

Measuring Financial Inclusion and Its Impact on Macroeconomic Goals in South Asian countries

*A thesis submitted to the University of Hyderabad
in partial fulfilment of the requirement for the award of*

**DOCTOR OF PHILOSOPHY
IN
ECONOMICS**

By

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November 2021**

Dedicated
to
My Late Mother
Jharanabala Sethy



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DECLARATION

I, Mr. Susanta Kumar Sethy, hereby declare that this thesis entitled “**Measuring Financial Inclusion and Its Impact on Macroeconomic Goals in South Asian Countries**” submitted by me under the supervision of Prof. Phanindra Goyari, School of Economics, University of Hyderabad, is a *bonafide* research work which is also free from plagiarism. I also declare that it has not been submitted previously in part or in full to this University or any other University or Institution for the award of any degree or diploma. I hereby agree that my thesis can be deposited in Shodhganga/INFLIBNET.

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A. Publication:

1. Susanta Kumar Sethy and Phanindra Goyari (2018): “Measuring Financial Inclusion of Indian States: An Empirical Study” in: *Indian Journal of Economics and Development*, Vol.14(1), pp.111-118, Print ISSN: 2277-5412 and e-ISSN: 2322-0430, WoS, Scopus and UGC CARE listed journal, Source: <https://soed.in/article/113>

B. Presentations in conferences:

1. Presented a paper “Impact of formal financial services on households’ income and employment level in India” in: World Finance and Banking Symposium, at NIDA Business School, Bangkok, Thailand, 14-15 December, 2017.
2. Presented a paper “Digital payment and financial inclusion in emerging India: Progress and challenges” in: 3rd International Research Conference on Economics, Business and Social Sciences, at University of Malaya, Kuala Lumpur, Malaysia, 9-10 November, 2018.

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Contents

	Page
Dedication	i
Declaration	ii
Certificate	iii
Acknowledgments	iv-v
Contents	vi-x
List of Tables	xi-xiii
List of Figures	xiv-xv
List of Abbreviations	xvi-xix
Abstract	xx

Chapter 1	1-7
------------------	-----

Introduction, Objectives and Scope of the Study

- 1.1 Background of the study
- 1.2 Motivation of the study
- 1.3 Why only those countries?
- 1.4 Objectives
- 1.5 Data and methodology
- 1.6 Organization of the study

Chapter 2	8-33
------------------	------

Measuring Financial Inclusion: A Multidimensional Financial Inclusion Index for the South Asian Countries

- 2.1 Introduction
- 2.2 Review of literature
 - 2.2.1 Review of literature on calculation of financial inclusion index (FII)
- 2.3 Objective of the study
 - 2.3.1 Contribution of the study
- 2.4 Causes of financial exclusion in SAARC countries
- 2.5 Present status of financial inclusion indicators in SAARC countries
- 2.6 Measuring financial inclusion for SAARC countries

2.6.1 Calculating financial inclusion index (FII)	
2.7 Data sources and variables	
2.7.1 Dimensions or indicators of financial inclusion	
2.8 Empirical results and analysis	
2.9 Summary	
Appendix	

Chapter 3

34-66

Nexus between Financial Inclusion and Human Development in South Asian Countries: Evidence from a Modified HDI

3.1 Introduction	
3.2 Review of literature	
3.2.1 Economic growth and human development	
3.2.2. Chain from economic growth to human development	
3.2.3 Theoretical and empirical linkages between financial development, FI and human development	
3.3 Financial inclusion and human development: A theoretical framework	
3.4 Methodology	
3.4.1 Measuring human development for South Asian countries	
3.4.2 Measuring financial inclusion for SAARC countries	
3.5 Model specification	
3.6 Data sources and variables	
3.7 Empirical results and discussion	
3.7.1 HDI, HDI_M and FII in South Asia countries	
3.7.2 Descriptive statistics and correlation result	
3.7.3 Panel regression results	
3.7.3.1 Results on the determinants of human development (HD)	
3.7.3.2 Hausman test results	
3.7.3.3 Findings the effect of financial inclusion on human development	
3.8 Conclusion and policy implications	
Appendix	

Chapter 4

67-106

Does Financial Inclusion Increase Per Capita Income and Reduce Income Inequality in South Asian Countries?

4.1 Introduction

4.2 Review of literature

4.2.1 Relationship between financial inclusion and per capita income

4.2.2 Financial inclusion (FI) and income inequality: Empirical evidence

4.3 Causal connection between FI-per capita income and FI-income inequality

4.3.1 Causal linkages between FI and per capita income/standard of living

4.3.2 Causal linkages between FI and income inequality

4.4 Current status of per capita income and income inequality in South Asia countries

4.5 Measuring financial inclusion for South Asian countries

4.5.1 Construction of financial inclusion index (FII)

4.6 Model specification

4.7 Data sources and variables

4.8 Econometric methodology

4.8.1 Panel unit root tests

4.8.2 Panel cointegration tests

4.8.3 FMOLS and DOLS approach

4.9 Empirical results and analysis

4.10 Summary and policy implication

Appendix

Chapter 5

107-138

Examining Financial Inclusion -Agricultural Productivity Connection in South Asian countries: Evidence from FMOLS and DOLS Approaches

5.1 Introduction

5.2 Theory and review of literature

5.2.1 Agrarian credit market structure in South Asian countries

5.2.2 Linkages between credit and agricultural productivity

5.2.3 Nexus between financial inclusion (FI) and agricultural productivity	
5.2.4 Research gap	
5.3 Nexus between financial inclusion and agricultural productivity: Theoretical argument	
5.4 A brief agrarian history of South Asian countries	
5.4.1 Overview of agricultural sector in South Asian countries	
5.4.2 Sources of agricultural credit in South Asian countries	
5.4.3 Current status of formal financial services and agricultural credit in South Asian countries	
5.5 Construction of financial inclusion index (FII)	
5.6 Model specification	
5.7 Variables and data sources	
5.8 Empirical methodology	
5.9 Empirical findings	
5.9.1 Descriptive statistics and correlation Matrix	
5.9.2 Empirical results on the conditional impacts of FI on agricultural productivity	
5.9.3 Panel unit root results	
5.9.4 Cointegration result	
5.9.5 Panel FMOLS and DOLS estimations	
5.10 Summary and policy implications	

Chapter 6

139-161

Does Financial Inclusion Reduce Carbon Emissions in South Asian Countries? Evidence from co-integration and Dumitrescu-Hurlin Causality Approaches

6.1 Introduction	
6.1.1 Contribution of the study	
6.2 Theory and review of literature	
6.2.1 The role of financial development (FD) and financial inclusion (FI) for carbon emissions	
6.3 Financial inclusion (FI) on carbon emissions: Theoretical argument	
6.4 Current status of carbon emissions in South Asian countries	
6.5 Calculating financial inclusion index (FII)	

6.6 Model specification	
6.7 Data sources and variables	
6.8 Empirical methodology	
6.8.1 Dumitrescu-Hurlin (D-H) causality test	
6.9 Empirical findings and discussion	
6.9.1 Descriptive statistics and correlation matrix	
6.9.2 Panel regression results (on the factors that influence CO ₂ emissions)	
6.9.3 Panel unit roots results	
6.9.4 Cointegration result	
6.9.5 FMOLS and DOLS estimations	
6.9.6 Dumitrescu-Hurlin panel ganger causality results	
6.10 Summary	

Chapter 7	162-167
------------------	---------

Overall Conclusions, Policy Implications and Scope for Future Research

7.1 Overall conclusion and policy implications	
7.2 Limitations and scope for future research	

References	168-206
Annexure -1: Journal publication	207-214
Annexure -2: Certificates of conference presentations	215-216
Annexure -3: Plagiarism statistics	217-241

List of Tables

Table No.	Title of the Table	Page
2.1	Causes of financial exclusion (as a percentage of adults) in SAARC countries	12
2.2	Users of formal financial services (values in percentage) in SAARC countries	15
2.3	List of Indicators for constructing Financial Inclusion Index (FII)	19
2.4	Trend of Financial Inclusion Index in SAARC countries from 2004 to 2018	20
2.5	High financial inclusion category of South Asian countries	22-23
2.6	Medium financial inclusion category of South Asian countries	23
2.7	Low financial inclusion category of South Asian countries	24-25
2.8	Category of South Asian countries in FII for 2004, 2011 and 2018	25
3.1	List of Indicators for constructing Human Development Index (HDI)	44
3.2	Variables definition, Identifier and Sources of data for empirical analysis	44
3.3	Movement of HDI and modified HDI (i.e., HDI_M) in South Asian countries from 2004 to 2018	45-46
3.4	Movement of FII and modified HDI in South Asian countries from 2004 to 2018	48-49
3.5	Movement and Rank of South Asian countries according to the value of HDI_M and FII (2004, 2011 and 2018)	49
3.6	Classification of South Asian countries according to the values of HDI_M (2004, 2011 and 2018)	51
3.7	Descriptive statistics	52
3.8	Correlation matrix	53
3.9	Determinants of human development (Time fixed effect estimation)	54
3.10	Determinants of human development (Time random effect estimation)	56
3.11	Hausman test results	57
3.12	FI and Human Development (Fixed effect estimation)	58
3.13	FI and Human Development (Random effect estimation)	59
4.1	Variables and data sources, definition and measurement	82
4.2	Factors impact on financial inclusion (Fixed effect estimation)	85
4.3	Factors impact on financial inclusion (Random effect estimation)	87

4.4	Hausman test	87
4.5	Descriptive statistics	88
4.6	Correlation matrix	89
4.7	IPS Panel unit root test	89
4.8	Pedroni panel cointegration estimation	90
4.9	Panel FMOLS and DOLS estimation (Financial inclusion and Per capita income)	91
4.10	Descriptive statistics	92
4.11	Correlation matrix	93
4.12	IPS Panel unit root test	93
4.13	Pedroni panel cointegration estimation	94
4.14	Panel FMOLS and DOLS estimation (Financial inclusion and income inequality)	95
4.15	Effects from financial inclusion on each key variables	96
5.1	Sources of agricultural credit in Afghanistan	118
5.2	Sources of agricultural credit in Bhutan	119
5.3	Sources of agricultural credit in Maldives	121
5.4	Sources of agricultural credit in Pakistan	122
5.5	Sources of agricultural credit in Sri Lanka	122
5.6	Definition, description and sources of the variables	128
5.7	Descriptive statistics	129
5.8	Correlation matrix	129
5.9	Conditional impacts of FI on agricultural productivity (Time fixed effect estimation)	131
5.10	Conditional impacts of FI on agricultural productivity (Time random effect estimation)	133
5.11	IPS Panel unit root test	134
5.12	Pedroni panel cointegration estimation	135
5.13	Panel FMOLS and DOLS estimation	136
6.1	List of the variables used for empirical analysis	152
6.2	Descriptive statistics	153
6.3	Correlation matrix	153
6.4	Factors influence CO2 emissions (Fixed effect estimation)	154

6.5	Factors influence CO2 emissions (Random effect estimation)	156
6.6	Hausman test	156
6.7	IPS Panel unit root test	157
6.8	Pedroni panel cointegration estimation	157
6.9	Panel FMOLS and DOLS estimation	159
6.10	Dumitrescu-Hurlin Granger causality results	160

List of Figures

Figure No.	Title of Figure	Page
2.1	Availability indicators of financial inclusion	13
2.2	Accessibility indicators of financial inclusion	14
2.3	Usage indicators of financial inclusion	14
2.4	Financial Inclusion Index (FII) of South Asian countries	21
2.5	Financial Inclusion Index (FII) of South Asian countries	21
A.2.1	Number of ATMs	28
A.2.2	Number of ATMs per 1 lakh adults	29
A.2.3	Number of ATMs per 1000 Km^2	29
A.2.4	Branches of commercial banks	30
A.2.5	Branches of commercial banks per 1000 Km^2	30
A.2.6	Branches of commercial banks per 1 lakh adults	31
A.2.7	Outstanding deposits with commercial banks	31
A.2.8	Outstanding deposits with commercial banks (% of GDP)	32
A.2.9	Outstanding loans with commercial banks	32
A.2.10	Outstanding loans with commercial banks (% of GDP)	33
3.1	Financial Inclusion and Human Development	39
3.2	Modified Human Development Index in South Asian countries (2004-2018)	47
A.3.1	Social expenditure by SAARC Countries (as % of GDP)	62
	Movement of SAARC countries according to the value of modified HDI and Financial Inclusion Index (FII) from 2004 to 2018	
A.3.2	Afghanistan	63
A.3.3	Bangladesh	63
A.3.4	Bhutan	64
A.3.5	India	64
A.3.6	Maldives	65
A.3.7	Pakistan	65
A.3.8	Sri Lanka	66

4.1	Causal mechanism between financial inclusion and income or standard of living	74
4.2	Causal mechanism between financial inclusion and income inequality	75
4.3	Per capita income or standard of living in South Asian countries	77
4.4	Income inequality in South Asian countries	78
A.4.1	FII and per capita GDP in South Asia countries from 2004 to 2018	99-102
A.4.2	FII and income inequality of South Asia countries from 2004 to 2018	103-106
5.1	Linkages between financial inclusion and Agricultural productivity	114
5.2	Agricultural land (percentage of Land area)	116
5.3	Employment in agriculture (percentage of total employment)	116
5.4	Agriculture, forestry and fishing, value added (percentage of GDP)	117
5.5	Sources of agricultural credit in Bangladesh	118
5.6	Institutional sources of agricultural credit in India	119
5.7	Non-Institutional sources of agricultural credit in India	120
5.8	Branches of commercial banks per 100000 adults	123
5.9	Outstanding loans with commercial banks (percentage of GDP) from 2004 to 2018	123
5.10	Outstanding deposit with commercial banks (percentage of GDP) from 2004 to 18	124
5.11	Share of agriculture in total credit flow to economy in region wise	124
6.1	Positive and negative impact of financial inclusion on CO_2 emissions	147
6.2	World carbon dioxide emissions: from 2009 to 2019, by region (Million metric tons of carbon dioxide)	148
6.3	CO_2 emissions (metric tons per capita) in South Asian countries, 1990-2019	149

List of Abbreviations

ABL	Allied Bank Limited
ADF	Augmented dickey fuller
AFI	Alliance for Financial Inclusion
APEC	Asia Pacific Economic Corporation
ARDL	Autoregressive Distributed Lag Model
ATMA	ATMs per 1 lakh adults Km^2
ATMK	ATMs per 1000
ATMs	Automated Teller Machines
BCB	Branches of Commercial Bank
BCBA	Branches of Commercial Bank per 1 lakh Adults Km^2
BCBK	Branches of commercial banks per 1000
BDBL	Bhutan Development Bank Limited
BDFC	Bhutan Development Finance Corporation
BIPS	Bhutan Immediate Payments Services
BKB	Bangladesh Krishi Bank
BML	Bank of Maldives
BNBS	Bhutan National Banks
BoB	Bank of Bhutan
BoK	Bank of Khartoum
BRDB	Bangladesh Rural Development Board
BSBL	Bangladesh Samabay Bank Limited
CEGS	Credit Enhancement Guarantee Scheme
CGAP	Consultive Group to Assist the Poor
CMDA	Capital Market Development Authority
DAB	Da Afghanistan Bank
DH	Dumitrescu-Hurlin
DOLS	Dynamic Ordinary Least Square
DSUR	Dynamic Seemingly Unrelated co-integration Regressions

EFTs	Electronic Fund Transfers
ESR	Endogenous Switching Regression
FAO	Food and Agriculture Organization
FAS	Financial Access Survey
FCP	Developing Financial Consumer Protection
FDI	Foreign Direct Investment
FDRC	Financial Dispute Resolution Commission
FE	Fixed Effect
FI	Financial Inclusion
FII	Financial Inclusion Index
FINCA	Foundation for International Community Assistance
FMOLS	Fully Modified Ordinary Least Square
GCC	Gulf Cooperation Council
GDI	Gender Development Index
GFDR	Global Financial Development Report
GHS	Greenhouse Gas
GMM	Generalized Method of Moments
GNI	Gross National Income
GNP	Gross National Product
HBL	Habib Bank Limited
HDI	Human Development Index
HDI_M	Modified Human Development Index
HPI	Human Poverty Index
IFAD	International Fund for Agricultural Development
IMF	International Monetary Fund
IPA	Innovations for Poverty Action
IPS	Im-Pesaran-Shin
ITT	Intention-to-Effect
LATE	Local Average Treatment Effect
LSMSISA	Living Standards Measurement Study Integrated Survey on Agricultural

MCB	Muslim Commercial Banks
MDFI	Mutahid Development Finance Institution
MED	Ministry of Economic Development
MFI	Micro Finance Institutions
MFS	Mobile Financial Services
MIPS	Maldives Interoperable Payments System
MISFA	Microfinance Investment Support Facility for Afghanistan
MMA	Maldives Monetary Authority
MRA	Meta Regression Analysis
NABARD	National Bank for Agricultural and Rural Development
NBP	National Bank of Pakistan
NFIS	National Financial Inclusion Strategy
NFLP	Nationwide Financial Literacy Programme
NGOs	Non-Governmental Organizations
ODCB	Outstanding Deposits with Commercial Banks
ODCBG	Outstanding Deposit with Commercial Banks (% of GDP)
OECD	Organization for Economic Co-operation and Development
OLCB	Outstanding Loan with Commercial Banks
OLCBG	Outstanding Loan with Commercial Banks (% of GDP)
OLS	Ordinary Least Square
PAFI	Payment Aspects of Financial Inclusion
PCA	Principal Component Analysis
PCBs	Private Commercial Banks
PIP	Private Income Poverty
PKSF	Palli Karma Sahayak Foundation
PMJDY	Pradhan Mantri Jan DhanYojana
PMMY	Pradhan Mantri Mudra Yojana
PMVVY	Pradhan MantriVayaVandhanYojana
PP	Philips-Perron
PSM	Propensity Score Matching

RAKUB	RajshahiKrishiUnnayan Bank
RBI	Reserve Bank of India
RE	Random Effect
RICB	Royal Insurance Corporation of Bhutan
RPP	Remittance and Payment Partnership
SBs	State Banks
SCBs	State owned-Commercial Bank
SHGs	Self Help Groups
SMFs	Small and Marginal sized Famers
STIRPAT	Population, Affluence and Technology
SWIID	Standardized World Income Inequality Database
UAE	United Arab Emirates
UBL	Union Bank of Limited
UNDP	United Nation Development Programme
VECM	Vector Error Correction Model
WDI	World Development Indicator
WEF	World Economic Forum
WGI	World Governance Indicator

Measuring Financial Inclusion and Its Impact on Macroeconomic Goals in South Asian countries

Abstract

Financial inclusion is a key element of social inclusion, particularly useful in increasing inclusive growth by opening blocked advancement opportunities for underprivileged segments of the population. This study empirically investigates the impact of financial inclusion on macroeconomic goals in South Asian countries. The analysis is carried out using annual panel data for the period of 2004-2018. For this purpose, the study constructs two novel indices: financial inclusion index (FII) which measures the level of financial inclusion and modified human development index (i.e., HDI_M) which measures inclusive growth. Particularly, the study uses availability, accessibility and usages of formal financial services for FII.

Overall, the cross country study has evidenced that the performance of all the South Asian countries on financial inclusion has been increasing from 2004 to 2018. But it is interesting that among study countries, India is the only country which performed better with the highest value of FII from 2013 to 2017. The result also indicated that all South Asian countries were included in the high financial inclusion category in 2018. Further, the study employed various econometrics tools such as IPS unit root test, Pedroni panel cointegration test, panel FMOLS (fully modified ordinary least squares) and DOLS (dynamic ordinary least squares) to determine the long-run elasticity of independent variables on dependent variables. The results of the study have evidenced that financial inclusion has a positive and statistically significant impact on human development, per capita income, agricultural productivity and CO₂ emissions. That means access to and usage of formal financial services would increase the level of human development, per capita income, agricultural productivity and CO₂ emissions in South Asian countries. Additionally, the results of the study have indicated that financial inclusion has a negative and statistically significant impact on income inequality. That means access to and usage of formal financial services would reduce income inequality in the long-run. The findings are in favour of further promoting access to and usage of formal financial services by underprivileged segments of the population in order to increase inclusive growth.

Keywords: Financial inclusion, Human development index, Per capita income, Income inequality, Agricultural productivity, Carbon emissions, FMOLS, DOLS, South Asian countries
JEL Classification Codes: G21, O15, D63, Q10, P18, C33

Chapter 1

Introduction, Objectives and Scope of the Study

1.1 Background of the study

Financial inclusion (FI) is increasingly being attributed as a major driving force of economic growth and poverty alleviation across the globe (RBI, 2020). An increasing number of literature is suggesting that FI has a strong multiplier effect on the various macroeconomics indicators. Through multiplier effect, an inclusive financial system achieves faster economic growth, thereby, helping to reduce poverty and income inequality (RBI, 2020). Several prominent scholars have defined financial inclusion considering various dimensions of financial services. According to R.G. Rajan (2009), financial inclusion has been understood as the process where the people have universal access to a wide range of financial services at a reasonable cost. The scope of financial inclusion is not limited to banking products only, now it is expanded to other financial products, like, insurance. A sophisticated and well managed financial system ensures smooth flow of financial services which creates sustainable economic growth. The growth benefits are shared among various sectors. Further, an inclusive financial system is crucial for achieving gender parity. A high gender gap is detrimental to economic growth. The eminent scholar Dr. B. R. Ambedkar has pointed out that the countries' progress is highly dependent on the progress of women. When a women progresses with greater financial power, she can transform the lives of her and her family members by migrating to above the poverty line.

Several eminent economists have advocated that a formal financial system where people, especially underprivileged and disadvantage groups have access to finance and financial products, brings transformation in their production process, employment activities and helps to exit poverty (Banerjee and Newman, 1993 and Banerjee, 2001). So, it is imperative to understand the catastrophic effect of a financial system which excludes largely those people from accessing the financial services. This is called as financial exclusion. As rightly pointed out by Zhang and Posso (2019) that the financial exclusion (exclusive financial system) refers to a process wherein the poor and underprivileged social groups have problems to accessing affordable financial services. One could easily attribute this exclusion to informal financial system which these countries had in past. The informal financial market was playing a dominant

role to provide financial services. These informal markets were usually out of the regulatory activities of the central banking authorities. The informal finances were provided mainly by the money lender or an authorized businessman. Those informal finances were divided into commercial finance (e.g., money lenders), mutual (group) finance, and reciprocal finance (e.g., friends and family). The market primary based on these structures was prone to inefficient allocation and larger exclusions in providing financial services. Due to incomplete information, resources were kept idle both by money lender and people. Since people were not in the financial system, in the absence of a saving account, their accumulated assets were not flowing to financial system causing non utilization of resources. The money lender normally had no clue about the credit demand outside his area, leading to large exclusion again. Further, people in vulnerable group had no access to insurance products. These factors have caused deprivation of poor and marginalized people from the mainstream growth process, leading to more poverty, unemployment, inequality, unequal distribution of growth benefits, etc.

Therefore, to address these issues there was some bare necessities to have a formal financial system which will be inclusive in nature. When we say inclusive we mean a universal access to credit, savings opportunities, insurance products, and other financial products (Rajan, 2009; Sethi & Sethy, 2018; Sethi & Acharya, 2018). Towards this goal, a process of financial inclusion was initiated thorough various governmental reforms. The purpose is to allow poor and marginalized sections of society to access formal financial services, so that the benefits of economic growth can be shared equally.

A formal financial system has some unique characteristics which can accelerate the process of financial inclusion. It works through market mechanism where savings available with households are pulled into banking and non-banking financial institutions for efficient utilization. The proper use of saving funds thorough market mechanism ensures need of the particular sector and sections of the society. Through this process, people can access to low cost borrowings for their need. This helps local production; basically community based organized production, which helps people to augment their level of income leading to decline in poverty. Further, expanding the banking penetration in unbanked area to provide affordable financial services has been a part of action plan of a formal financial system (Sarma, 2008; 2018, Sarma and Pais, 2011). One of the best examples for this is the Grammen Bank model in Bangladesh. This model was proposed by

Muhammad Yunus to bring poor people and women to formal financial system by giving access to financial products. This model has worked remarkably well in the country in accelerating financial inclusion. The model was based on the premise that local level financial market needs to be strengthened to uplift the society, especially some social groups. The success of Grammen Banks counts for enhancing the level of credit among different social groups, initiating organized production (which can be now referred to some forms of SHGs work responsibility), self-employment to reduce unemployment, empowering the rural women to take part in organized production and entrepreneurship, small and marginal farmers cultivating more land, rise in agriculture productivity, poverty reduction, finally an inclusive financial system (Alam, 1988; Hossain, 1993).

However, the objective of greater financial inclusion by increasing access to financial services by the people remained challenging to address. Apart from access obstacles (such as lack of collateral populations, including women and rural poor), other factors such as the low financial literacy, geographical location, complex banking procedure, religion, and caste, etc. have been an impediment to achieving the goal of an inclusive financial system. All these fall in the category of self-exclusion. This self-exclusion is voluntary in nature, basically attributable to people's inability and choice for accessing a particular financial service (Ibrahim et al. 2012).

Of late, several policy makers and academicians have advocated for an inclusive growth economy which one of the sustainable development goals (Demirguc-Kunt et al. 2018). The multifaceted organizations like the IMF, and the World Bank have been emphasizing on the greater role of an inclusive growth economy. The key to a successful inclusive growth economy is to accelerate the pace of financial inclusion. An inclusive financial system makes the growth broad base and thereby, involves different sections of societies into the growth process.

1.2 Motivation of the study

It's all most one and half decades, since financial inclusion programs came into existence for the first time in the World. Immediately many developing countries adopted this programme but their success story was different from country to country. Factors like lack of awareness, financial literacy, geographical area and religion issues etc. could be attributed to the varying level of success. In addition, developing countries are one of the most suffering from financial

exclusion, according to recent data, more than half of the poorest 40% are without bank accounts, and 35% of small business have difficulty accessing formal financial services. But developing countries have an endless opportunity to create a change. In different developing countries policymakers claim that an inclusive financial system and financial inclusion will increase *economic growth* (Sethi and Sethy, 2018; Sethi and Acharya, 2018), increase *agricultural productivity* (Binswanger et al., 1995; Magri, 2002; 2016; Olaniyi, 2017; Vitor et al., 2014, 2018; Fowowe, 2020; Atakli and Agbenyo, 2020), *human development* (Sarma and Pais, 2011; Kuri and Laha, 2011; Bihari, 2011; Nanda and Kaur, 2016; Datta and Singh, 2019), reduce *income inequality* (Honohan 2008), *increase income or standard of living* (Aportela, 1999, Jayachandran, 2006; Dupas and Robinson, 2013), *CO₂ emissions* (Le et al. 2020; Koomson and Danquah, 2021; Hussain et al. 2021) and *social welfare* (Demirguc-Kunt and, Levine, 2009). Majority of research are either cross country analysis or single country where socio-economic background significantly differs from South Asian countries. When we look at Asian countries, we can see that their financial systems have improved significantly in recent decades. But, in many selective Asian countries are still underdeveloped when related to the rest of the World. It is difficult for emerging South Asian countries to bring together all segments of society under one financial services umbrella. In addition, money lenders continue to dominate the rural credit markets in the countries listed above and maximum rural peoples are unaware about the formal financial services available like mobile banking and micro credit etc.

In light of the above, the primary goal of this research is to determine the level of FI in South Asian nations and it tries to investigate the multiple effect of FI on macroeconomic goals such as human development, per capita income or standard of living, income inequality, agricultural productivity and *CO₂ emissions*.

1.3 Why only those countries?

By focusing on emerging countries, we cover large growing economies like India to small developing countries like Afghanistan, Bhutan, Pakistan, Bangladesh, Sri Lanka and the Maldives among others. This present study is restricted up to these countries because of the data availability issues of other South Asian Country like Nepal. Data non-availability is a major limitation of this study. Inclusive finance is not a new concept for many of the emerging

countries in the world. These South Asian countries have a long history of promoting inclusive banking structures. However, historically, their policies have been on supply side such as nationalization of private banks, imposing interest rate ceiling on credit and offering credit to private sector at subsidized rates etc.

1.4 Objectives

In view of the above motivations, the following objectives have been formulated.

- (i) to measure the level of financial inclusion by calculating a multidimensional financial inclusion index (FII) in South Asian countries,
- (ii) to examine the connection between financial inclusion and human development,
- (iii) to investigate the role of financial inclusion on increasing per capita income or standard of living and reducing income inequality,
- (iv) to find out the impact of financial inclusion on agricultural productivity and
- (v) to examine the influence of financial inclusion on CO_2 emissions.

