European Online Journal of Natural and Social Sciences 2018;
Vol.7, No 4 pp. 728-736
ISSN 1805-3602

Investment in Telecom and Economic Growth of Developing Asian Countries: A Case Study of Panel Data Analysis

Samara Haroon, Dong Hui Zhang*, Qamar uz Zaman
School of Economics, Shandong University, Jinan, PR China
*Email: zdh@sdu.edu.cn
Tel.: *+8613708926062*

Received for publication: 03 May 2018.
Accepted for publication: 20 November 2018.

Abstract

The study presents the new regression estimates of the relationship between telecom investment and GDP per capita growth for selected developing Asian countries over the period 19992014. Pooled OLS and Fixed effect techniques are used to measure the country group effects, individual country effects and time effects also while exploring the relationship between telecom sector investment and GDP per capita growth with other explanatory variables like gross capital formation, population growth, trade openness, internet users and inflation. The results suggested that GDP per capita growth for India, Indonesia, Pakistan, Philippines, Sri Lanka and Thailand had a positive relationship with telecom investment and changed much due to explanatory variables effects, individual country effects and as well as time effects also. Based on results the authors have suggested that increase in telecom sector investment would be a better option for more and sustained economic growth for the long run and also improve the welfare of the society.

Keywords: Telecom, Economic Growth, Panel Data, Developing Countries, Fixed Effects.

Introduction

The 21st Century has witnessed the steady economic growth of developed countries due to their technological superiority than developing nations. It will not be unrealistic / surprising to state, that technology has affected human culture and thinking philosophies. Technological advancements have reduced the time and helped in making efficient utilization of world resources. Developed economies are economically better than other economies due to their economic growth, its stability which is based on their developed infrastructure and advanced information technology systems. On the other side, developing economies are just self-reliant due to lack of infrastructure and information technology. In this global world, technology is a significant contributor towards economic progress by providing timely & accurate information to decision makers. Obtaining the information and communicating it in the right time and at the right place to make an affective decision is a landmark of technology. Advanced technological systems deployed in developed countries have facilitated them to store data, process it and than forecasting solution from the previous information. However, there are few countries, out of many hundreds of countries they are able to generate knowledge from knowledge and have led to innovation and technological advancement in the world. These countries were not only able to facilitate and benefit their fellow citizens. In addition, they have shown success path for other nations to follow.

One of them is an advancement in Broadband technology which has broken the distance and time problem and is easy in getting advice and information on any business its hurdles from experts around the world which is ultimately helping in effective decision making for businesses, in turn it helps in improving a country's economy as a whole. An economy with research and development capabilities is able to introduce technological changes in its country. Among various

technology solutions, information technology has been an attraction for transferee nations. With in information technology broadband has increased the mobility of information and reduced the gap of decentralizing innovations in general-purpose technologies; through this broadband has become the main flux or the vertebra of the information technology to stand on its feet.

We are aware that timely and accurate availability of information has helped the decision makers to take effective decisions. Czernich, *et al* in 2011, stated that among various technologies the impact of broadband technology on economic growth of developed countries is very much evident. Broadband technology is one of the leading elements of information technology. Broadband technology in last decade has played a key role in economic development of developed economies. Government initiatives and their policies for technology adoption are important for shaping the economic outlook of a country. Government investment in building basic telecommunication infrastructure is beneficial for the economy. Recently, the concept of efficient production through technological advancements has negated old theories. Economic growth via technological advancement has become a vital force in improving the economy.

Developed countries have benefited from innovation and creation of ideas and information through knowledge sharing and spillover of tacit knowledge by removing trade barriers and facilitating trade openness. Visible change in their working environment has been noticed the old methods of completing tasks were replaced by new techniques and technology driven processes. Computer and other technology-enabled methods are in use to complete routine and non-cognitive tasks. Economic growth of a country is primarily due to the internal factors of a state. The primary drivers for economic growth are an investment in human capital, knowledge, and innovations (Philippe & Peter, 1997). Economic Development is reliant on the innovation and technology transfers made by a country (Gurbiel, 2002). Successful technology transfers are dependent on government policies for public infrastructure development ((Munnell, 1992). The investment in building telecommunication infrastructure is essential for economic growth. Datta & Agarwal (2004) finds out positive effect on Macro Economic Growth of a country by government initiative for investing in telecommunication infrastructure development. The investment in the telecom sector will increase the real GDP per capita growth of the economy. Therefore, it is favorable for the government to invest at an early stage of development. Munnell (1992) figures out that government's investment in building public infrastructure is beneficial for the economy and private sector investments. This will create a new opportunity for private sector investors.

