FINANCIAL DEVELOPMENT AND GDP GROWTH WITH MEDIATING ROLE OF TELECOMMUNICATION: EVIDANCE FROM SOUTH ASIAN DEVELOPING ECONOMIES

Submitted by

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CERTIFICATE

This is to certify that this thesis entitled: **"Financial Development and GDP Growth with Mediating Role of Telecommunication: Evidence from South Asian Developing Economies"** submitted by **Ms. Wardah Mehboob** is accepted in its present form by the School of Economics, Pakistan Institute of Development Economics (PIDE), Islamabad as satisfying the requirements for partial fulfillment of the degree in Master of Philosophy in Economics and Finance.

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I Wardah Mehboob hereby state that my MPhil thesis titled "Financial Development and GDP Growth with Mediating Role of Telecommunication: Evidence from South Asian Developing Economies" is my own work and has not been submitted previously by me for taking any degree from this university Pakistan Institute of Development Economics Islamabad, Pakistan or anywhere else in the country/world.

At any time if my statement is found to be incorrect even after my Graduation the university has the right to withdraw my MPhil degree.

Date: 16- 09- 2021

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Dedicated to my beloved Parents

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ABSTRACT:

In the literature, the effectiveness of financial development has been a point of interest. The objective of this research is to investigate if financial development helps or hinders economic growth. For this purpose, this study looks at panel data regression estimation on the association between financial development and economic growth while controlling for other variables. Furthermore, it is important to understand the mediating factors that might enhance the effectiveness of financial development, such as telecommunications infrastructure including mobile cellular, Fixed Broadband Subscription, Individuals using Internet subscription and Fixed Telephone subscription. To assess the influence of financial development on economic growth. Over the period 2000-2019, the current study examines a sample of seven developing countries: India, Pakistan, Bangladesh, Sri Lanka, Bhutan, Maldives, and Nepal. Empirical model is estimated by using Granger causality test and Autoregressive Distributed Lag (ARDL) technique. The findings show a positive and significant association between financial development and GDP per capita, as well as a positive and strong relationship between telecommunication infrastructure and GDP growth and vice versa. This study further adds the evidence to policy makers and researchers that improve the effectiveness of banking sector, branchless banking, and digital banking, which helps in long term sustainable economic growth.

Keywords: *Telecommunication Infrastructure; South Asian Developing Countries; Economic growth; Financial Development; Autoregressive Distributed Lag (ARDL); Granger Causality Test*

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ABBREVIATIONS

Fixed BB	Fixed Broadband Subscription
FD	Financial Development
Fixed Tele	Fixed Telephone Subscription
GCF	Gross Capital Formation
GE	Government Expenditure
INF	Inflation Rate
INT	Individual Using Internet
MC	Mobile Cellular Subscription
NR	Natural Resources
PG	Population Growth
SE	School Enrollment
TO	Trade Openness
Y	GDP per Capita
Z	Controlled Variables

CHAPTER 1

INTRODUCTION

1.1 Background of the Study

Financial development and GDP per capita have garnered a lot of attention in recent decades, but their relationship has remained a source of debate in economics and finance literature. Most of the research on the financial-growth nexus is likely to be based on prior work. Telecommunication is unlike any other conventional infrastructure since it is a gift of contemporary science. Telecommunication is the primary means of maintaining a continuous and instantaneous flow of information exchange, from the worldwide market to the local market, corporate communication to personnel communication.

Telecommunication, in terms of modern economic activity, not only has a substantial effect on the economy in terms of GDP per capita, but it also helps a huge number of people by giving employment opportunities. Schumpeter (1911) explained that financial sector growth would create the funds required to expand the real sector. This approach was subsequently supported by Demirgüç- Kunt and Levine (1996), Levine and Zervos (1998), Beck et al. (2000), and Beck and Levine (2004). The innovation of telecommunications technologies has been an important means of allowing the exchange of knowledge to evolve as a useful product.

The telephone has reached almost every corner of contemporary society as a new medium of telecommunications technology. Wellenius, (1977) stated that the accessibility and availability of telephones as a part of telecommunications networks has been commonly acknowledged to be an integral part of economic growth and development. For progressive economic change and sustainable productivity, the new telecommunications infrastructure is vital for economic growth. Advanced telecommunications infrastructure is important for

domestic economic growth in developing countries, as well as participation in hypercompetitive markets.

Romer (1986, 1987) according to AK model, the telecommunication infrastructure is an importance source of technological changes and this excess lift the growth of economy's pursuing those financial development strategies based on telecommunication. Universal telecommunications networks have reached every field of society in the industrialized developed countries of Europe and America. Telecommunication infrastructure is an important component for enhancing GDP per capita and financial development, in return it also increases the demand and investment for telecommunication infrastructure Dutta, (2001)

Technological development has been a guiding force for the financial sector of most South Asian economies over the last several years. The emergence of telecommunications infrastructures in south Asian economies' financial sectors has the potential to reinforce and drive major gains in financial development over the past two decades.

In the recent studies on the role of telecommunication on financial development and GDP per capita has not paid proper attention to the other factors associated with telecommunication sector like the impact of cellular mobile on financial development, broadband and internet as in the modern technologies changes are already prevailing in the developed economies. This study includes dynamic panel data of six south Asian developing countries including Pakistan, India, Bangladesh, Sri Lanka, Nepal and Afghanistan. This study will analyze the impact of remaining telecommunication factors as well as other controlled variable such as inflation rate, trade openness, school enrolment, government expenditures, capital formation, natural resources, and population growth rate in order to measure their impact on GDP per capita and relationship with financial development.

1.2 Theoretical Framework of Controlled Variables

From Adam Smith's time onward, the link between trade and GDP has been frequently studied. Trade boosts economic growth by expanding local markets, effectively allocating resources, enhancing economies of scale, and maximizing capacity utilization.

Blassa (1978) found that, in addition to the classic aggregate production function inputs of labor and capital, export orientation is a significant element in explaining inter-country disparities in GDP growth rates. Trade openness adds imports and exports of goods and services of a nation. Here we have considered its percentage share in GDP. There is abundant evidence that shows that trade openness spur national growth. According to economic theory, trade liberalization boosts the rate of per capita growth.

Not only does the huge growth process demand an increase in government expenditure, but it also necessitates an improvement in the composition and efficiency of that spending. It may assist the government in obtaining advantages from limited resources since government expenditure may serve as a foundation for efforts to eliminate poverty and boost growth in the country.

SAARC is a developing region of the world with vast manpower that can be regarded a country's most asset. Economic growth is linked to addressing the issue of education spending. Excessive government borrowing to fund its spending will crowd out private investment, resulting in a drop in private investment. Furthermore, if the government borrows more to fund its spending, the private sector will be squeezed out, and private investment will suffer.

1.3 Research Gap

In the recent studies, the impact of telecommunication specifically usage of fixed telephone on GDP per capita and financial development has been found. However, to my

knowledge, no such attention has been devoted to mobile cellular, fixed broadband, and internet services and how they impact financial development in South Asian developing nations in order to raise GDP per capita.

It has been determined that there was no such use of mobile cellular, fixed broadband, and individuals using the internet in South Asian countries prior to the year 2000.

As these countries were emerged together after 2000. It is, in my opinion, a significant gap in the telecommunications sector, with significant implications for financial development and economic development.

1.4 Significance of the Study

Recent studies have focused on the influence of financial development on economic growth in the presence of telecommunications, with the majority of studies focusing on the impact of fixed telephones on financial development and GDP per capita. The purpose of this study is to examine the impact of different telecommunication aspects on financial growth and GDP per capita in South Asian emerging economies.

The influence of financial development on the GDP per capita of south Asian emerging nations is growing as telecommunication infrastructure improves. This study will examine the influence of cellular mobile, fixed broadband, and internet on financial development to enhance economic growth in the presence of telecommunication.

1.5 Research question

The study's major focus is on the function of telecommunication infrastructure in mediating the association between financial development and GDP per capita in emerging nations in South Asia. To investigate this relation, the research question is as follow:

1- How telecommunication affects GDP per capita in South Asian developing economies?

2- How does financial development affect GDP per capita in South Asian emerging countries?

1.6 Objective of the study

The study's main goal is to look at how telecommunication infrastructure influences the relationship between financial development and GDP per capita in Asian emerging nations. To test the relation, following is the actual objective of the study:

1- To investigate the mediating role of telecommunication infrastructure in establishing the relationship between financial development and economic growth.
2- To investigate the impact of financial development on GDP per capita of south Asian developing countries

1.7 Contribution in the study

Theoretical relationships between GDP per capita and financial development were the subject of previous economic growth research. Various studies on economic growth and financial development have various empirical analyses. We have added to the current study in this area by examining how actual financial development impacts economic growth in developing countries in South Asia, taking into account their particular characteristics. We also looked at how telecoms infrastructure may help financial development have a bigger effect on economic growth. Our research also examines at how South Asia's telecommunication infrastructure acts as absorbent skills in the nexus between financial development and economic growth, which is a significant addition.

1.8 Organization of the study

This study is structure in to five chapters. Chapter one contains the introduction of the study which includes background of the study, research gap, research questions, objective of the study, significance of the study. Chapter two consists of literature of the study which

includes the discussion of the previous researchers on the value of telecommunication in financial development and economic growth. Chapter three is conducted on research methodology. It contains introduction, research design, conceptual framework of the study, framework to select econometric techniques for estimation, model specification, econometrics modelling, description of variables, and econometrics analysis. Chapter five is about model estimation and discussion of results whereas, chapter six is on conclusion and recommendation and limitations of the study.

CHAPTER 2

LITERATURE REVIEW

A wide spectrum of research is being undertaken on the correlation between financial development and GDP per capita. This same research has discovered a beneficial relationship between financial development and economic growth Schumpeter (1911), Hicks (1969), Khan and Senhavdji (2000), Jalil *et al*. (2009). Several other research, on the other hand, have detected an inverse relation between economic expansion and financial development. (Robinson, 1952), Friedman and Schwartz (1963).

According to a number of studies, financial development is a reliable predictor of economic growth (Jung, 1986; Kugler, 1998). The degree of financial development may be influenced by GDP per capita, which creates resources as well as the requirements and incentives for financial growth.

According to Levine (1997), "empirical studies do not clearly address the problem of causality" between financial development and economic growth. According to Gurley and Shaw (1955), the real sector cannot function without the financial sector. Buffie (1984) took a different approach to the connection between financial and economic development. Throughout the industrial revolution, the role of financial development in economic growth was firmly established, and it remains so in the context of developing countries (Gupta, 1984). This is due to the fact that the financial industry manages. Large amounts of working capital provide knowledge and creative ideas to entrepreneurs, many of whom are new to the market, and enable them to manage the new entity, which increases output and employment while simultaneously raising consumption and saving (Perera & Paudel, 2009; Shrestha, 2005).

Furthermore, financial development aids in the expansion of the economy, the increase of income, the reduction of poverty, and the enhancement of economic growth. An inefficient

financial system is expensive, lowers investment, and diminishes employment and production. In this situation, the economy will be slowed (Shrestha, 2005).