1.5 Data and methodology

1.5.1 Data

To achieve the above objectives, South Asian countries were chosen. These include Afghanistan, Bangladesh, Bhutan, India, Maldives, Pakistan and Sri Lanka. Nepal has been excluded due to a lack of relevant financial inclusion data. Here, the study period is spanning from 2004 to 2018. Chapter 2 considers ten financial inclusion indicators such as: two demographic branch penetration, two demographic ATMs penetration, one geographic ATMs penetration, one geographic branch penetration, two credit penetration and two deposit penetration. These ten penetration data are the part of availability, accessibility, and usage of formal financial services, which measure the level of financial inclusion. Chapter 3 considers eight variables such as HDI, financial inclusion index (FII), technological progress (i.e., *INTSCI*), domestic credit to private sector, GDP growth, health expenditure, rule of law and political stability. Chapter 4 consists of three parts: first, for determinants of financial inclusion, it considers eight variables such as

financial inclusion index, per capita GDP, income inequality, population, govt. law, education, ratio of internet users and age dependence ratio. For second part, it considers five variables such as per capita GDP, financial inclusion index, education, remittances and employment. For third part, it considers seven variables such as Gini coefficients, financial inclusion index, per capita GDP, education, inflation, domestic credit and trade openness. Chapter 5 considers seven variables namely agricultural productivity, capital, labor, financial inclusion index, CO_2 emissions, lending interest rate and trade openness. Finally, chapter 6 considers seven variables namely financial inclusion index, CO_2 emissions, urbanization, trade openness, energy intensity, per capita GDP, and industrialization. All data sets are collected from IMF, WDI, World Governance Indicator and Standardized World Income Inequality Database (SWIID).

1.5.2 Methodology

To address above objectives, one first needs to properly measure financial inclusion (FI) and quantify it. Therefore, this study constructed a multidimensional FII using UNDP method for calculating HDI, HPI etc. in Chapter 2, econometrics techniques have been used. In Chapter 3, a modified Human Development Index (i.e., HDI_M) is calculated and then it employs a panel data regression with both Fixed Effect (FE) and Random Effect (RE) models to investigate the impact of FI on human development. To compare the usual time FE and time RE model, the robust Hausman test was employed in panel data model. Chapter 4 employs both FE and RE models to find out the determinants of financial inclusion, Hausman test to compare the usual FE and RE model, IPS unit root test, Pedroni panel cointegration test, FMOLS and DOLS method to estimate the long-run connection between independent and dependent variables, and particularly to find out the impact of financial inclusion on increasing per capita income or standard of living and reduce income inequality. Chapter 5 uses both time fixed effect and random effect models, IPS unit root test, Pedroni panel cointegration test, FMOLS and DOLS method to find out the effect of financial inclusion on agricultural productivity. Finally, in Chapter 6, both fixed effect and random effect models are employed to find out the determinants of CO_2 emissions, and uses Hausmen test, IPS unit root test, Pedroni panel cointegration test, Dumitrescu-Hurlin (DH) granger causality test, FMOLS and DOLS method employed to determine the long-run connection between FI and CO_2 emissions.

1.6 Organization of the study

The rest of this thesis contains six chapters. Chapter 2 constructs a new multidimensional Financial Inclusion Index (FII). Chapter 3 constructs a modified HDI (i.e., HDI_M) and then examines the connection between FI and human development (HD). The effects of FI on increasing per capita income or standard of living and reduce income inequality are examined in Chapter 4. Chapter 5 finds out the effect of financial inclusion on agricultural productivity. Chapter 6 examines the effect of FI on CO_2 emissions. Chapter 7 has offered overall concluding remarks, policy recommendations, limitations and scope for future research.

Chapter 2

Measuring Financial Inclusion: A Multidimensional Financial Inclusion Index for the South Asian Countries

2.1 Introduction

Financial inclusion (FI) has been a recent policy anxiety among policymakers across countries. Financial inclusion is of greater importance because policymakers have found that it can boost development process by reducing poverty (Cull et al., 2014). Furthermore, financial exclusion can threaten economic growth due to a lack of financial infrastructure (Greenwood and Jovanovic, 1990; Angadi, 2003). As a result, it is clear that financial inclusion shapes a country's financial structure and helps to increase economic development by ensuring equitable distribution of resource. To add further, the Rangarajan Committee (2008) said that “financial inclusion is no longer an option but a necessity”. Financial inclusion does not imply that everybody has a bank account. The definition of financial inclusion lies in a broader context. Raghuram Rajan Committee (2009) defined Financial Inclusion as ‘the *universal access to a wide range of financial services at a reasonable cost. This includes not only banking products, but also other financial services, such as insurance and equity products*’. Several authors have attempted to measure financial inclusion using different proxy indicators and methods. It is observed that a large number of literatures have stressed the role of banking sector indicators in the measurement of financial inclusion. Numerous literature has been used formal financial services indicators like bank branch, credit and deposit penetration as an vital factors of financial inclusion (Beck et al., 2009; Chattopadhyay, 2011; Sarma and Pais, 2011; Allen et al. 2012; Gupte et al., 2012; CRISIL, 2013). This indicates that the banking sector plays a significant role in achieving higher FI.

In addition, individual indicators of financial inclusion may be misleading when used to determine the extent of financial inclusion (Sarma, 2008). To avoid such an issue, a comprehensive measure of FI is needed. Some studies have been found on the measurement of financial inclusion, and their major drawback is that they do not provide a measure of FI which changes over time. In addition, there are only a few researchers like Gupte et al. (2012), Sarma

(2008), and Chattopadhyay (2011) who have measured the financial inclusion index for a single year. As a result, a time-varying financial inclusion calculation is needed.

The rest of the study is prepared as follows: Section 2 review of literature. Section 3 gives the objective and contribution of the study. Section 4 gives an overview of financial exclusion and financial inclusion initiatives. Section 5 describes the present status of FI in South Asian nations. Section 6 explains procedure of measuring Financial Inclusion Index. Data sources and variables presented in Section 7. Section 8 empirical findings and analysis. Finally, in the last section conclusion and policy recommendations are offered.

2.2 Review of literature

2.2.1 Review of literature on calculation of financial inclusion index (FII)

On the calculation or measurement of FII, some related literature is provided in this section. Honohan (2007) made an early attempt to quantify financial inclusion (FI) by constructing cross-country financial access indices. For a large number of countries, Sarma (2008) suggested a multidimensional index for calculating financial inclusion. Furthermore, several empirical studies have been constructed multidimensional financial inclusion index. For the year 2008-2009, Gupte et al. (2012) used Sarma (2008) formula to measure the financial inclusion index, which included some important variables like outreach, use, and ease of transaction. Sarma (2008, 2012 and 2016) investigated three main determinants of FI: banking penetration, availability of banking services and banking usage.

A research by Sarma and Paise (2011) looked into the relationship between FI and human growth. They discovered that high FI would contribute to human development using data on banking services from 49 countries. As a result, financial inclusion can be described as policy interventions that seek to reduce poverty and increase living standards.

Mehrotra, et al. (2009), used different formal financial services variables and calculated a multidimensional FII to compute the level of FI for sixteen major states of India. After that, they try to investigate the relationship between FI and economic growth among considered states.

They argue that economic growth can be induced by allowing individuals to access various banking products.

CRISIL Incusix (2013) is a non-profit organization that attempted to investigate the extent of financial inclusion (FI) at the national, state, regional and district levels. Financial inclusion indexes were developed by CRISIL Inclusix based on three indicators: branch, deposit and credit penetration. However, Chakravarty and Pal (2013), who used eight measures of financial inclusion, to create an axiomatic approach for calculating the level of financial inclusion. Their findings evidenced that banking products play a vital role for achieving a high level of FI.

Yorulmaz (2013) used three indicators of FI such as availability, accessibility and usages of banking services to compute financial inclusion in Turkey from 2004 to 2010. He closely followed Sarma (2008) and UNDP methodology to calculate the extent of FI. The study evidences that high income regions have a better extent of financial inclusion in Turkey. Istanbul has scored the highest rank in FII and categorized as a high financial inclusion (FI) region, whereas mid-east Anatolia has scored the lowest rank in FII, and categorized as a low financial inclusion region. A research was conducted by Laha and Kuri (2014) to assess the extent of FI in India. They developed two FII, one for demand side data and other for supply side data. The researcher came to a conclusion that there are some major disparities in access to formal financial services in India between rural and urban areas.

Using all the important indicators of FI such as usage, barriers and access of banking services, Camara and Tuesta (2014) developed a FII by employing two stages PCA approach from 2004 to 2012 in 82 developed and under developed countries. Park and Mercado (2015) followed the methodology of Sarma (2008) for FII for 188 countries from 2004 to 2012. They used five financial inclusion dimensions such as two availability indicators of banking services (ATMs per 1 lakh adults, and bank branches per 1 lakh adults), three usage indicators of banking services. Financial inclusion index (FII) was measured individually for demand and supply side indicators of FI by Ambarkhane et al. (2016) and Sethy (2016). Sethy (2016) computed two FII (i.e FII_S and FII_D). According to his findings, India is classified as a having high FI (with demand-side indicators) from 2010 to 2012, but low FI (with supply-side indicators) from 1987 to 1988 and, 1989 to 2009.

Specifically, it can be seen that different studies (e.g. Yorulmaz, 2013; Park and Mercado, 2015; Sethy, 2016; Anwar et al., 2017; Sethy and Goyari, 2018; Prastowo and Putriani 2019; Sethi and Sethy, 2019; Huang and Zhang, 2020) used Sarma's multidimensional technique to construct FII. Since this method is similar to the UNDP's method of calculating notable development indicators such as HDI, HPI, and GDI.

Sethi and Sethy (2018) conducted a study on the connection between FI and economic growth in India from 2004 to 2014. Their study followed the UNDP and Sarma (2008) formula for calculating FII. Finally, their study evidence that FI would increase economic growth and also a long run association exists between FI and economic growth.

Using 49 Islamic banks from 13 countries, Prastowo and Putriani (2019) investigated the role of Islamic banking performance on income inequality from 2010 to 2015, and used depth, access, efficiency and stability indicators of financial institutions. Their study has evidenced that formal financial services can reduce income inequality. Nguyen (2020) calculated a composite FII to know the degree of FI in 40 developing nations from 2012 to 2018 and he used two stage of PCA method. Furthermore, using the methodology of Sarma (2008, 2012), a recent study examined the effect of financial inclusion on urban-rural income inequality from 1985 to 2013. Huang and Zhang (2020) confirm that inclusive financial services can reduce urban-rural income inequality.

Overall, literature review shows that there have been a few efforts to construct a multidimensional financial inclusion index (FII) to calculate the level of FI. However, this raises the argument that these indices are necessary but insufficient for the definition of "Financial inclusion". Each of the above mentioned method for the FII has its own set of merits and demerits. As a result, it is clear that a proper consensus about how to calculate the level of financial inclusion has yet to be achieved. In this study, not only our method of calculating financial inclusion is different, but also selected financial inclusion indicators to calculate FII are different. Furthermore, here our major focus is to calculate a comprehensive multidimensional FII to measure the level of FI for South Asian countries. From the above literature, measurement of FII is not very comprehensive and not captured some key features of financial inclusion. In light of this, the current study aims to investigate not only the causes of financial exclusion, but also its key characteristics. Finally, this study proposed a comprehensive and new multidimensional FII for South Asian countries.

2.3 Objective of the study

Based on the above mentioned motivations and background, the specific objective of the present study is to understand the present status of South Asian countries' financial inclusion (FI) by applying the financial inclusion index (FII).

2.3.1 Contribution of the study

This study contributes to the existing literature by developing a new multidimensional FII based on cross country data of accessibility, availability and usage of banking services. Our calculation is based on existing methodology but we are considering more FI indicators to measure the level of financial inclusion. Furthermore, this will be used to standardize the level of FI for merging South Asian countries.

Table 2.1: Causes of financial exclusion (as a percentage of adults) in SAARC countries

Reasons	Afghanistan	Bangladesh	Bhutan	India	Maldives	Pakistan	Sri Lanka
Lack of money	72	40	25.3	11	40	44	23
No need for financial services	2	3	12.5	0	54	4	0
Opening account is too expensive	21	10	2.1	6	11	19	10
Bank is too far away	30	9	30.6	5	8	16	6
Lack of necessary documents	21	9	4.2	5	7	15	4
Lack of trust in financial institutions	20	7	1.4	4	14	13	5
Family member already has one	14	12	29.2	11	46	13	11
Religious reasons	14	3	0.7	1	6	12	2

Note: Here values are in percentage

Source: Compiled from Global Findex Database 2017

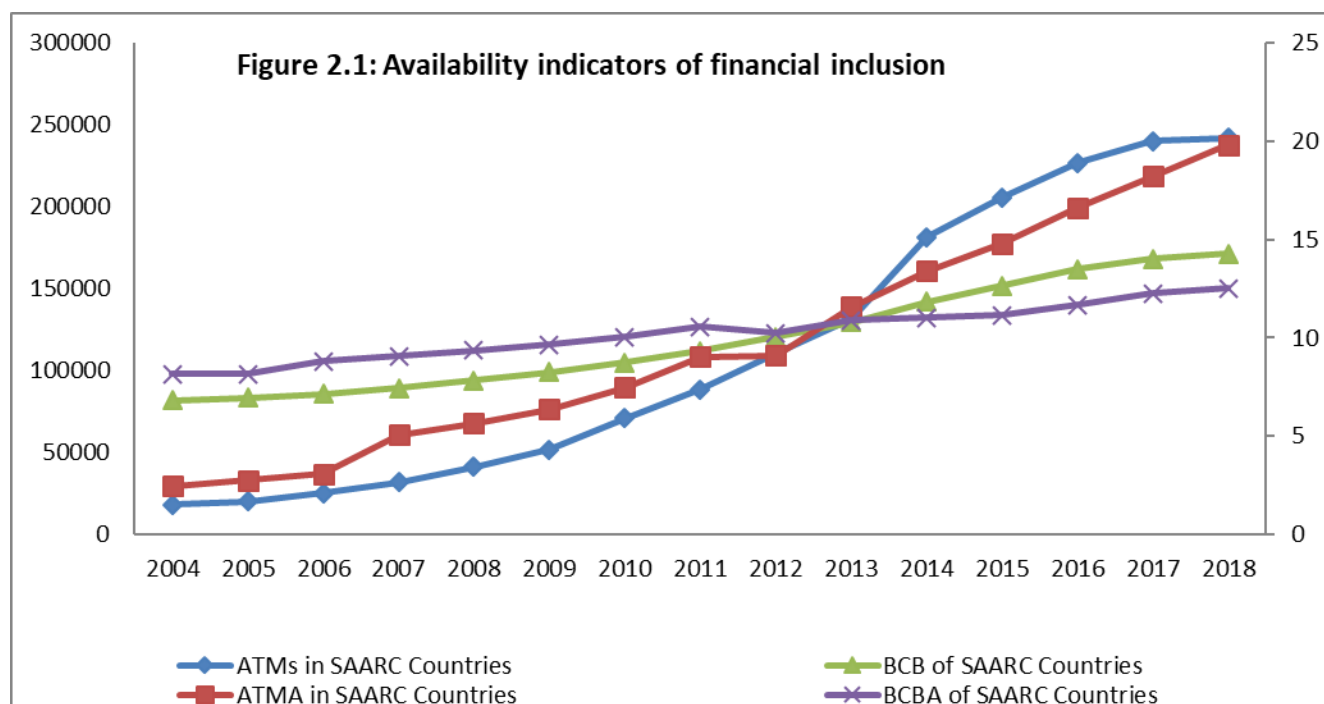
2.4 Causes of financial exclusion in SAARC countries

The reasons of financial exclusion (as percentage of adults) in SAARC countries are explained in Table 2.1. Except for India, the key barrier to financial inclusion in Afghanistan, Bangladesh, Pakistan, Maldives, Bhutan and Sri Lanka is a 'lack of money'. However, of all the countries in

South Asia, Afghanistan has the highest number of people citing ‘lack of money’. The most common reasons of financial exclusion in Bhutan are that ‘no need for financial services’ and ‘Bank is too far away’. In contrast to the rest of SAARC countries, the major causes of financial exclusion are ‘opening account is too expensive’, ‘lack of necessary documents’, ‘Lack of trust in financial institutions’, and ‘Religious reasons’. Furthermore, ‘Family member already has one bank account’ is the leading cause of financial exclusion in Maldives (for details see Table 2.1).

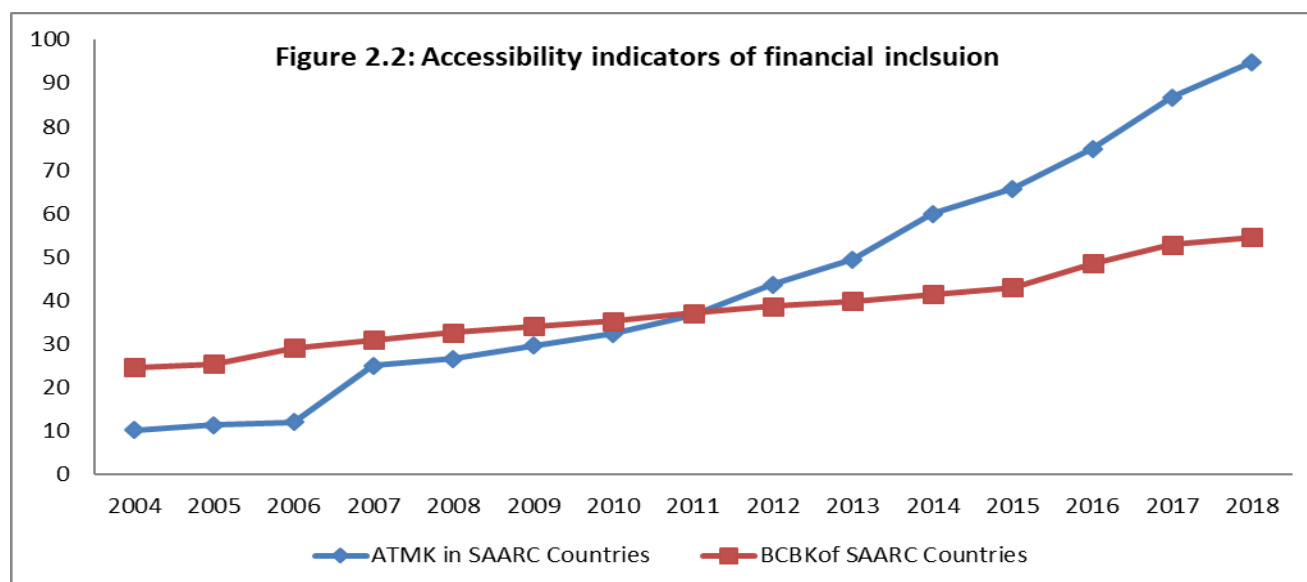
2.5 Present status of financial inclusion indicators in SAARC countries

In developing countries policy makers have been concerned about an inclusive financial system. In addition, we need better financial inclusion policies which improve income and increase savings allowing the earlier unbanked population to invest in basic requirements such as health care, education, food, and growing their business in South Asian countries. Furthermore, FI is a necessary condition for sustainable development.

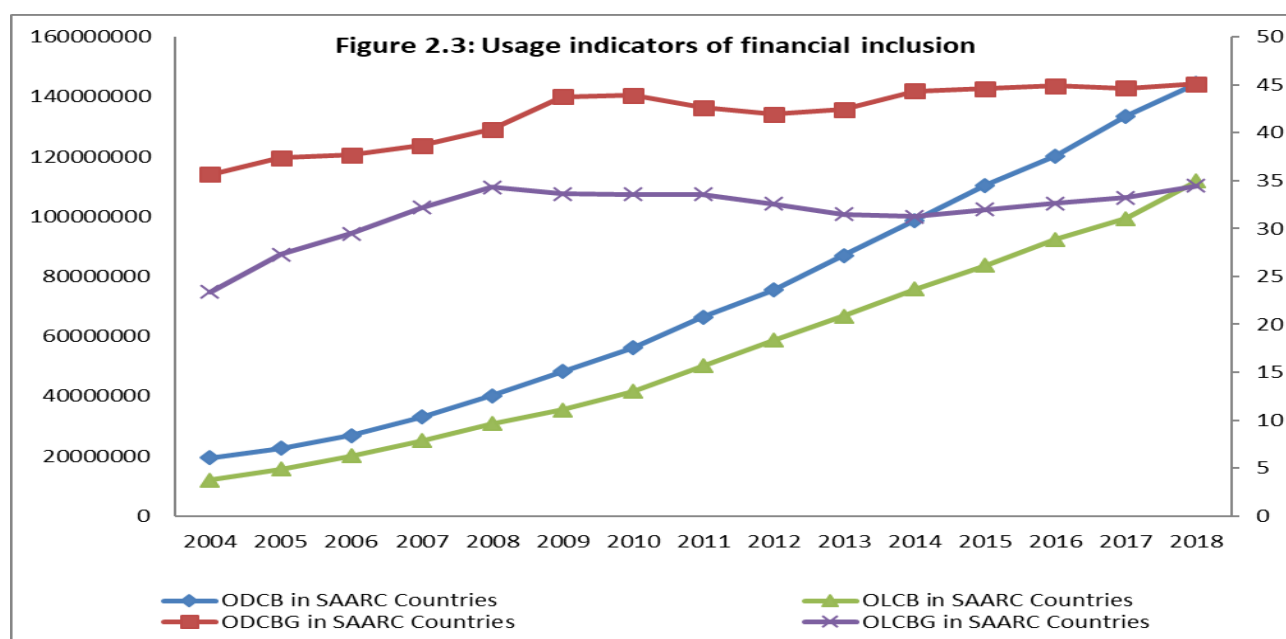


Note: For details of ATMs, ATMA, BCB, and BCBA, see Abbreviation section

Source: IMF, FAS Data



Note: ATMK = Number of ATMs per 1000Km², BCBK = Branches of commercial banks per 1000 Km²
Source: IMF, FAS data



Notes: For details of ODCB, ODCBG, OLCB, and OLCBG, see the list of abbreviations
Source: IMF, FAS data

This study presents graphically an overview of FI indicators such as availability, accessibility and usage indicators from 2004 to 2018 in seven South Asian countries. Above figures indicates the level of financial inclusion in South Asian countries. Figure 2.1 reveals that all the availability indicators of financial inclusion are increasing over time, especially number of ATMs and number of ATMs per 1 lakh adults in South Asian countries. Figure 2.2 indicates that accessibility indicators of financial inclusion are increasing from 2004 to 2018, but the growth rate of number of ATMs per 1000 Km^2 is higher comparison to branches of commercial banks per 1000 Km^2 . Similarly, the usage indicators of financial inclusion are all increasing over time, as shown in Figure 2.3. Therefore, these three figures indicate that availability, accessibility and usage indicators of financial inclusion are increasing from 2004 to 2018 justifying some recent financial inclusion programs and policy taken by the South Asian Government (for details see Figure 2.1, Figure 2.2, Figure 2.3 and for country wise FI indicators see Appendix Figure from A 1.1 to 1.10).

Table 2.2: Users of formal financial services (values in percentage) in SAARC countries

Financial services		Afghani stan	Bangladesh	Bhutan	India	Maldives	Pakista n	Sri Lanka
Adults with a bank account (%)		15	50	64	80	79	21	74
Bank accounts in Financial Institution (%)	Male	22	50	39	83	84	29	74
	Female	7	32	28	77	74	6	73
Richest 60 percent population having bank account or mobile banking		15.61	56.67	43	81	84	25	75.67
Poorest 40 percent population having bank account or mobile banking		13.80	40.07	27	77.08	71	14.21	70.58
Adults with a mobile phone		60	72	90.5	69	93	52	71
Active use bank accounts (% of Adults)		10	39	64.47	42	74	18	48
Inactive use bank accounts (% of Adults)		4	11	-	38	6	3	25
Digital payments (made or received) in past		11	34	17	29	67	18	47
Used a mobile phone or the interest to access an account (% age 15+)		1	5	-	5	38	2	7

Source: Global Findex database 2017 (World Bank)

On the basis of usage indicators of financial services, Table 2.2 depicts a country-wise image of financial services users. Among seven South Asia countries percentage of adults with a bank accounts are highest in India. Comparative depiction of male and female users of banking services like percentage of bank accounts in financial institutions (male) is highest in Maldives and percentage of bank accounts in financial institutions (female) highest in India. Afghanistan's low-income gap is most likely due to the country's low total account holdings. Research confirms that online banking is consistently safer, faster, and less expensive than cash. In addition, Maldives has the highest percentage (i.e more than 90 percent) of adults with a cell phone in South Asia. South Asian countries, especially India, are known for having large number of unused bank accounts. In India, nearly half of all bank accounts are unused in the last year for some form of deposit or withdrawal. Some recent initiatives like 'Pradhan Mantri Jan Dhan Yojana (PMJDY)', which provided free accounts to unbanked population is the major cause for India's high dormancy rate. On the other hand, in Maldives, dormancy rate is relatively low, with more than 90 percent account owners using their bank accounts actively. This finding confirms that online banking payments are widely used in Maldives (for details see Table 2.2).

2.6 Measuring financial inclusion (FI) for SAARC countries

This study developed a multidimensional Financial Inclusion Index (FII) that takes into account different financial services indicators. Furthermore, a FII is computed over 2004 to 2018 to take into account dynamic change in financial inclusion. This problem can be addressed by constructing a comprehensive FII. As Sarma (2008) correctly points out, using a single indicator to measure a county's level of FI can be misleading. As a result, in order to avoid the issue of uncertainty this study includes several important indicators in the calculation of FII. We used 10 indicators of financial inclusion, but due to data constraints, some important indicators were left out of the index calculation.

2.6.1 Calculating financial inclusion index (FII)

This study uses UNDP method for calculating FII. UNDP method has been used in the past to calculate HDI, GDI and HPI etc. The advantage of using this method is that it allows incorporate multiple dimensions of financial inclusion (FI). This study FII as explained below.

Step 1:

$$d_i = w_i * \frac{A_i - m_i}{M_i - m_i}$$

Where, A_i is actual value of dimension i ; m_i represents minimum value of dimension i ; M_i is maximum value of dimension i ; d_i is dimensions of financial inclusion i , w_i is weight (equal weighting approach).

The worst point (0) and the ideal point (1) are necessary for constructing a FII for states and countries. If the distance between X and 0 is larger, it indicates higher FI; likewise, if the distance between X and 0 is smaller, it indicates lower FI.

Step 2:

$$X_1 = \frac{\sqrt{d_1^2 + d_2^2 + d_3^2 + \dots + d_n^2}}{\sqrt{w_1^2 + w_2^2 + w_3^2 + \dots + w_n^2}}$$

Step 3:

$$X_2 = 1 - \frac{\sqrt{(w_1 - d_1)^2 + (w_2 - d_2)^2 + (w_3 - d_3)^2 + \dots + (w_n - d_n)^2}}{\sqrt{w_1^2 + w_2^2 + w_3^2 + \dots + w_n^2}}$$

Step 4:

$$FII = \frac{1}{2} (X_1 + X_2)$$

In Step 2, when X_1 value is high, it indicates a greater expansion in financial inclusion. Step 4 measures the overall financial inclusion, which is the mean of X_1 and X_2 (derived from Step 3).

A country will be classified into three categories based on its FII value^{1 2}.

$0.6 < FII \leq 1$	High financial inclusion (HFI)
$0.4 < FII < 0.6$	Medium financial inclusion (MFI)
$0 \leq FII < 0.4$	Low financial inclusion (LFI)

¹ Sethy, S. (2016), "Developing a financial inclusion index and inclusive growth in India", Theoretical and Applied Economic, Vol. 2 No. 607, pp. 187-206.

² Goel, S and Sharma, R (2017), Developing a financial inclusion index for India, Procedia Computer Science, 949–956.

2.7 Data sources and variables

2.7.1. *Dimensions or indicators of financial inclusion (FI)*

Various indicators of access to banking services might be simple physical access, flexibility and reliability (Beck et al. 2009; Sarma 2008). In addition, all financial inclusion indicators should be considered in order to present a complete image of the inclusive banking system across countries. Due to data availability limitations, maximum studies are unable to achieve this goal. However, to confirm that the financial system is inclusive, we considered 10 financial inclusion indicators, such as Availability, Accessibility and Usage of the banking services. Here, this study calculates FII considering supply side indicator. The supply side indicators of financial inclusion consist of 10 indicators. All the data are taken from the IMF's FAS. For absolute measure of financial inclusion of selective SAARC countries like Afghanistan, Bangladesh, Bhutan, India, Maldives, Pakistan and Sri Lanka, the study period is spanning from 2004 to 2018.

Dimensions of some important variables used in the study are described below.

(i) Availability of banking services: In this study, we have used availability indicators like number of bank branches per 1 lakh populations (demographic branch penetration), ATMs per 1 lakh adults, number of ATMs and branches of commercial bank (Sophastienphong and Kulathunga, 2009).

(ii) Accessibility of the banking services: Shortage of financial resources is a key factor in income inequality and lower economic growth (World Bank Report, 2010). In addition, access to banking services helps in the reduction of income inequality, thus it directly increasing income and decreasing vulnerability for the poor. In this study specifically we include indicators for accessibility such as: ATMs per 1000 Km^2 (Geographic ATMs penetration) and Branches of Commercial Bank per 1000 Km^2 (Geographic branch penetration).

(iii) Usage of the banking services: In a financial inclusion system, instead of bank account, use of different number of financial services plays an important role. So *usage of the banking services* dimension is inspired by the idea of “under banked” or “marginally banked” people. Here, we divided this dimension in two parts such as: *Credit penetration* and *Deposit penetration*.