Li-Hua (2006) evaluates the European technology transfer in South East Asian country and considers technology as main cause for social and economic development. Hollanders, n.d. (1999) stated that technology changes are not beneficial for all type of economies. Usually all General Purpose Technologies like Broadband, may not itself be as enabling technology, but to create new opportunities that enhanced by innovational complementarities. Broadband Technology benefits applied to all type of work places where timely and accurate information is necessary to reach on a solution. Datta & Agarwal (2004) finds out the importance of government investment in Telecommunication Sector. His research suggested that fixed investments of the governments in making telecommunication infrastructure have resulted in the progress of their economies.

Importance of Capital Formation is not only highlighted in economic literature of developed countries. In addition, in developing country like, China the government has invested heavily in building the local infrastructure of the nation along with the human capital. Capital formation is significant and of much importance for the development of countries. Developed countries have helped to improve their economies by evaluating the role and need of capital formation in their economies. (R R Nelson, 1966) has researched on the American economy and tried to answer how much capital

formation is necessary to support economic growth. Concluding, technology, and capital formation tends to impart an essential role in the economic development / growth in a country.

Efficient economic policies for developing countries have been a long debated subject for an economist. One of the popular growth prospects for developing countries is to increase export and thus increasing the available capital. Not only it will help local investors to utilize local opportunities but also attract foreign direct investment. (Barro et al., 2007) in his work on inflation and economic growth suggested that inflation, economic growth are related to each another and high inflation has a negative impact on economic growth. He finds that with 10 percent inflation rate the real GDP falls to 0.2 to 0.3 percent annually. The researches on Inflation suggests that high inflation is negative for growth and developing countries of the world need to tame their inflation level at a point where economic progress keeps on growing and investments are increasing. Estimating and maintaining appropriate inflation level through control with monetary and fiscal policies is an essential job for the economist to perform and achieve sustainable and long-term economic growth.

Zhou in 2011, researched on the behavior of real interest rates in industrial economies. He finds that real interest rates have a significant effect on the decision to save or to invest in the economy. Usually, high real interest rate attracts investment and low rate motivates savings. (Klasra, 2011) examines the role of trade openness and export of Pakistan and turkey with respect to their economic growth. He found that in long run trade openness is essential for a positive effect on economic success in Pakistan. Trade openness is helpful and a possible way for developing countries to achieve economic growth. Reducing trade barriers in the less developed country with low education level may not be as beneficial as for a state with the educated and skilled labor force. According to World Bank report 2009, 70 percent of Asian population and about 75 percent Asia's poor are living in rural areas and they mostly rely on agriculture. Due to mismatch of skills and education, many Asians are leaving their colleges and universities without completing their education, because they are demanded by the employers. Population growth has a negative relationship with economic growth in developing courtiers (Imran, Mughal, Salman, & Makarevic, 2015). They also find that nature, size and structure of the population of Asia region have been changing qualitatively and quantitatively. Technology as a single factor cannot be a signal success factor in economic growth some of the other explanatory factors like inflation, trade openness, gross capital formation and real interest rates also play a vital role in economic growth which is needed to be investigated empirically with broadband technology.

Methodology

Secondary data for a research study is obtained from World Bank, Trading Economies, Penn World Table, UNESCO, and IMF data catalogs. Data set of six selected developing countries for the period of 16 years from 1999 to 2014 has been selected which is converted to panel data. Here t=16 and n=6 so $n \times t = 16 \times 6 = 96$ observations. Table 2 presents the descriptive statistics and selected countries for research are presented in table 1. And the graphical presentation is presented in figures 1 to 3.