Jeremy Greenwood and Boyan Jovanovic (1990) looked on the use of financial intermediaries to route building funding. The fund's vast scale is managed at a minimal cost for long-term investment, accelerating economic growth. According to a research based on the Pareto optimization technique, the extent of financial intermediation and economic development is decided inside the system. Both variables are endogenous. Economic expansion, on the other hand, controls high-value capital while financial intermediation stimulates favorable returns on investment and promotes industrial development. The inextricable relation between financial development and economic growth favors greater levels of growth.

Arestis & Demetriades (1995) conducted research to determine the relationship between financial creation and economic growth. They estimated the macro variables of many nations using a cross-country regression and time series technique and found that financial advancement drives economic growth. Individual country data, in contrast to time-series techniques, exposes. The outcome is not accurate as cross-country regression method. The association between financial development and economic growth was first officially applied, according to (Bernanke & Gertler, 1989; Becker & Thorbjørn Knudsen, 2002; Schumpeter, 2002). He emphasized the importance of financial development to economic progress. Prior to it, the position of finance had been overlooked. Effective financial intermediation is critical during the expansion period. It lowers the cost, risk, and time associated with data. The entrepreneur devises a new method that is more productive than the previous one. It is the direction of production. Using Sri Lankan time series data from 1955 to 2005.

Perera and Paudel (2009) investigated the correlation between financial development and economic growth. The six major financial growth measures are used in the

research. Instruments for unit root and co-integration econometrics have been introduced. The A causal link between financial development and economic growth was discovered using the Granger causality test. The finding suggests that rapid urbanization contributes to economic growth, although this is only partially proven.

Adelakun (2010) looked into the correlation between financial development and economic growth in Nigeria, a developing nation. The data was analyzed by using econometric technique of Ordinary Least Square Estimation Method (OLSEM). Financial development has a substantial positive influence on economic growth, according to the findings. Financial development stimulates economic growth, according to the Granger causality test, whereas evidence of causation indicated that economic growth supports financial intermediaries. Finally, financial progress, particularly financial diversity, is beneficial to economic growth. Gautam (2012) studied the relationships between financial development and economic growth in Nepal using time series data from 1975 to 2012. The root unit test and the co-integration test were utilized by the researcher. The Granger causality test was sufficient for analyzing the causal link. Researchers argue that there is a substantial relationship between financial development and economic growth based on these statistical techniques. Even still, scientific evidence cannot establish who is in command of the economies.

However, a substantial literature of theoretical and empirical research demonstrates how financial intermediation mobilizes savings, distributes funds, diversifies risks, and helps to economic progress (Greenwood & Jovanovic, 1990; Jbili, Enders, & Treichel, 1997). On the one hand, several researchers have demonstrated a logical and empirical relationship between FD and EG. In other words, efforts that are geared toward changing financial markets help to drive economic growth. This assertion is backed up by McKinnon (1973), King and Levine (1993a), Levine et al. (2000), and Christopoulos and Tsionas (2004). Other experts, on the other hand, think that the path to financial development is through economic growth.

The need for financial services rises in tandem with the economy, driving the financial industry to expand. Gurley and Shaw (1967), Goldsmith (1969), and Jung (1986) all hold this perspective. Others suggest that a causal relationship exists in both directions. Economic growth and financial development (FD) are driving significant. FD backs EG, and EG backs FD. The growth stage hypothesis was suggested by Patrick (1966).

Initially, the causality is the one from finance to growth, while at the later stage, causation runs from growth to finance. Finance stimulates economic growth by promoting genuine per capita capital formation in the early stages of development. As a result, the economy has been growing, and level of financial development will increase, enabling both the financial and real sectors to develop. This entails causation in everything from development to money. A positive two-way causal relationship between growth and financial development was also identified (Blackburn and Huang, 1998). Private knowing agents obtain external funding for their programmes, according to their study, through incentive-compatible credit arrangements, which are carried out via high-priced surveillance techniques that financial activities may be outsourced by lenders.

Khan (2001) was the one to show a positive two-way causation between growth and finance. He proposed that companies that have access to financial intermediary loans receive more profit. While their financing costs are lower, allowing them to invest in the technology required to obtain investment loans, lowering the cost of lending and boosting economic growth.

A considerable volume of longitudinal study was conducted on the relationship between the financial sector and long-term growth (Levine, 1997, 2005). According to Levine (1997), financial networks may serve five functions to minimize information and transaction divergence and endorse long-term growth. Promoting risk improvement, obtaining investment and capital information, tracking managers, corporate regulation and exercise, investment

mobilization, and trade facilitation are some of these tasks. These roles encourage investment and, as a result, quicker economic growth. A well-functioning financial system, according to Schumpeter (1912), will promote technical creativity by recognizing, selecting, and funding such entrepreneurs who will be able to efficiently implement their discoveries and efficient procedures. King and Levine (1993a) recently concluded that the level of financial development is a strong predictor of economic growth after studying 80 nations from 1960 to 1989. Furthermore, because numerous steady state equilibria are likely to exist, a lack of financial development might possibly lead to a "poverty trap" (Berthelemy & Varoudakis, 1996).

Granger's development of the financial sector, according to Wachtel and Rousseau (1995), generated economic growth. It's also worth noting that we're not aware of any observational studies that do multivariate causality tests. According to Czernich, et al. (2011) broadband "fast speed internet" has effect on output growth. They have empirically investigated the impact of broadband economic growth by taking data of OECD countries over the years of 1996 to results indicate that broadband upsurges growth up to 3.9 percent. Mahyideen, (2012) proposed that ICT upsurge economic development by enhancing productivity cutting down production cost. They empirically explored the relationship economic prosperity and information and communication technologies (ICT) for ASEAN countries from 1976 to 2010. The results of granger causality supported relationship between ICT and economic growth.

Norton (1992) examined the influence of telecommunications infrastructure on economic development for the years 1957 to 1977. The study analyzed data from 47 nations and found that communications infrastructure had a favorable and considerable influence on economic development. The research went on to say that communications infrastructure lowers

transaction costs because smart manufacturing decreases production costs because of technology adoption, which promotes overall economic growth and development.

Dholakia and Harlam (1994) examined the association between telephone infrastructure investment and economic growth by looking at a variety of parameters such as education, energy, telephone, and other physical infrastructure. The results of their multiple regressions demonstrate that investment in education, telecommunications, and other physical infrastructure at the same time stimulates economic growth.

According to Zahra et al. (2008), telecommunications can play a vital role in economic growth. The telecommunications sector in most developing nations is plagued by low tele-density, particularly in rural regions, and poor service quality. Granger's convergence hypothesis was used in this investigation. Causality and autoregressive model for global countries classified as low, medium, and high income. The impact of four factors on the export performance of 101 developing countries was investigated: physical infrastructure, ICT, border and transportation efficiency, and the business and regulatory environment by Portugal-Perez and Wilson (2012). The aggregate indicator for trade was calculated using factor analysis. As a result, it was discovered that physical infrastructure had the largest influence on exports.

Madden and Savage (1998) looked at a study of 27 Central and Eastern European (CEE) nations from 1990 to 1995 and discovered a substantial between telecommunications infrastructure investment and economic progress. The Southern African Developing Nations (SADC) and the Republic of South Africa (RSA), According to Alleman et al. (2004), they are among the least developed countries in terms of both economic development and telecommunications usage. According to a variety of studies, more investment in telecommunications is critical not just for productivity but also for the global economy's ability to remain competitive in an increasingly information-oriented environment. If developing nations' telecommunications systems fail to develop, a gap will open between RSA and SADC

and industrial countries. To assess the significance of telecommunication on economic growth, the study used a country-based analysis of ordinary least square approach for SADC member nations.

Din (2004) also looked at the export-led development hypothesis for five South Asian countries, taking imports into consideration. For Pakistan and Bangladesh, the study found long-run unidirectional causality from GDP to exports and imports, as well as short-run bidirectional causality for Bangladesh, Sri Lanka, and India. In Nepal, India, and Sri Lanka, however, no long-term correlation between the two variables was observed.

Shamim (2007) looked at how communications technology affected output growth in 61 countries from 1990 to 2001. She argued that communications technologies purify information, minimize data processing asymmetry information, and promote buyer-seller contact. It revealed that e-government communications technology mediates the favorable influence of financial development.

Choi and Yi (2009) used panel data from 217 nations from 1991 to 2000 to evaluate the influence of the internet on output. According to the findings, the percent rise in internet customers is around 0.05 percent. The influence of e-government on growth, according to Teo and Lim (2013), is the management of corruption and environmental damage. They used averaged data from the years 2004 to 2008. Their findings concluded that e-government prosperity has a minor direct influence on development, and that its impact on growth is mediated by corruption and environmental deterioration.

From 1991 to 2012, Pradhan et al. (2016) looked at the causal relationship between telecommunications development, financial development, and economic growth index in 21 Asian nations. PVAR was employed in the study to discover a causation trend while preserving equilibrium in the short and long term. Granger-causality exists both in the short and long term

in Asian nations, according to the causality test, although the specific type of causality differs by country in Asian areas.

According to Sridhar (2009), The influence of competition and networks on the growth of mobile services in India are key aspects to consider. After using the diffusion technology system, traditional variables such as income, population, and fixed line saturation have no substantial effect on the adoption of mobile networks. Telecommunications infrastructure is largely regarded as playing a good and effective role in economic growth and development in 23 Indian areas, as well as facilitating the spread of economic activity in Nigeria. (Osotimehin et al., 2010; Posu, 2006; Chiemeke & Longe, 2007). ICT (including communications) infrastructure lowers both the fixed and variable costs of accessing information and interacting in markets (Norton, 1992). The ICT infrastructure is improving for companies in various areas of the economy, lowering transaction costs and increasing production (Roller & Waverman, 2001).

Intensity of ICT adoption discrepancy between Asian nations is higher than the disparity in GDP per capita, and Asia's share of global ICT consumption has stayed consistently lower than its share of worldwide output, although gradually growing (Wong, 2002). Parker (2005) investigates how mobile technology is bridging the technical divide between Sub-Saharan Africa and the industrialized world. According to this study, Sub-Saharan Africa had more different mobile phone users in 2004 than all of North America. The telephone and (Trans-Atlantic) cable contributed to market efficiency by decreasing intermarket pricing differentials (Garbade & Silber, 1978).

Businesses might have more spatially scattered activity and profit from worldwide markets with additional telecom services (Leff, 1984). Cronin (1993) established a statistically significant relationship between increasing output and telecom share. Eggleston (2002) shows how basic communication infrastructure may help to create a "virtual economy" by improving

the living conditions of the world's poor and enhancing market efficiency by disseminating information to isolated local residents, therefore promoting growth. Income patterns affect discretionary income levels, i.e., buying power for telecom services, and hence service expansion (Chatterjee, 1998). One method for increasing rural tele density is to reduce the cost of delivering broadband services using wireless technologies (Jain & Sridhar, 2003).

Research on the distribution process has been published in several academic disciplines, including geography, social science, finance, business, economics, and telecommunications (Roger, 1983). According to a study of new lines in Germany, when there is a supply constraint, the spontaneous transmission tendency slows, and a negatively skewed diffusion pattern emerges (Simon & Sebastian, 1987).