Table 2.3: List of indicators for constructing Financial Inclusion Index (FII)

Availability Indicators	Accessibility Indicators	Usage Indicators
Demographic branch penetration: (1) Number of bank branches per 1 lakh adults	Geographic ATM penetration: (5) Number of ATMs per 1000 Km^2	Credit penetration: (7) Outstanding loans with Commercial Banks (8) Outstanding loans with Commercial Banks (% of GDP)
(2) Branches of Commercial Bank		
Demographic ATM penetration: (3) ATMs per 1 lakh adults	Geographic branch penetration: (6) Branches of Commercial Bank per 1000 Km^2	Deposit penetration: (9) Outstanding deposits with Commercial Banks (10) Outstanding deposits with Commercial Banks (% of GDP)
(4) Number of ATMs		

Source: Financial Access Survey (FAS), IMF 2018

2.8 Empirical results and analysis

For seven South Asian countries, data on financial inclusion dimensions such as Availability, Accessibility, and Usage was used. The Financial Inclusion Index (FII) values from 2004-2018 computed for South Asia countries are presented in Table 2.4. Results show that, there has been increasing of the performance of financial inclusion in SAARC countries from 2004 to 2018. But among seven South Asia countries, Afghanistan, Bangladesh, India and Sri Lanka are better performers than others. It is interesting to note that among all South Asia countries, India is the only country who performs better with the highest value of FII from 2013 to 2017. This result indicating that, there has been number of important financial inclusion initiatives such as PMJDY, PMMY, Credit Enhancement Guarantee Scheme (CEGS) for Schedule Casts (SCs), Mobile Banking, Financial literacy programmes, new SHGs frame work and Post office savings bank etc taken by the Govt. of India and RBI. In addition, in the group of seven South Asia countries, Sri Lanka (1, First Rank) leads with the highest value of FII followed by Bhutan (0.9549, 2nd Rank), Bangladesh (0.9394, 3rd Rank), India (0.9249, 4th Rank), Pakistan (0.8639, 5th Rank), Afghanistan (0.7914, 6th Rank) and Maldives (0.7820, 7th Rank) in 2018. Despite of different ranks of South Asia countries, finally all countries are included in full financial

inclusion or high FI category in 2018 due to the different financial inclusion strategies in South Asian countries.

Table 2.4: Trend of Financial Inclusion Index (FII) in SAARC countries from 2004 to 2018

Year	Value of FII in SAARC countries						
	Afghanistan	Bangladesh	Bhutan	India	Maldives	Pakistan	Sri Lanka
2004	0 (7)	0.0061 (4)	0.0793 (3)	0.0025 (6)	0.0033 (5)	0.2391 (1)	0.1335 (2)
2005	0.0797 (4)	0.0468 (6)	0.0510 (5)	0.0466 (7)	0.1672 (3)	0.2949 (1)	0.1805 (2)
2006	0.1921 (4)	0.0897 (6)	0.0739 (7)	0.0950 (5)	0.2202 (3)	0.2561 (2)	0.2679 (1)
2007	0.3114 (3)	0.1028 (6)	0.0619 (7)	0.1688 (5)	0.3973 (1)	0.3259 (2)	0.3038 (4)
2008	0.4421 (1)	0.1583 (6)	0.1551 (7)	0.2651 (5)	0.4403 (2)	0.3436 (3)	0.3063 (4)
2009	0.5828 (1)	0.2350 (7)	0.2728 (6)	0.3205 (4)	0.4695 (2)	0.2879 (5)	0.3611 (3)
2010	0.6473 (1)	0.3528 (6)	0.3775 (4)	0.3547 (5)	0.4732 (2)	0.3019 (7)	0.3832 (3)
2011	0.5579 (1)	0.4747 (3)	0.4516 (5)	0.4369 (6)	0.4688 (4)	0.2979 (7)	0.4967 (2)
2012	0.5567 (1)	0.5357 (3)	0.2928 (7)	0.5147 (4)	0.4503 (5)	0.3702 (6)	0.5397 (2)
2013	0.5998 (2)	0.5899 (3)	0.4856 (5)	0.6017 (1)	0.4599 (6)	0.4467 (7)	0.5849 (4)
2014	0.6196 (4)	0.6797 (2)	0.5386 (5)	0.7508 (1)	0.5154 (6)	0.5089 (7)	0.6275 (3)
2015	0.6555 (4)	0.7685 (2)	0.5659 (6)	0.8380 (1)	0.5425 (7)	0.5787 (5)	0.7237 (3)
2016	0.6772 (5)	0.8397 (2)	0.6572 (7)	0.9010 (1)	0.6637 (6)	0.6851 (4)	0.8162 (3)
2017	0.7082 (7)	0.9056 (2)	0.8035 (4)	0.9344 (1)	0.7659 (5)	0.7247 (6)	0.9016 (3)
2018	0.7914 (6)	0.9394 (3)	0.9549 (2)	0.9249 (4)	0.7820 (7)	0.8639 (5)	1 (1)

Note: Ranks of the countries are given in the parenthesis

Source: Author's calculations.

Figure 2.4: Financial Inclusion Index (FII) of South Asian countries from 2004 to 2018

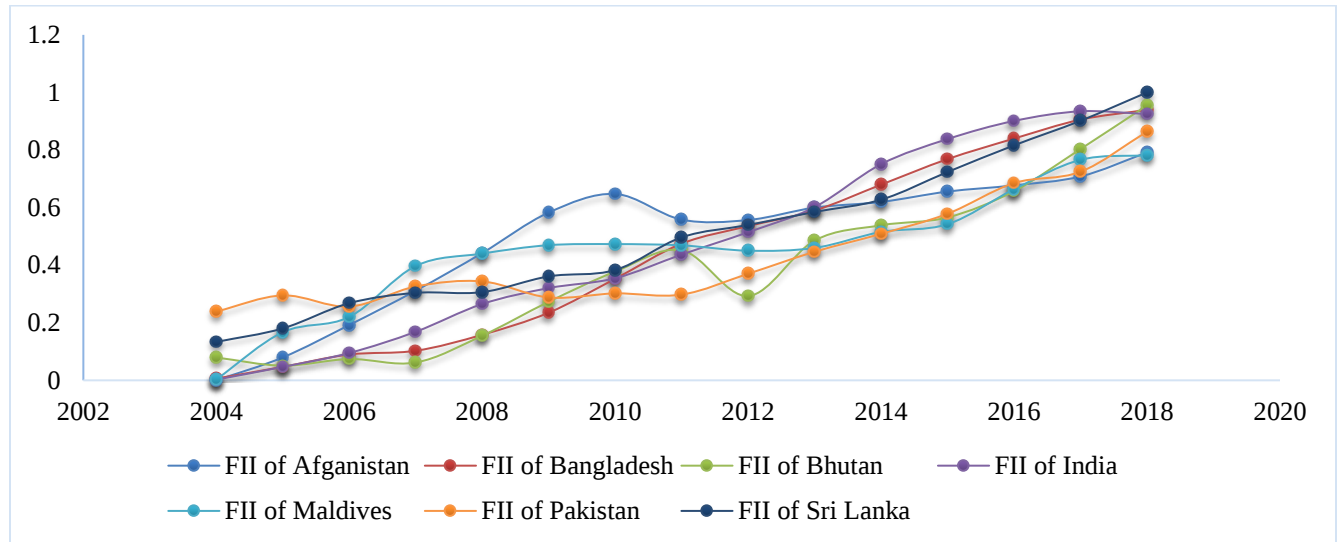
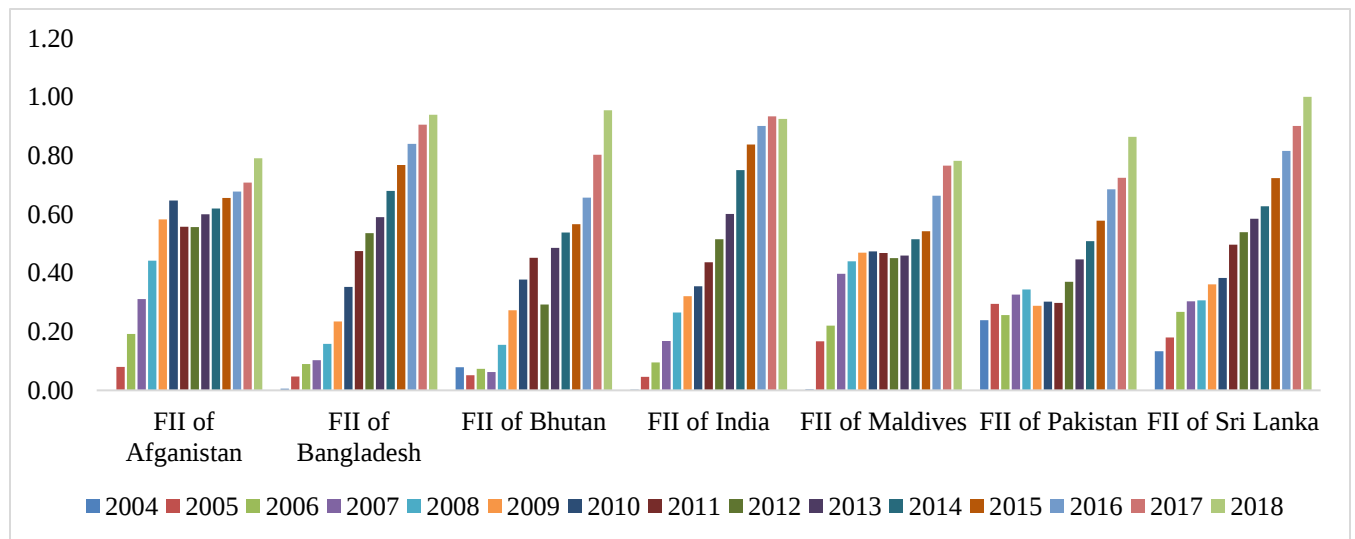


Figure 2.5: Financial Inclusion Index (FII) of South Asian countries from 2004 to 2018



Source: Author's estimations

This study investigated the level of FI in South Asian countries. Above Figure 2.4 and Figure 2.5 show that the overall performance of FII in South Asian countries has been tremendously increasing from 2004 to 2018. Here the study considered only seven South Asia countries except Nepal due to the availability of banking services data. The results of this study show that among

all seven South Asia countries, the value of FII varies between 0 in the case of Afghanistan and 0.239 in the case of Pakistan in 2004. The value of FII varies between 0.292 in the case of Bhutan and 0.556 in the case of Afghanistan in 2012. Interestingly, the results indicate that the performance in case of access to financial services in Afghanistan, Bhutan and Maldives were decreasing and on the other side countries like Bangladesh, India, Pakistan and Sri Lanka were increasing may be due to some major government initiatives in 2012. In addition to, the value of FII is highest in Sri Lanka (1), followed by Bhutan (0.954), Bangladesh (0.939), India (0.924), Pakistan (0.863), Afghanistan (0.791) and Maldives (0.782) in 2018. Here, all the South Asia country included in the category of full financial inclusion. Overall, this figure indicates that access to formal financial services (or FII) are increasing over time, which indicating some recent government initiatives in South Asia such as: National Financial Inclusion Strategy in 2016 (Afghanistan), established Financial Inclusion Department in 2015 (Bangladesh), Financial Literacy programme (Bhutan), Pradhan Mantri Jan Dhan Yojana (India), Mobile Phone Banking Projects in 2005 (Maldives), National Financial Inclusion Strategy in 2015 (Pakistan) and Postal Banking Services (Sri Lanka) etc.

Table 2.5: High Financial Inclusion category of SAARC countries

Countries	Year	Value of FII	FII Range	Category
Afghanistan	2017 2018	0.7082 0.7914	(0.6 < FII ≤ 1)	High Financial Inclusion (HFI)
Bangladesh	2015 2016 2017 2018	0.7685 0.8397 0.9056 0.9394		
Bhutan	2017 2018	0.8035 0.9549		
India	2014 2015 2016 2017 2018	0.7508 0.8380 0.9010 0.9344 0.9249		
Maldives	2017 2018	0.7659 0.7820		

Pakistan	2017	0.7247		
	2018	0.8639		
Sri Lanka	2015	0.7237		
	2016	0.8162		
	2017	0.9016		
	2018	1		

Source: Author's estimations

Table 2.6: Medium Financial Inclusion category of SAARC countries

Countries	Year	Value of FII	FII Range	Category
Afghanistan	2009 2010 2011 2012 2013 2014 2015 2016	0.5828 0.6473 0.5579 0.5567 0.5998 0.6196 0.6555 0.6772	$(0.4 \leq \text{FII} < 0.6)$	Medium Financial Inclusion (MFI)
Bangladesh	2012 2013 2014	0.5357 0.5899 0.6797		
Bhutan	2014 2015 2016	0.5386 0.5659 0.6572		
India	2012 2013	0.5147 0.6017		
Maldives	2014 2015 2016	0.5154 0.5425 0.6637		
Pakistan	2014 2015 2016	0.5089 0.5787 0.6851		
Sri Lanka	2012 2013 2014	0.5397 0.5849 0.6275		

Source: Author's calculations

Table 2.7: Low Financial Inclusion category of SAARC countries

Countries	Year	Value of FII	FII Range	Category
Afghanistan	2004	0	$(0 \leq \text{FII} < 0.4)$	Low Financial Inclusion (LFI)
	2005	0.0797		
	2006	0.1921		
	2007	0.3114		
	2008	0.4421		
Bangladesh	2004	0.0061		
	2005	0.0468		
	2006	0.0897		
	2007	0.1028		
	2008	0.1583		
	2009	0.2350		
	2010	0.3528		
	2011	0.4747		
Bhutan	2004	0.0793		
	2005	0.0510		
	2006	0.0739		
	2007	0.0619		
	2008	0.1551		
	2009	0.2728		
	2010	0.3775		
	2011	0.4516		
	2012	0.2928		
	2013	0.4856		
India	2004	0.0025		
	2005	0.0466		
	2006	0.0950		
	2007	0.1688		
	2008	0.2651		
	2009	0.3205		
	2010	0.3547		
	2011	0.4369		
Maldives	2004	0.0033		
	2005	0.1672		
	2006	0.2202		
	2007	0.3973		
	2008	0.4403		
	2009	0.4695		
	2010	0.4732		
	2011	0.4688		
	2012	0.4503		
	2013	0.4599		
Pakistan	2004	0.2391		
	2005	0.2949		
	2006	0.2561		
	2007	0.3259		
	2008	0.3436		
	2009	0.2879		

	2010	0.3019		
	2011	0.2979		
	2012	0.3702		
	2013	0.4467		
Sri Lanka	2004	0.1335		
	2005	0.1805		
	2006	0.2679		
	2007	0.3038		
	2008	0.3063		
	2009	0.3611		
	2010	0.3832		
	2011	0.4967		

Source: Author's estimations

Table 2.8: Category of South Asian countries in FII for 2004, 2011 and 2018

Country	2004		2011		2018	
	FII (Rank)	Category	FII (Rank)	Category	FII (Rank)	Category
Afghanistan	0 (7)	Low Financial Inclusion	0.557 (1)	Medium Financial Inclusion	0.791 (6)	High Financial Inclusion
Bangladesh	0.006 (4)	Low Financial Inclusion	0.474 (3)	Low Financial Inclusion	0.939 (3)	High Financial Inclusion
Bhutan	0.079 (3)	Low Financial Inclusion	0.451 (5)	Low Financial Inclusion	0.954 (2)	High Financial Inclusion
India	0.002 (6)	Low Financial Inclusion	0.436 (6)	Low Financial Inclusion	0.924 (4)	High Financial Inclusion
Maldives	0.003 (5)	Low Financial Inclusion	0.468 (4)	Low Financial Inclusion	0.782 (7)	High Financial Inclusion
Pakistan	0.239 (1)	Low Financial Inclusion	0.297 (7)	Low Financial Inclusion	0.863 (5)	High Financial Inclusion
Sri Lanka	0.133 (2)	Low Financial Inclusion	0.496 (2)	Low Financial Inclusion	1 (1)	High Financial Inclusion

Source: Author's estimations

Notes: Ranks of the countries are given in the parenthesis

HFI = $0.6 < \text{FII} \leq 1$, MFI = $0.4 \leq \text{FII} < 0.6$, LFI = $0 \leq \text{FII} < 0.4$, FII = Financial Inclusion Index

2.8.1 Category of South Asian countries in financial inclusion index (FII), 2004-2018

Based on their Financial Inclusion Index (FII) values, countries are divided into three categories. High financial inclusion (HFI) countries are categorized as those having FII values vary between 0.6 and 1. Medium financial inclusion (MFI) countries are those having FII values vary between 0.4 and 0.6. Low financial inclusion (LFI) countries have FII values less than 0.4.

From the above Table 2.8 it indicates that, all the SAARC countries were included in low financial inclusion category because the value of FII varies between 0 to 0.4 in 2004. Similarly, six SAARC countries like Bangladesh, Bhutan, India, Maldives, Pakistan, and Sri Lanka were included in low FI because the values of FII varies between 0 to 0.4 but except one country like Afghanistan which included in medium FI because the value of FII varies between 0.4 to 0.6 in 2011. All the South Asia countries performed better and included in the high financial inclusion category in 2018 (for details see Table 2.5, 2.6 and 2.7). Table 2.8 also indicates that, out of seven South Asia countries, levels of financial inclusion, as measured by Financial Inclusion Index (FII), varied from as low (0) for Afghanistan (seventh rank) to as high (0.239) for Pakistan (first rank) in 2004. The FII values vary from as low (0.297) for Pakistan (seventh rank) to as high (0.557) for Afghanistan (first rank) in 2011. Similarly, the FII values vary from as low (0.782) for Maldives (seventh rank) to as high (1) for Sri Lanka (first rank) in 2018. But here out of seven South Asia countries, Sri Lanka is the only country that maintains consistent performance on financial inclusion. In addition, the result also indicates that all the South Asia countries included in the high financial inclusion category in 2018.

Overall cross country evidence suggests that the performance of all South Asia countries on financial inclusion (i.e Financial Inclusion Index) has been increasing from 2004 to 2018 (for details see Table 2.5). This is primarily due to some recent financial inclusion initiatives taken by the Government of South Asia countries such as: National Financial Inclusion Strategy in 2016 (Afghanistan), established Financial Inclusion Department in 2015 (Bangladesh), Financial Literacy programme (Bhutan), Pradhan Mantri Jan Dhan Yojana (India), Mobile Phone Banking Projects in 2005 (Maldives), National Financial Inclusion Strategy in 2015 (Pakistan) and Postal Banking Services (Sri Lanka), etc.

2.9 Summary

This chapter has proposed a Financial Inclusion Index (FII) – a multidimensional measure developed for South Asia countries but exclude Nepal because of the non-availability of relevant data. FII can be used to measure the level of financial inclusion across different countries and to monitor the development of those countries over time.

FII calculation is based on the available data from 2004 to 2018 are presented in this study. We are unable to include many indicators of an inclusive financial system in our present index due to a lack of relevant data like affordability, mobile banking, timeliness, and quality of the banking services.

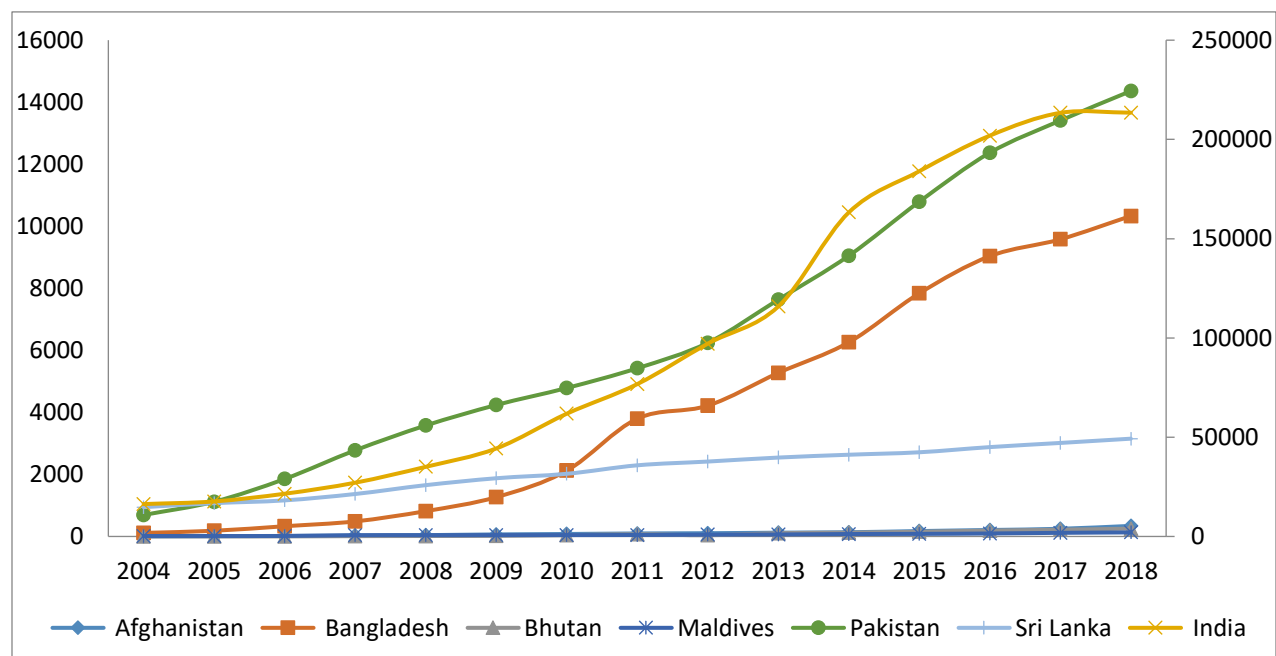
In this study, analytical results indicate that all the financial inclusion indicators like Availability, Accessibility, and Usage of formal financial services have been drastically increasing in SAARC countries. Overall cross country evidence suggests that the performance of all the South Asian country on financial inclusion (i.e Financial Inclusion Index) has been increasing from 2004 to 2018 but it is interesting to note that among seven South Asian countries, India is the only country who performs better with the highest value of FII from 2013 to 2017. In addition, the result also indicates that all the South Asia countries included in the high financial inclusion category in 2018, explaining some recent financial inclusion initiatives taken by the South Asian governments. The study also explains the benefits of financial inclusion and the most common reasons for financial exclusion in South Asian countries.

This study can be helpful to many researchers in future. They can explore the major hindrance for having low financial inclusion in South Asian countries, specifically the result relevant to individual country. This study further can be extended to incorporate some socio-economic determinants in their analysis to understand the linkage of the determinants on financial inclusion.

Appendix

Country-wise financial inclusion indicators

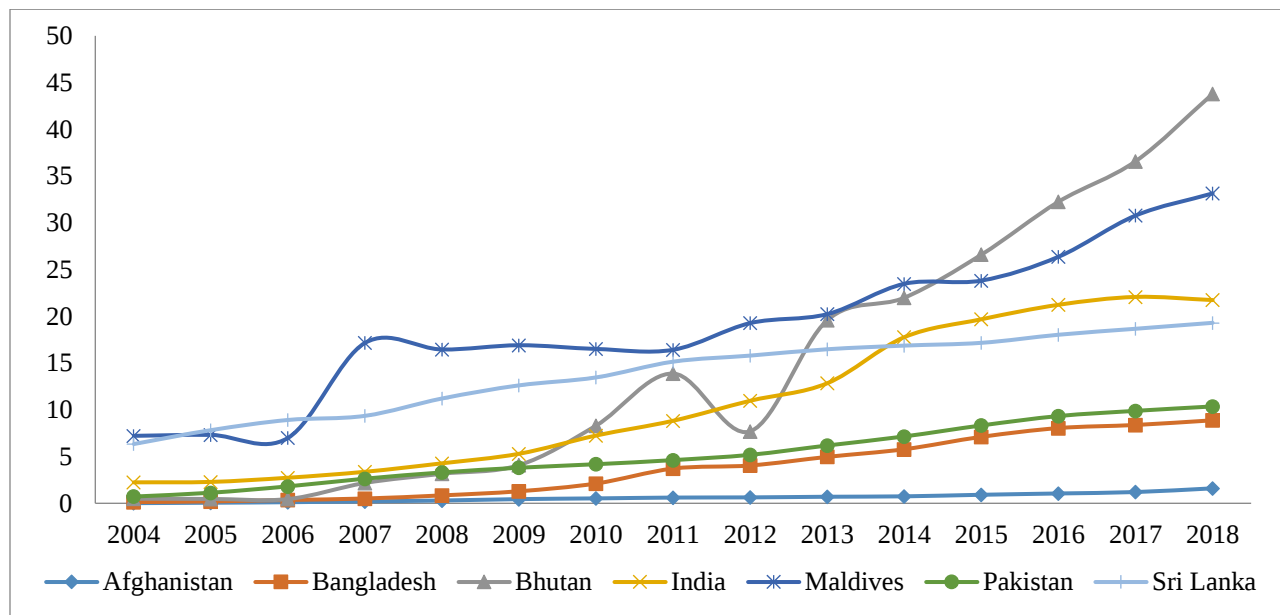
Figure A.2.1: Number of ATMs



Note: India is to be read from Secondary axis.

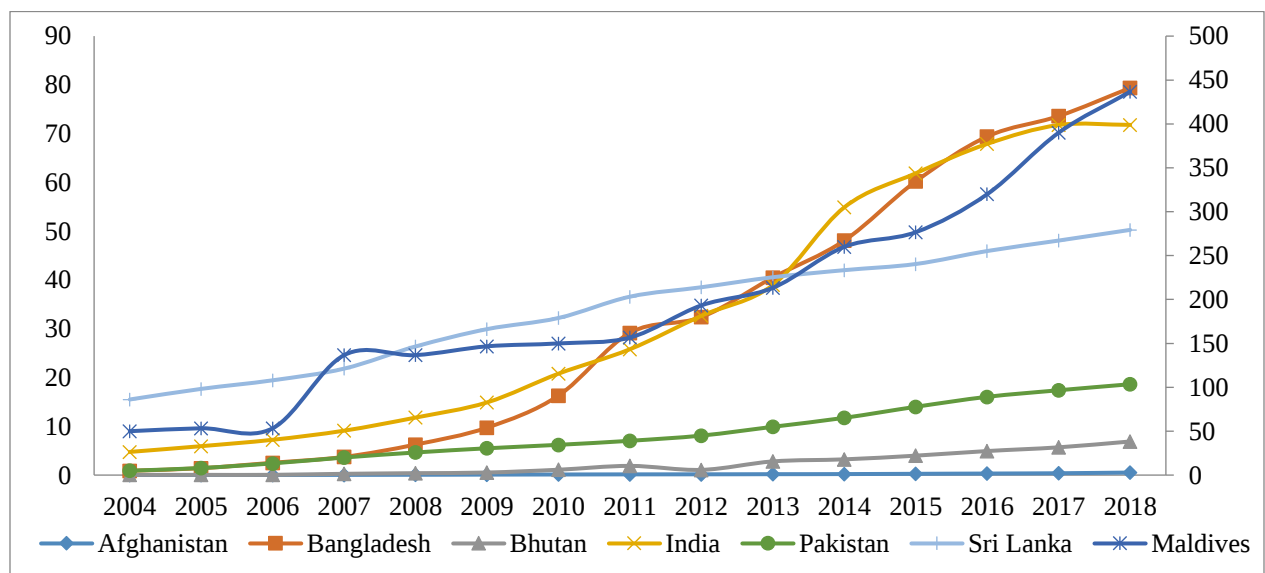
Source: Author's estimations from financial access service, IMF

Figure A.2.2: Number of ATMs per 1 lakh adults



Source: IMF

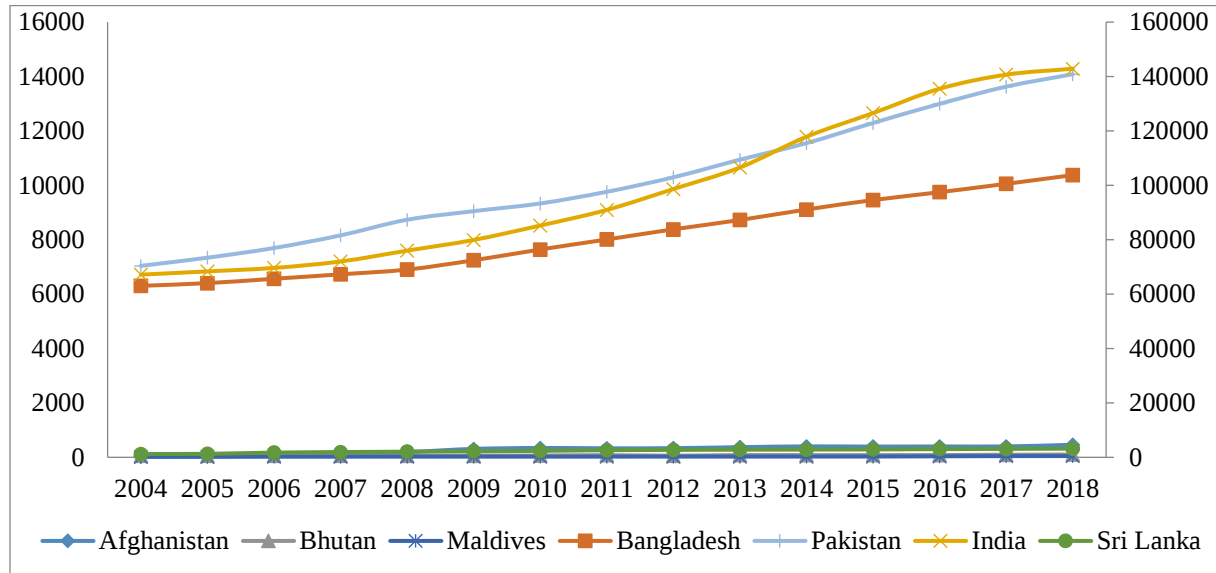
Figure A.2.3: Number of ATMs per 1000 Km^2



Note: Maldives to be read from secondary axis.