Table 1 List of selected countries

Selected Developing Countries	
1. India	4. Philippines
2. Indonesia	5. Sri Lanka
3. Pakistan	6. Thailand

Table 2 Descriptive statistics

Variables	Obs.	Mean	Std. Dev.	Min	Max
GDPPC	96	3.771979	2.35136	-2.47	9.17
ITS	96	1.84e+09	2.77e+09	8600000	2.03e+10
GCFG	96	5.744479	10.58537	-25.17	31.74
PG	96	1.361146	.6241877	-1.61	2.35
TO	96	69.61417	35.85864	24.39	150.33
IU	96	9.415833	9.347111	-2.12	39.69
INF	96	6.535	4.288341	-.85	22.56

Notes: GDPPC = GDP per capita growth (annual %) ITS = Investment in telecoms with private participation (current US$), GCFG = Gross capital formation (annual % growth), PG = Population growth (annual %), TO = Trade (% of GDP), IU = Internet users (per 100 people) , INF = Inflation, consumer prices (annual %).

According to the Neo-classical model of Endogenous growth theory, economic growth of a country is dependent on the technological advancements. The theory argues that in the long run, an economy with an abundance of labor and financial stock will become stuck in a bottleneck. The efficiency of labor and increase in financial gains are diminishing by nature with the passage of time. Therefore, too sooner but in a relatively more longer run, the rate of depreciation on both labor and financial gains will offset the additional benefits derived from each additional unit. Thus, the economy with innovational capabilities will create more opportunities for labor and capital and their returns will remain higher even in longer run. Therefore, the role of technology in economic growth is crucial for economic success in longer run and in the times to come. Furthermore, Technology on itself cannot be a single factor that can turn the economic wheel of fortune in a country. Other factors like inflation, real interest rate, trade openness, and gross capital formation also play a considerable role in a country economy. By keeping the view of above discussion, the proposed model can be written as:

$$GDPPCit = f(ITSit, GCFGit, PGit, TOit, IUit, INFit) \quad \text{... (i)}$$

Where
GDPPC = GDP per capita growth (annual %)
ITS = Investment in telecoms with private participation (current US$)
GCFG = Gross capital formation (annual % growth)
PG= Population growth (annual %)
TO = Trade Openness (% of GDP)
IU= Internet users (per 100 people)
INF = Inflation, consumer prices (annual %).

Here, i shows country effects in explanatory variables, and t shows time effects in explanatory variables and the assumptions of $_{Uit}$ is that, $U \approx IID(0, o)$ i.e. errors are independently identically distributed with zero mean and stable variances. Where i denote a particular country and t indicates a specific time.