The globe is getting more connected as information and communication technology advances, as well as the increase and diversity of global telecommunication traffic (Barnett, 1999). Expanding urban links, according to research, split instead of following traditional economic, political, and cultural fault lines (Monge & Matei, 2006).

The conventional concept of the global broadband network, grounded in a clearer framework of economics and international communication flows, underlines the imbalance between the content and evidence nations from the viewpoints of dependence and world organization theory (Kick & Davis, 2001). This viewpoint provides a structural reason for a country's unequal growth, which is divided into three categories: core, perimeter, and semi-periphery.

The uneven flow of knowledge and information via sector and development in the Global Telecommunications Network International Communication Association captures the framework of the international economy from this perspective. The interplay between economic and communication systems has been studied. According to Barnett (2001), the fundamental measures of the global transmission system were quality services and goods with

gross domestic product (GDP). Furthermore, the location of a country's connectivity was shown to be strongly related to its income (Barnett et al., 2001).

In the industrial design process, the most recent developments in information technology are becoming increasingly significant. Information technology allows for new methods to share data and conduct business, changing the financial and other service industries while also allowing for better resource use. Knowledge-based firms tend to be more efficient than those that rely on natural resources or low labor costs. Traditional sources of comparative advantage (a big labor force and plentiful natural resources) have just lately been evident as having less of an influence on export performance. The reliance on digital current equipment is progressively determining countries' competitive and comparative advantages. The current competitive advantage is a man-made advantage gained through the use of knowledge and skills.

The evolution of a civilization is often initiated at the most fundamental level and evolves to a more complex stage (Durkheim, 1984). Telecommuting is a system that has shifted the focus of an employee's presence at work away from his or her physical presence and toward what he or she can give from home. Because of communication networks, people can work outside of the traditional job or office environment (Huws, Morrison & Saveri, 1991). Telecommuting is a significant advancement in the workplace that allows an increasing proportion of the workforce to work at least one day a week at home or at a location other than the central office (Brown, 2010).

Pakistan is a developing country with a technologically disadvantaged population. Pakistan has just a restricted amount of Internet connection. Although the majority of individuals in Pakistan's metropolitan regions have access to the internet, this is not the case for the bulk of the country's population. According to the findings of The Telework Research Network which analyzed approximately 250 case studies and research papers. As well as

supplementary telecommuting documents and discovered that "80 percent of workers wanted to telecommute and 30 percent would be willing to take a pay cut in order to telecommute," and that "less than 2 percent of employees worked from home for the major corporations".

The number of people who telecommute (work from home) increased from 300,000 in 1997 to 1.5 million in 2000 in the United Kingdom. Numerous major businesses, such as Young, Ernst & IBM, have promoted telecommuting throughout this period (Dudman, 2001). The usage of a telecommuting programme has grown increasingly popular among various segments of the United States workforce because of the financial benefits that it delivers (Dieringer, 2006). In the report's conclusion, it states that "the availability of cellular and broadband connections has made telecommuting low-budget and more fruitful to interact online." However, despite the fact that knowledge of telecommuting is growing among users such as employees, communities, telecom companies, transportation authorities, and others, the actual levels of telecommuting appear to be progressively changing, even though reliable data on the subject is lacking (Mokhtarian & Handy, 1993).

The long-term viability of telecommuting is based on employers offering the option of telecommuting, employees taking full use of this choice, and, ultimately, government laws that encourage both company and employee policies to be implemented. When it comes to telecommuting, teleworkers are so enthusiastic that they would gladly give up their favourite television shows (54 percent), an hour's nap (48 percent), favourite food (40 percent), or even a portion of their salary (40 percent) in exchange for the opportunity to continue working from home (Lesonky, 2011).

Gajendran and Harrison (2007) found that in a meta-analysis of 46 research including 12,883 employees, "Working from home had no generally harmful consequences for the quality of workplace interactions". In terms of downstream consequences, such as autonomous motivation and (reduced) work-family conflict, working remotely had a tiny but discernible

positive influence on the results. More peripheral outcomes such as job satisfaction, efficiency, attrition, and job strain were found to be positively impacted by working remotely. When employees are not at their old office, they are able to complete even more tasks. According to steelworkers and their supervisors, the most significant benefit of joining a virtual team is increased productivity in the workplace.

When asked about increased work efficiency in an AT&T-sponsored study of Fortune 1000 managers, 58 percent said it was important (Zelinsky, 1994). Cooper and Kurland (2002) utilized the Grounded Theory Technique. They examined the impact of telecommuting on the perceptions of occupational isolation among private and public sector employees in the United States. With their efforts, these groups want to open the door to an issue that has to be addressed in an environment that is friendly to telecommuting enterprises. The interviewers discovered that telecommuters' occupational exclusion was related with employee development activities such as teaching, intimate learning, social networking, and other forms of social interaction, among others. In these organizations, the number of remote employees who are subjected to professional isolation is decided by the degree to which operations are valued and the degree to which remote workers fail to take advantage of the opportunities presented to them (Cooper &Kurland, 2002). Therefore, it is plausible to assume that working remotely hinders the career progression of public-sector employees less than it does those in the private sector.

In a study effort, Heibel (2007) claimed that the US Central State promotes telework initiatives. A key goal of the conference was to assure the development of telework projects that have environmental and energy potential, and that there is enough available capacity to keep operations running, especially in emergency situations. Georgia's clean 'Air Tele-work Campaign' is an example of a programme that focuses on improving air quality and decreasing traffic congestion in metropolitan areas, and it is one of several examples. A lot of small and home-based enterprises profited from this effort, which provided them with tax benefits,

incentives, support, and other motivational materials to aid them in building their timework programmes and other time management tools. Natural disasters may have a devastating impact on a country, but organizations that employ people and move can continue to operate professionally and effectively (Oliver, 1994).

2.1 Concluding Reviews

In comparison to developed countries, the telecommunications infrastructure in South Asia is lacking. Oligopolistic markets make up the telecommunications infrastructure. Individual communications breakthroughs have a major influence on financial development and economic growth, according to prior research.

The impact of telecommunications, specifically the use of fixed telephones, on financial development and economic growth has been discovered, but other telecommunication sectors, such as mobile cellular, fixed broadband, and other internet services, have yet to be studied in developing countries to see how they affect financial development.

Telecommunication services in developing countries are improving day by day as a result of innovations, and their use is expanding, which has a good and substantial impact on financial development and economic growth.

Table 1: Summary of Earlier Research

S. No	AUTHOR/YEAR	DESCRIPTION OF THE STUDY	METHODOLOGY	RESULTS
1	Gautam (2012)	In Nepal, researchers examined the correlation between financial development and economic growth.	To assess the casual test, he employed the unit root test and cointegration test	The findings indicate a substantial correlation between financial sector development and economic development.
2	Zahra et al (2008)	Demonstrate how telecommunications may contribute to an economy's growth	The study applied an autoregressive model to test the converged hypothesis Granger Causality for global economies divided into three income groups: low, medium, and high.	The findings reveal that the telecommunications industry is experiencing low tele-density, particularly in rural regions, as well as a low level of service.
3	Aker and Mbiti (2010),	This study has shown the rate of telecommunication in different countries of Africa	The descriptive analysis tools were used in this study	Only 10% of the population had access to a mobile phone network in 1999. 60% of the population has access to a mobile phone network in 2008. In 2012, the majority of villages have mobile phone coverage.
4	Pradhan et al. (2016)	From 1991 to 2012, this research examined at the correlation	PVAR was employed in the study to identify a causation	The result shows the causality test shows that in the Asian countries,

		between telecommunications development, financial development, and economic growth index in 21 Asian nations.	trend while retaining equilibrium in the short and long term.	Granger-causality occurs both in the short and long term, but the exact form of causality varies by country in Asian regions.
5	Sridhar (2009)	This study investigates the impact of competition and networks are critical factors, and they have a positive impact on mobile service development in India.	The descriptive statistical tools were used, and secondary data has been collected of 23 regions of India	Telecommunications infrastructure is largely regarded as playing a beneficial and useful role in economic growth and development in 23 Indian regions
6	Alleman et al. (2004),	To investigate the comparative study between developed and developing countries in Africa that how telecommunication effect the economic growth	To assess the significance of telecommunications on economic growth in SADC member nations, this study used a country-based analysis of ordinary least square approach.	According to the research, more investment in telecommunications is critical not just for productivity but also for the global economy's competitiveness in an increasingly information-oriented environment. If developing nations' telecommunications systems fail to develop, a gap will open between RSA and SADC and industrial countries.

7	Dholakia and Harlam (1994)	To illustrate the relationship between telephone infrastructure investment and economic growth, this study focused at the interaction between several components such as education, electricity, telephone, and other physical infrastructure.	The multi regression approach was employed in this study to look at the influence of various factors on economic growth. The analysis was conducted using secondary data	The findings imply that investing in education, telecommunications, and other physical infrastructure at the same time is beneficial to economic development.
8	Czernich et al. (2011)	The study examined the impact of broadband on OECD nations' economic development.	They used data from OECD nations from 1996 to 2007 to empirically evaluate the influence of broadband economic growth.	Their results indicate that broadband upsurges growth up to 3.9 percent. Fast speed internet has positive impact of economic growth.
9	Mahyideen et al. (2012)	They have proposed that ICT upsurge economic development by enhancing productivity cutting down production cost	They empirically explored the relationship economic prosperity and information and communication technologies (ICT) countries from 1976 to 2010.	The results of granger causality supported association between ICT and economic growth.
10	Shamim (2007)	The effect of telecommunication on production growth was studied in this study. It is also proposed that telecommunication technologies provide refine information, mitigate the data processing asymmetric information.	Using panel data from 61 nations from 1990 to 2001, researchers examined the effect of telecommunication technologies on production growth.	The findings suggest that financial development has a beneficial influence when it is mediated via E-government or telecommunication technology.

Chapter 03

DATA AND RESEARCH METHODOLOGY

3.1 Introduction

This chapter represents the methodology used for the study along with data sources and description of variables. The study's major objective is to examine the influence of communications infrastructure on financial development and GDP per capita in developing nations in South Asia. This chapter is divided into two subsections, the first section explains the methodology used for estimating the effect of telecommunication on financial development and GDP per capital in south Asian developing economies and Section 2 describes the complete description of data variables and their sources used in the study.

3.2 Research Design

A researcher's research design is a logical arrangement of methodologies and approaches that he or she chooses to integrate numerous research components in order to effectively manage the research topic. This provides insight into how work can be done in a consistent manner. Many researchers have a list of research questions that need to be answered, and research design can help them do it. It not only demonstrates the data collection process but also explains how it works. Data from the World Development Index (WDI) and the International Technology Unit (ITU) from the years 2000 to 2019 were utilized in this study to examine the association between economic growth and financial development and the presence of communications infrastructure. The dataset contains data from seven countries, which is sufficient for regression analysis. The research design explains the overall framework of the investigation and how it will be conducted.

3.3 Research Design

Research Design in this study indicates the relationship of the variables between themselves. As study includes how telecommunication effects the financial development which boosts the economic growth of South Asian Developing Countries (SAARC). Economic growth is considered as dependent variable whereas the rest of the variables are independent variables. The study's conceptual framework describes the variable's association.