Source: Author's estimations

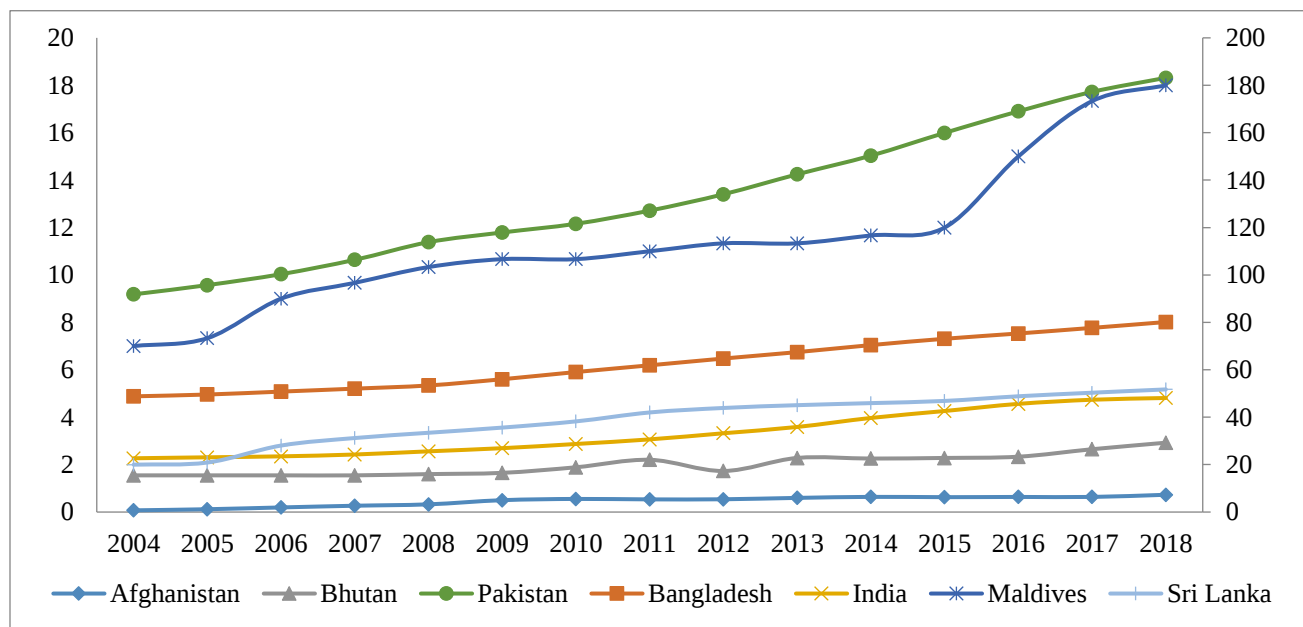
Figure A.2.4: Branches of commercial banks



Note: India is to be read from secondary axis.

Source: Author's estimations

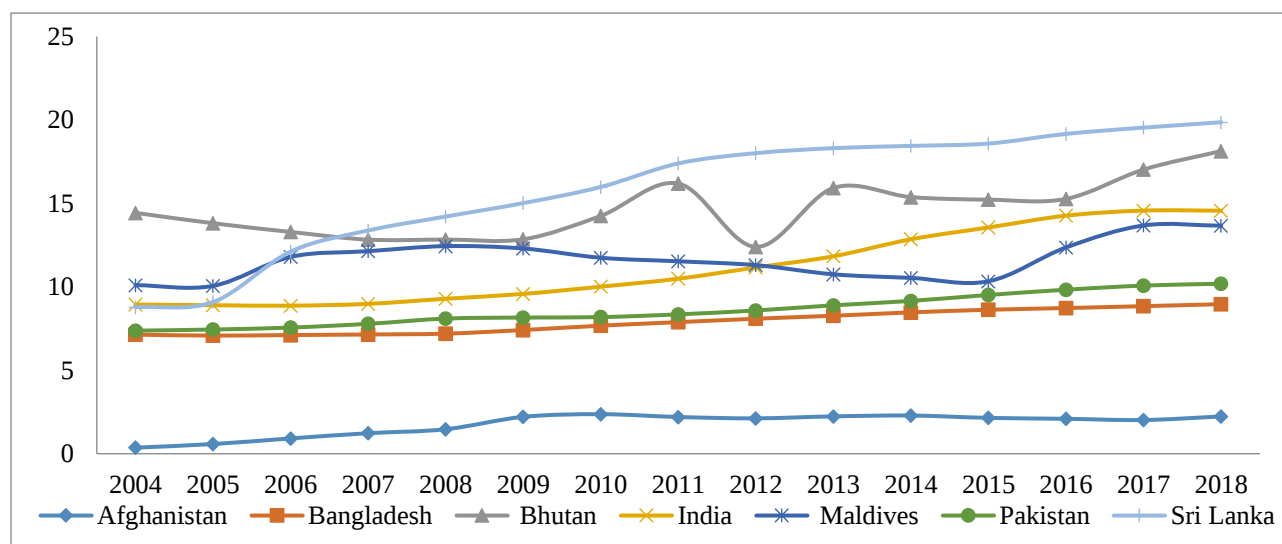
Figure A.2.5: Branches of commercial banks per 1000 Km²



Note: Bangladesh, India, Maldives, Sri Lanka are to be read from secondary axis.

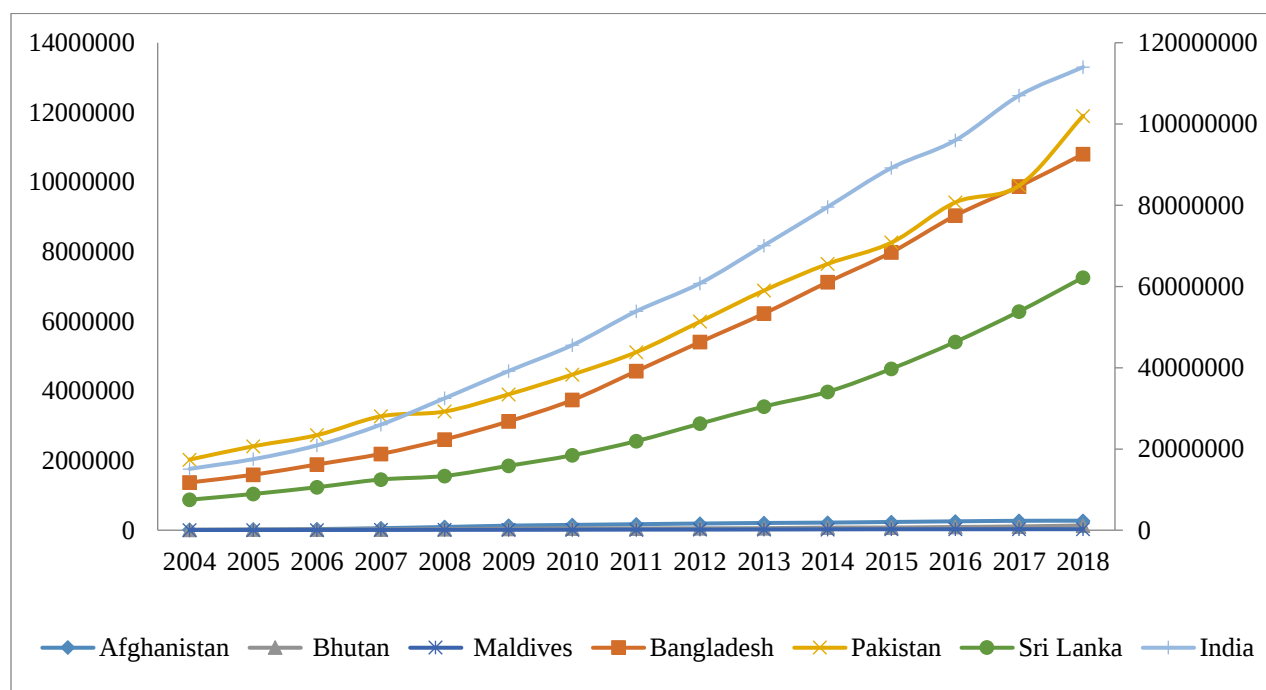
Source: IMF

Figure A.2.6: Branches of commercial banks per 1 lakh adults



Source: IMF

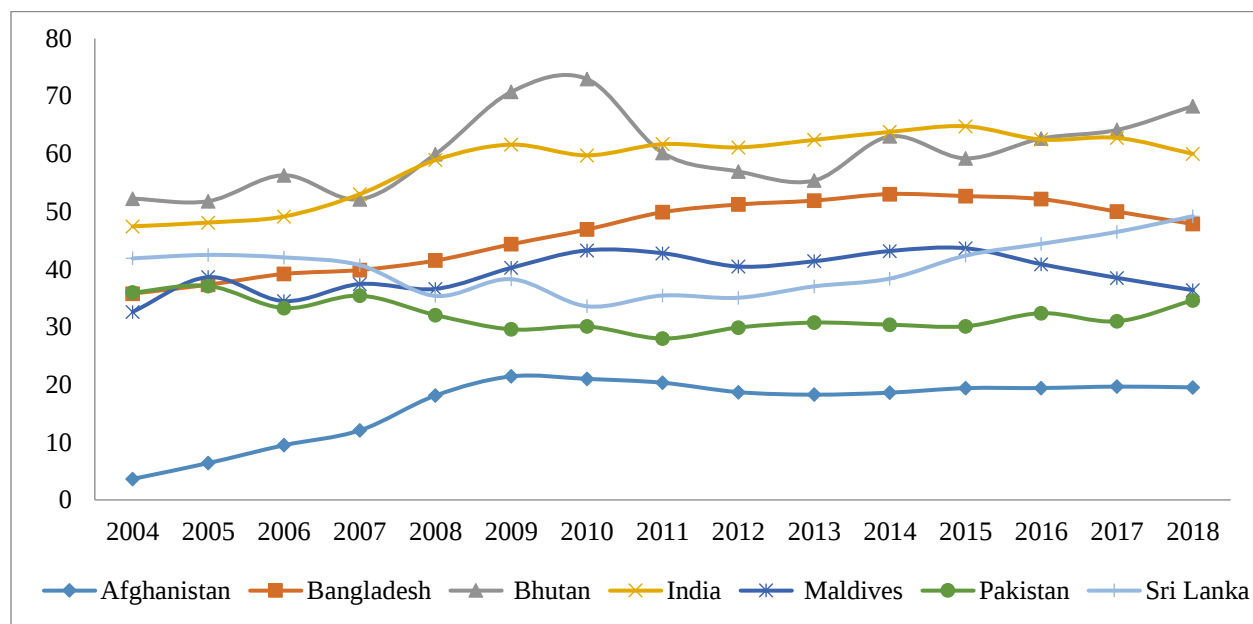
Figure A.2.7: Outstanding deposits with commercial banks



Note: India is to be read from secondary axis.

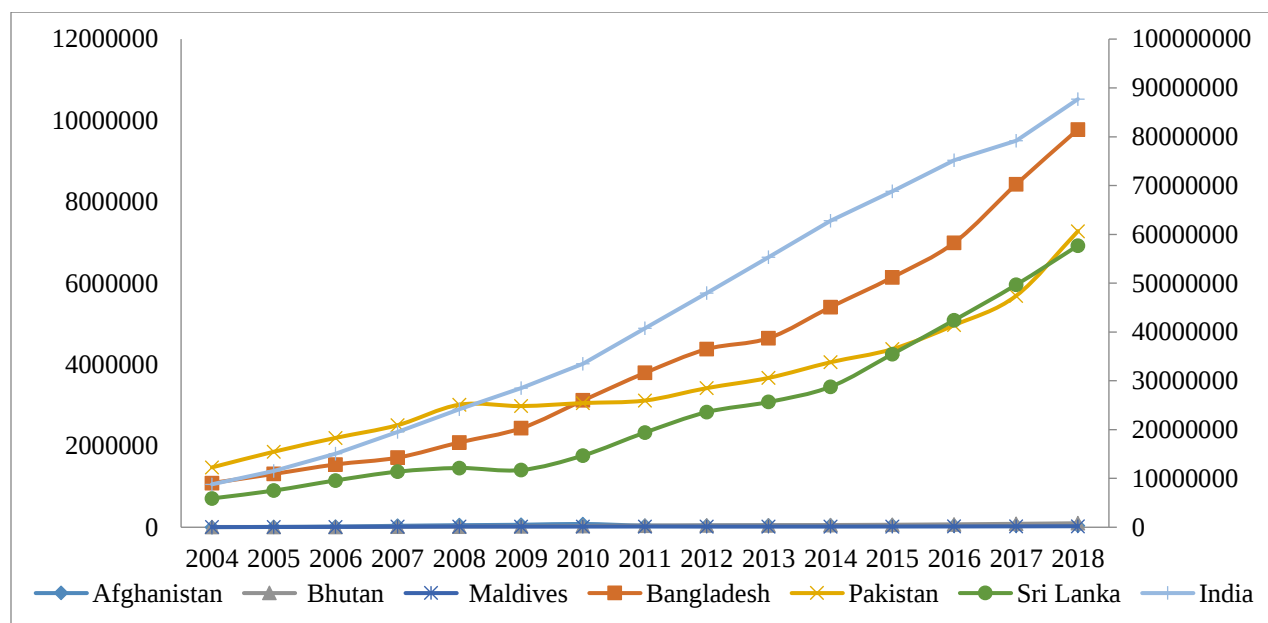
Source: Author's estimations

Figure A.2.8: Outstanding deposits with commercial banks (% of GDP)



Source: IMF

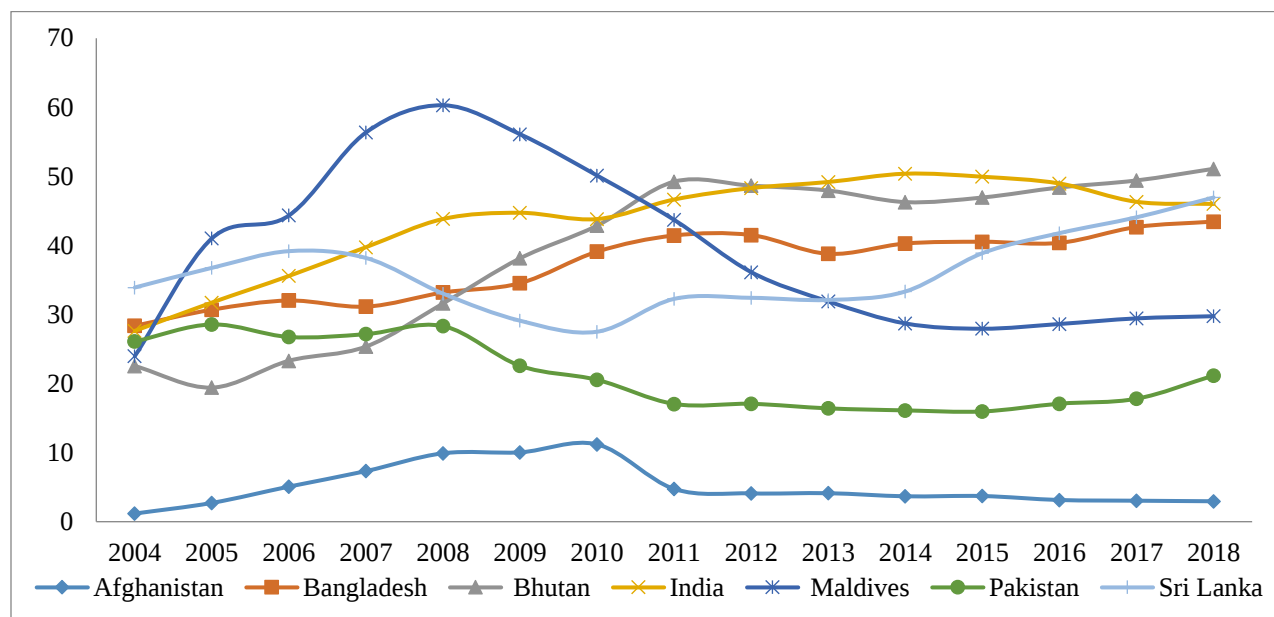
Figure A.2.9: Outstanding loans with commercial banks



Note: India is to be read from secondary axis

Source: Author's estimations

Figure A.2.10: Outstanding loans with commercial banks (% of GDP)



Source: IMF

Chapter 3

Nexus between Financial Inclusion and Human Development in South Asian Countries: Evidence from a Modified HDI

3.1 Introduction

Financial inclusion (FI) plays a critical role in shaping the structure of human development (HD). Several eminent economists have advocated that a formal financial system where people, especially underprivileged and disadvantage groups have access to finance and financial products, brings transformation in their production process, employment activities and helps to exit poverty (Banerjee and Newman, 1993 and Banerjee, 2001). So, it is imperative to understand the catastrophic effect of a financial system which excludes largely those people from accessing the financial services.

In addition, when there is society with many poor people, higher is the financial exclusion. Financial exclusion (FE) is one of major cause of low human development. The literature on financial exclusion was defined by Leyshon and Thrift (1995) that, it is a process where some social classes and individuals are denied access to the banking services. FE averts low-income and disadvantaged social classes from accessing their countries' formal financial system (Conroy, 2005). In addition, according to Rangarajan (2008) Committee, financial inclusion is a process that ensures sufficient and timely access to formal financial services for the poorer sections of society at a fair cost. However, neglecting structural issues can cause failure to the process of financial inclusion.

Human development has been defined as increasing people's capabilities in a way which allows them to live longer, healthier and happy life. According to the UNDP, there are three significant measures of Human Development (HD) such as: living a healthy and stable life, being educated, and having a good standard of living. As a result, we will define a country's human development as its people's health, education, and financial access. In addition, it is expected that the expansion of economic opportunities through inclusive financial system would have an indirect effect on access to education and health care, and thus, increases the level of HD in the county. In respect of human development, SAARC countries are observed that, only two countries in the region (Sri Lanka and Maldives) included in the category of high HD, and all other five countries

are classified as medium level of human development (India, Bhutan, Bangladesh, Nepal and Pakistan) and only one country in the region included in low level of human development i.e. Afghanistan (UNDP, 2019).

In several ways, our research differs from the previous research. *First*, the purpose of this research is to construct a multidimensional FII for South Asian countries from 2004 to 2018, using a multiple indicator of banking services. Furthermore, it uses new methodology to develop a new human development index and its resulting value is called modified HDI. The modified HDI (HDI_M) is then used to compare the level of socio-economic development of South Asia countries. *Second*, it identifies the factors that can influence human development (HD) and analyze the influence of FI on HD, focusing on South Asian countries. *Third*, with the use of a panel data set, fixed and random effect models, this analysis examines all major relationship between variables in relation to human development. *Fourth*, it uses Hausman test to compare the usual fixed effect and random effect estimates, in every panel data model.

The remaining sections are organized as follows: Section 2 provides review of literature. Section 3 presents a theoretical framework for understanding the linkages between financial inclusion (FI) and human development. Section 4 presents construction of a multidimensional FII and HDI_M for testing impact of financial inclusion on human development through regression analysis. Section 5 presents the model specification. Data sources and variables presents in Section 6. The empirical findings and discussions are presented in Section 7. Finally, in the last section, concluding remarks and policy implications are offered.

3.2 Review of literature

3.2.1 Economic growth and human development

Economists like Simon Kuznets (1966), Psacharopoulos and Woodhall (1985), Psacharopoulos (1994), Becker and Chiswick (1964), Becker (1975), Dennison (1962 and 1965) and Morris (1979) are considering human capital as a major factor for any economy. However, since the 1980s, a much broader view of human capital, i.e., human development, has become extremely relevant in development literature. All of these activities finished in the UNDP's human development reports, which based on different component of human development. The human development process focuses on the investment in education, health, nutrition and income.

3.2.2. Chain from economic growth to human development (HD)

The economic resources including Gross National Product (GNP) contributes to human development basically through household, government actions, and different Non-Governmental Organizations (NGOs). Furthermore, the propensity of households to spend their income (after tax) on products for example food, drinking water, education and health, that directly contribute to the improvement of human development in underdeveloped countries. Generally, poor families tend to have highest spending on human development indicators; whereas rich families spend less of it.

When a country's poverty levels are high, households spending on human development would certainly be low. For given GNP, an equitable distribution of family incomes would result in lower Private Income Poverty, which would certainly lead to better human development outcomes. Since poor families are deficient in human development components, they are more likely to spend a larger portion of their income on products that directly contribute to human development, such as food, schooling, and health.

Another important factor is NGO which can strengthen a nexus between economic growth and HD. NGOs play a minor or no role in most countries, but in a few, such as Bangladesh, India, Peru and Kenya, it seems to be an important source of human development improvement (Riddell et al, 1995).

Few empirical results on India, Brazil, Chile, Ghana, Indonesia, Bolivia, Pakistan, Philippines, and Peru show that a positive impact of family income on child schooling (Behrman and Wolfe 1987a, b; King and Lillard, 1987; Birdsall 1985; Deolalikar 1993) and it directly improves the human development. The extent of female influence over income is another important factor in deciding how economic resources are converted in human development. For instance, in Gambian households, greater is the decision making power of women on food intake, higher is the households' calorie intake (Von Braun, 1988). Similarly, in Philippines as income of wives increases the calorie intake rises (Garcia, 1990).

3.2.3 Theoretical and empirical linkages between financial development (FD), financial inclusion (FI) and human development (HD)

There are quite a large number of literatures which observed that an improvement in human development is influenced by greater development in financial market. After the seminal work by Schumpeter (1911), it is established that a better financial market can enhance economic development. Some cross country evidence suggest that financial development can be taken as an important instrument for economic growth (King & Levine, 1993b, 1993c, Apergis, et al. 2007).

Furthermore, financial sector development can effect inclusive development (i.e., human development) directly (Banerjee & Newman, 1993) or indirectly (Greenwood & Jovanovic, 1990). Financial innovation and financial services contribute to the achievement of sustainable and inclusive development (Asongu & De Moor, 2015).

Financial development is as essential as human capital in theory, and both positively impact on economic growth. In addition, low economic growth outcomes can result from a combination of physical capital and poor human development. On the other hand, the combination of high human development and low physical capital could not result in positive economic growth. Chou and Chinn (2001), in their theoretical model, argued the importance of human capital in increasing financial innovation, which leads to financial development and further it increases human capital formation. As a result, their model suggests that higher stock of financial services, and financial intermediaries allow to increase human capital by converting household savings into investment.

Using the trans-log output function as a framework, Evans et al. (2002) confirm that there exists some connection between human capital and financial development in 82 countries. Brown et al. (2004) conducted a study on 297 new small business in Romania, the study evidence that access to external credit increases sales and jobs. Kumar et al. (2005) suggested that literacy rate and other socio-economic factors like income and wealth are the most important causes of financial access. Furthermore, their research confirmed that people with a higher literacy rate used more

private banks than public sector banks. As a result, the number of people with bank accounts differed according to their education level.

Nguyen (2008) confirmed that literacy rates were positively linked to financial development in Vietnamese households. Household savings were also found to be positively linked to literacy rate. Furthermore, Benhabib and Spiegel (1992) have strongly identified the importance of human development in economic development. A study conducted by Beck, et al., (2007) on financial inclusion; concluded that FI reduces income inequality and poverty levels. As a result, financial development contributes to human development.

Arora (2012) conducted a study on 21 developing Asian countries to investigate the links between FI and HD. He concluded that a strong negative association between financial development and proportion of teachers, as well as a strong association between access to banking services and expected years of schooling.

Laha (2015) study the impact of FI on HD in South Asia, focusing on India. He used a new statistical measure to calculate HDI as well as FII and called it modified HDI and FII. Unlike UNDP method, the study used empirically observed lowest and highest values for each dimensions of human development. Finally, this study concluded that a positive correlation between FI and HD both in South Asia and India.

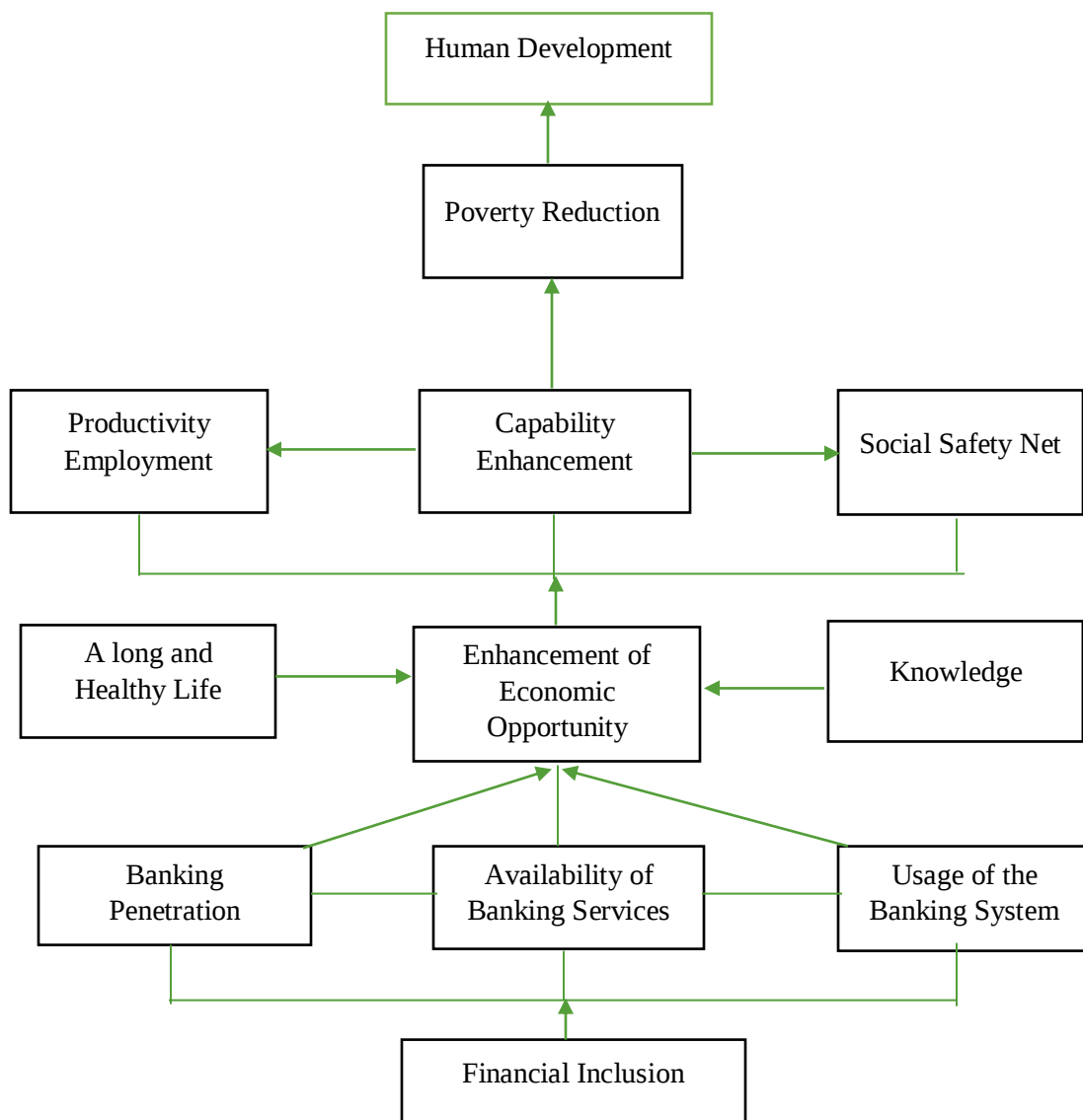
Few empirical studies on cross country analysis observed that there exists a strong and positive connection between FI and HD (Sarma and Pais, 2011; Yorulmaz, 2012; Nanda and Kaur, 2016; Raichoudhury, 2016). Datta and Singh (2019) is a recent cross country analysis on the determinants of financial inclusion and its link with human development for the period 2011 and 2014. This study used PCA to calculate FII. It is observed that there exists a significant and positive association between FI and HD (Datta and Singh, 2019).

Using dynamic panel GMM technique, Ababio et al. (2019) evidenced that low human development causes low FI. Similarly, a recent study conducted by Matekeny et al. (2020) on FI and HD in Sub-Saharan Africa. They used GMM approach and their result evidence that FI is the major factor to increase human development.

3.3 Financial inclusion (FI) and Human development (HD): A theoretical framework

In Figure 3.1, a theoretical linkage between FI and HD is given. When financial inclusion expands in region/country, it makes banking services easily available to the needy section and it increases the uses of banking products. This in turn creates more economic opportunities which lead to more productivity, employment, and social safety. Thus, it reduces the poverty and it improves quality of human development (Kuri and Laha, 2011; Laha, 2015).