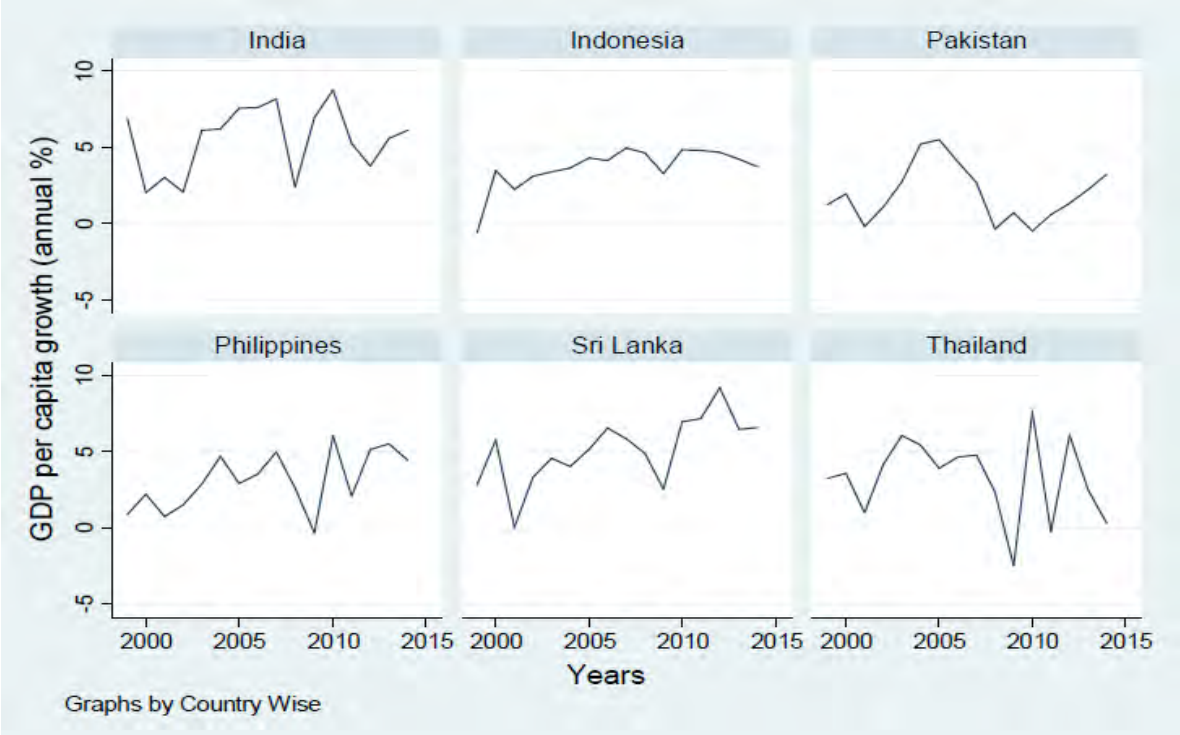

Figure 1 GDP per capita growth differences among studied countries.