The study initially looks at data collection sources and ethical methods in this part, then moves on to econometric modelling and an explanation of the variables used in this study, and lastly to econometric analysis.

3.3.1 Research Design to select econometric techniques for estimation.

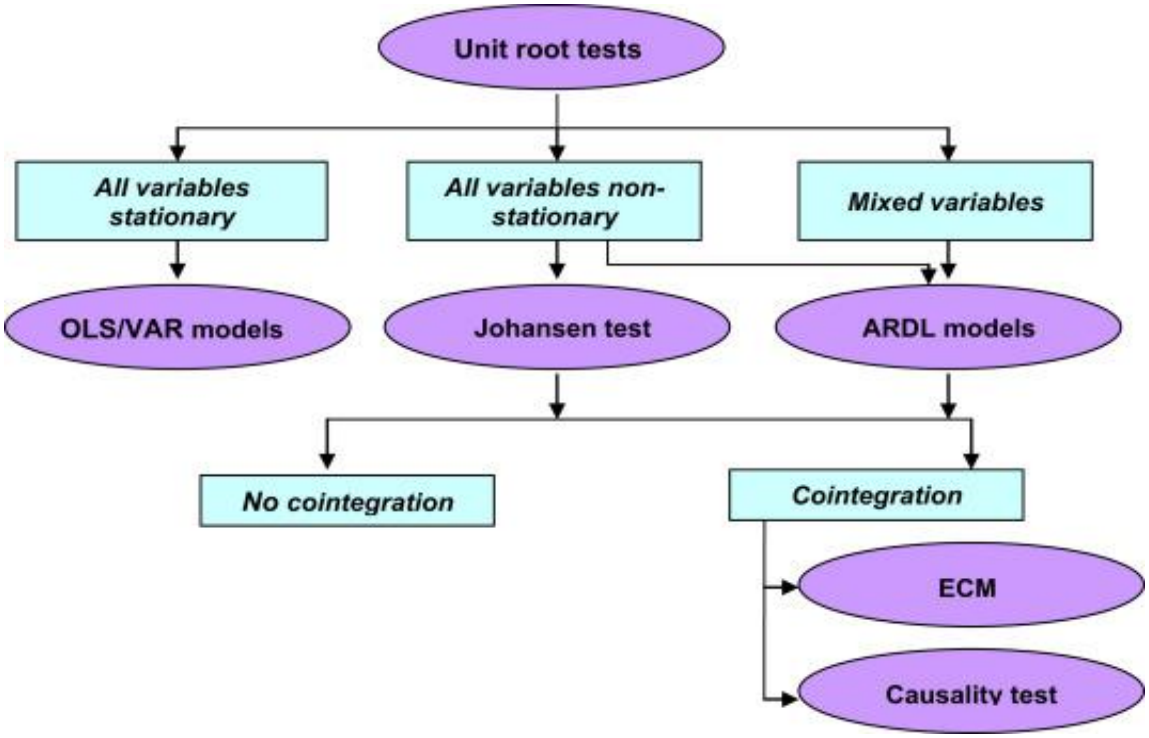

Figure 1: Research Design

3.4 Steps to estimation of ARDL Model

We will be using specific econometric methods to estimate the ARDL model by following these steps. Specify the model(s)

1) Descriptive statistics
2) Performing unit root test
3) Estimate the model(s)

The study begins by describing the model that will be obtained in this study, followed by a data summary, and finally a unit root test. The null hypothesis is rejected and use the estimator if the p-value is larger than 5% of the significance level. The ARDL model will be used. The ARDL model's estimate technique for data analysis will be applied if the variables are stationary at level I. (0) and at the first difference I. (1).

3.5 Model Specification

$$\boldsymbol{Y_{it} = \alpha + \beta FD_{it} + \gamma Z_{it} + \mu_{it}} \quad \textbf{.....Eq.1}$$

Where Y_{it} represents the economic growth that is GDP per capita of country **i** and period **t**. β_{it} is the set of regressors or independent variables in our estimation, and μ_{it} is the error**?** Controlled variables (Zit) of GDP per capita comprising government spending $(GOVEXPit)$, population growth $(POPGROWit)$, trade openness $(TRADEit)$, natural resources $(NATRESit)$, inflation rate $(INFit)$, School enrollment $(SCHOOLit)$ and gross capital formation $(GCFit)$

The expected model of the study is given as:

3.6 Econometric Modelling

3.6.1 Single equation model:

To empirically investigate the relationship between Y, FD, MC, INT, FIXED Tele, Fixed BB, and Z, where Y is dependent variable while FD, MC, INT, FIXED Tele, Fixed BB, and Z, are independent variables.

$$\boldsymbol{Y_{it} = \alpha_{\circ} + \alpha_1 FD_{it} + \alpha_2 MC_{it} + \alpha_3 INT_{it} + \alpha_4 Fixed\ Tele_{it} + \alpha_5 Fixed\ BB_{it} + \alpha_6 Z_{it} + \mu_{it}} \quad \boldsymbol{.....Eq.2}$$

Where, Y_{it}= GDP per Capita

FD_{it}= Financial Development

MC_{it}= Mobile Cellular Subscription

INT_{it} = Individual Using Internet

$Fixed\ Tele_{it}$= Fixed Telephone Subscription

$Fixed\ Broadband_{it}$= Fixed Broadband Subscription

Z_{it}= Controlled Variables

μ_t = error term

t = Years (2000, 2006, ……., 2019)

i = Index (Pakistan, India, Sri Lanka, Bangladesh, Nepal, Bhutan, Maldives)

α_0, α_1, α_2, α_3, α_4, α_5 and α_6= Partial slope coefficients.

Based on the data, this study chooses panel data regression technique to analyze data, The estimator used for estimation would be Auto Regressive Distributed Lag (ARDL To address the foregoing issues with the estimation of regression model, The ARDL model was first proposed by Pesaran & Shin (1995), and more lately by Pesaran et al. (2001), to estimate the long-run relationship between income inequality and regressors such as financial development, openness, inflation, population growth, and state final consumption and expenditure. The ARDL offers several benefits over other technical approaches. First, ARDL can be used when the variables are stationary at the level, first difference, or both. We can't use

Engel Granger's (1987) method since it only applies to two variables. The same is true for (Johanson & Juselius, 1990), which is likewise relevant even if all estimated variables have the same level of integration and only works with huge data sets. It includes the maximum lags for transitioning a data set from a generic to a particular method. ARDL is applied for a single equation that can easily extract and estimate the results. As it does not include the error term correlation, Autoregressive distributed lag provides an advantage over other methods for small samples. (Pesaran & Shin, 1999) further said that the ARDL overlooks the problems of serial correlation and endogeneity because of the lengthy time span and short estimate and lag order.

3.7 Description of data variables

In this study, we will use panel data of six south Asian developing countries from 2005 to 2019, countries include India, Pakistan, Bangladesh, Sri Lanka, Nepal and Afghanistan. The variables involved in this study are GDP per capita, financial development, mobile cellular, fixed telephone, fixed broadband, internet, trade openness, natural resources, gross capital formation, government consumption expenditure, population growth, inflation rate and school enrollment. Secondary data from 2005 to 2019 was used in this investigation and the main sources of the data are World Development indicators (WDI) and international telecommunication unit (ITU).

Table 2: Provides Variable Labels, Description, Measures and Data Sources.

VARIABLES	***MEASUREMENTS***	***DATA SOURCES***
GDP per capita	GDP per Capita	World development indicators 2000-2019
Financial Development	Domestic credit to private sector	World development indicators 2000-2019
TELECOMMUNUCATION (Mobile Cellular)	Mobile cellular subscriptions (per 100 persons)	International telecommunication unit (ITU) 200-2019

TELECOMMUNICATION (Internet)	Individuals using the internet (% of population)	International telecommunication unit (ITU) 2000-2019
TELECOMMUNICATION (Fixed Telephone)	Fixed telephone subscription (per 100 persons)	International telecommunication unit (ITU) 2000-2019
TELECOMMUNICATION (Fixed Broadband)	Fixed broadband subscription (per 100 persons)	International telecommunication unit (ITU) 2000-2019
Trade Openness	Trade (% of GDP)	World development indicators 2000-2019
Natural Resources	Total natural resources rent (% of GDP)	World development indicators 2000-2019
Gross Capital Formation	Gross capital formation (current US$)	World development indicators 2000-2019
Government Expenditure	General government final consumption expenditure (% of GDP)	World development indicators 2000-2019
Population growth	Population growth (annual %)	World development indicators 2000-2019
Inflation rate	Inflation, CPI	World development indicators 2000-2019
School Enrollment	School enrollment, secondary (% gross)	World development indicators 200-2019

In the above table, GDP per capita is dependent variable. cellular mobile, broadband, fixed telephone and internet are independent variables, lie in the telecommunication whereas remaining variables lie under controlled variables which are also independent. Financial development is also the main variable of the study.

3.7.1 GDP per capita

GDP per capita is a measure of economic growth, and GDP is where every economy's economic stability is found. Growth per capita (commonly known as growth for everyone) is a clearer indicator of economic growth in developing nations since they are generally saturated with comparably low levels of growth (Sala-I-Martin & Barro, 1995). In developing nations,

measuring GDP per capita is considerably more inclusive and essential than in wealthy countries. The World Development Indicator would be used to analyze GDP per capita.

3.7.2 Financial Development

Domestic loans to the private sector are used to gauge financial development. Domestic credit to the private sector, as defined by the World Bank, is a proxy for financial growth. It states to financial services provided to the private sector by financial firms, such as deposits, non-equity instrument sales, trading credits, and other receivable accounts that allow for a demand for repayment. In several emerging countries, such as south Asian developing countries, domestic lending to the private sector is considered as a proxy for economic growth, since the private sector is thought to be the driving factor behind economic development (Obeng-Amponsah et al., 2019).

3.7.3 Telecommunication Infrastructure

In this study, we concentrate on telecommunications infrastructures since they may help the financial sector's human capital while also being directly linked to productivity growth. Fixed telephone lines and their relevance for industrial expansion were the focus of previous telecommunications research. The number of individuals allied to the telephone network has increased substantially since the worldwide commercial debut of cellular telephones. Furthermore, in emerging-market financial markets, telephone banking and mobile banking have become quite apparent. Consequently, we feel it is important to include both wireless and fixed telephones as part of the telecommunications infrastructure when assessing their importance in the financial sector of established countries like South Asia's rising markets.

Fixed broadband is the last proxy used in telecommunication. Fix high-speed connection subscriptions to the public Internet are referred to as fixed broadband subscriptions. Fixed broadband has become more prevalent in the telecommunications sectors of many

advanced economies, prompting study into its implementation in south Asian economies' banking sectors.