Figure 3.1: Financial inclusion and Human development



Source: Compiled from Laha (2015)

3.4 Methodology

After 1990, different alternative method has been developed or suggested by many economists, organizations and research scholars to calculate human development (for details see UNDP report 2015). Based on the previous studies, this study makes a different idea to measure human development and we develop a new human development index (i.e. modified human development index) to compare with original human development index (which is measured by the UNDP). We then develop a multidimensional financial inclusion index (FII) that can be used in different regression model.

3.4.1 Measuring human development for South Asian countries

Construction of a modified human development index (HDI_M)

Different studies have been used three dimensions of human development to measure the overall level of HD across the countries. The UNDP's Human Development Index (HDI) provides an overall idea about different aspects of economic development. Because HDI is a three-dimension composite measure of HD such as healthy life, literacy rate and a decent living.

Methodology of HDI calculation used by the UNDP:

$$HDI = I$$

$$I = \sqrt[3]{I_h * I_e * I_y}$$

Where I = Average Achievement Indicator

I_h = Health Index, I_e = Education Index, I_y = Income Index

Calculating the dimension specific indices

Step 1. Forming the dimension indices

First, for each dimension of human development, we have calculated the dimension index. In order to construct human development index, the dimension index for the i^{th} dimension, d_i is calculated by the following formula

$$d_i = \frac{A_i - m_i}{M_i - m_i} \quad (3.1)$$

Where, A_i is Actual value of dimension i ; m_i is Minimum value of dimension i ; M_i is Maximum value of dimension i ; d_i the Dimensions of human development i .

Unlike the UNDP Goal post method, which uses *pre-determined*¹ maximum and minimum values, but this study used empirically observed maximum and minimum values for each dimension.

Step 2

Here dimensions can be observed that $0 < d_i < 1$. By considering the above three dimensions for each index, country i can be represented by a point (d_1, d_2, d_3) . Here, the worst point (0) and the ideal point (1) are necessary for constructing a Human Development Index (HDI). Here, this study used new statistical technique to calculate HDI. Algebraically,

Modified method for HDI calculation

$$HDI_M = 1 - \sqrt{\frac{(1-d_1)^2 + (1-d_2)^2 + (1-d_3)^2}{3}} \quad (3.2)$$

Note: HDI_M means modified Human Development Index (HDI)

A country will be classified into three categories based on the value of HDI_M

$0.6 < HDI_M \leq 1$	High Human Development
$0.4 \leq HDI_M < 0.6$	Medium Human Development
$0 \leq HDI_M < 0.4$	Low Human Development

¹For life expectancy: Max (85) and Min (20), for expected years of schooling: Max (18) and Min (0), for mean years of schooling: Max (15) and Min (0), for GNI per capita: Max (75,000) and Min (100). These pre-determined values were used by the UNDP to calculate HDI.

This study used the formula of HDI computed by Laha (2015)² for South Asia countries and also for Indian states. The resulting value is referred to as the “Modified Human Development Index (i.e. HDI_M)”, and it is used to compare the ranking of countries based on HDI (which is measured by the UNDP) alone and modified HDI. Here, the value of HDI_M is more reliable comparison to the value of HDI.

3.4.2 Measuring of financial inclusion (FI) for SAARC countries

Methodology regarding calculation of FII can be found in section 2.6 in Chapter 2.

3.5 Model specification

The empirical model that supports the relationship between FI and human development (i.e. inclusive growth) is based on Ejemeyovwi et al. (2018) and Ejemeyovwi et al. (2019)’s empirical model, which indicates that growth not only the function of technology and quality of institutions but also depends on other factors. Furthermore, some policymakers and research scholar have recognized the important role of inclusive financial system for increasing economic growth, and reducing poverty (Sethi and Sethy, 2018; Sethi and Acharya, 2018; Cull et al., 2014; Qian and Qian, 2005; Rajan and Zingales, 1998; Miller, 1998; Begehot, 1873).

Here, the empirical model describes that to achieve high human development (i.e. inclusive growth), several factors must be present, including inclusive finance, technology adoption and other control variables. The functional form of the model is as follows:

$$Y = f(F, A, S, X) \quad (3.3)$$

Where, $F_{i,t} = FII_{i,t}$; $A_{i,t} = INTSCI_{i,t}$; $S_{i,t} = \text{RULE, Political stability}$; $X = \text{GDP growth, Credit, Health expenditure}$. In addition, Y is human development (i.e. HDI); F denotes financial inclusion index (FII) or inclusive finance, A represents technology adoption; S is socio-economic settings; X represents endogenous growth components.

²Laha, A. (2015). “Association between financial inclusion and human development in South Asia: Across country analysis with special reference to India”, *Journal of Economic Policy and Research*, Vol.10, No.2.

To determine the impact of FI on human development, the following model is:

$$(HDI_M)_{i,t} = \alpha_0 + \beta_1(\ln FII)_{i,t} + \beta_2(\ln INTSCI)_{i,t} + \beta_3(\ln rule)_{i,t} + \beta_4(\ln polstab)_{i,t} + \beta_5(\ln gdpgr)_{i,t} + \beta_6(\ln credit)_{i,t} + \beta_7(\ln healthexp)_{i,t} + \alpha_i + \mu_{i,t} \quad (3.4)$$

$$(HDI_M)_{i,t} = \alpha_0 + \beta_1(FII)_{i,t} + \sum_{k=1}^k \rho X_{i,t} + \alpha_i + \mu_{i,t} \quad (3.5)$$

Where HDI_M refers to modified Human Development Index used for inclusive growth (Tchamyou, 2015; Asongu, 2018), FII refers to Financial Inclusion Index, used for inclusive finance is expected to affect growth (Bagehot, 1873; Schumpeter, 1912; Gurely and Shaw, 1955; Goldsmith, 1969; Miller, 1998; Love, 2003; Sharma and Pais, 2008, 2011; Sethy, 2016; Sethi and Sethy, 2018, Sethi and Achariya, 2018), and X represents a set of control variables are: $\ln INTSCI$ represents technological progress (Ejemeyovwi et al.; 2009, Oluwatobe et al.; 2016) is predicted to have a major effect on human development (Pohjola 2001; Edwards 2002a; Niebel, 2014; Guerriero, 2015; Karakara and Osabuohien, 2018; Hettiarachchi, 2018; Ejemeyovwi and Osabuohien 2018), $rule$ = rule of law (Omar and Inaba, 2020), $\ln polstab$ = log of political stability and absence of violence (Outreville, 1999); $\ln gdpgr$ = log of GDP growth (Lacalle-Calderon et al.; 2019); $\ln credit$ = log of domestic credit to private sector (Ejemeyovwi et al. 2019; Omar and Inaba, 2020), $\ln healthexp$ = log of health expenditure (Purohit, 2012; Nuhu et al., 2018; Pakdaman et al., 2019), α_i = the unseen effects and $\mu_{i,t}$ = error term, $t = 1, 2, 3, \dots, 15$ and $i = 1, 2, 3 \dots n$.

Financial inclusion is anticipated to be positively related to human development because increased uses of banking services, especially by poor people, helps them to save more, spend more, and earn more, finally it helps to increase the level of human development.

3.6 Data sources and variables

The study is based on 15 years of annual panel data from 2004 to 2018. By excluding one South Asia country like Nepal (because of data availability issues of formal financial services), rest of the seven South Asia countries are taken for the analysis. Here, almost all of the variables (except the human development index) are expressed in a logarithm scale due to severe fluctuations in data across countries. The data set was collected using the IMF, FAS, UNDP

human development report, WDI, and WGI. Table 3.1 and Table 3.2 offer a comprehensive overview of the variables and their sources. For details list of indicators for constructing Financial Inclusion Index, see Table 2.3 in Chapter 2.

Table 3.1: List of indicators for constructing HDI

Dimensions	Indicators	Data sources
Health (Long and healthy life)	Life expectancy (Years)	WDI, World Bank (2018)
Education (Knowledge)	Expected Years of Schooling (Years)	WDI, World Bank (2018)
	Mean Years of Schooling (Years)	WDI, World Bank (2018)
Decent standard of living	Gross National Income Per capita (2011 PPP \$)	WDI, World Bank (2018)

Source: Author's compilation

Table 3.2: Variables definition, identifier and source of data for empirical analysis

Variables	Identifier	Data sources
Human development (measured by Human Development Index)	<i>HDI</i>	WDI, World Bank
Inclusive finance (measured by Financial Inclusion Index)	<i>lnFII</i>	FAS, IMF
Technological knowledge: <i>number of Internet users per hundred people multiply by scientific and technical journal</i> (proxied for innovation)	<i>lnINTSCI</i>	WDI
Institution (Rule of law)	<i>rule</i>	WGI
Political Stability and absence of violence	<i>lnpolstab</i>	WGI
Gross domestic product growth rate	<i>gdpgr</i>	WDI
Domestic credit to private sector as a percentage of GDP	<i>lncredit</i>	WDI
Domestic general government health expenditure (percentage of current health expenditure)	<i>lnhelathexp</i>	WDI

Source: Author's compilation

3.7 Empirical results and discussion

3.7.1 *HDI, HDI_M and FII in South Asian countries*

Table 3.3 presents the modified HDI (i.e. HDI_M) and HDI (by UNDP) value and rank for seven South Asia countries from 2004 to 2018. The number of countries for which HDI_M is calculated using a multiple indicator and multidimensional method that covers different dimensions of human development. It then compares different countries human development as calculated by the UNDP, and by the modified human development index which used new methodology.

Table 3.3: Movement of HDI and modified HDI (HDI_M) in South Asian countries (2004-2018)

Year	Index	Afghanistan	Bangladesh	Bhutan	India	Maldives	Pakistan	Sri Lanka
2004	HDI_M	0.404 (7)	0.495 (5)	0.505 (4)	0.527 (3)	0.624 (2)	0.487 (6)	0.706 (1)
	HDI	0.4 (7)	0.499 (5)	0.508 (4)	0.53 (3)	0.638 (2)	0.486 (6)	0.715 (1)
2005	HDI_M	0.413 (7)	0.503 (5)	0.511 (4)	0.536 (3)	0.619 (2)	0.499 (6)	0.712 (1)
	HDI	0.41 (7)	0.506 (5)	0.512 (4)	0.539 (3)	0.632 (2)	0.499 (6)	0.721 (1)
2006	HDI_M	0.421 (7)	0.509 (5)	0.522 (4)	0.545 (3)	0.632 (2)	0.503 (6)	0.719 (1)
	HDI	0.419 (7)	0.514 (5)	0.524 (4)	0.548 (3)	0.647 (2)	0.503 (6)	0.728 (1)
2007	HDI_M	0.433 (7)	0.516 (5)	0.536 (4)	0.555 (3)	0.631 (2)	0.5111 (6)	0.725 (1)
	HDI	0.431 (7)	0.521 (5)	0.539 (4)	0.558 (3)	0.647 (2)	0.511 (6)	0.734 (1)
2008	HDI_M	0.437 (7)	0.518 (5)	0.543 (4)	0.562 (3)	0.641 (2)	0.512 (6)	0.734 (1)
	HDI	0.436 (7)	0.524 (5)	0.547 (4)	0.565 (3)	0.657 (2)	0.513 (6)	0.742 (1)
2009	HDI_M	0.448 (7)	0.529 (5)	0.554 (4)	0.567 (3)	0.641 (2)	0.518 (6)	0.737 (1)
	HDI	0.447 (7)	0.535 (5)	0.559 (4)	0.571 (3)	0.658 (2)	0.52 (6)	0.745 (1)
2010	HDI_M	0.464 (7)	0.542 (5)	0.565 (4)	0.577 (3)	0.651 (2)	0.522 (6)	0.742 (1)
	HDI	0.464 (7)	0.549 (5)	0.571 (4)	0.581 (3)	0.669 (2)	0.524 (6)	0.75 (1)
2011	HDI_M	0.465 (7)	0.552 (5)	0.574 (4)	0.586 (3)	0.664 (2)	0.526 (6)	0.749 (1)

	HDI	0.465 (7)	0.559 (5)	0.581 (4)	0.59 (3)	0.681 (2)	0.528 (6)	0.756 (1)
2012	HDI_M	0.478 (7)	0.560 (5)	0.584 (4)	0.595 (3)	0.670 (2)	0.530 (6)	0.755 (1)
	HDI	0.479 (7)	0.567 (5)	0.591 (4)	0.6 (3)	0.688 (2)	0.533 (6)	0.762 (1)
2013	HDI_M	0.484 (7)	0.564 (5)	0.586 (4)	0.603 (3)	0.675 (2)	0.534 (6)	0.758 (1)
	HDI	0.485 (7)	0.572 (5)	0.594 (4)	0.607 (3)	0.693 (2)	0.537 (6)	0.765 (1)
2014	HDI_M	0.487 (7)	0.564 (5)	0.593 (4)	0.614 (3)	0.684 (2)	0.543 (6)	0.761 (1)
	HDI	0.488 (7)	0.572 (5)	0.601 (4)	0.618 (3)	0.702 (2)	0.546 (6)	0.769 (1)
2015	HDI_M	0.488 (7)	0.574 (5)	0.597 (4)	0.622 (3)	0.691 (2)	0.546 (6)	0.764 (1)
	HDI	0.49 (7)	0.588 (5)	0.606 (4)	0.627 (3)	0.709 (2)	0.55 (6)	0.772 (1)
2016	HDI_M	0.490 (7)	0.589 (5)	0.601 (4)	0.633 (3)	0.695 (2)	0.552 (6)	0.766 (1)
	HDI	0.491 (7)	0.599 (5)	0.61 (4)	0.637 (3)	0.713 (2)	0.556 (6)	0.774 (1)
2017	HDI_M	0.492 (7)	0.599 (5)	0.605 (4)	0.638 (3)	0.696 (2)	0.554 (6)	0.768 (1)
	HDI	0.493 (7)	0.609 (5)	0.615 (4)	0.643 (3)	0.716 (2)	0.558 (6)	0.776 (1)
2018	HDI_M	0.494 (7)	0.604 (5)	0.607 (4)	0.642 (3)	0.698 (2)	0.556 (6)	0.772 (1)
	HDI	0.496 (7)	0.614 (5)	0.617 (4)	0.647 (3)	0.719 (2)	0.56 (6)	0.78 (1)

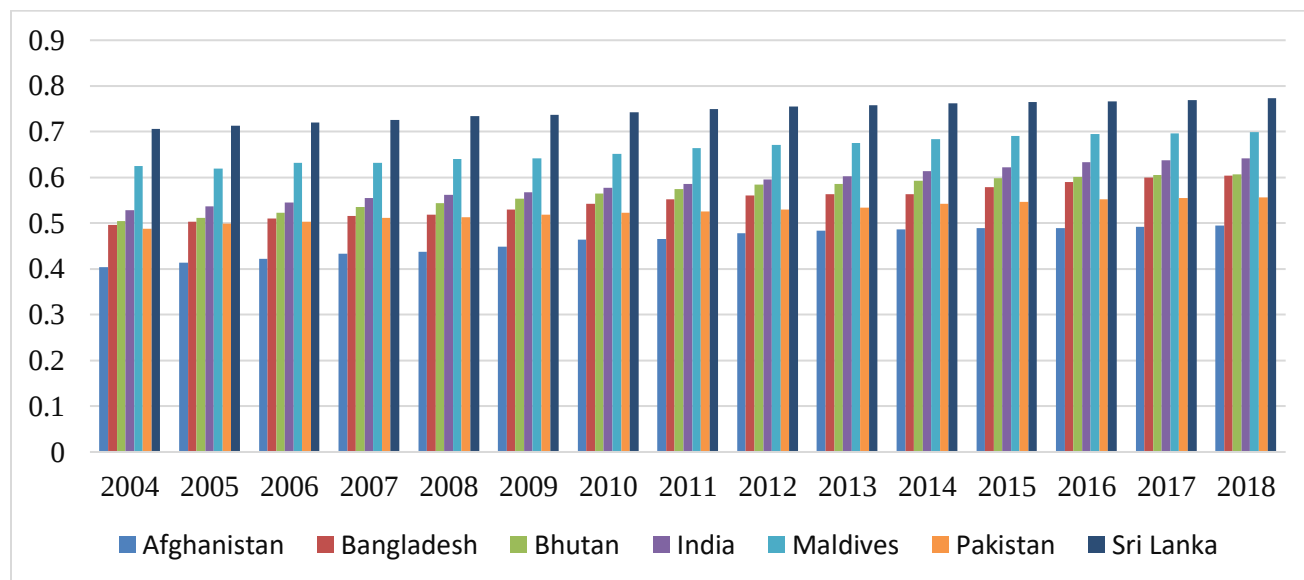
Note: Ranks of the countries are given in the parenthesis

Source: Author's calculations of Modified HDI (HDI_M) and HDI values are based on data from Human Development Report (UNDP, 2019).

It is evident from the Table 3.3 that the movement of HDI and HDI_M in South Asia countries from 2004 to 2018. Out of seven South Asia countries, levels of human development, as measured by HDI, varied from as low (0.4) for Afghanistan to as high (0.715) for Sri Lanka and on the other side, modified HDI varied from as low (0.404) for Afghanistan to as high (0.706) for Sri Lanka in 2004. The HDI values varies from as low (0.465) for Afghanistan to as high (0.756) for Sri Lanka and modified HDI values varies from as low (0.465) for Afghanistan to as high (0.749) for Sri Lanka in 2011. Similarly, among all seven South Asia countries HDI values varies from as low (0.496) for Afghanistan and to as high (0.78) for Sri Lanka and modified HDI

values vary from as low (0.494) for Afghanistan to as high (0.722) for Sri Lanka in 2018. The value of HDI of the South Asia countries as indicated by the UNDP changes due to differences in methodology for calculation of HDI (for detail see Table 3.3). Overall results confirm that the movement of HDI and modified HDI (i.e. HDI_M) are relatively the same.

Figure 3.2: Modified Human Development Index (HDI_M) in South Asia countries (2004-2018)



Source: Author's estimations

In this study, we have developed and used a modified HDI instead of original HDI (by the UNDP). Figure 3.2 reveals that the extent of human development in South Asian countries. This figure shows that the performance in human development has been increasing from 2004 to 2018. The level of human development is highest in Sri Lanka followed by Maldives, India, Bhutan, Bangladesh, Pakistan and Afghanistan over the last decade. Out of seven South Asian countries, levels of human development, as measured by modified HDI varied from as low (0.49) for Afghanistan to as high (0.77) for Sri Lanka in 2018. Above figure observed that the level of human development increases in seven South Asian economies over time. This is because of the higher amount of spending in social sector such as health, education and social assistance (i.e. urban development, labor welfare, nutrition, social security etc.) by the South Asian Government (for details, see Appendix Figure A.3.1).

Table 3.4: Movement of FII and modified HDI (HDI_M) in South Asia countries, 2004-2018

Year	Index	Afghanistan	Bangladesh	Bhutan	India	Maldives	Pakistan	Sri Lanka
2004	FII	0 (7)	0.006 (4)	0.079 (3)	0.002 (6)	0.003 (5)	0.239 (1)	0.133 (2)
	HDI_M	0.404 (7)	0.495 (5)	0.505 (4)	0.527 (3)	0.624 (2)	0.487 (6)	0.706 (1)
2005	FII	0.079 (4)	0.0468 (6)	0.051 (5)	0.0466 (7)	0.167 (3)	0.294 (1)	0.180 (2)
	HDI_M	0.413 (7)	0.503 (5)	0.511 (4)	0.536 (3)	0.619 (2)	0.499 (6)	0.712 (1)
2006	FII	0.192 (4)	0.089 (6)	0.073 (7)	0.095 (5)	0.220 (3)	0.256 (2)	0.267 (1)
	HDI_M	0.421 (7)	0.509 (5)	0.522 (4)	0.545 (3)	0.632 (2)	0.503 (6)	0.719 (1)
2007	FII	0.311 (3)	0.102 (6)	0.061 (7)	0.168 (5)	0.397 (1)	0.325 (2)	0.303 (4)
	HDI_M	0.433 (7)	0.516 (5)	0.536 (4)	0.555 (3)	0.631 (2)	0.511 (6)	0.725 (1)
2008	FII	0.442 (1)	0.158 (6)	0.155 (7)	0.265 (5)	0.440 (2)	0.343 (3)	0.306 (4)
	HDI_M	0.437 (7)	0.518 (5)	0.543 (4)	0.562 (3)	0.641 (2)	0.512 (6)	0.734 (1)
2009	FII	0.582 (1)	0.235 (7)	0.272 (6)	0.320 (4)	0.469 (2)	0.287 (5)	0.361 (3)
	HDI_M	0.448 (7)	0.529 (5)	0.554 (4)	0.567 (3)	0.641 (2)	0.518 (6)	0.737 (1)
2010	FII	0.647 (1)	0.352 (6)	0.377 (4)	0.354 (5)	0.473 (2)	0.301 (7)	0.383 (3)
	HDI_M	0.464 (7)	0.542 (5)	0.565 (4)	0.577 (3)	0.651 (2)	0.522 (6)	0.742 (1)
2011	FII	0.557 (1)	0.474 (3)	0.451 (5)	0.436 (6)	0.468 (4)	0.297 (7)	0.496 (2)
	HDI_M	0.465 (7)	0.552 (5)	0.574 (4)	0.586 (3)	0.664 (2)	0.526 (6)	0.749 (1)
2012	FII	0.556 (1)	0.535 (3)	0.292 (7)	0.514 (4)	0.450 (5)	0.370 (6)	0.539 (2)
	HDI_M	0.478 (7)	0.560 (5)	0.584 (4)	0.595 (3)	0.670 (2)	0.530 (6)	0.755 (1)
2013	FII	0.599 (2)	0.589 (3)	0.485 (5)	0.601 (1)	0.459 (6)	0.446 (7)	0.584 (4)
	HDI_M	0.484 (7)	0.564 (5)	0.586 (4)	0.603 (3)	0.675 (2)	0.534 (6)	0.758 (1)
2014	FII	0.619 (4)	0.679 (2)	0.538 (5)	0.750 (1)	0.515 (6)	0.508 (7)	0.627 (3)
	HDI_M	0.487 (7)	0.564 (5)	0.593 (4)	0.614 (3)	0.684 (2)	0.543 (6)	0.761 (1)

2015	FII	0.655 (4)	0.768 (2)	0.565 (6)	0.838(1)	0.542 (7)	0.578 (5)	0.723 (3)
	HDI_M	0.486 (7)	0.579 (5)	0.597 (4)	0.622 (3)	0.691 (2)	0.546 (6)	0.764 (1)
2016	FII	0.677 (5)	0.839 (2)	0.657 (7)	0.901 (1)	0.663 (6)	0.685 (4)	0.816 (3)
	HDI_M	0.490 (7)	0.589 (5)	0.601 (4)	0.633 (3)	0.695 (2)	0.552 (6)	0.766 (1)
2017	FII	0.708 (7)	0.905 (2)	0.803 (4)	0.934 (1)	0.765 (5)	0.724 (6)	0.901 (3)
	HDI_M	0.492 (7)	0.599 (5)	0.605 (4)	0.638 (3)	0.696 (2)	0.554 (6)	0.768 (1)
2018	FII	0.791 (6)	0.939 (3)	0.954 (2)	0.924 (4)	0.782 (7)	0.863 (5)	1 (1)
	HDI_M	0.494 (7)	0.604 (5)	0.607 (4)	0.642 (3)	0.698 (2)	0.556 (6)	0.772 (1)

Note: Ranks of the countries are given in the parenthesis

Source: Authors calculation of FII is based on FAS (2004-2019), IMF and calculation of HDI_M (i.e. modified HDI) is based on Human Development Report (UNDP, 2019)

Table 3.5: Movement and Rank of South Asia countries according to the value of HDI_M and FII (2004, 2011 and 2018)

Country	2004		2011		2018	
	HDI_M (Rank)	FII (Rank)	HDI_M (Rank)	FII (Rank)	HDI_M (Rank)	FII (Rank)
Afghanistan	0.404 (7)	0 (7)	0.465 (7)	0.5579 (1)	0.494 (7)	0.7914 (6)
Bangladesh	0.495 (5)	0.0060 (4)	0.552 (5)	0.4747 (3)	0.604 (5)	0.9394 (3)
Bhutan	0.505 (4)	0.0792 (3)	0.574 (4)	0.4516 (5)	0.607 (4)	0.9549 (2)
India	0.527 (3)	0.0024 (6)	0.586 (3)	0.4369 (6)	0.642 (3)	0.9249 (4)
Maldives	0.624 (2)	0.0033 (5)	0.664 (2)	0.4687 (4)	0.698 (2)	0.7820 (7)
Pakistan	0.487 (6)	0.2390 (1)	0.526 (6)	0.2978 (7)	0.556 (6)	0.8638 (5)
Sri Lanka	0.706 (1)	0.1334 (2)	0.749 (1)	0.4967 (2)	0.772 (1)	1 (1)

Note: FII = Financial Inclusion Index, and here ranks of the countries are given in the parenthesis.

Source: Author's estimations

To test the statistical association between FII and HDI, the study estimated the modified HDI (i.e. HDI_M) and FII for seven South Asia countries from 2004 to 2018. Here the study divided 15 years of time series (i.e. from 2004 to 2018) into three sections i.e. 2004, 2011 and 2018.

Table 3.5 shows that the movement in modified HDI is significantly related with the movement of FII. The modified HDI varies between 0.706 in the case of Sri Lanka and 0.404 in the case of Afghanistan in 2004. The value FII varies between 0.239 in the case of Pakistan and 0 in the case of Afghanistan. That means the individuals are fully financially excluded in Afghanistan in 2004. Similarly, HDI_M varies between 0.749 in the case of Sri Lanka and 0.465 in the case of Afghanistan in 2011. The value of FII varies between 0.557 in the case of Afghanistan and 0.297 in the case of Pakistan in 2011. However, in 2018 HDI_M varies between 0.772 in the case of Sri Lanka and 0.494 in the case of Afghanistan. The value of FII lies between 1 for Sri Lanka and 0.782 for Maldives in 2018.

The performance of human development in five SAARC countries like Bhutan, India, Maldives, Pakistan, and Sri Lanka was very high because HDI_M values are more than 0.4 but the performance of human development in Afghanistan and Bangladesh was very low because the value of HDI_M is less than 0.4 in 2004. As compared to Afghanistan (0.5), other six South Asian countries had better HDI in 2011. Similarly, the situation of HDI in six South Asian countries like Bangladesh, Bhutan, India, Maldives, Pakistan, and Sri Lanka are very emerging i.e. high in the value of HDI_M but only Afghanistan included in low category in 2018.

Furthermore, Table 3.5 results show that the ranks of FII and HDI_M values for South Asia countries move closely with each other. Countries like Sri Lanka secured the first rank among all the South Asia countries in terms of HDI_M during the reference periods of the study. Sri Lanka ranked first in terms of HDI_M and second in terms of FII in 2004. Pakistan secured the first rank in terms of FII but sixth-ranked in terms of HDI_M in 2004. Similarly, Sri Lanka ranked first in terms of HDI_M and second in terms of FII in 2011. On the other hand, Afghanistan secured the seventh rank in terms of HDI_M but first in FII in 2011. In addition, Sri Lanka ranked first in terms of HDI_M (0.772) and also first in FII (1) in 2018. Maldives ranked second in HDI_M (0.698) and seventh in FII (0.782). Bhutan ranked second in terms of FII (0.954) and fourth in HDI_M (0.607) in 2018 (for details see Table 3.4 and Table 3.5).

Table 3.6: Classification of South Asia countries according to the values of modified human development index (HDI_M) (2004, 2011 and 2018)

Country	2004		2011		2018	
	HDI_M (Rank)	Category	HDI_M (Rank)	Category	HDI_M (Rank)	Category
Afghanistan	0.404 (7)	Low HD	0.465 (7)	Low HD	0.494 (7)	Low HD
Bangladesh	0.495 (5)	Low HD	0.552 (5)	Medium HD	0.604 (5)	High HD
Bhutan	0.505 (4)	Medium HD	0.574 (4)	Medium HD	0.607 (4)	High HD
India	0.527 (3)	Medium HD	0.586 (3)	Medium HD	0.642 (3)	High HD
Maldives	0.624 (2)	High HD	0.664 (2)	High HD	0.698 (2)	High HD
Pakistan	0.487 (6)	Low HD	0.526 (6)	Medium HD	0.556 (6)	Medium HD
Sri Lanka	0.706 (1)	High HD	0.749 (1)	High HD	0.772 (1)	High HD

Source: Author's own calculations.