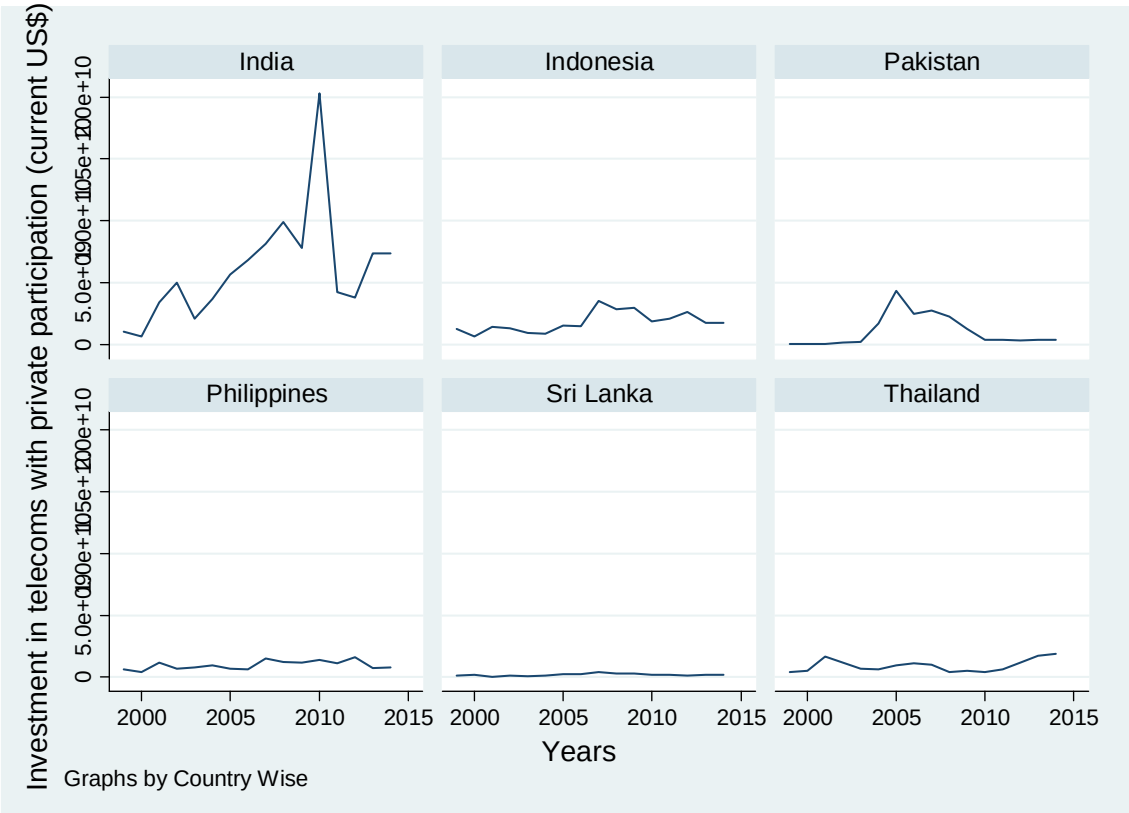

Figure 2.Investment in Telecoms differences among studied developing countries.

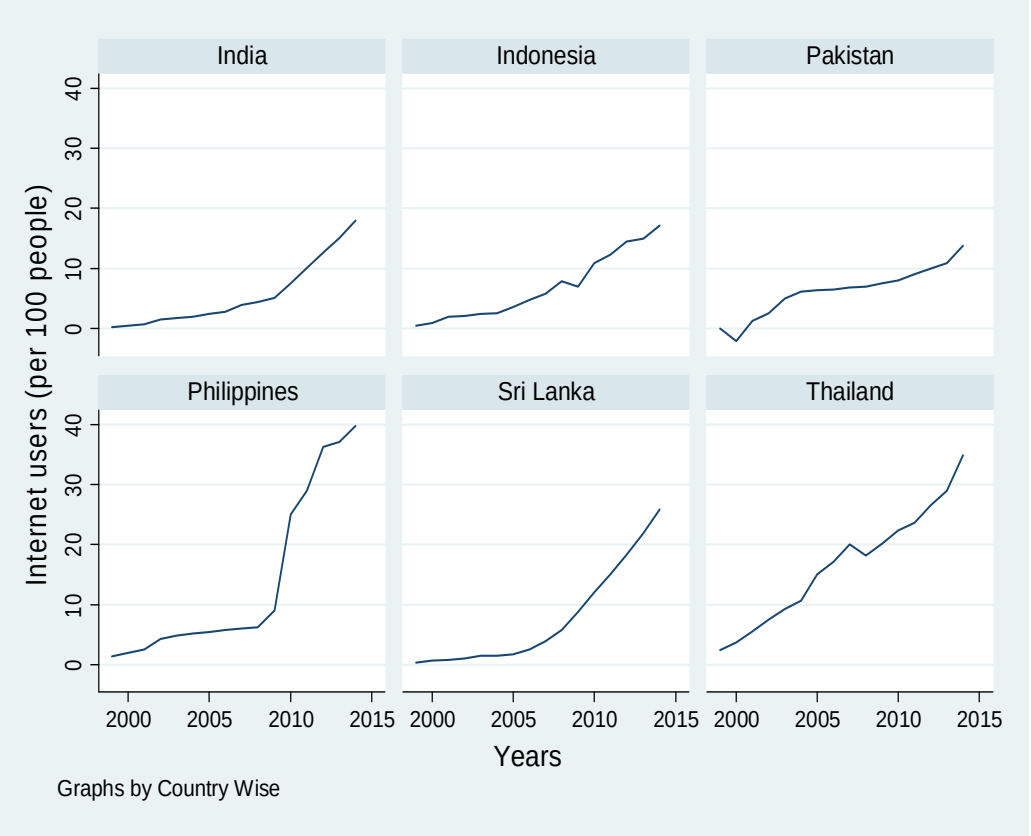

Figure 3 Internet users differences among studied developing countries.

Results

Panel data analysis technique has been used for finding the impact of broadband investments on economic growth of selected developing countries. Pooled and Fixed effect model has been utilized in finding the relationship between explanatory variables and GDP per capita growth. Hausman test has been applied to detect the suitable test between random and fixed effect model. The results from Hausman test verify the use of fixed effect model in our sample countries among developing nations. Hausman test results are presented in table 3. Data stationary has been validated by unit root test. The results are further divided into three groups as: First: Group effects with constant slope coefficients, Second: Country effects with constant slope coefficients, Third: Time effects with constant slope coefficients.