3.7.4 Telecommunication (Mobile Cellular)

Over the last three decades, the mobile telecommunications sector has developed at a phenomenal rate, making it one of the most fascinating technological great achievements. Globally, the number of mobile customers has surpassed that of fixed lines since 2002. Mobile networks required less than a quarter of the time it took fixed phones to achieve what they had been struggling with for more than 120 years. For developing countries, the transition period for mobile users was much shorter. The number of mobile telecommunications users hit 4.6 billion at the end of 2009, accounting for 67 percent of the world's population. In 2017, this ratio hit more than 89 percent of the world's population. This technology is especially important in developing nations, where there are nearly twice as many subscriptions (3.2 billion) as there are in affluent countries (1.4 billion).

The proxy which is required for Mobile Cellular is Mobile cellular subscriptions (per 100 persons).

3.7.5 Telecommunication (Internet)

The proxy which is required for Internet is Individuals using the internet (% of the population). Internet users are those who have access to the Internet from anywhere on the planet. Internet users are those who can access the Internet from any location on the globe. The Internet is a large public access network that provides users to connect through a wide range of communication services. Any location, including a workplace, can be used as a use site. Divide the total population by the number of Internet users and multiply by 100 to get the indicator.

3.7.6 Telecommunication (Fixed Telephone)

Fixed telephone patterns with a designated line on a telephone exchange that connects a customer's terminal equipment (e.g., a phone set or a facsimile machine) to the Public Switched Telephone Network (PSTN). There is worry that the number of fixed lines per 100 people does not necessarily reflect the state of telecommunications development. For starters, there are additional telecommunications indicators such as mobile cellular and internet subscribers. Second, although analyzed statistics is available for some countries, fixed lines on a country level do not reveal the breakdown of line distribution into financial development and economic growth.

The proxy used for Fixed Telephone is Fixed telephone subscription (per 100 persons).

3.7.7 Telecommunication (Fixed Broadband)

Broadband (or high-speed) internet connection is no longer a luxury, but rather a need for both developed and emerging countries' economic and human growth. Broadband connectivity for everybody is the difficulty. In underdeveloped nations, only approximately 35% of the population has Internet connection (versus about 80 percent in advanced economies). Broadband has also become a basis for smart infrastructure (such as Intelligent Transportation Systems) enabled by new wireless technologies. The adoption of new financial applications has improved the competitiveness of the communication business. Electronic finance has evolved into one of the most significant tools for ensuring effective internal financial reporting management. Because of the internet's fast worldwide expansion, all governments must evaluate its causes, particularly in terms of financial implications.

3.8 Control Variables

We keep an eye on several variables since a traditional economic growth model is so important. Capital and labor, in theory, determine GDP per capita (the rate of output).

Considering population growth and school enrolment, respectively, as quantitative, and qualitative labor indicators.

Capital controls also include natural resources, gross capital formation, and government spending. Finally, the inflation rate and trade openness must be controlled since both variables are critical in assessing GDP per capita and their influence on macroeconomic core variables.

3.8.1 Gross Capital Formation

Gross Capital formation is seen as a critical component of economic development. The impacts of capital formation on price levels have an effect on economic growth. In theory, it is thought that increasing capital production can alleviate inflationary pressures in developing economies to a large extent. Capital formation aids in the self-sufficiency of a country and the reduction of foreign debt burdens. In this study gross capital formation is used as controlled variable.

3.8.2 Government Expenditure

Government expenditures are defined as general government final consumption spending's expressed as a percentage of GDP in this research. On a country's national income accounts, government final consumption expenditure (GFCE) is considered as a transaction amount, that indicates how much the government spends on products and services that directly meet the needs of individuals or communities (consumption by the group). It is the value of government-generated products and services other than own-account capital production and sales, as well as the value of government purchases of market-produced commodities and services supplied to households without conversion. Government spending is critical in stimulating economic growth.

3.8.3 Population growth

The uptick in the number of individuals in a population is known to as population growth. In some respects, population increase helps the development process, while in the

other, it hinders it. This is due to the complicated, dynamic, and overlapping relationship between population growth and economic growth. The telecommunications sector will continue to thrive due to steady population growth and higher purchasing power. Connectivity has been an integral part of modern-day life, thus accelerating the growth in telecommunication infrastructure is increasing in the population. In this study population growth is the part of controlled variables

3.9 Econometrics Analysis

By proceeding on to the methodology and final analysis of the data, a few preliminary tests were performed on git to ensure its appropriateness and validity for analysis. The data is subjected to unit root tests to check that the variables are stationary.

3.9.1 Panel Data Unit Root Testing

Canning and Pedroni (2004) To avoid a spurious regression problem, we first check the stationarity of variables before performing Panel Autoregressive analysis. "Panel Data illustrates the crux of time series if each cross-section has data of more than 10 years". Time series data, on the other hand, generally start off non-stationary. As a result, to avoid spurious regression. (Maddala & Wu, 1999; Hadri, 2000; Levin et al., 2002; Pesaran et al., 2004; Pesaran, 2007). Here we will use panel unit root tests such as LLC, IPS and Breitung unit root tests.

3.10 ARDL Estimation

The ARDL (Autoregressive Distributed Lag) model is applied in this study to investigate the relationship between economic growth, financial development, gross capital formation, government expenditure, inflation, population growth, natural resources, school enrollment, trade openness, fixed broadband, fixed telephone, internet users, and mobile cellular. (Pesaran, Shin, 1999) was the first to design and introduce this model, and it was later

updated and redefined by (Pesaran, Shin, & Smith, 2001), Because of its approach to cointegration analysis across variables and the capacity to estimate short-run and long-run estimates independently, ARDL has been widely utilized and is preferable over previous approaches.

In addition, despite other tests like the Johnsen Cointegration Test (Johnsen, 1991) and the Engle and Granger Test (Engle & Granger, 1987), this method may be used to determine relationships between variables that are either 1(0) or 1(1), or a mixture of 1(0) and 1(1) variables.

Another advantage of this test over previous approaches is that it uses to integrate the short-run effect of key variables with long-run equilibrium without forgetting information in the long run, the Error Correction Method (ECM) is used for this purpose. ARDL could potentially determine different optimal lags for each of the variables (Pesaran et al., 2007).

3.10.1 Reasons to use ARDL model

There are certain advantages to use ARDL model which are given below.

1. According to (Alam & Quazi 2003). When independent variables are dependent, estimate is achievable in the ARDL procedure. Furthermore, the ARDL model has a lower endogeneity problem and no residual correlation.
2. The ARDL model is corrected for the selection of the appropriate lags shown by for both endogeneity and residual correlation (Pesaran & shin, 1999).
3. One of the most notable benefits of the ARDL method over the single equation method is that in co-integration analysis, for example, (Engle & Granger, 1987) had to deal with endogeneity issues, whereas the ARDL method can differentiate between dependent and independent variables.

4. Another feature of the ARDL approach is that it produces asymptotically normal estimates of long-run parameters regardless of whether the variables are 1(0), 1(1), or mutually integrated" (Pesaran and Pesaran, 1997).
5. In comparison to traditional approaches, ARDL can use the Error Correction Method (ECM) to integrate the short-run effect of key variables with long-run equilibrium without losing information in the long run. ARDL might potentially identify different optimum lags for each of the variables (Pesaran et al., 2007)

3.10.2 Assumptions of ARDL

There are few assumptions of ARDL model which are given below:

1. We will not use ARDL if the variable is stationary at the second difference I(2).
2. We shall use ARDL whenever the variables are stationary at level 1(0) as well as at the first difference 1(1).
3. There must be appropriate lag selection.
4. The error should be exogenous in series.
5. The model should be dynamically stable.

If one variable is stationary at second difference 1(2), the study does not use ARDL. "In case of second difference, ARDL method makes no sense," Pesaran et al. (2001) and Narayan (2005) write, "because if a variable is stationary at second difference 1(2), then the estimated value of F-statistics can no longer be valid."

As shown in, ARDL may be used to specify a basic model with a single equation in where Economic growth is the dependent variable and is a vector of independent variables (Pesaran & Shin, 1999; Pesaran et al., 2001).

3.11 The Estimation Procedure

The study will use different techniques of empirical analysis to assess the association between GDP per capita, financial development, controlled variables, fixed broadband, fixed telephone, mobile cellular and individual using internet.

We'll starting with a statistical analysis. After that, the stationarity will be checked applying the enhanced unit root test. When the Unit root test findings are significant at the level and first difference, we will use the ARDL test in the study.

CHAPTER 4

MODEL ESTIMATION AND DISCUSSION OF THE RESULTS

4.1 Introduction

In this chapter, data analysis is used to generate results and explain them in a complete manner using selected data. The study began with presenting a summary of dataset statistics that illustrate and explain the features of each variable in the model. The Causality Test is used to determine which way the variables are related. We also used a unit root test to evaluate the stationarity of the variables in the study. At the level, certain variables were significant, while others were not. The first difference is utilized to make them significant. Because several variables showed significance at the level but not at the first difference, the ARDL model was used. Finally, the findings are reviewed in relation to other results discovered in the previous literature.

4.2 Descriptive statistics

The main indicators of interest in this study are GDP per capita (GDP), Financial Development (FD), Government Expenditure (GE), Inflation Rate (INF), Gross Capital Formation (GCF), Natural Resources (NR), Population Growth (PG), Trade Openness (TRAD), School Enrollment (SE), Fixed Broadband (FX BB), Fixed Telephone (FX TELE), Mobile Cellular (MOB CELL), Individuals Using Internet (IND USERS). Table 4.1 presents the summary of statistics on these indicators.

Table 3: Summary of statistics

Variables	Mean	Median	Max	Mini	Std. Dev.	Obs
GDP	4.31341	4.10053	17.03	-1.4	2.83945	59
FD	34.4801	31.62	59.17	16.94	10.9756	59
GE	5.13716	5.097	5.44	4.8	0.14398	59

Inflation	7.23816	7.036	20.28	2.0	3.39415	59
Log-Gcf	23.8165	23.76	24.3	23.2	0.36292	59
NR	2.18976	1.62	7.10	0.14	1.51606	59
PG	1.4306	1.42	2.34	-0.19	0.56008	59
SE	51.1818	49.99	99.44	22.51	15.5918	59
Trad	49.922	44.06	116.5	25.9	25.944	59
Log- Fx BB	0.10833	0.69	1.6	-3.4	1.63622	59
Fx Tele	3.33029	3.04	17.6	0.38	3.52216	59
Log Ind Users	0.00968	0.58	1.6	-2.64	1.48431	59
Mob Cell	29.9335	21.03	94.1	0.042	28.2577	59

Source: Author's own collection

Before moving towards multivariate analysis, the descriptive variables of primary study variables are represented in table 4.2.1. Descriptive statistics of indicators showed some key aspects of the indicators. All the indicators have same number of observations. The mean average values of the data and median about the most middle value of the ascending or descending order of the data. The standard deviation describes us about the deviation of the series from its mean for its analysis. The central values of data set are mean and median. The mean value of GDP per capita for selected South Asian countries is 4.31341 respectively whereas mean value of financial development, government expenditure, inflation, gross capital formation, natural resources, population growth, school enrollment, trade openness, fixed broadband, fixed telephone, internet and mobile cellular are 34.4801, 5.13716, 7.23816, 23.8165, 2.18976, 1.4306, 51.1818, 49.922, 0.10833, 3.33029, 0.00968, 29.9335 respectively. The median values of GDP per capita for selected South Asian countries is 4.10053 respectively whereas mean value of financial development, government expenditure, inflation, gross capital formation, natural resources, population growth, school enrollment, trade

openness, fixed broadband, fixed telephone, internet and mobile cellular are 31.6263, 5.09745, 7.03638, 23.7602, 1.62703, 1.42653, 49.9982, 44.063, 0.69406, 3.04338, 0.58779, 21.0377 respectively. Composition effect seems normally distributed, because the mean and median values are approximately same. Moreover, table also represents maximum values of South Asian countries that is largest value in the data set whereas minimum represents the smallest values in data set for the variables of South Asian countries. The standard deviation describes us about the deviation of the series from its mean for its analysis.