Notes: Ranks of the countries are given in the parenthesis

$0.6 < HDI_M \leq 1$ = High Human Development

$0.4 \leq HDI_M < 0.6$ = Medium Human Development

$0 \leq HDI_M < 0.4$ = Low Human Development

HDI_M : Modified Human Development Index, HD: Human Development

Based on their HDI_M values, countries are divided into three categories. High HDI_M countries are categorized as those having HDI_M values between 0.6 and 1. Medium HDI_M countries are those having HDI_M values between 0.4 and 0.6. Low HDI_M countries are those having HDI_M values less than 0.4. Table 3.6 indicates that, among all the South Asia countries Afghanistan, Bangladesh and Pakistan were included in low human development because the value of HDI_M varies between 0 to 0.4. Bhutan and India were included in medium human development because HDI_M values vary from 0.4 to 0.6. Only two countries like Sri Lanka and Maldives were included in high human development (because values vary between 0.6 to 1) in 2004. But all the South Asia countries included in low FII in 2004. Similarly, four South Asia nations like Bangladesh,

Bhutan, India and Pakistan were included in medium human development (HD) because the values varies between 0.4 to 0.6 but except one country like Afghanistan which included in low HD in 2011. But Maldives and Sri Lanka were included in high HD in 2011. In addition, Bangladesh, Bhutan, India, Maldives and Sri Lanka were performing better and included in high HD category. Here Pakistan included in medium HD and Afghanistan included in low HD category in 2018. But all the South Asia countries were included in high FII category in 2018 (for details see Table 3.6).

Overall cross country evidence suggests that the performance of Bangladesh, Bhutan, India, Maldives, Pakistan and Sri Lanka on human development (i.e. Modified Human Development Index) as well as on financial inclusion (i.e. FII) has been increasing from 2004 to 2018. This is mainly due to the higher amount of spending in social sector such as health, education and social assistance (i.e. urban development, labor welfare, nutrition and social security etc.), and financial inclusion policies taken by the South Asian Government to improve human development of the population.

Table 3.7: Descriptive statistics

	HDI_M	lnFII	lnINTSCI	lnCredit	lnGDPgr	lnHealthexp	RULE	Polstab
Mean	0.587	1.065	8.28	3.303	1.722	3.314	0.461	1.008
Median	0.565	0.757	7.997	3.527	1.831	3.315	0.407	1.212
SD	0.089	1.076	3.284	0.73	0.582	0.79	0.647	1.222
Min	0.421	-6.008	2.398	1.202	-0.852	1.468	-1.896	-2.81
Max	0.772	0	15.806	4.062	3.262	4.318	0.627	1.283
Skewness	0.496	2.504	0.236	1.577	1.091	0.86	0.557	0.278
Kurtosis	2.337	10.659	2.154	4.648	6.767	3.091	2.512	1.955
Observation	101	101	101	101	101	101	101	101

Source: Author's own calculations.

3.7.2 Descriptive statistics and correlation result

In Table 3.7, descriptive statistics shows that human development (i.e. HDI_M) varies from 0.421 to 0.772 with an average value of 0.587 and SD of 0.089. The coefficient of our key independent variable, financial inclusion (i.e. FII) varies from -6.008 to 0, with an average value of 1.065 and SD of 1.076.

In Table 3.8, the correlation results reveal that a positive correlation exists between FI and HD (i.e., 0.249). This result indicates that an increase in FI (i.e. proper access and usage of formal financial services at an affordable cost for unbanked population) leads to increase human development (for more details, see Table 3.7 and Table 3.8).

Table 3.8: Correlation matrix

	HDI_M	lnFII	lnINTSCI	lnCredit	lnGDPgr	lnHealthexp	RULE	Polstab
HDI	1							
lnFII	0.249	1						
lnINTSCI	0.16	0.298	1					
lnCredit	0.543	-0.015	0.361	1				
lnGDPgr	0.088	-0.16	-0.082	0.348	1			
lnHealthexp	0.636	-0.053	-0.029	0.716	0.199	1		
RULE	0.576	-0.137	0.183	0.749	0.24	0.831	1	
Polstab	0.468	-0.094	-0.296	0.566	0.273	0.785	0.758	1

Source: Author's calculations.

3.7.3 Panel regression results

This section presents the empirical results, beginning with the key factors that affect HD in South Asian nations. Then, our results on the effect of FI on human development are summarized in the following section.

3.7.3.1 Results on the determinants of human development (HD)

Table 3.9 summarizes our empirical results on the important factors that influence human development in South Asian countries. Model 1 includes *FII* (i.e financial inclusion index), *INTSCI* (i.e., technological progress), *credit* (i.e., domestic credit to private sector), *GDPgr* (i.e., GDP growth), *healthexp* (i.e., health expenditure), *rule* (i.e., rule of law) and *polstab* (i.e., political stability and absence of violence).

The time fixed effect estimates show that financial inclusion, INTSCI, credit, health expenditure, rule of law and political stability influence the level of HD in South Asian nations. In particular, financial inclusion, credit, health expenditure and rule of law positively influence the human development, while INTSCI, GDP growth, and political stability have a negative impact on human development.

Table 3.9: Determinants of human development (Time fixed effect estimation)

Variables	(1) HDI_M
lnFII	0.019(0.000)***
lnINTSCI	- 0.0123(0.019)***
lnCredit	0.048(0.023)**
lnGDPgr	- 0.001(0.940)
lnHealthexp	0.038(0.047)**
lnRule	0.080(0.009)***
lnPolstab	- 0.045(0.010)***
Constant	0.415(0.000)***
Observations	101
R^2	0.565
Number of Id	7

Notes: HDI_M is the modified Human Development Index.

*** and ** indicate 1 % and 5 % level of significance, respectively.

Source: Author's estimations

Financial inclusion has a positive and significant coefficient, implying that countries with higher financial inclusion have higher levels of human development. This result implies that one percent increase in FI leads to 0.01 unit increase in human development. This finding is consistent with Kuri and Laha (2011), Bihari (2011), Yorulmaz (2012), Nanda and Kaur (2016), Datta and Singh (2019), Ababio et al. (2019), Matekenya, Moyo and Jeke (2020), who found that financial inclusion significant and positively correlated with human development. In addition, this result indicates that South Asian countries with an affordable cost of access and usage of formal financial services lead to higher human development.

Credit has a positive coefficient and significantly related with human development, meaning that countries with higher domestic credit to private sector enhance human development. This result implies that one percent increase in domestic credit to private sector leads to 0.04 unit increase in human development. This result is consistent, in the sense that domestic credit to private sector increase investment, increase employment which further increase income and standard of living, ultimately increase human development.

Health expenditure has a positive and significantly effect on the human development, indicating that one percent increase in health expenditure leads to 0.03 unit increase in human development. This result implying that government expenditure on health has a positive influence on the health component of the index (i.e life expectancy) and, further it promotes educational attainment and income. This evidence is consistent with Purohit (2012), Barouni et al. (2015), Agarwal (2015), Nuhu et al (2018), Pakdaman et al (2019), who found health expenditure having significant role in improving human development.

Rule of law has the positive impact on HD, suggesting that a country with better rule of law is positive impact on the human development. On the other hand, *INTSCI* (i.e technological progress) coefficient is negative, implying that countries with a high technological progress have a negative impact on HD. This negative association between technological progress and human development is consistent in the sense that technological progress such as social media and mobile devices create psychological and physical issues. It contributes more serious health conditions, such as depression, musculoskeletal problem and sleep problems etc. which in turn

reduce the level of human development. This result is line with Muchdie (2016) who found that technological progress has a negative impact on human development.

Political stability has a negative impact on human development, implying that economies with a political stability and absence of violence experience low level of HD. But the impact of institutional quality and good governance on human development is expected to be positive (Outreville, 1999; Binder and Geoggiadis, 2011).

Surprisingly, there is no proof that *GDP growth* has a significant impact on HD. As expected, economic growth through increased income will increase the level of human development. While our result is positive in this regard, it is not significant in comparison to Ranis' findings (2004).

Table 3.10: Determinants of human development (Time random effect estimation)

Variables	(1) <i>HDI_M</i>
lnFII	0.026(0.0004)***
lnINTSCI	- 0.0023(0.540)
lnCredit	0.018(0.297)
lnGDPgr	- 0.004(0.705)
lnHealthexp	0.049(0.009)***
lnRule	0.041(0.128)
lnPolstab	- 0.012(0.332)
Constant	0.423(0.000)***
Observations	101
R^2	0.514
Number of Id	7

Notes: *** indicates 1 percent level of significance.

Source: Author's estimations

A panel regression is used to specify the model above, which examines important variables that impact human development (HD) in South Asian countries. Estimating a time random effect model is used to account for the time factor. This model reported in Table 3.10 shows that the coefficient of FI is positive and significant, implying that countries with higher financial inclusion have a higher level of human development. After taking into account specific impact, it

is clear that a one percentage increase in financial inclusion contribute to 0.02 unit increase in HD in South Asian countries. Furthermore, it has been found that government spending on health has a positive impact on HD. A percent increase in health expenditure leads to 0.04 unit increase in human development. This result implying that government expenditure on health has a positive impact on the health component of the index (i.e. life expectancy) and, further it promotes educational attainment and income. This evidence is consistent with Purohit (2012), Barouni et al. (2015), Agarwal (2015), Nuhu et al (2018), Pakdaman et al (2019), who found a significant impact of health expenditure on human development. However, no significant impacts of INTSCI, credit, GDP growth, rule of law and political stability on HD in these results.

Table 3.11: Hausman test (Fixed effect and random effect)

Hausman Test	8.899 (0.260)
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Source: Author's estimations

3.7.3.2 Hausman test results

The above result indicates that the test accepted the null hypothesis of the time random effect and rejected the time fixed effect estimation (see Table 3.11).

3.7.3.3 Findings the effect of financial inclusion (FI) on human development (HD)

Our empirical results on the effect of FI on HD in South Asian countries presented in Table 3.12. This study begins with a simple model that considers only four variables and progressively adds more control variables.

The fixed effect results indicate that financial inclusion and human development (HDI_M) have a positive relationship across the model. This result indicates that 1 percent increase in FI leads to 0.20 unit increase in human development. This result supports the hypothesis that financial inclusion may provide some of the development goals of the South Asian countries. Availability, usage and accessibility of banking products at an affordable cost especially in remote areas, may

encourage the use of financial services for health and education expenditure. This result supports Sarma and Pais (2011); Kuri and Laha (2011); Bihari (2011); Nanda and Kaur (2016); Ababio et al. (2019), Dutta and Singh (2019); Matekenya, Moyo and Jeke (2020), who reported a positive connection between financial inclusion and HD. This finding has evidenced that South Asian countries enhance availability, accessibility and usage of banking products as a means of achieving the socio-economic aim of equality, increase standard of living, poverty reduction and creating more employment. In addition, access to loan may promote expenditure in rural areas that improve human development such as health care and education.

Among other control variables, health expenditure or Govt. expenditure on health is the only control variable which is positive and significantly related to human development. Positive sign confirms that one percent increase in health expenditure leads to 0.05 unit increase in human development. This evidence is consistent with Purohit (2012), Agarwal (2015), Nuhu et al (2018), Pakdaman et al (2019), who found a positive impact of health expenditure on human development.

Table 3.12: FI and Human development (Fixed effect estimation)

Variables	(1) HDI_M	(2) HDI_M	(3) HDI_M
lnFII	0.020* (0.102)	0.022* (0.074)	0.022* (0.072)
Lcredit	0.024* (0.087)	0.017 (0.262)	0.022 (0.248)
lnGDPgr	- 0.003 (0.823)	- 0.002 (0.846)	- 0.004 (0.774)
lnHealthexp	0.056*** (0.000)	0.045*** (0.006)	0.040** (0.043)
Rule		0.023 (0.279)	0.026 (0.251)
lnINTSCI			- 0.001 (0.680)
Constant	0.343 (0.000)	0.417*** (0.000)	0.432*** (0.000)
Observations	101	101	101
R	0.52	0.527	0.528
Number of Id	7	7	7

Notes: HDI_M is modified Human Development Index.

***, **, and * denote 1 %, 5 %, and 10 % level of significance.

Source: Author's estimations

Table 3.13 reports the random effect estimation results which show that there is highly significant and positive relationship between financial inclusion and human development. Financial inclusion is very important for youth development as access of financial services may encourage skill development and education. One possible explanation is that, access to easier banking payments methods may encourage parents to keep their children at school and colleges longer periods, which further promotes higher human development (Matekenya et al. 2020). Similarly, random effect result indicates that among other control variables, health expenditure is the only control variable which is significant and positively related to human development (for details see Table 3.13).

Table 3.13: FI and Human development (Random effect estimation)

Variables	(1) HDI_M	(2) HDI_M	(3) HDI_M
lnFII	0.022*** (0.000)	0.024*** (0.004)	0.024*** (0.000)
lnCredit	0.022 (0.115)	0.015 (0.331)	0.014 (0.428)
lnGDPgr	- 0.005 (0.663)	- 0.005 (0.675)	- 0.005 (0.701)
lnHealthexp	0.059*** (0.000)	0.047*** (0.004)	0.047*** (0.015)
Rule		0.026 (0.222)	0.025 (0.255)
lnINTSCI			0.001 (0.948)
Constant	0.348*** (0.000)	0.428*** (0.000)	0.426*** (0.000)
Observations	101	101	101
R	0.500	0.509	0.509
Number of Id	7	7	7

Notes: HDI_M is modified Human Development Index. *** denotes 1 percent level of significance.

Source: Author's estimations

3.8.1 Conclusion and policy recommendations

This chapter attempted to determine the impact of financial inclusion (FI) on human development (HD) for a group of seven South Asian countries from 2004 to 2018. The main findings are as follows.

First in this study, we have proposed a new HDI and called it modified Human Development Index (HDI_M) for seven South Asian countries. *Second*, we have proposed a financial inclusion index (FII) – a multidimensional measure developed for seven South Asian countries but excluded Nepal due to the non-availability of relevant financial inclusion indicators data.

Empirical findings suggest that only five (Bangladesh, Bhutan, India, Maldives and Sri Lanka) of the seven South Asian countries classify as high human development category (HDI_M). While two other countries (Pakistan and Afghanistan) fall in the category of medium and low human development. Furthermore, the performance of all the South Asian country on financial inclusion has been increasing from 2004 to 2018. The result also indicates that all South Asian countries are included in the high financial category in 2018.

This study also includes a comparative analysis to determine the linkages between the extent of FI and human development. The result indicates that the ranking of human development (calculated by the UNDP) follows a similar trend to the new human development index (i.e., modified Human Development Index).

Third, this study has explored the important factors that influence human development in South Asian countries using the modified HDI and the FII. The results of time fixed effect indicate that health expenditure, financial inclusion, and rule of law are positively influence human development, while INTSCI (i.e., technological progress), political stability negatively influence the level of human development. But there is no evidence of significant impact of GDP growth on human development. The results of time random effect indicate that financial inclusion and health expenditure are positively influence human development, while other control variables such as INTSCI, credit, GDP growth, political stability, and rule of law, are no significant impact on human development. *Fourth*, this study used Hausman test to compare the usual time fixed

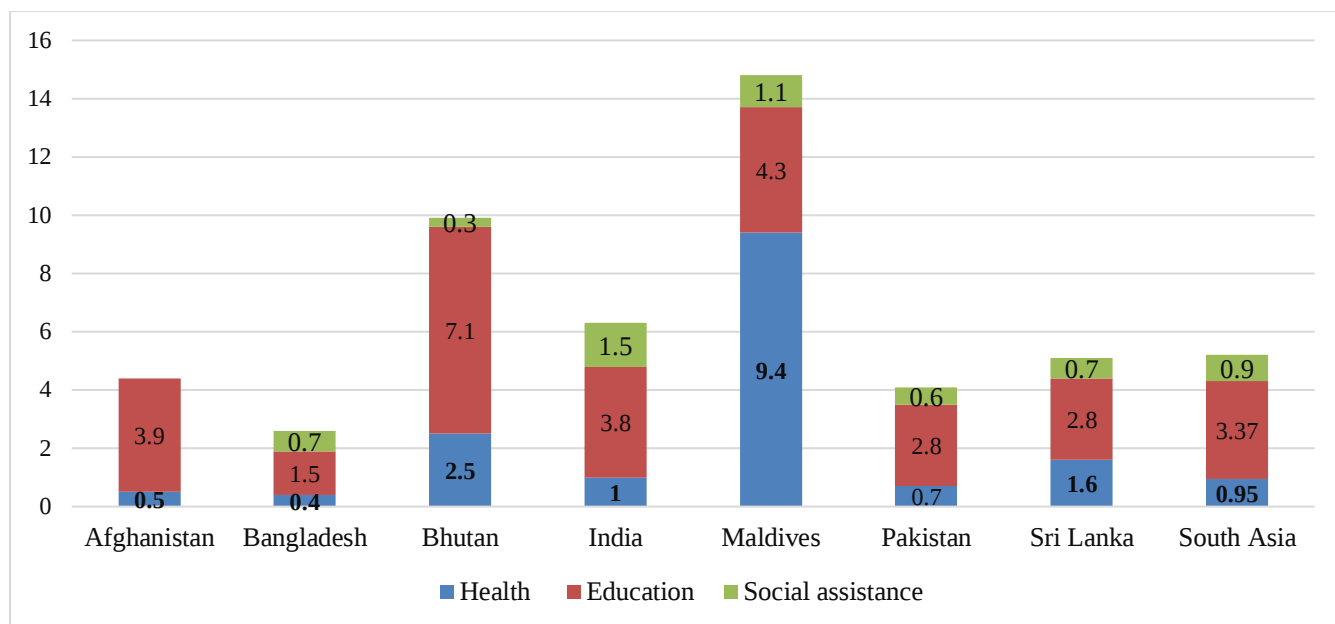
effect and random effect estimates. The result indicates that null hypothesis of the random effect was accepted and fixed effect was rejected.

Fifth, this study then has examined the influence of FI on HD in South Asian nations. The time fixed effect and random effect results show that higher FI increases human development significantly in South Asian countries. This result is in line with Kuri and Laha (2011); Bihari (2011); Raichoudhury (2016); Nanda and Kaur (2016); Ababio et al. (2019), Dutta and Singh (2019); Matekenya, Moyo and Jeke (2020), who reported a positive connection exists between financial inclusion and human development.

Overall, the study indicates that financial inclusion has a positive effect on human development. Therefore, this study suggests that policymakers in South Asian countries should promote or encourage effective investments in the financial sector in order to increase banking services. Policymaking needs to emphasis financial sector reforms in order to increase human development in long run. Furthermore, policymakers should focus on to create more awareness about the available of banking services. Availability of banking products at an affordable cost may encourage the use of banking services, which in turn will increase the level of human development.

Appendix

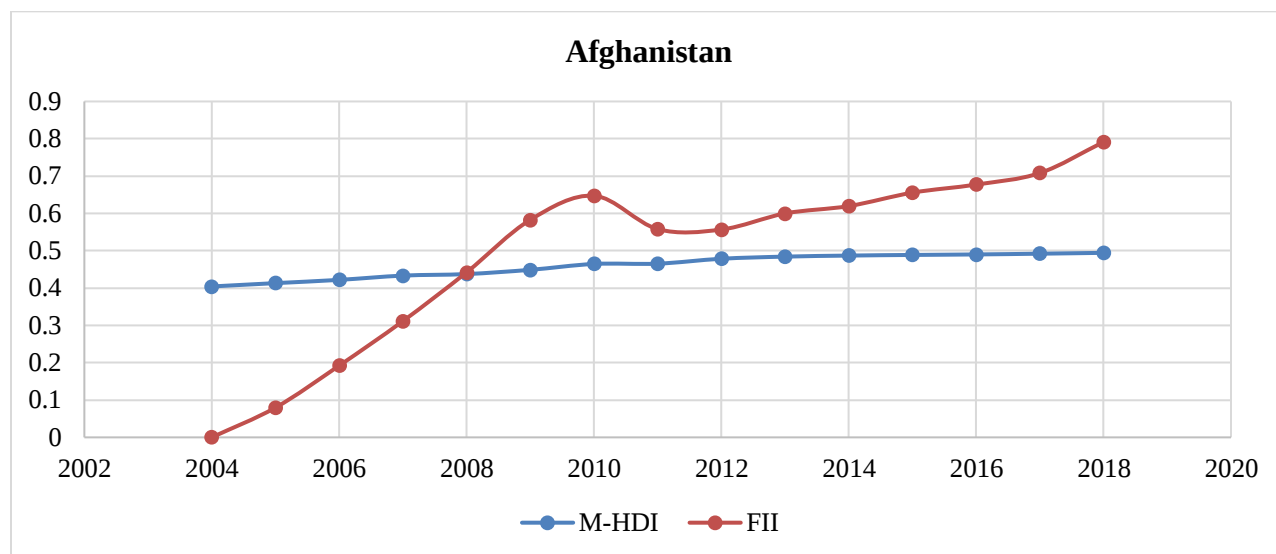
Figure A.3.1: Social expenditure by SAARC countries (as a % GDP)



Source: WHO (2019), UNESCO (2019) and World Bank (2019d).

Movement of SAARC countries according to the value of modified HDI (HDI_M) and Financial Inclusion Index (FII) from 2004 to 2018

Figure A.3.2:



Sources: Author's estimations

Figure A.3.3

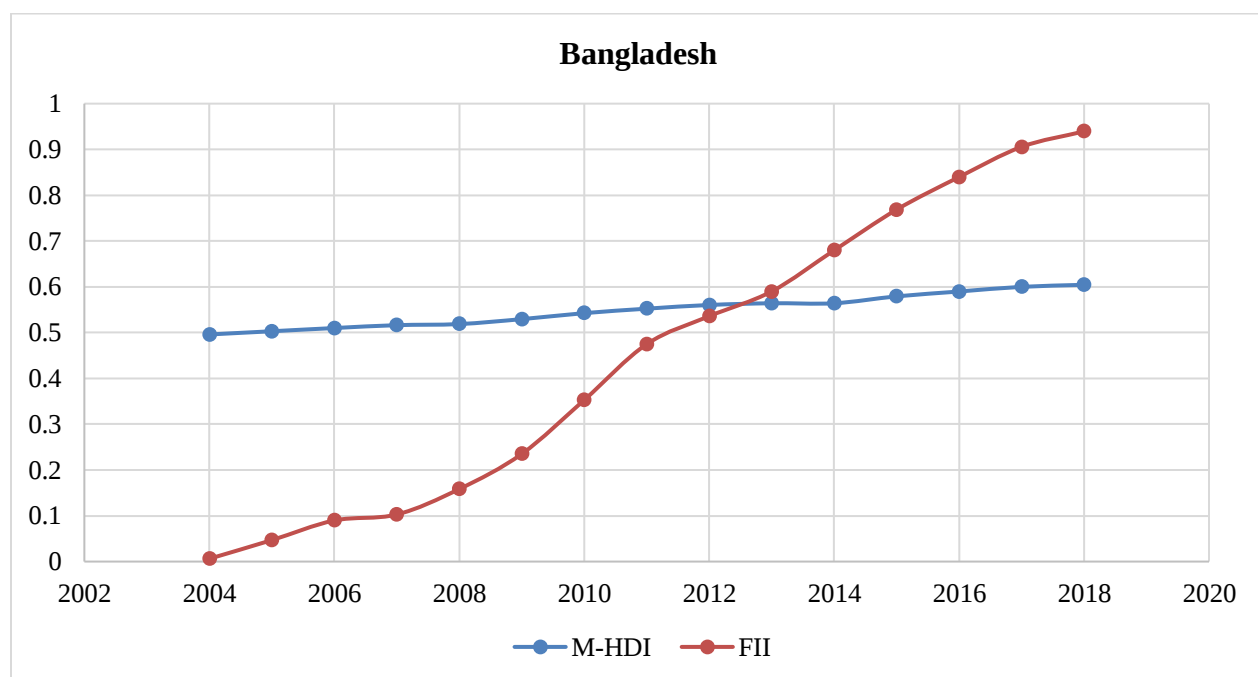


Figure A.3.4

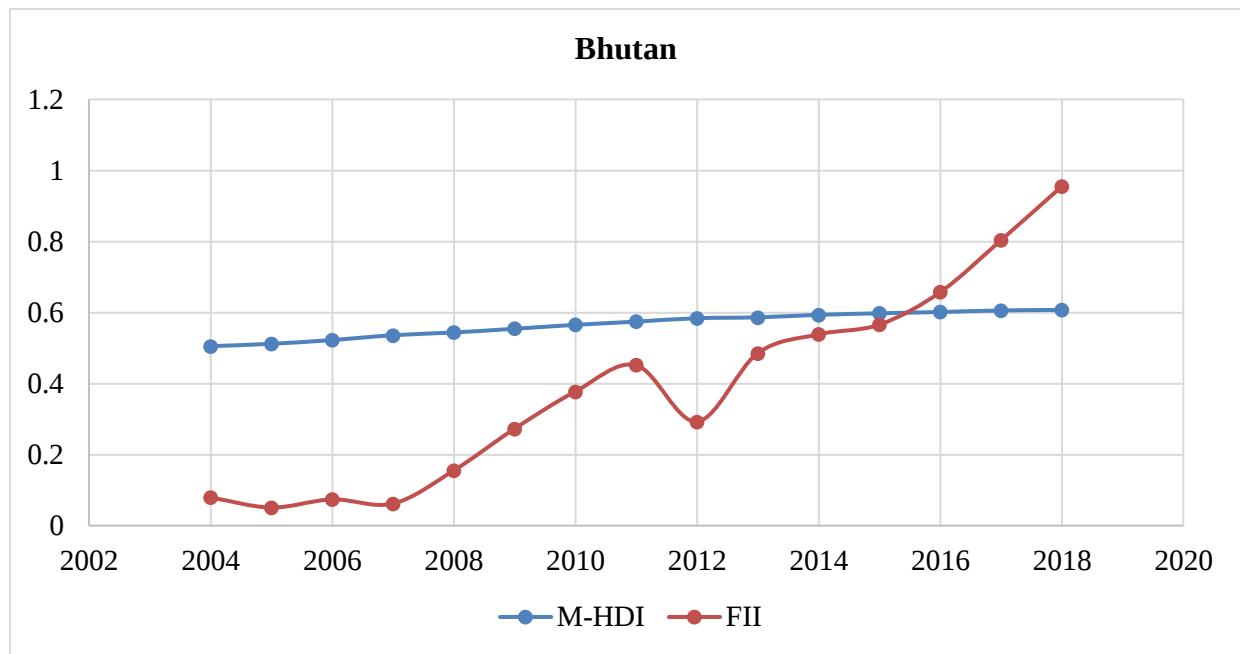


Figure A.3.5

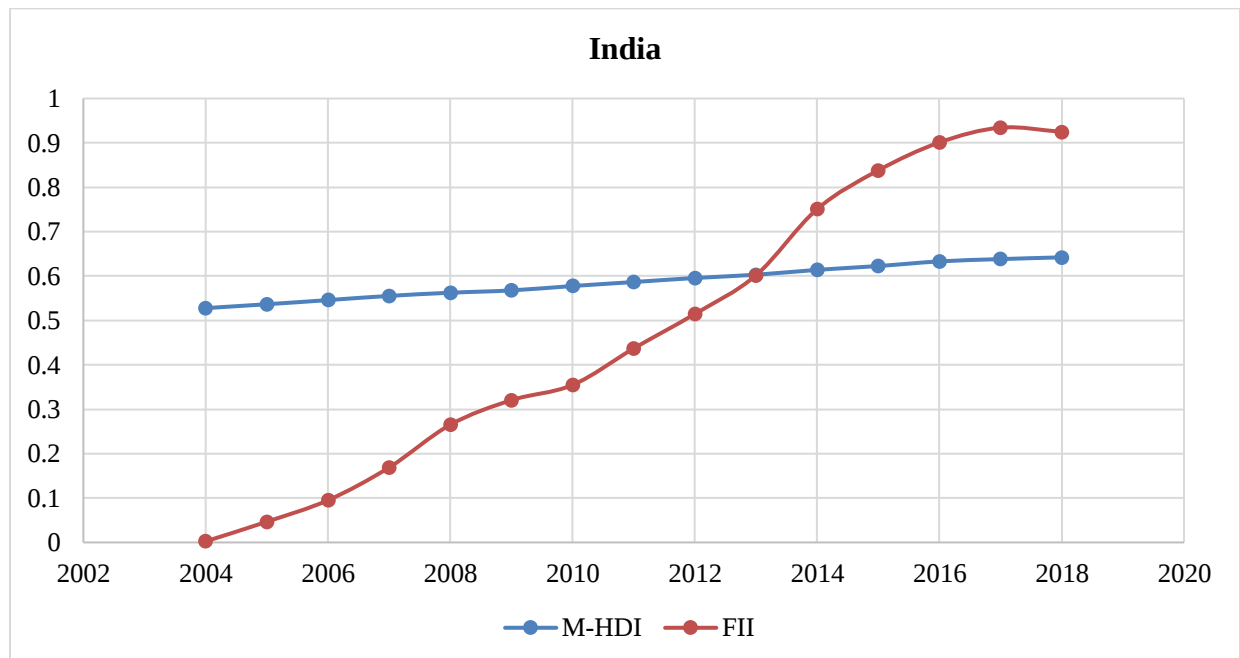


Figure A.3.6

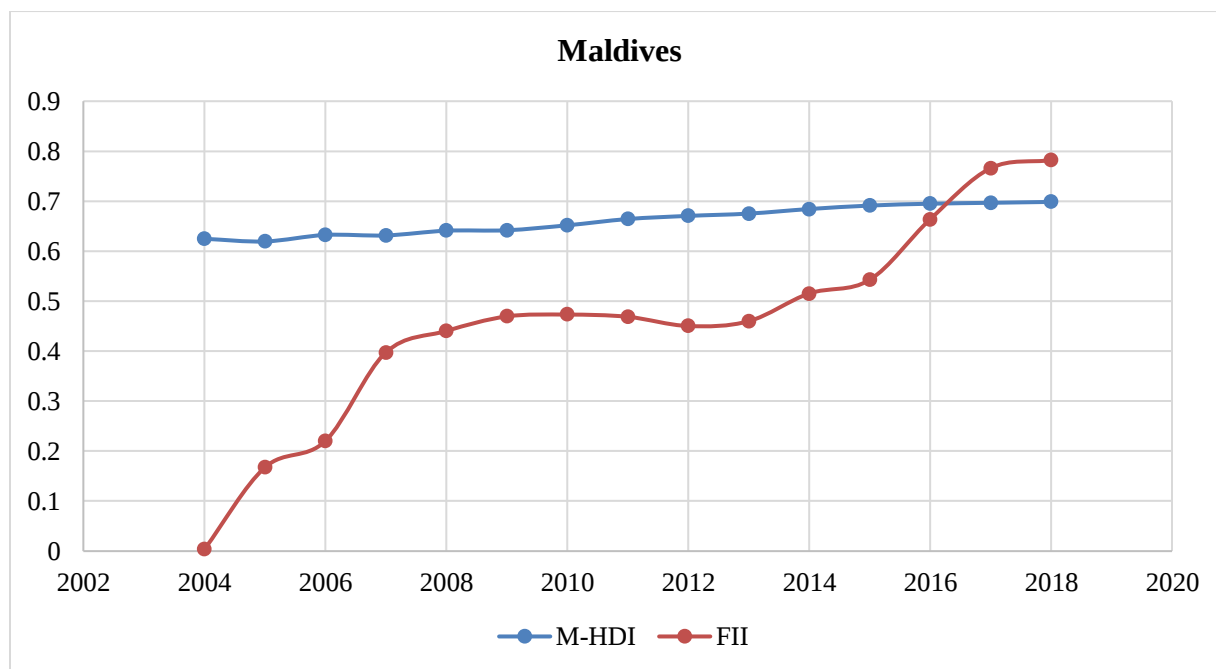


Figure A.3.7

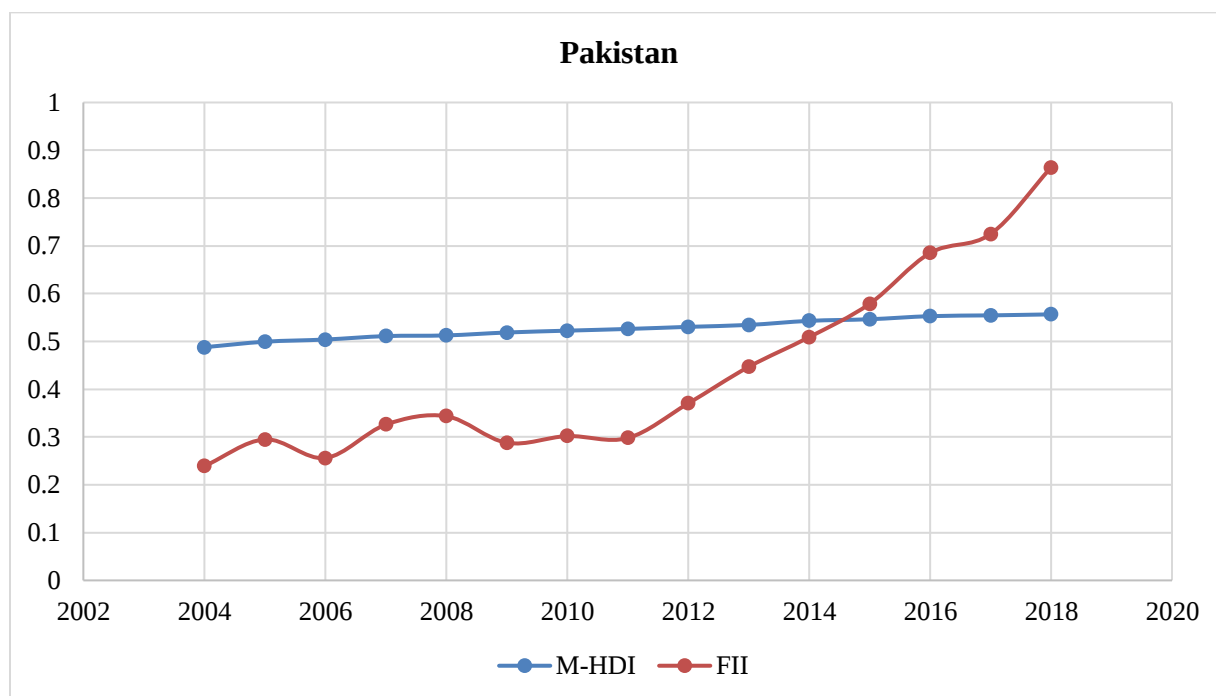
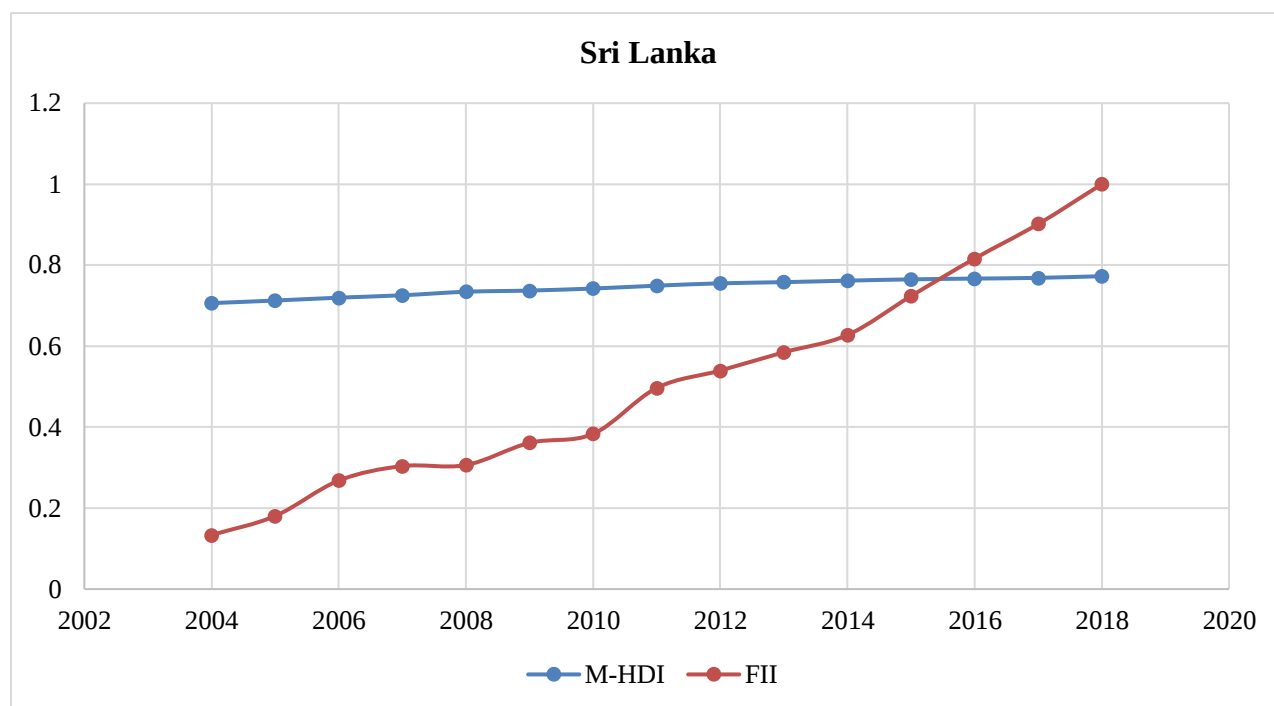


Figure A.3.8



Source: Author's estimations

Chapter 4

Does Financial Inclusion Increase Per Capita Income and Reduce Income Inequality? Evidence from South Asian Countries

4.1 Introduction

There is a growing recognition that increasing access to formal financial services has both personal and social benefits. Extending the range of financial services available to a population leads to economic growth and can help to increase income distribution. In a broad sense, financial inclusion has a multiplier effect in an economy such as economic growth, reducing poverty, employment, reducing inequality, social inclusion, and women empowerment, etc. Financial inclusion (FI) is of greater importance because policymakers have found that higher economic growth reduces poverty (Cull et al., 2014). Moreover, financial exclusion can threaten economic growth due to a lack of financial infrastructure (Greenwood and Jovanovic, 1990; Angadi, 1983). Thus, it is clear that higher financial inclusion provides a sound financial system, thereby, enhancing economic activities through proper allocations of resources. In addition, financial inclusion is an important process in allowing people to exit from poverty by transforming their production and employment activities (Burgess and Pande 2005; Basu and Srivastava 2005). A well-functioning financial system, according to Levine (2005) and Pasali (2013) increases the macroeconomic conditions of an economy.

Inclusive financial system creates knowledge about a person's cash flow by allowing the poor to save. This will help the poor gain access to credit and make high return investments, therefore increasing their profits and income (Aportela, 1999, Dupas and Robinson, 2013). Furthermore, the importance of microfinance in promoting financial inclusion which contributes to economic growth is widely acknowledged. Srinivasan (2007) argued the importance of the banking sector in the process of financial inclusion (FI) in India. After mentioning several challenges in the policy formulations, he pointed out that the unorganized sector can be included in the financial system through the expansions of banking activity in the country. Dev (2006) argued that FI has a significant role in increasing living conditions of poor farmer, rural enterprise, and venerable groups in India. To add more, he pointed out that financial exclusion in terms of access to credit is higher in small and marginal farmers. So, he proposed that formal credit institutions such as self-

help groups and microfinance play an important role in achieving an inclusive financial system. While some empirical studies indicate that financial inclusion can benefit households and businesses and in the field of savings, the evidence for benefits of financial inclusion is relatively strong (Aportela 1999, Dupas and Robinson 2009). In addition, there is also a significant and direct effect of financial inclusion on households and businesses. Several studies have shown that credit is a strong motivator for formality (Blackburn, Bose and Capasso 2012; Beck, Lin and Ma 2014).

Overall we can say that if access to formal financial services or banking habits will increase than it a force to increase investment, production, and employment as well as income in an economy. Further, it leads to economic growth and the reduction of poverty. There are various reasons to investigate possible causes of income inequality. To begin with, progressive equitable income distribution can be a policy objective by itself, and it has suddenly increased attention after the global economic crisis.

In addition, income inequality can influence other macroeconomic variables, especially economic growth even though some income disparities can encourage economic activity (Lazear and Rosen 1981; Barro 2000). Many research has shown that less income allocations are linked with lower average growth (Dabla-Norris and others 2015; Ostry et al. 2014; Hakura and others 2016). Furthermore, financial inclusion seems to be a sign of social inclusion, as countries with higher level of financial inclusion seem to have lower level of income inequality. According to several recent studies, financial inclusion and income inequality have a negative relationship (Zhang and Posso, 2019, Demir et al. 2020; Fintel and Orthofer, 2020).

This research adds to the existing literature by looking at the connection between financial inclusion (FI) - per capita income - income inequalities in the South Asian nations. The following questions are addressed in this research: (i) what are the most important variables affecting the level of financial inclusion? (ii) Does financial inclusion increase per capita income/standard of living and reduce income inequality in South Asian nations? To answer the above questions, a multidimensional FII calculated for South Asian nations using availability, accessibility and usage of banking services data set from 2004 to 2018, following Sarma (2012) and Sethy (2016) multidimensional approach. Our research is different from previous research in four ways. *First*, a multidimensional FII is used, which is methodologically sound.

Second, to examine the determinants of FI, this study used fixed effect and random effect estimates to process endogeneity link with financial inclusion. *Third*, it uses Hausman test to compare the usual fixed effect and random effect estimates, in every panel data model. *Fourth*, panel cointegration methods are also used in this study to check a long run connection between key variables such as FI - per capita income - income inequality. To the best of our knowledge, there is no empirical research in South Asian countries that is using multidimensional FII to investigate the long-run connection between FI - per capita income - income inequalities.

The remaining sections are organized as follows. Section 2 reviews existing literature and theoretical framework of the study. Section 3 presents the causal mechanism between financial inclusion-per capita income, and financial inclusion-income inequality. Section 4 presents current status of per capita income and income inequality in South Asia countries. Section 5 presents construction of a multidimensional FII. Section 6 reveals the model specification and Section 7 presents data sources, variables and empirical methodology. Section 8 presents the empirical results and analysis, and Section 9 presents conclusion and policy implications.

4.2 Review of literature

4.2.1 Relationship between financial inclusion and per capita income/standard of living

There are some studies which confirm that having a developed financial system which is inclusive in nature can have a greater impact on enhancing income level of poor. Microcredit and other financial institutions like SHGs giving their denied customers with informational services which objective to build their income through financial services.

Inclusive financial systems may also provide information on potential high yield investments and capital allocation, allowing people to take advantage of these opportunities. They can increase investment opportunities, and providing loans can help people with credits problems. As a result, it can be allowed high return investments, entrepreneurship and generates more income. (Kaboski and Townsend, 2012, Karlan and Valdivia, 2011). In addition, inclusive financial system creates knowledge about a person's cash flow by allowing the poor to save. This will help the poor gain access to credit and make high return investments, therefore increasing their profits and income (Aportela, 1999, Jayachandran, 2006; Dupas and Robinson, 2013).

Jayachandran (2006), according to him financial inclusion facilitates ‘consumption smoothing’. Financial inclusion also increases investments and increase their income. Dupas and Robinson (2013) conducted a study on savings constraints and microenterprise development in Kenya. They used baseline characteristics data such as marital status, household composition, assets and health. The study also used data of deposit and withdrawal in the village bank in Kenya. According to the research, increasing poor people’s access to credit encourages them to invest more and further it increases their income. If formal financial institutions will offer efficiencies in opportunities and scale, especially permitting poor individuals to offer loans with more hopeful conditions (i.e., lower interest rate), then it increases their income (Aleem, 1990).

In India, Swamy (2014) evidenced that women participation in financial inclusion initiatives had a significant effect on rising family income and further improving health, and education. Increasing formal financial services for poor farmers in Malawi by providing commitment savings accounts had a huge effect on their well-being Brune et al. (2011). Microfinance’s contribution to investment stimulation, job growth, and economic development is less debatable (Duvendack et al., 2011; Pande et al., 2012). The development of successful financial related instruments, such as microfinance, to fund micro and small business would increase jobs, standard of living, health, education, and savings, and serve as a powerful tool for poverty reduction (Green, Kirkpatrick, and Murinde, 2006).

Asghar (2012), microfinance can be a powerful tool for increasing the poor’s income and educating their families. The research shows that income generated from microfinance credit reduces poverty and improves both economic and social well-being. Individuals’ payments and income can be positively increased by better banking facilities with low transaction costs (Ashraf et. al. 2011).

In addition, the existence of well-established formal banking institutions is associated with higher average incomes (Acemoglu et al. 2001). But theoretical explanations suggest different mechanisms about the relationship between formal financial services and increase incomes, access to banking services will increase income and minimize income inequality by allowing people to choose their jobs and improve their production skills (Banerjee and Newman 1993). A new study conducted by Zhang and Posso (2019) on the connection between household income and FI. According to their findings, FI has a favorable impact on household income in India.

4.2.2 Financial inclusion (FI) and income inequality: Empirical evidences

Owing to non-availability of data on FI in a frequently basis, studies establishing the connection between FI and income inequality have been limited. That may be one of the reasons for having a mixed finding. FI and income inequality nexus is largely unknown due to lack of empirical studies. An increasing number of cross-country studies on inclusive finance and income inequality has confirmed that FI reduces income inequality (Honohan 2008).

A study conducted by Mookerjee and Kalipioni (2010) confirms that greater access of formal financial services such as bank branches strongly reduce income inequality in different countries and barriers to bank access strongly increase income inequality. Sahay et al. (2015) conducted a study on financial inclusion's multiple effect on macroeconomic goals. Finally, their research evidence shows a positive effect of FI on income inequality.

Kim (2016) used cross sectional data from 40 organizations for economic co-operation and Development and EU countries for 2004 to 2011. The study evidences that access to financial services reduces income inequality. Increasing the usage of banking services by a greater portion of the population (as measured by the percentage of population with a bank account, deposits and borrowing from a bank, and obtaining digital payments) reduces income inequality (Aslan et al. 2017).

FII developed by Sethy (2016), Sarma (2012), Cámara and Tuesta (2014), Turégano and Herrero (2018) confirm that higher financial inclusion is associated lower income inequality. Similarly, some studies have examined the critical role of microfinance enhancing financial inclusion. Lacalle-Calderon et al. (2019) and Kai and Hamori (2009) show that developing nations with higher levels of involvement in microfinance programmes have reduced income inequality.

Hermes (2014) tried to find out the answer of does microfinance affect income inequality? He used cross sectional data of inequality because of data availability issue. He observed that income level of people has increased after they had access to microfinance.

García-Herrer and Turégano (2015) investigated the effect of FI in reducing income inequality. Due to some major relevant variables, such as economic development and fiscal policy, the study shows that FI plays an important role in reducing income inequality. Salazar-Cantú et al. (2015)

used regional level data of Mexico to examine the effect of FI on income inequality. According to their findings, more inclusive finance system initially increases income inequality, but as financial inclusion success improves in Mexican municipalities, income inequality decreases significantly.

From cross-country analysis, various studies have observed that income inequality can be brought down by putting greater focus on enhancing coverage of financial inclusion. In the Middle East and North Africa, higher FI appears to be linked to lower income inequality (Neaime and Gaysset, 2018), but this is not the same result in case of Sub-Sahara Africa, Asia, and Latin America (Tita and Aziakpono, 2017; Dabla-Norris et al. 2015b). Furthermore, some empirical research evidence that FI and income inequality have a positive relation (Dimova and Adebawale, 2018; Kochar, 2011); but other researcher evidence that there exists a negative relation (Mahjabeen, 2008; Khandker, 2005). FI has potential to reduce income inequality but the nexus may change country to country depending upon the level of economic growth, organizational efficiency, and regulatory environment; and the form of financial inclusion policies implemented.

Khandker (2005) is one study on the association between microfinance and poverty in Bangladesh. He used panel data to find out the effect of microfinance on poverty reduction in Bangladesh. He suggested that access to microfinance contributes to poverty reduction and further it reduces income inequality in Bangladesh.

Cuong et al. (2007) investigated the effect of micro credit on poverty and inequality in Vietnam. They analyzed Vietnam Bank's social policies and concluded that micro credit reduce inequality but micro credit effect on inequality is insignificant.

Mahjabeen (2008) conducted a study on the impact of microfinance on households, consumption and welfare in Bangladesh. He used a general equilibrium (CGE) model to find out the role of microfinance to reduce income inequality in Bangladesh. The study empirically evidence that a strong effect of microfinance on inequality.

Kochar (2011) conducted a study on the distributive consequences of social banking in India. He concluded that social banking have a larger effect on non-poor households relative to poor in India. The study evidences that there is a positive connection between FI and income inequality.

Huang and Zhang (2019) examine the relationship between FI and urban-rural income inequality in China. In their study, they used Chinese provincial data from 1985-2013 and conducted the panel co-integration method. This study concluded that FI in China reduces urban-rural income inequality in the long term, but it raises urban-rural income inequality in the short term.

According to a new research, FI reduces income inequality significantly in developing nations (Omar and Inaba, 2020). Similarly, Demir et al. (2020) confirms that financial inclusion is an important mechanism by which Financial Technology reduces income inequality. In addition, an empirical study conducted on South African countries, which evidence that there exists a negative connection between FI and income inequality. Further, the result also indicates that FI improves wealth shares of only the middle-class family in South African countries (Fintel and Orthofer, 2020). The relationship between FI and income inequality shows mixed outcomes i.e positive and negative. But number of empirical studies confirms that FI has a great potential to reduce income inequality in different countries.

4.3 Causal connection between FI-per capita income and FI-income inequality

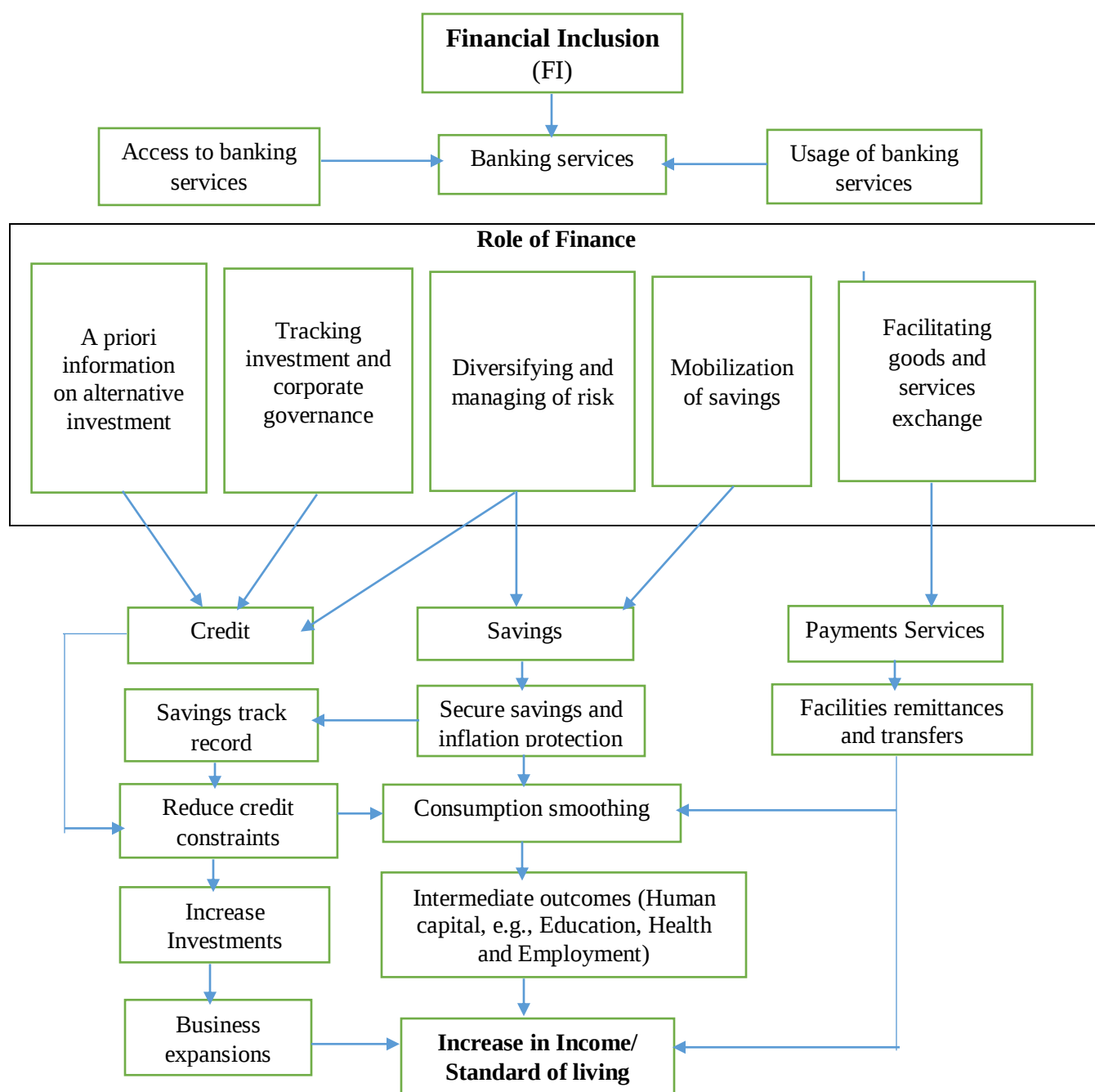
4.3.1 Causal linkages between FI and per capita income/standard of living

Figure 4.1 depicts the different types of supply and demand interferences, as well as the strategies that can be used to increase income in the long run. Access to banking products can be increased on the supply side through plans or techniques that increase public or private sector regulated banking services, or through advancements in banking technology. Financial literacy programmes that increase awareness of financial products, on the other hand, may increase demand for banking services.

The connection between FI and per capita income or standard of living can be explained using a causal mechanism is explained in Figure 4.1. Figure 4.1 indicates that FI can increase the per capita income or standard of living. The logic goes in the following ways.

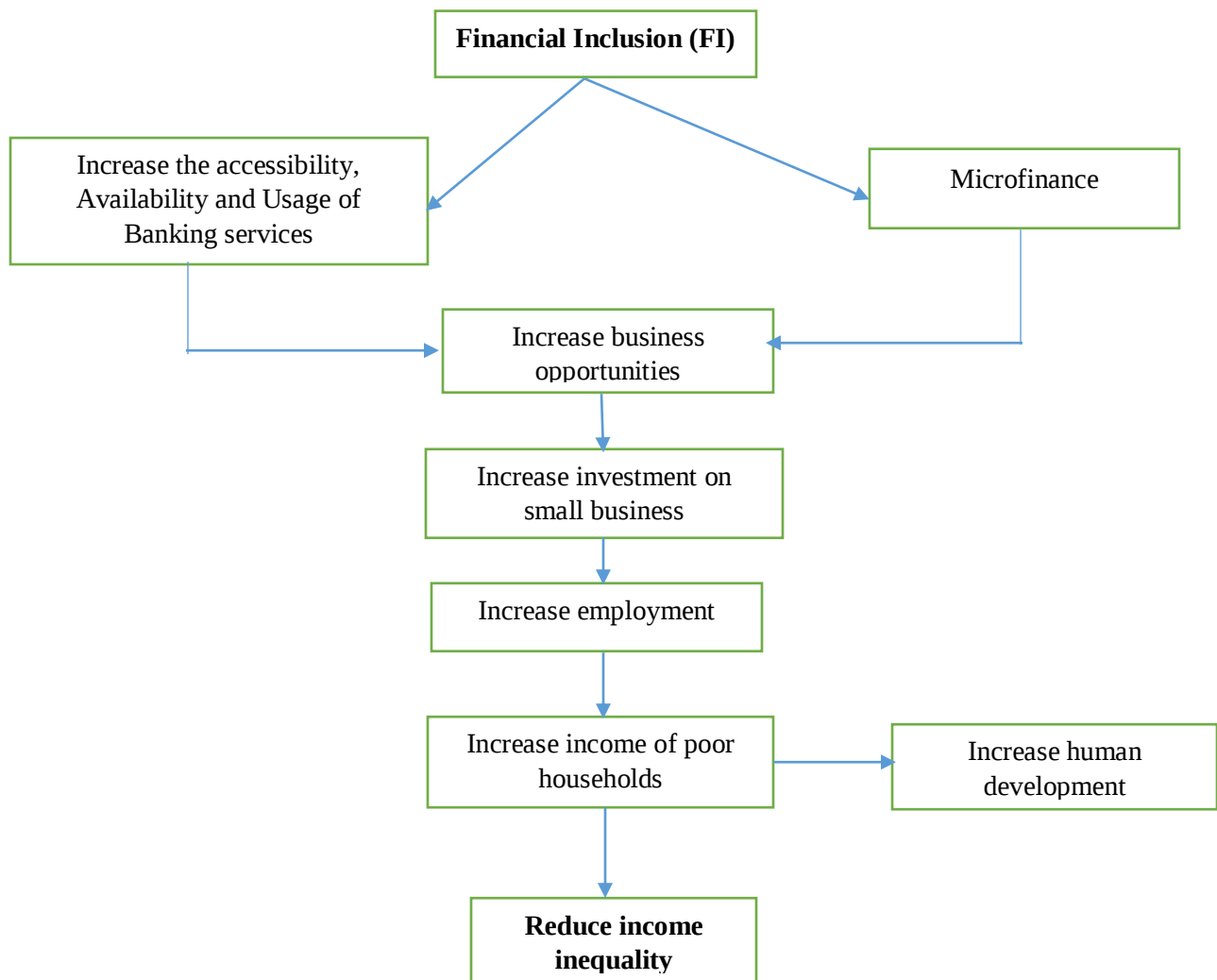
The effective financial inclusion programs and affordable cost of access and usages of formal financial services like savings, deposits and microfinance induce to improve investment on small business, which further increase production, employment and ultimately increase the per capita income or standard of living. Furthermore, providing poor people with affordable and low cost

Figure 4.1: Causal mechanism between financial inclusion and income/standard of living



Source: Designed by the author based on the available literature

Figure 4.2: Causal mechanism between FI and income inequality



Source: Designed by the author based on the available literature

financial services decreases their insecurity by increasing their standard of living (Rajan, 2009). Most of the studies evidence that access to and usages of financial services would increase the poor's income or standard of living (Aleem, 1990; Banerjee and Newman, 19993; Aportela, 1999; Acemoglu, Johnson, and Robinson, 2000; Levine, 2005; Jayachandran, 2006; Green et al. 2006).