Table 3. Hausman test for all models.

Sr. No	Model	Hausman test	Significant or not.
1	Model-2a	0.024	Significant
2	Model-2b	0.011	Significant
3	Model-2c	0.001	Significant
4	Model-3a	0.020	Significant
5	Model-3b	0.000	Significant
6	Model-3c	0.000	Significant

If Hausman test value <0.05 then it is statistically significant otherwise not.

Group effects with constant slope coefficients

Results are presented in Table 4. In Model-1a we choose two explanatory variables to forecast their explaining power to determine GDP per capita growth. Then other explanatory variables are increased which shoes that not only results are improved but R^2 is going to increase which is a grantee of the best fitted model. Other independent variables are growth in Gross Capital Formation (GCFG), Population growth (PG), Trade Openness (TRD) and traditionally used indicator Inflation (INF). Investment in telecoms is accounts for 2.35e-10 change in GDP per capita growth by increasing 1 unit in investment in telecom sector while holding other variables constant. F-test results are going to improve and R^2 is going to increase as more and more explanatory variables are used.

Table 4 OLS Results for period 1999-2014. DV is GDP per capita growth.

	Model-1a	Model-1b	Model-1c
	(Pooled OLS)	(Pooled OLS)	(Pooled OLS)
ITS	2.35e-10***	2.17e-10***	2.19e-10***
GCFG	.1231596***	.1258984***	.1241682***
PG		-1.085944***	-1.02938***
TO		-.0115608*	-.0139681**
IU			0272783
INF			-.0165542
Intercept	2.630644***	4.931067***	4.880745***
F Test	*34.24****	*20.94****	*14.33****
R2	*.42*	*.47*	*.49*
Obs.	*96*	*96*	*96*

****, **, and * represents significance level at 1%, 5% and 10% respectively.*

Table 5. OLS Results for period 1999-2014. DV is GDP per capita Growth.

	Model-2a	Model-2b	Model-2c
	(Fixed Effect)	(Fixed Effect)	(Fixed Effect)
ITS	2.32e-10***	2.53e-10***	2.27e-10***
GCFG	.1096476***	.1066493***	.1018448***
PG		.0207884	.513489
TO		-.0206085	-.001413
IU			.0583584**
INF			-.033927
C2 Dummy for Indo-	-.3857478	-.0003645***	-.3450486
C3 Dummy for Pakis-	-1.53173**	-1.647965**	-1.915533**
C4 Dummy for Phil-	-.7937982	-.1824908	-1.476218
C5 Dummy for Sri	1.165268	1.842923*	1.472201
C6 Dummy for Thail-	-.5750852	-1.472166	-.8375286
Intercept + Baseline	3.06831***	3.791372***	2.356941*
F Test	15.00***	11.84***	10.90***
R2	.54	.55	.59
Obs.	96	96	96

****, **, and * represents significance level at 1%, 5% and 10% respectively.*

Country effects with constant slope coefficients

Results are presented in table 5. Here for checking the country specific characteristics like as, Policy changes; political regimes and good governance, different monetary and fiscal policies and different managerial abilities that affect the GDP per capita growth, we have used the country dummies. As countries are six so we have only introduced five dummies to prevent from dummy variable trap. The differential intercept coefficient tells by how many the other countries are different from the intercept of India. In short, we can say India is a comparison country.

Time effects with constant slope coefficients

Results are presented in table 6. For checking the time effects, time dummies are introduced. As data set is for 16 years from 1999 to 2014, so we propose only fifteen dummies for preventing from dummy variable trap. Here, 1999 is treating as a base year. In model-3a, individual time dummies were individually statistically significant as they include year's 2001, 2008 and 2009 which suggest that GDP per capita growth has changed much over time.

Table 6. OLS Results for period 1999-2014. DV is GDP per capita Growth.

