecommunication and economic development of Bangladesh?

Based on answering the prime research question and previously demonstrated discussions in the review of literature, the developed central hypothesis is as:

H1: There is significant relationship between telecommunication and economic development.

Against the null hypothesis which is there is no relationship.

3.1 Identifying Variables:

3.1.1 Dependent Variables:

GDP per capita: GDP per capita is the average income per person in a country. The formula is $\text{GDP per capita} = \frac{\text{Gross domestic products}}{\text{Total population}}$.

Employment rate: Employment rate can be defined as percentage of the labor force which is employed. It is one of the most vital economic indicators which is implemented to understand the state of the economy. Broadly speaking, the employment rate is a macroeconomic variable that indicates the labor force which is currently employed to the total working age population of specific region or country. It is calculated as $\text{Employment rate} = \left(\frac{\text{Labor force currently employed}}{\text{Total population}} \right) * 100$.

3.1.2 Independent variables:

Teledensity: It is the total number of telephone line which includes both fixed telephone line (PSTN) and wireless mobile in a region compared to the number of whole population in that same region.

Investment in telecommunication: The amount of money which is invested for the for both of the fixed telephone line and wireless mobile phone by the government and private sectors for infrastructural development and operations.

Revenue from telecommunication: The amount of revenues which is earned from the provision of telecommunication services by considering both the governmental and private telecommunication institutions.

Revenue percentage of GDP: It is the percentage contribution by the telecommunication industry through their revenue in the whole Gross domestic products.

Internet users: The total number of internet subscriptions or connections in a region compared to the number of inhabitants of the same region.

Through the identification of multiple simpler variables of telecommunication and economic development leads us to answer individual research questions:

1. Is there any significant relationship between teledensity and GDP per capita?

2. Is there any significant relationship between investment in telecommunication and GDP per capita?

3. Is there any significant relationship between telecommunication revenue and GDP per capita?

4. Is there any significant relationship between internet users and GDP per capita?

5. Is there any significant relationship between telecommunication revenue percentage of GDP and GDP per capita?

6. Is there any significant relationship between teledensity and employment rate?
7. Is there any significant relationship between investment in telecommunication and employment rate?
8. Is there any significant relationship between telecommunication revenue and employment rate?
9. Is there any significant relationship between internet users and employment rate?
10. Is there any significant relationship between telecommunication revenue percentage of GDP and employment rate?

These individual research questions lead us to individual test of following sub-hypotheses:

H1A: There is significant relationship between teledensity and GDP per capita.

H1B: There is significant relationship between investment in telecommunication and GDP per capita.

H1C: There is significant relationship between telecommunication revenue and GDP per capita.

H1D: There is significant relationship between internet users and GDP per capita.

H1E: There is significant relationship between telecommunication revenue percentage of GDP and GDP per capita.

H1F: There is significant relationship between teledensity and employment rate.

H1G: There is significant relationship between investment in telecommunication and employment rate.

H1H: There is significant relationship between telecommunication revenue and employment rate.

H1I: There is significant relationship between internet users and employment rate.

H1J: There is significant relationship between telecommunication revenue percentage of GDP and employment rate.

Table I. Variables with respective symbols and sources:

Variables	Symbol	Source
GDP per capita	GPC	Kanwal (2008), Lei and Kingsley (2006)
Employment rate	EMP	Tella et al., (2012), Stette (2009)
Teledensity	TEL	Kawajeet and Neena (2007), Adegbemi et al., (2012)
Telecommunication investment	TEI	Oladipo (2013), Hendrick and Leonard (1996)
Telecommunication revenue	TER	Farcis et al (2012), Rahul and Xue (2012)
Internet users	INU	Joseph (2011), Donner and Marsden 2011
Telecommunication revenue percentage of GDP	TRG	Sheriffdeen (2012)

3.2 Model:

GDP per capita (GPC) and Employment rate (EMP) both of these two dependent variables are implemented as the multiple simpler variables of economic development dependent construct. Teledensity (TEL), telecommunication investment (TEI), telecommunication revenue (TER), Internet users (INU), Contribution of telecommunication revenue percentage of GDP (TRG) all of these independent variables are implemented as the multiple simpler variables of role of telecommunication construct. These independent variables are implemented with an intention to determine the economic development. Based on the two dependent variables GDP per capita (GPC) and employment rate (EMP), the OLS regression models are illustrated below:

$$GPC_{it} = \alpha_0 + \alpha_1 TEL_{it} + \alpha_2 TEI_{it} + \alpha_3 TER_{it} + \alpha_4 INU_{it} + \alpha_5 TRG_{it} + \epsilon_i$$

$$EMP_{it} = \alpha_0 + \alpha_1 TEL_{it} + \alpha_2 TEI_{it} + \alpha_3 TER_{it} + \alpha_4 INU_{it} + \alpha_5 TRG_{it} + \epsilon_i$$

3.3 Data and Sample:

For this study the considered secondary data which are derived from various economical data storage website, mobile operators annual reports, annual report of Bangladesh telecommunication regulatory commission (BTRC); a central authority of telecommunication in Bangladesh. Here 41 years telecommunication and economical data with a time series of 1975-2015 for each of the variables are collected with convenience sampling method. E-views 8.0 statistical software is implemented for regression analysis with an assumption that is all the variables are linearly related.