After analyzing the descriptive statistics, we have taken log of gross capital formation, fixed broadband and individual using internet. Before analysis of our data, it is needed to identify the presence of non-stationarity, if yes, then the order of integration of all variables will need to be undertaking. All variables may be tested for stationarity using the panel unit root. Table 4 summarizes the results of the panel unit root test. The variables in this study are a combination of stationary I(0) and non-stationary I(1) regressors, according to the findings. Table 4 below summarizes the findings. Panel Data Stationarity is crucial to achieve reliable findings and prevent spurious Regression Analysis since forecasting is difficult when the data is non-stationary.

4.3 Correlation Test

The positive and negative relation between the specified variables was determined using correlation analysis. This type of analysis determines how closely the two regressors move together. The Pearson Correlation Coefficient (PCC) is a sign test for the nature of a relationship, and its coefficients determine the strength of relationship between the pairs of correlations.

Table 4: Results of Correlation Test

	GDP	FD	GE	INF	LGCF	NR	PG	SE	TO	LFBS	FTS	LIUI	MC
GDP	1.00												
FD	0.23	1.00											
GE	0.21	-0.03	1.00										
INF	-0.16	0.28	0.10	1.00									
LGCF	0.20	0.51	-0.01	0.64	1.00								
NR	0.25	0.33	0.18	0.16	0.24	1.00							
PG	-0.43	-0.63	0.05	-0.03	-0.52	0.06	1.00						
SE	0.48	0.47	-0.16	-0.01	0.49	0.09	-0.75	1.00					
TO	0.51	0.14	0.14	-0.02	0.29	0.53	-0.35	0.32	1.00				
LFBS	0.21	0.48	0.27	0.67	0.92	0.28	-0.46	0.40	0.30	1.00			
FTS	0.37	-0.01	-0.02	0.02	0.33	-0.08	-0.37	0.68	0.19	0.28	1.00		
LIUI	0.21	0.51	0.17	0.65	0.95	0.29	-0.49	0.44	0.32	0.96	0.29	1.00	
MC	0.21	0.36	-0.15	0.56	0.92	0.21	-0.43	0.60	0.28	0.80	0.52	0.86	1.00

Perfect: If the value is near ± 1, then it said to be a perfect correlation: as one variable increases, the other variable tends to also increase (if positive) or decrease (if negative).
High degree: If the coefficient value lies between ± 0.50 and ± 1, then it is said to be a strong correlation.

The cross-correlation matrix for all the variables included in our empirical analysis is shown in the table above. It clearly shows that there is no multicollinearity problem, as independent variables do not have high correlation of 0.9. The above table exhibits that, financial development, government expenditure, log of gross capital formation, natural resources, school enrollment, trade openness, log of fixed broadband subscription, fixed telephone subscription, log of individual using internet and mobile cellular subscription are positively and significantly related with GDP per capita, whereas inflation rate and population growth are inversely correlated with GDP per capita. Government expenditures, population growth and fixed telephone subscription are inversely and substantially correlated with Financial Development, whereas the remaining independent variables are positively correlated with financial development.

Government expenditure is inversely linked with log of gross capital formation, school enrollment and also inversely related to two of telecommunication indicators i.e., Mobile cellular and fixed telephone subscription. The remaining independent variables are positively correlated with Government Expenditure. In the correlation matrix, inflation rate is inversely related to population growth, trade openness and school enrollment, whereas mobile cellular, fixed telephone subscription and other independent variables are positively correlated with inflation rate. Further with the log of gross capital formation, only population growth is negatively correlated, rest of the variables are positively and significantly related with log of gross capital formation. All the independent variables are negatively correlated with population growth.

School enrollment, trade openness and all the variables included in telecommunication sector are positively correlated with independent variables.

We may assume that our data has no problems with perfect multi-collinearity throughout the examination of inter-relationships.

4.4 Unit Root Tests Results

It is important to prevent spurious regression analysis for data stationarity in order to get accurate results, because forecasting is unattainable if the data is non-stationary. E-views results for the Dickey-fuller augmented unit root test on all variables are shown in Table 4.4. At the level and at the first difference, results are presented with and without trend.

Here in this study, levin-lin chu (LLC) test, Im, Pesaran and Shin (IPS) Test and PP – Fisher Chi - Square tests are performed.

4.4.1 Levin-Lin Chu (LLC) Test

We used the Levin-Lin-Chu (LLC) Root Test Unit only. According to Slamon et al. (1987), In 1992, Levin and Lin created the panel unit root test. The test was first introduced in a working paper by Levin and Lin in 1992, and it was fully published in 2002 with chu (coauthor). Because of Levin and Lin's work, the test is still known as the LL test. This is a variation of the DF (Dickey Fuller) test.

The LLC unit root test takes into account cross section heterogeneity and serial correlation; however, it has minimal power in small samples. To address the LLC unit root test's shortcomings, IPS techniques were applied, which take into account the same heterogeneity of numerous cross-sections, serial correlation, and perform well in small sample sizes.

The null hypothesis(H0) of Levin-Lin-Chu (LLC), indicates the existence of unit root (i.e., non-stationary variables), the alternative hypothesis (H1) is (i.e., the variables are stationary).

H_0 = There is unit root in the variables.

H_1 = The variables are stationary.

The LLC model is given below.

$$\Delta Y_{it} = \alpha_i + \beta_1 Y_{it-1} + \gamma_{it} + \sum_{j=1}^{k} \emptyset \Delta Y_{it-j} + \Theta_t + \mu_{it}$$ ***.....Eq.3***

The difference operator □, □i and □t is applied as a fix and time effect in LLC equations, and Yit represents the economic growth (GDP per capita) whereas □it shows the error term. I shows the cross sections and t shows time series, i = 1, 2 ,….7 and t = 1, 2,…., 25. LLC check integrates null hypothesis H0: β = 0 as contrasting to H1: β<0. The results are shown at the level of the first difference, without a trend or intercept. The presence of the trend alternative indicates that this model has a linear time trend. Whereas at 1st difference, all of the variables are stationary.

Table 5: Results of Levin-Lin-Chu unit root test at the level and first difference

Variables	Level		First Difference		Decision
	Statistic	Prob.	Statistic	Prob.	
	LEVIN-LIN-CHU				
FD	2.01451	0.9780	-4.31405	0.0000	I(1)
GDP	-0.65004	0.2578	-10.7944	0.0000	I(1)
GE	1.60494	0.9457	-7.05939	0.0000	I(1)
GCF	3.19024	0.9993	-2.60929	0.0045	I(1)
INF	-1.60897	0.0538	-11.0142	0.0000	I(1)
NR	-2.06623	0.0194	-11.1602	0.0000	I(0)
PG	-2.25649	0.1020	-4.08486	0.0000	I(1)
SE	4.61720	1.0000	-2.21026	0.0135	I(1)
TRAD	-0.72316	0.2348	-7.75968	0.0000	I(1)
FX BB	0.37325	0.6455	-2.59784	0.0047	I(1)
FX TELE	-1.81150	0.0350	-5.13715	0.0000	I(0)
MOB CELL	0.69322	0.7559	-2.73612	0.0031	I(1)
IND USERS	4.81568	1.0000	-3.07277	0.0011	I(1)

4.4.2 The Im, Pesaran and Shin (IPS) Test

Im, Pesaran, and Shin (IPS) are an extension of the Levin, Lin Chu (LLC) test that Im, Pesaran, and Shin proposed (IPS). In 1997, the IPS was introduced. The objective of this dissertation was to introduce heterogeneity coefficient of Yit. IPS introduce a new stationary approach based on the average of individual test results. The Im, Pesaran, and Shin (IPS)

method is used to distinguish between time series dimension and cross section dimension estimates, and it allows for varied residual values, lag lengths, and parameter values. The Im, Pesaran and Shin (IPS) model is given bellow.

$$\Delta Y_{it} = \alpha_i + \beta Y_{it-1} + \gamma_{it} + \sum_{j=1}^{k} \emptyset \Delta Y_{it-j} + \Theta_t + \mu_{it} \quad \textbf{.....Eq.4}$$

The dependent variable in this equation, Yit, is in the autoregressive form (AR) form. □i is the intercept or drift in multiple I cross sections, indicating that each cross section is unique. T stands for time series length, whereas I stand for cross sections, with i=1,2,3...7 and t=1,2,3...25. □ the set of parameters that differs from each cross section Yit-1 displays the dependent variable's lag. Yit-j is for removing the autocorrelation problem, indicates more lag of the dependent variable. Whereas □it displays the words "white noise disturbance."

Im, Pesaran, and Shin (IPS) hypotheses are;

H_O: □i= 0 for each i.

H_1: □<0 for at least one of the I

The Null hypothesis Ho states that data have a unit root, indicating that they are non-stationary, whereas the alternative hypothesis H1 states that data do not have a unit root, indicating that they are stationary.

The Im, Pesaran, and Shin Tests assume that the time series is constant throughout all cross sections.

Table 6: Results of IM, PESARAN and SHIN unit root test at the level and first difference

Variables	Level		First Difference		Decision
	Statistic	Prob.	Statistic	Prob.	
	IM, PESARAN AND SHIN W-STAT				
FD	1.07949	0.8598	1.70704	0.0439	I(1)
GDP	3.64836	0.0001	7.38298	0.0000	I(0)
GE	0.83487	0.7981	4.94521	0.0000	I(1)
GCF	3.26352	0.9994	2.34286	0.0096	I(1)

INF	1.46615	0.0713	6.90059	0.0000	I(1)
NR	0.96695	0.1668	7.38802	0.0000	I(1)
PG	2.48036	0.0066	4.79010	0.0000	I(0)
SE	1.06954	0.8576	1.98042	0.0238	I(1)
TRAD	1.01132	0.1559	3.79364	0.0001	I(1)
FX BB	1.98854	0.9766	-1.62413	0.0522	I(1)
FX TELE	0.53285	0.7029	2.15802	0.0155	I(1)
FX CELL	1.27307	0.8985	-2.27587	0.0114	I(1)
IND USERS	6.48002	1.0000	3.42689	0.0003	I(1)

Table 7: Results of PP-FISHER CHI-SQUARE unit root test at the level and first difference

Variables	**Level]**		**First Difference**		**Decision**
	Statistic	**Prob.**	**Statistic**	**Prob.**	
	PP – FISHER CHI-SQUARE				
FD	2.60205	0.9996	64.8030	0.0000	I(1)
GDP	39.2619	0.0003	128.429	0.0000	I(0)
GE	18.6238	0.1798	102.293	0.0000	I(1)
GCF	1.10282	1.0000	54.0361	0.0000	I(1)
INF	21.0390	0.1006	140.300	0.0000	I(1)
NR	19.8812	0.1339	112.002	0.0000	I(1)
PG	60.1685	0.0000	47.4600	0.0000	I(0)
SE	0.40544	1.0000	48.0663	0.0000	I(1)
TRAD	15.8172	0.3247	94.5448	0.0000	I(1)
FX BB	2.29855	0.9998	30.0905	0.0074	I(1)
FX TELE	10.0322	0.7598	82.7668	0.0000	I(1)
FX CELL	0.62854	1.0000	26.5965	0.0217	I(1)
IND USERS	0.57051	1.0000	52.0811	0.0000	I(1)

4.5 ARDL model

The results of panel ARDL model are shown in table 5.5. As some of our variables were stationary at level 1(0) and the rest were at first difference 1(1), therefore, ARDL was the most appropriate technique to check the relationship between economic growth, financial development, inflation, gross capital formation, government expenditure, natural resources,

population growth, school enrollment, fixed broadband, fixed telephone, individual using internet, mobile cellular.