	Model-3a	Model-3b	Model-3c
	(Fixed Effect)	(Fixed Effect)	(Fixed Effect)
ITS	2.25e-10***	2.17e-10***	2.20e-10***
GCFG	.1191699***	.1212273***	.121479***
PG		-1.269505***	-1.270786***
TO		-.0138551**	-.015049**
IU			.0132221
INF			.0015003
T2 Time dummy for	-.1465035	-.3496335	-.3394225
T3 Time dummy for	-2.257878***	-2.910736***	-2.925945***
T4 Time dummy for	-.799613	-1.032189	-1.061585
T5 Time dummy for	.5479939	.390192	.3514327
T6 Time dummy for	.9647319	.8162991	.771531
T7 Time dummy for	.6043139	.3545059	.2917039
T8 Time dummy for	1.537907	1.185956	1.111252
T9 Time dummy for	1.527855	1.020866	.9256979
T10 Time dummy	-1.351429	-1.861907**	-1.970934
T11 Time dummy	-.7887909	-.2163129*	-1.587422
T12 Time dummy	-.4128621	-.2163129	-.4130749*
T13 Time dummy	-.1256086	-.3966962	-.6048369
T14 Time dummy	1.583332*	1.052756	.8016465
T15 Time dummy	.2429082	-.1708783	-.3986639
T16 Time dummy	.9950455	.3439047	.0203059
Intercept + Baseline	2.449672***	5.560609***	5.619419***
F Test	7.59***	8.94***	7.89***
R2	.63	.69	.70
Obs.	96	96	96

****, **, and * represents significance level at 1%, 5% and 10% respectively.*

Conclusion

Based on above discussion GDP per capita growth for India, Indonesia, Pakistan, Philippines, Sri Lanka and Thailand have changed due to explanatory variables effects, individual country effects and as well as time effects also. Our discussion concludes that technology creates opportunities for the economies and hence is beneficial for economic growth. Specially, in our paper the role of broadband technology in facilitating the speed of information through investment in telecom sector is helping decision makers by providing timely information to take effective decisions has contributed towards benefiting economies. Statistical findings support the positive effect of Broadband Technology on economies for selected developing countries. Based on results and discussion the authors have concluded that increase in telecom sector investment would be a better option for more and sustained growth in GDP per capita for the long run and also improving the welfare of the people of society.

References

Barro, R. J., Quarterly, T., & May, N. (2007). Economic Growth in a Cross Section of Countries, *106*(2), 407–443.

Czernich, N., Falck, O., Kretschmer, T., & Woessmann, L. (2011). Broadband Infrastructure and Economic Growth, *121*, 505–532. doi:10.1111/j.1468-0297.2011.02420.x.

Datta , A., & Agarwal, S. (2004). Telecommunications and economic growth: a panel data approach. *Applied Economics*, *36*(15), 1649–1654. doi:10.1080/0003684042000218552

Gurbiel, R. (2002). Impact of Innovation and Technology Transfer on Economic Growth: The Central and Eastern, *162*(July), 1–18.

Hausman, J. A. (1978). Specification Tests in Econometrics. Econometrica, Vol.46, 69-85. Hollanders, H. (1999). Skill-Biased Technological Change in an Endogenous Growth Model.

Imran, M., Mughal, K.S., Salman, A., & Makarevic, N. (2015). Unemployment and Economic Growth of Developing Asian Countries: A Panel Data Analysis. European Journal of Economic Studies, 13(3), 147-160.

Klasra, M. A. (2011). Foreign direct investment , trade openness and economic growth in pakistan and turkey: an investigation using bounds test, 223–231. doi:10.1007/s11135-009-9272-5

Li-Hua, R. (2006). Examining the appropriateness and effectiveness of technology transfer in China. *Journal of Technology Management in China*, *1*(2), 208–223. doi:10.1108/17468770610670992

Munnell, A. H. (1992). Infrastructure Investment and Economic Growth, *6*(4), 189–198.

Philippe, A., & Peter, H. (1997). Endogenous growth theory. *MIT Press Cabridge, Massachusetts London, England*.

The World Bank (2009). World Development Report. World Bank, Washington, DC

Zhou, S. (2011). Nonlinear stationarity of real interest rates in the EMU countries. *Journal of Economic Studies*, *38*(6), 691–702. doi:10.1108/01443581111177394