3.3.1 Scope of the Study:

- This research paper does not consider any data for any variables before 1975 to maintain equal observations and ensure the accuracy and reliability of data for each variable.
- This study only consider a few factors (GDP per capita, teledensity, telecommunicating investment, telecommunication revenue etc) which is a limitation in term of scope of the study.

4. Findings and Analysis:

4.1 Regression analysis:

Based on the established two regression models dependent variables GDP per capita (GPC) and employment rate (EMP) are regressed through the independent variables teledensity (TEL), telecommunication investment (TEI), telecommunication revenue (TER), internet user (INU), telecommunication revenue percentage of GDP (TRG). Table 2 represents the results of regression models.

Table II. Regression analysis of selected telecommunication's determinants on dependent variables GDP per capita (GPC) in model 1 and employment rate (EMP) in model 2.

Independent Variables	Model 1	Model 2
Constant (C)	204.9896 (0.0000)*	73.96721 (0.0000)*
Teledensity (TEL)	2.32E-06 (0.0762)*	3.99E-08 (0.0928)*
Telecommunication investment (TEI)	-6.19E-10 (0.5599)*	1.06E-11 (0.5845)*
Telecommunication revenue (TER)	1.03E-10 (0.9160)*	-7.95E-12 (0.6550)*
Internet user (INU)	1.45E-05 (0.0004)*	-3.64E-08 (0.5939)*
Telecommunication revenue percentage of GDP (TRG)	5.93995 (0.0001)*	-4.203172 (0.0000)*
F-Statistic	198.0290	48.65872
P-Value	0.0000	0.0000
R ²	96.5858%	87.4234%
Adjusted R ²	96.0981%	85.6267%

The P-Value is parentheses with * denoting significance level 20%.

Based on the first model the results show us that teledensity is significantly and positively related with GDP per capita. This is consistent with prior results where teledensity has significant relationship with GDP per capita (Lei and Kingsley 2006). This result also indicates the growth of the teledensity intensifies GDP per capita of an economy. Internet user is also significantly and positively related to GDP per capita which also supports the previous research results (Joseph, 2011). Evidently this is an indication of increasing in the number of internet user enhances overall GDP per capita. Moreover, contribution of telecommunication revenue percentage of GDP has significant positive relationship with GDP per capita. This result also support the prior research results (Adegbemi, 2012). The indication

of this result is, contribution of the revenue percentage from the telecommunication towards the GDP has positive significant role in order to amplifying GDP per capita. Based on the value of R^2 and Adjusted R^2 96.5858% and 96.0981% respectively postulate that 96.5858%, variation of GDP per capita can be explained by the independent variables of this model.

In the second regression model teledensity has significant positive relationship with employment rate. It indicates the more the teledensity increases in Bangladesh the more the employment rate will increase and it is evidently true based on the regression results. Moreover, this regression result is also consistent with previous research results where significant positive relationship between teledensity and employment rate was found (Jenny and Isac 2001). The relationship between telecommunication revenue percentage of GDP and employment rate is also significant but negative. Based on the value of R^2 and Adjusted R^2 87.4234%, 85.6267% respectively postulate that 87.4234%, variation of employment rate can be reasonably explained by the independent variables of this model.

5. Conclusion:

On the basis of the regression analysis it can be evidently postulated that the role of telecommunication has significant influence in order to economic development of Bangladesh to some extent. The results might have varied based on different variables' regression model. As GDP per capita is a prime indicator of economic development and implemented extensively as well as acknowledged in many previous research, this dependent simpler variable is considered in this paper and the results of this paper based on GDP per capita has supportive attitude towards the prior research results where telecommunication has positive and significant association with GDP per capita in term of the economic development of developing countries. Argument can be predominated based on the results of the second regression model where revenue percentage of GDP and employment rate relationship is significantly negative. This result might shade the light of previous research where significant positive relationship was found (Zhara and Mahmud 2014). But above all it is evident based on prior results of other research where telecommunication role more signifies in term of economic development of developing country. However, as Bangladesh is a developing country of third world it is hoped that the telecommunication role will show adhesion in economic development and the impact will be more intensified than developed country which will in return minimize the technological and economical gap between Bangladesh and other developed countries in this era of globalization.

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