4.5.1 Long Run ARDL Model

Table 8: Results of ARDL Model

Dependent Variable: GDP Per Capita				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.***
Long Run Equation				
Financial Development	1.484007	0.0569	26.08096661	0.0000
Trade Openness	2.627505	0.0069	380.7978261	0.0452
Natural Resources	3.350493	0.0172	194.7961047	0.0000
Gross Capital Formation	3.700096	0.006	616.6826667	0.0000
Log Gross Capital Formation	4.049699	0.0017	2382.175882	0.0016
Government Expenditure	0.399302	0.0026	153.5776923	0.0012
Population Growth	0.748905	0.0069	108.5369565	0.0816
Inflation Rate	5.098508	0.0112	455.2239286	0.0718
School Enrollment	0.456732	0.0155	29.46658065	0.7643
Mobile Cellular Subscriptions	0.326795	0.0198	16.50479798	0.0361
Individuals Using the Internet	0.196858	0.0241	8.168381743	0.0250
Log Individuals Using the Internet	0.066921	0.0114	5.870263158	0.2929
Fixed Telephone Subscription	-0.063016	0.0321	-1.96311526	0.0823
Fixed Broadband Subscription	3.456677	0.0111	311.4123423	0.0000
Log Fixed Broadband Subscription	1.677835	0.0419	40.04379475	0.0000

Table provides the model's ARDL estimate results. According to this model, the coefficient value of financial development is positively and highly significant with GDP per capita in the long term ARDL model. These findings are consistent with previous research (Lombardo & Pagano, 1999; Asongu, 2012; Ajide, 2014). The partial slope of the coefficient for financial development implies that a 1% rise in financial development will result in a 1.48 % increase in long run GDP per capita.

According to this model, the coefficient value of trade openness is positively and highly significantly related with GDP per capita. In the long run, ARDL estimates that a 1% increase in trade openness will result in a 2.62 percent rise in GDP per capita. Natural resources are also positively and highly significant with GDP per capita, the partial slope of coefficient suggests that 1% increase in natural resources will increase the GDP per capita by 3.35% in long run dynamics of ARDL. In the long run, ARDL, the log of gross capital formation is likewise positively and substantially associated to GDP per capita, as the partial slope of the coefficient reveals that a 1% rise in log of gross capital formation leads to a 4.04% increase in GDP per capita. Government spending is likewise positively and strongly related to GDP per capita, with the partial slope of the coefficient implying that a 1% rise in government spending would result in a 0.399 % increase in GDP per capita in the long run dynamics of ARDL.

Population growth and inflation rate in long run ARDL are positively and strongly associated to GDP per capita at 10% significance level, as the partial slope of coefficient suggests that 1% increase in Population growth will result an increase of 0.74% in GDP per capita whereas 1% increase in inflation rate will result an increase of 5.09% in GDP per capita which is very high as compared to other variables. School enrollment is also positively and strongly associated to GDP per capita in long run dynamic ARDL, the coefficient value of School Enrollment depicts that 1% increase in School Enrollment will take a lead to increase 0.45% increase in GDP per capita in long run ARDL. Moving on to telecommunications, it is clear that mobile cellular subscription is correlated with GDP per capita in a favorable and substantial way. As the slope of coefficient indicates that 1% increase in mobile cellular subscription will take a lead to increase in 0.32% increase in GDP per capita in long run dynamics of ARDL Log of Individuals using internet are also positively and highly insignificantly associated with GDP per capita.

The slope of log of Individual using internet suggests that 1% increase will result in 0.06% rise in GDP per capita. Fixed telephone subscription is inversely but significantly associated to GDP per capita at 10% significance level. As the partial slope of coefficient of fixed telephone subscription explains that 1% increase will decrease the GDP per capita by -0.06% (negative sign shows the inverse relationship between Fixed telephone and GDP per capita) in long run dynamics of ARDL. The log of fixed broadband subscription has a positive and highly substantial effect on the dependent variable GDP per capita, as if the partial slope of coefficient of Log of fixed broadband is increased by 1% will take a lead to increase in 1.67% in GDP per capita in long run dynamics of ARDL.

If we see the overall level of significance through the long run dynamic ARDL model, according to the t-statistics, if the overall value of t-statistics is greater than 2 (less than 2) in absolute form then the whole model is significant (insignificant).

If we check the overall model through probability, it tells you the regression's overall significance. However, unlike t-statistic, which evaluates significance for individual variables, this is used to examine the significant level of all variables collectively.

The null hypothesis under this is

H_0 = All the regression coefficients are equal to zero

H_1 = At least one regression coefficient is no equal to zero

then we can say that is for significance of the model p-value should be less than 0.05 (p-value < 0.05). if the value is greater than 0.05 then long run ARDL model will be insignificant. As the above results, probability is close to very zero. This depicts that the regression is significant and meaningful.

4.5.2 Short Run ARDL Model

Table 9: ***Results of ARDL Model***

Short Run Equation				
Dependent Variable: GDP Per Capita				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.***
COINTEQ01	-0.101008	0.0287	-3.51944251	0.0003
Financial Development	1.734256	0.0174	99.66988506	0.0618
Trade Openness	4.653435	0.0534	87.14297753	0.0314
Natural Resources	7.572614	0.0875	86.54416	0.0442
Gross Capital Formation	3.491792	0.062	56.31922581	0.0343
Log Gross Capital Formation	0.410971	0.0108	38.05287037	0.0357
Government Expenditure	-0.66985	0.0231	-28.9978355	0.0365
Population Growth	0.750672	0.0757	9.916406869	0.0435
Inflation Rate	0.831493	0.034	24.45567647	0.0840
School Enrollment	0.912314	0.0056	162.9132143	0.0061
Mobile Cellular Subscriptions	0.993136	0.0357	27.81893557	0.0332
Individuals Using the Internet	1.073957	0.456	2.35516886	0.0596
Log Individuals Using the Internet	1.154779	0.0983	11.74749746	0.0000
Fixed Telephone Subscription	0.134946	0.191034	0.706394	0.0819
Fixed Broadband Subscription	-0.041993	0.068761	-0.610716	0.0431
Log Fixed Broadband Subscription	-0.155292	0.045552	-3.409121	0.0010
Root MSE	0.933871	**Mean dependent var**		0.034971
S.D. dependent var	2.976483	**S.E. of regression**		1.574192
Akaike info criterion	3.578114	**Sum squared resid**		203.2026
Schwarz criterion	5.814623	**Log likelihood**		-265.8502
Hannan-Quinn criter.	4.479974			

*"The ***, **, and * asterisks indicate the level of significance at 1%, 5%, and 10% respectively".*

Table provides the model's ARDL estimate results. According to this model, the coefficient value of financial development is favorably and insignificantly related to GDP per capita in the short run ARDL model. According to the coefficient slopes, a 1% rise in financial development leads to a 1.73 % increase in GDP per capita. In short run dynamic ARDL model, trade openness has positively and substantially associated to GDP per capita, as the coefficient

values depicts that 1% rise in trade openness will cause in an increase of 4.65% in GDP per capita. In the short run dynamic of the ARDL model, natural resources have a positive and substantial influence on GDP per capita.

As the coefficient slope of Natural resources suggests that by increasing 1% change in natural resources, it will take a lead to increase the GDP per capita by 7.57% in short run, which is a positive change in the overall growth. Log of Gross capital formation is also positively and substantially related with GDP per capita in short run dynamics of ARDL. The coefficient of value of Log of gross capital formation in the table suggests that 1% increase in Log of gross capital formation will cause an increase of 0.41% in GDP per capita in short run dynamics of ARDL. Government expenditures are significantly but negatively related with GDP per capita. The coefficient value of Government Expenditures in the table depicts that if Government expenditures are increased by 1% then the GDP per capita will be decreased by 0.66% (negative sign indicates the inverse relation between Government expenditures and GDP per capita) in short run dynamics of ARDL model.

The population growth is positively and substantially related with GDP per capita. The coefficient value of Population growth indicates that 1% rise in Population growth will result in 0.75% increase in GDP per capita in short run dynamic ARDL model. Inflation rate in short run equation is significantly related to GDP per capita at 10% significance level also positively associated with GDP per capita. The coefficient value in the table implies that 1% rise in inflation rate will cause 0.83% increase in GDP per capita. School enrollment is also positively and substantially related to GDP per capita in short run dynamic ARDL, the coefficient value of School Enrollment depicts that 1% increase in School Enrollment will take a lead to increase 0.91% increase in GDP per capita in short run ARDL.

In the telecommunication sector, it can be seen that, mobile cellular is positively and significantly related with GDP per capita in short run ARDL. The coefficient value in the table

indicates that 1% rise in mobile cellular will result in an increase of 0.99% in GDP per capita in short run dynamics of ARDL. Log of individual using internet has positive and highly significant effect on GDP per capita. The coefficient value indicates that 1% increase in Log of individual using internet will result in an increase in GDP per capita by 1.15% in short run dynamics of ARDL. Fixed telephone subscription is also positively and substantially associated to GDP per capita at 10% level of significance. The slope of coefficient depicts that 1% rise in Fixed telephone subscription will increase GDP per capita by 0.13% in short run dynamics of ARDL. The log of fixed broadband subscription has a negative but highly significant effect on the dependent variable GDP per capita, as if the slope of coefficient of Log of fixed broadband is increased by 1% will take a lead to increase in -0.15% in GDP per capita in long run dynamics of ARDL.

If we see the overall level of significance through the short run dynamic ARDL model, according to the t-statistics, if the overall value of t-statistics is greater than 2 (less than 2) in absolute form then the whole model is significant (insignificant).

If we check the overall model through probability, it tells you the regression's overall significance. However, unlike t-statistic, which evaluates significance for individual variables, this is used to examine the significant level of all variables collectively.

The null hypothesis under this is

H_0 = All the regression coefficients are equal to zero

H_1 = At least one regression coefficient is no equal to zero

then we can say that is for significance of the model p-value should be less than 0.05 (p-value < 0.05). if the value is greater than 0.05 then short run ARDL model will be insignificant. As Based on the above findings, the probability is relatively close to zero. This depicts that the regression is significant and meaningful.

4.6 Granger Causality Tests

The Granger causality test evaluates if one time series may forecast another. The goal of this test is to ensure that the data variables are correctly related. The null hypothesis says that there is no Granger Causality between the variables. The alternative hypothesis claims that causation exists and that it is either unidirectional or bidirectional. Table 4.3.1 below displays the results of the Granger Causality Check having 2 lags and 75 observations from 2000 – 19.

4.6.1 Hypothesis testing of Granger Causality Tests

The hypothesis made for Granger Causality test is given below

H_0 = There is no causality in the variables.

H_1 = There is causality in the variables.

Table 10: Granger Causality Tests

Variables	GDP per Capita	FD	GE	INF	GCF	PG	Fixed BB	Fixed Tele	Mobile Cellular	Ind Using Internet
GDP per Capita		7.56741 (0.0008)	2.66194 (0.0739)	0.31441 (0.7308)	1.76206 (0.1761)	0.13952 (0.8699)	0.18637 (0.8304)	1.90691 (0.1530)	5.57780 (0.0049)	0.17238 (0.8419)
FD	8.63577 (0.0003)		0.64308 (0.5275)	0.74981 (0.4747)	0.53013 (0.9500)	1.25766 (0.2881)	1.00863 (0.3701)	1.07559 (0.3445)	3.56513 (0.0315)	0.81391 (0.4462)
GE	1.01214 (0.3665)	0.29201 (0.7473)		1.68508 (0.1898)	3.11687 (0.0479)	3.00588 (0.0532)	10.9076 (7.E-05)	0.74998 (0.4746)	0.18761 (0.8292)	4.36997 (0.0152)
INF	0.39248 (0.6762)	6.07346 (0.0031)	2.75676 (0.0675)		3.13356 (0.0471)	1.04131 (0.3562)	3.44181 (0.0374)	0.22401 (0.7996)	0.47478 (0.6232)	2.52868 (0.0849)
GCF	0.23844 (0.7882)	0.05134 (0.9500)	12.0554 (2.E-05)	0.90806 (0.4061)		0.80845 (0.4479)	0.29794 (0.7429)	2.68269 (0.0725)	0.38739 (0.6797)	5.19176 (0.0072)
NR	1.78275 (0.1726)	0.03919 (0.9616)	1.90742 (0.1529)	0.16001 (0.8523)	0.14958 (0.8612)	8.16633 (0.0005)	3.46949 (0.0331)	1.25985 (0.2862)	3.46949 (0.0331)	1.62866 (0.1989)
PG	5.49350 (0.0052)	3.18045 (0.0452)	1.32174 (0.2705)	1.45968 (0.2364)	0.38084 (0.6841)		0.13919 (0.8703)	1.08332 (0.3422)	3.84386 (0.0258)	3.59743 (0.0324)
Fixed BB	0.56290 (0.5720)	0.34613 (0.7085)	13.5928 (1.E-05)	2.97203 (0.0576)	16.7614 (1.E-06)	0.17477 (0.8400)		0.80161 (0.4526)	0.93560 (0.3973)	11.5867 (4.E-05)
Fixed Tele	0.17751 (0.8376)	0.12894 (0.8792)	0.54636 (0.5707)	0.34123 (0.7166)	0.29794 (0.7429)	2.73243 (0.0696)	0.29413 (0.7461)		2.40241 (0.0950)	0.01415 (0.9859)

Mobile Cellular	1.06051 (0.3496)	0.79036 (0.4562)	6.12763 (0.0029)	5.48188 (0.0053)	1.63070 (0.2002)	0.49166 (0.6136)	2.37983 (0.1001)	3.69914 (0.0277)		0.62269 (0.5386)
Ind Using Internet	0.37011 (0.6916)	0.31214 (0.7326)	13.9461 (5.E-05)	0.63014 (0.5346)	16.3321 (7.E-07)	1.04131 (0.3562)	65.0847 (7.E-17)	4.15351 (0.0185)	0.64298 (0.5280)	

0.05 is the alpha (α)value.

If the P-value is less than 0.05, reject H0.

DNR stands for "do not reject."

It does not Granger Cause

To testify the null and alternative hypothesis we randomly taken four variables Financial Development, Inflation, Fixed Telephone and Mobile Cellular. For Financial Development the null hypothesis financial development does not Granger Cause GDP per capita is rejected as its value is 0.0003 which is less than 5% of probability and for Inflation the null hypothesis, Inflation does not Granger Cause GDP per capita is accepted as its value is 0.6762 which is greater than 5% of probability. For Fixed Telephone the null hypothesis Fixed Telephone does not Granger Cause GDP per capita is accepted as its value is 0.8376 which is greater than 5% of probability. Next variable is Mobile Cellular, and the null hypothesis is, Mobile Cellular does not Granger Cause GDP per capita is accepted as its value 0.3496 which is greater than 5% of probability. There are 13 variables out of 81 accepting the null hypothesis which is GDP does not Granger Cause GDP per capita as their probabilities are greater than 5% and 30 variables rejected the null hypothesis which is GDP per capita does not Granger Cause GDP their values are less than 5%.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

The main contribution of this research is to examine the influence of interaction terms on financial development to observe the impact of financial development on economic growth. This study develops based on two main objectives to examine the impact of telecommunication on GDP per capita in South Asian developing economies, to examine the impact of Financial Development on GDP per capita in South Asian developing economies and to attain these objectives, annual dynamic panel data has been used from period 2000-2019 in this study. GDP per capita is used as a dependent variable. In the first model, financial development is considered as the main dependent variable and the independent variables are from telecommunication sector which includes fixed telephone subscription, fixed broadband subscription, individuals using internet and mobile cellular. In the second model GDP per capita is considered as dependent variables other variables are financial development and controlled variables which are government expenditure, gross capital formation, natural resources, trade openness, school enrollment, inflation, and population growth. The control variables are chosen based on the prior research on the factors that affect GDP per capita.

According to existing research, telecommunication infrastructure, has the potential to improve the financial sector's effectiveness while also contributing to economic growth.

Estimation technique used for analysis is unit root test, granger causality and auto regressive distributed lag (ARDL) model. This technique integrates all the regression equation and is more efficient in estimation as compared to other techniques. In the unit root test, it can be seen that some of the variables are stationary at level I(0) and some variables are stationary at 1st difference I(1). The long run estimates the coefficient value of the financial development is positively and highly significant with GDP per capita in long run ARDL model. The partial slope of the coefficient for financial development suggests that 1% increase in financial

development will result in improvement in GDP per capita by 1.48% in long run. Resultant estimates of telecommunication sector can be easily seen that mobile cellular subscription is positively and substantially associated to GDP per capita. In long run dynamics of ARDL Log of Individuals using internet are also positively and highly insignificantly associated with GDP per capita as the slope of coefficient indicates that 1% increase in mobile cellular subscription will cause an increase of 0.32% in GDP per capita. The slope of log of Individual using internet suggests that 1% increase will cause in an increase of 0.06% in GDP per capita. Fixed telephone subscription is inversely but strongly related to GDP per capita at 10% significance level. As the partial slope of coefficient of fixed telephone subscription explains that 1% increase will decrease the GDP per capita by -0.06% (negative sign shows the inverse relationship between Fixed telephone and GDP per capita) in long run dynamics of ARDL. The log of fixed broadband subscription has a positive and highly substantial impact on the dependent variable GDP per capita, as if the partial slope of coefficient of Log of fixed broadband is increased by 1% will take a lead to increase in 1.67% in GDP per capita in long run dynamics of ARDL.

In the short run dynamics of ARDL, the resultant estimates show that the coefficient value of the financial development is favorably and insignificant with GDP per capita in short run ARDL model, according to this model. According to the coefficient slopes, a 1% rise in financial development will result in a 1.73 % increase in GDP per capita. In the telecommunication sector, it can be seen that, mobile cellular is positively and substantially related with GDP per capita in short run ARDL. The coefficient value in the table indicates that 1% rise in mobile cellular resulted in an increase of 0.99% in GDP per capita in short run dynamics of ARDL. Log of individual using internet has positive and highly influential effect on GDP per capita. The coefficient value indicates that 1% increase in Log of individual using internet will cause an increase in GDP per capita by 1.15% in short run dynamics of ARDL. Fixed telephone subscription is also positively and substantially associated to GDP per capita

at 10% level of significance. The slope of coefficient depicts that 1% rise in Fixed telephone subscription will increase GDP per capita by 0.13% in short run dynamics of ARDL. The log of fixed broadband subscription has a negative but highly significant effect on the dependent variable GDP per capita, as if the slope of coefficient of Log of fixed broadband is increased by 1% will take a lead to increase in -0.15% in GDP per capita in long run dynamics of ARDL.

By considering seven South Asian developing countries i.e. India, Pakistan, Sri Lanka, Bangladesh, Nepal, Bhutan and Maldives for the period of 2000 – 2019. The ARDL findings indicated that telecommunication infrastructure has the ability to enhance the financial sector in order to stimulate the economic growth of the countries, respectively. Furthermore, it has also been indicated that constructing a reliable telecommunication infrastructure will have direct influence on economic growth.

5.1 Policy implications

The findings reveal that South Asia's telecommunication infrastructure lowers financial transaction costs. The telecommunications infrastructure network promotes flexibility and facilitates the growth of branchless banking services, therefore improving financial services. As a result, telecommunications infrastructure may improve credit access, make credit allocation more effective, simplify financial transactions, and boost financial development. Following are the policy recommendations for policy makers and government for boosting economic growth through financial development and economic growth.

1- According to the findings, South Asia's developing economies should have a more stable financial system. The most significant policy conclusion drawn from our findings is that governments should focus on long-term measures to assist emerging nations in South Asia in improving their banking systems.

2- The financial services industry is undergoing a massive shift that demands banks and telecoms firms to adopt Mobile Financial Services (MFS) to engage people who are engaged in mobile and social ecosystems.

3- Policymakers should also focus on establishing regulations that foster the expansion of the private sector, such as increasing banking sector efficiency, which is helpful to South Asia's long-term economic growth.

4- Finally, government policies should strive to create a favorable environment for the development of the financial industry and telecommunications a solid framework and essential support for the growth of mobile banking and branchless banking, as well as by allowing banks to offer innovative products in favorable conditions.

5- There should be financial inclusion initiatives to facilitate women in developing countries like Financial inclusion Program (FIP) has been developed with the aim to improve access to financial services in Pakistan by transforming the microfinance sector, and by introducing several industry level initiatives to promote financial inclusion.

In this framework, increasing the financial system and telecommunication infrastructures in South Asian economies will result in continuous and stable economic growth in the region.

5.2 Limitations

We competed into several constraints when doing our research. One problem rise from a data difficulty caused by the lack of Afghanistan data, so we had to remove the entire country and work on data from seven other countries. It's confounding to apply the findings to countries in South Asia. However, due to a unavailability of data for the variable components. Because the economies of South Asia are so similar, the findings may readily be applied to the whole Region.

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