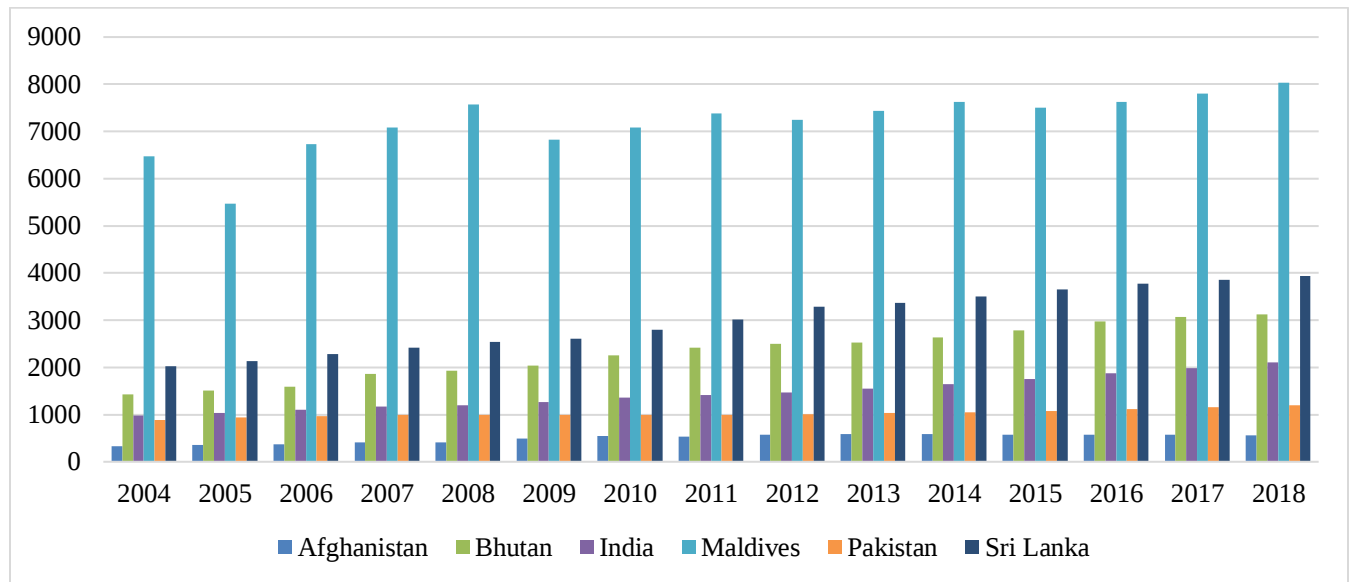
4.3.2 Causal linkages between FI and income inequality

Figure 4.2 depicts a causal mechanism analysis for the relationship between FI and income inequality. Figure 4.2 indicates that FI can reduce income inequality. Access and usages of formal financial services such as savings and microfinance, which increase business opportunities, increase investment on small business, increase employment and which in turn increase income of poor households, and ultimately reduce income inequality. Further, most of the cross-country studies evidence that FI reduces income inequality by increasing the access and usages of banking services (Khandker, 2005; Claessens and Perotti, 2007; Mahjabeen, 2008; Neaime and Gaysset, 2018; Zhang and Posso, 2019; Omar and Inaba, 2020).

4.4 Current status of per capita income or standard of living and income inequality in South Asia countries

This section presents graphically the current status of per capita income or standard of living (i.e. measured by the per capita GDP because it is known as income per person or the mean income of the people in a country) and income inequality (i.e. measured by the Gini coefficients) of South Asian countries from 2004 to 2018.

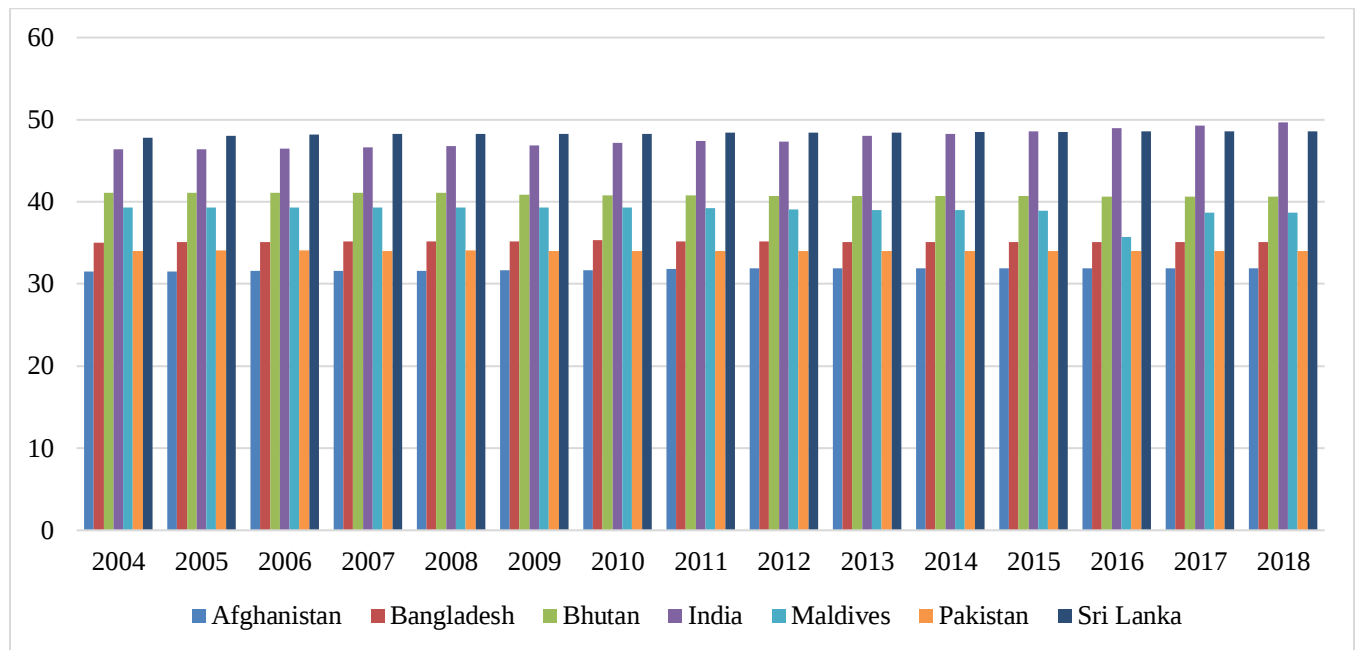
Figure 4.3: Per capita income in South Asian countries from 2004 to 2018



Source: Author's estimations based on WDI, World Bank

Figure 4.3 illustrates that per capita income or standard of living is highest in Maldives followed by the Sri Lanka, Bhutan, India, Pakistan, Bangladesh and Afghanistan over the last decade. From the above figure, it indicates that, Maldives is the only country whose performance in per capita income is very high comparisons to other six South Asian countries from 2004 to 2018. Per capita income or standard of living has been increasing from past three decades in the Maldives because tourism is the largest source of income in the Maldives, which contributes 28 % of GDP and more than 60 % of the foreign exchange receipts (World Bank, 2018). Furthermore, fishing is the second major sector in the Maldives.

Figure 4.4: Income inequality in South Asian countries from 2004 to 2018



Note: Income inequality is measured by the Gini coefficients

Source: Standardized World Income Inequality Database

Figure 4.4 shows the overview of income inequality in South Asian countries. Figure 4.4 indicates that income inequality is highest in India followed by Sri Lanka, Bhutan, Maldives, Bangladesh, Pakistan and Afghanistan over the last decade. Figure shows that income inequality in India has been increasing over time. According to *Oxfam survey*¹, inequality in India is known to an important hindrance to an inclusive financial system and growth. If we check the inequality figure, it shows that 1% rich in Indian accounts for 58% wealth in the county. This is well above the worldwide statistics of nearly 50% (Business Today, January 30, 2019). Apart from India, income inequality in other South Asian countries (such as Sri Lanka, Bhutan and Maldives) has been increasing rapidly for the last decades. According to the number of researchers, increased penetration of technology and industrialization may be one of the cause for rapid income inequality. Since increased productivity leads to greater technological advancements, which in

¹ Oxfam India is non-profit organization under Indian Companies Act 2013 and this organization particularly works to find out the major causes of poverty and inequality. Available at: <https://www.oxfamindia.org/about-us>

turn increases the demand for skilled workers. This self-perpetuating cycle increases wealth and income inequality. Furthermore, as a result of globalization, technology, and industrialization often result in the substitution of medium-skilled workers, further widening the wage gap.

4.5 Measuring financial inclusion (FI) for South Asian countries

This section describes an econometric model to examine important variables that affect the degree of FI, the impact of FI on increasing per capita income or standard of living, and reducing income inequality. The study then discusses data collection from various sources. This research also explains how proxy variables were used to derive the three dimensions of FI, as well as how a FII was developed and used in various regression models.

4.5.1 Construction of financial inclusion index (FII)

Methodology regarding calculation of Financial Inclusion Index (FII) can be found in Section 2.6 in Chapter 2.

4.6 Model specification

This study uses fixed effect panel data model. The fixed effect model performs better comparison to the random effect model according to Hausman Test. The specified regression model is employed to find out determinants of FI in South Asian countries as given below.

$$FII_{i,t} = \alpha_0 + \beta_1(GDPpc)_{i,t} + \beta_2(rule)_{i,t} + \beta_3(popu)_{i,t} + \beta_4(agedep)_{i,t} + \beta_5(gini)_{i,t} + \beta_6(internet)_{i,t} + \beta_7(eduin)_{i,t} + \alpha_i + \mu_{i,t} \quad (4.1)$$

$$FII_{i,t} = \alpha_0 + \sum_{k=1}^k \rho_k X_{k,i,t} + \alpha_i + \mu_{i,t} \quad (4.2)$$

Where FII refers to financial inclusion index which measures availability, accessibility and usage of banking services (Sethy, 2016; Sethy and Goyari, 2018; Sethi and Sethy, 2018; Sarma, 2008) and X denotes a collection of control variables widely used in recent financial inclusion research.

In most regression equations, the independent variables are based on previous research by, Omar and Inaba (2020), Jabir et al. (2017), Aslan et al. (2017), Sarma and Pais (2008, 2011). These control variables are: $GDPpc$ = per capita GDP, $popu$ = total population, $agedep$ = age dependence ratio, $rule$ = rule of law (Omar and Inaba, 2020), $gini$ = Gini coefficient, $internet$ = internet users, $eduin$ = education index, α_i = the unseen effects, $\mu_{i,t}$ = error term, $t = 1, 2, 3, \dots, 15$ years, $i = 1, 2, 3, \dots, n$, and $\beta_1, \beta_2, \beta_3, \dots, \beta_n$ are the parameters.

The following regression equations are used to investigate the effect of *financial inclusion on per capita income* in South Asian countries.

$$(lnGDPpc)_{i,t} = \alpha_0 + \beta_1(lnFII)_{i,t} + \beta_2(lnremista)_{i,t} + \beta_3(lnemp)_{i,t} + \beta_4(lneduin)_{i,t} + \alpha_i + \mu_{i,t} \quad (4.3)$$

$$(lnGDPpc)_{i,t} = \alpha_0 + \beta_1(lnFII)_{i,t} + \sum_{k=1}^k \rho_k X_{k,i,t} + \alpha_i + \mu_{i,t} \quad (4.4)$$

Where $lnGDPpc$ represents log of per capita GDP used as proxy for per capita income or standard of living (UNDP, 2013; Anwar and Cooray, 2015; Diacon and Maha, 2015; Dynan and Sheiner, 2018; Nuhu et al. 2018; Islam, 2020; Omar and Inaba, 2020), $lnFII_{i,t}$ represents log of financial inclusion index or inclusive financial system and X denotes control variables are: $lnremista$ = log of remittances (Adam and Page, 2003), $lnemp$ = log of employment (Ioan, 2014; RBI, 2005), $lneduin$ = log of education index. Financial inclusion is supposed to have a positive connection with per capita income or standard of living. An increase in small investment, employment and engaging economically productive activities helps increasing per capita income of poor.

The following regression equations are used to examine the relationship between *financial inclusion and income inequality* in South Asian countries.

$$(lngini)_{i,t} = \alpha_0 + \beta_1(lnFII)_{i,t} + \beta_2(lnGDPpc)_{i,t} + \beta_3(lneduin)_{i,t} + \beta_4(lninfla)_{i,t} + \beta_5(lntradeopen)_{i,t} + \beta_6(lncredit)_{i,t} + \alpha_i + \mu_{i,t} \quad (4.5)$$

$$(lngini)_{i,t} = \alpha_0 + \beta_1(lnFII)_{i,t} + \sum_{k=1}^k \rho_k X_{k,i,t} + \alpha_i + \mu_{i,t} \quad (4.6)$$

Where *lngini* represents log of Gini coefficients (i.e used for income inequality), *lnFII* represents log of financial inclusion index and X denotes control variables used in recent research on FI and income inequality (Demir et al., 2020). These control variables are: *Eduin* = Education index used to measure education (Demir et al. 2020); *lninfla* = log of inflation, *Intradeopen* = log of trade openness (Lacalle-Caderon et al. 2019); *lncredit* = log of domestic credit (Omar and Inaba, 2020); *lnGDPpc* = log of GDP per capita. Here, financial inclusion is supposed to have a negative relationship with income inequality because it encourages lower income and poor people to save, investment, raise their standard of living etc. which help to reduce income inequality.

4.7 Data sources and variables

The study is based on 15 years of annual panel data from 2004 to 2018. By excluding one South Asia country like Nepal (because of data availability issues of formal financial services), rest of the seven South Asia countries are taken for the analysis. Here, all variables are expressed in a logarithm scale due to severe fluctuations in data across countries. The data set was collected using the IMF, FAS, World Development Indicator (WDI), SWIID and World Governance Indicator (WGI). Table 4.1 offers a comprehensive overview of the variables and their sources. For details list of indicators for constructing FII, see Table 2.3 in Chapter 2.

Dependent variables

Gini coefficient is the most commonly used indicator of *income inequality* (Demir et al. 2020; Omar and Inaba, 2020). *Per capita income* or *standard of living* is measured by the per capita GDP (Anwar and Cooray, 2015; Dynan and Sheiner, 2018; Islam, 2020; Omar and Inaba, 2020).

Table 4.1: Variables and Data sources, Definition and Measurement

Variables	Sources	Definition and Measurement
<u>Panel A:</u> Dependent Variables		
1. Financial Inclusion Index (<i>FII</i>)	FAS, IMF	FII is a multidimensional index which including availability, accessibility and usage of banking services.
2. Per capita GDP (<i>lnGDPpc</i>) (used as a proxy for per capita income)	WDI, World Bank	Per capita real GDP at constant 2010 US\$
3. Income inequality (<i>gini</i>)	The Standardized World Income Inequality Database (SWIID) (Version-6.1)	It is measured by the Gini coefficient.
<u>Panel B:</u> Control Variables		
Rule of law (<i>law</i>)	World Governance Indicator (WGI), World Bank	The level to which agents have followed the laws of society is reflected in rule of law.
Population (<i>lnpopu</i>)	WDI, World Bank	Total populations in a country
Age dependence ratio (<i>lnagedep</i>)	WDI, World Bank	The percentage of dependent population to working age population.
Inflation rate (<i>lninfla</i>)	WDI, World Bank	Annual percentage change in the average consumer price index
Internet (<i>lninternet</i>)	WDI, World Bank	Individual using the internet (percentage of population)
Education Index (<i>eduin</i>)	UNDP Report	Calculated using mean years of schooling and expected years of schooling)
Remittances (<i>lnremista</i>)	WDI, World Bank	Personal remittances (percentage of GDP)
Employment (<i>lnemp</i>)	WDI, World Bank	Employment to population ratio, 15+, total (%)
Trade openness (<i>Intradeopen</i>)	WDI, World Bank	Trade (% of GDP)
Credit to private sector (<i>lncredit</i>)	WDI, World Bank	Domestic credit to private sector as a percentage of GDP

Source: Author's compilations

4.8 Econometric methodology

4.8.1 Panel unit root tests

The first step of empirical research is panel unit root test. Before proceeding to co-integration analysis, a preliminary test for unit root in the variables is required. The panel unit root test is used to prevent spurious regression. Im-Pesaran-Shin (IPS) test is the most commonly used unit root test in research due to its simple and ease of use. Im-Pesaran-Shin (IPS) developed the following model, which was used in this study as below:

$$y_{i,t} = \beta_i + \rho_i y_{i,t-1} + \mu_{i,t} \quad (4.7)$$

for all $i = 1, 2, 3, \dots, n$ and $t = 1, 2, 3, \dots$

4.8.2 Panel cointegration tests

The second step of empirical research is to use the panel cointegration test to investigate the long-term relationship between the variables. For panel data research, Pedroni (1999 and 2014) co-integration is the best method for estimating cointegration among variables. This method has the advantage of capturing heterogeneity at the individual country level.

Pedroni (2004) considers the following type of regression:

$$z_{i,t} = \alpha'_i + \ddot{\alpha}_i t + \widehat{\alpha}_{1i} y_{1i,t} + \widehat{\alpha}_{2i} y_{2i,t} + \cdots \dots \dots + \widehat{\alpha}_{Mi} y_{Mi,t} + e_{it} \quad (4.8)$$

for $t = 1, 2, 3, \dots, T$; $i = 1, 2, 3, \dots, N$; $m = 1, 2, 3, \dots, M$,

For the panel data analysis, Pedroni (1997) suggests seven statistics to check the null hypothesis of no cointegration. There are two types of tests in this test. First is the panel cointegration test (within dimension) and Second, the panel cointegration test (between dimensions).

4.8.3 FMOLS and DOLS approach

The possibility of heterogeneity cannot be overlooked because this study was focused on panel data for seven South Asian countries. With this in mind, we have used FMOLS and DOLS, which are capable of dealing with heterogeneity and serial correlation in the data (Danish et al. 2019b). According to Hamit and Hagggar (2012), FMOLS is the most appropriate technique for

panel data analysis, which comprises heterogeneous co-integration. Furthermore, in case of small samples, these two methods are considered the most effective and provide an accurate result (Zhang and Danish, 2019). Phillips and Hansen (1990) developed the FMOLS method to implement an effective co-integration regression estimation. But, here the Pedroni (2001a, 2001b) heterogeneity FMOLS estimator was used.

Mathematically, the FMOLS equation can be written as follows:

$$z_{i,t} = b_i + \beta_i y_{i,t} + \tau_{i,t} \quad (4.9)$$

Where, cointegrating variables $z_{i,t}$ and $y_{i,t}$ are measured through β_i . After taking into account lag and lead factor for regression equation is written as follows:

$$z_{i,t} = b_i + \beta_i y_{i,t} + \sum_{k=-k_i}^{k_i} \vartheta_{i,k} \Delta y_{i,t-k} + \tau_{i,t} \quad (4.10)$$

Finally, for i-th panel, the FMOLS estimator is mentioned below

$$\hat{\beta}_{FMOLS} = \frac{1}{N} \left[\sum_{t=1}^T (y_{it} - y_i^-)^2 \right]^{-1} \left[\sum_{t=1}^T (y_{it} - y_i^-) z_{it}^* - T y_i^{\wedge} \right]$$

Where $z_{it}^* = y_{it} - y_i^- - \left(\Omega_{21i}^{\wedge} / \Omega_{22i}^{\wedge} \right) \Delta y_{it}$ and $y_i^{\wedge} = \Gamma_{21i}^{\wedge} + \Omega_{21i}^{\wedge 0} - \left(\Omega_{21i}^{\wedge} / \Omega_{22i}^{\wedge} \right) (\Gamma_{21i}^{\wedge} + \Omega_{21i}^{\wedge 0})$.

Stock and Watson (1993) developed the DOLS method and mathematically the equation can be written as follows:

$$z_{i,t} = y'_{i,t} \beta + \sum_{j=-p_1}^{p_2} c_j \Delta y_{i,j} + \mu_i + \epsilon_{i,t} \quad (4.11)$$

Here, if $z_{i,t}$ and $y_{i,j}$ are cointegrated, the long run parameter obtained is as follows:

$$b_{DOLS} = N^{-1} \sum_{i=0}^n \left(\sum_{t=1}^T \mathbf{V}_{it} \mathbf{V}'_{it} \right)^{-1} \left(\sum_{t=1}^T \mathbf{V}_{it} (z_{it} - z_i^-) \right)$$

4.9 Empirical results and analysis

Our empirical findings and analysis are divided into two parts in this section. First, it presents the important variables that impact the level of FI in South Asian countries. Second, the study presents our results on the impact of inclusive finance on per capita income or standard of living and income inequality

Table 4.2: Factors impact on financial inclusion (Fixed effect estimation)

Variables	FII
<i>GDPpc</i>	0.0015 (0.001)***
<i>Gini</i>	0.0264 (0.289)
<i>Popu</i>	1.840 (0.757)
<i>Rule</i>	0.292 (0.000)***
<i>Eduin</i>	5.761(0.000)***
<i>Internet</i>	0.002 (0.072)***
<i>Agedep</i>	0.012 (0.001)***
<i>Constant</i>	- 4.412 (0.000)***
<i>Observations</i>	105
<i>R-squared</i>	0.171
<i>Number of Id</i>	7

Notes: The dependent variable is a multidimensional financial inclusion index.

*** indicates 1 % level of significance

Source: Author's estimations

4.9.1 Results on the crucial factors of financial inclusion

4.9.1.1 Panel regression results

Table 4.2 presents empirical results on key factors that affect financial inclusion. To test the robustness of regression results, the model included different macroeconomic variables. Per capita GDP, income inequality (i.e Gini coefficients), population, rule of law, education, internet users and age dependency ratio are all included in the model. The fixed effect results indicate that rule of law, education, age dependency ratio, per capita real GDP, and internet users are all positive influences on financial inclusion. But income inequality and population size have insignificant relations with financial inclusion.

The *per capita GDP* coefficient is positive, implying that economies with higher standard of living have more FI. This result is line with Evans and Adeoye (2016), Camara et al. (2014), Park and Mercado (2015), and Omar and Inaba (2020).

The *Rule of law* found to be a significant determinant, implying that countries with good governance enhance financial inclusion by improving the rule of law. Our result is consistent with findings of Park and Mercado (2015), Allen et al. (2014), and Honohan (2008).

Education has a positive effect on financial inclusion (FI), implying that countries with more literate people and higher education have higher levels of FI. This finding is consistent with Ajayi and Ross (2020) and Demirguc-Kunt et al. (2017).

The *internet users* is also positively correlated with financial inclusion, suggesting that internet accessibility enhance financial inclusion by making financial services more mobile, this result support Sarma and Pais (2011), Evans and Adeoye (2016), Omar and Inaba (2020). The *age dependency ratio* coefficient is positive, implying that countries with higher ageing citizens have greater access to banking services. This result contradicts Park and Mercado (2015) empirical findings.

Surprisingly, *income inequality* and *population size* have no major effect on the level of FI in South Asian countries. Low income inequality is expected to increase financial inclusion, contrary to Suarez and Amado (2014) and Sarma and Pais (2011).

Table 4.3 shows that the random effect model included different macroeconomic variables. This finding suggests that in South Asian countries, population size, rule of law, education, ratio of internet users, and age dependence ratio are all positive and have a large impact on FI. Per capita real GDP and income equality, on the other hand, are both negative and highly significant.

Income inequality has a negative and important relationship with financial inclusion, implying that countries with unequal income distribution reduce household financial inclusion. This result is line with Rojas-Suarez and Amado (2014).

Table 4.3: Factors impact on financial inclusion (Random effect estimation)

Variables	FII
<i>GDPPC</i>	- 0.0003 (0.004)***
<i>Gini</i>	- 0.077 (0.000)***
<i>Popu</i>	4.530 (0.000)***
<i>Rule</i>	0.365 (0.000)***
<i>Eduin</i>	3.158 (0.000)***
<i>Internet</i>	0.013 (0.000)***
<i>Ageddep</i>	0.0098 (0.000)***
<i>Constant</i>	1.368 (0.000)***
<i>Observations</i>	105
<i>R-squared</i>	0.763
<i>Number of Id</i>	7

Notes: *** indicates 1 % level of significance.

Source: Author's estimations

Table 4.4: Hausman Test (Fixed effect and Random effect)

Hausman Test	84.51 (0.000)***
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Note: *** denotes 1 % level of significance.

Source: Author's estimations

The Hausman test suggests that a fixed effect model is appropriate for the analysis (Table 4.4).

4.9.2 Findings on the long-run connection between financial inclusion and per capita income /standard of living

4.9.2.A. Descriptive statistics and correlation result

In Table 4.5, observed that the per capita GDP (i.e. proxied for per capita income or standard of living) varies from 5.87 to 8.99 having a mean value of 7.39 and standard deviation (SD) of 0.84. The coefficient of our key independent variable, financial inclusion (i.e. FII) varies from -6.008 to 0 with average value of 1.083 and SD of 1.072. The correlation result reveals that financial inclusion and per capita income or standard of living are positively related (i.e. 0.14). This result implies that an increase in financial inclusion leads to increase in per capita income or standard of living (for more details see Table 4.5 and Table 4.6).

Table 4.5: Descriptive statistics

	lnGDPPC	lnFII	lnREMISTA	lnEDUIN	lnEMP
Mean	7.397	1.083	0.701	0.775	3.98
Median	7.256	0.767	1.235	0.818	3.964
SD	0.843	1.072	1.478	0.242	0.131
Min	5.878	-6.008	-2.536	-1.167	3.737
Max	8.991	0	2.359	0.279	4.227
Skewness	0.356	2.43	0.834	0.692	0.001
Kurtosis	2.22	10.347	2.389	2.639	2.489
Observation	104	104	104	104	104

Source: Author's estimations

Table 4.6: Correlation matrix

	lnGDPPC	lnFII	lnREMISTA	lnEDUIN	lnEMP
lnGDPPC	1				
lnFII	0.141	1			
lnREMISTA	-0.511	0.112	1		
lnEDUIN	0.593	0.299	0.191	1	
lnEMP	0.631	-0.183	-0.47	0.08	1

Source: Author's estimations

4.9.2.B. *Panel unit root results*

Before proceeding for panel cointegration test, order of variable integration is checked using unit root test in this section. The stationarity of the variables must be checked to prevent spurious regression. In order to confirm the reliability and stability of the data, Im-Pesaran-Shin (IPS) test is used since it emphasizes the heterogeneity of parameter in panel models. Here, the test indicates that the variables such as lnFII, lnGDPPC, lnEduin, lnRemista and lnEmp are integrated of order one [I(1)].

Table 4.7: IPS Panel unit root test

Variables	lnGDPPC	lnFII	lnEduin	lnRemista	lnEmp
<u>Level</u>	1.478 (0.930)	-1.052 (0.146)	-1.213 (0.112)	1.128 (0.870)	-1.370 (0.085)
<u>First differences</u>	-1.386* (0.082)	- 4.035*** (0.000)	- 1.530* (0.063)	- 2.439* (0.007)	- 0.888 (0.187)

Notes: * indicates 10 percent level of significance.

*** indicates 1 percent level of significance.

Source: Author's estimations

The unit root test is revealed in Table 4.7. The results of the Im-Pesaran Shin (IPS) unit root test show that the variables are non-stationary at level but stationary at first difference. In South Asian countries, the only variables $\ln\text{GDPpc}$, $\ln\text{FII}$, $\ln\text{Eduin}$ and $\ln\text{Remista}$ are found stationary at their first differences, rejecting the null hypothesis of non-stationary at 1 and 10 percent significance level. This finding supports the use panel cointegration, which requires integration in the same order.

Table 4.8: Pedroni panel cointegration estimation

Cointegration statistics	Statistics	Prob.
<i>With Dimensions</i>		
Panel v -Statistics	1.115	0.132
Panel ρ Statistics	0.289	0.613
Panel Phillips-Perron t	-4.666***	0.000
Panel Augmented Dickey Fuller t	-2.410***	0.008
<i>Between Dimensions</i>		
Group ρ Statistics	1.868	0.969
Group Phillips-Perron t	-9.740***	0.000
Group Augmented Dickey-Fuller t	-2.471***	0.006

Note: *** indicates 1 % level of significance.

Source: Author's estimations

4.9.2.C. *Cointegration results*

Here the variables are found to be non-stationary $I(1)$. This shows that after adjusting the effect of education, remittances, and employment, our two key variables such as $\ln\text{FII}$ (i.e financial inclusion) and $\ln\text{GDP}$ per capita (used as a proxy for per capita income) can be cointegrated. Table 4.8 shows seven test statistics for Pedroni cointegration. The cointegration result confirms financial inclusion and per capita income or standard of living are cointegrated. Out of seven, four Pedroni cointegration test statistics rejects the null hypothesis of non-cointegration at 1 percent level of significance. It means that in South Asian countries, there exists a long-term

connection between FI and per capita income or standard of living. Furthermore, we believe that now if financial inclusion is prioritized, it would help South Asian countries to achieve better standard of living in the long run.

4.9.2.D. *Panel FMOLS and DOLS estimations*

To avoid endogeneity and serial correlation issues, this study employs two improved methods like FMOLS and DOLS. Table 4.9 shows the FMOLS and DOLS results. The FMOLS result indicates that our key variables such as financial inclusion (i.e lnFII) and per capita income or standard of living (i.e., lnGDPpc) are cointegrated and coefficient has a positive sign. This result is indicating that one percent increase in access and usages of formal financial services across countries would increase per capita income or standard of living by 0.14 percent. In addition, DOLS result indicates that South Asian countries with higher financial inclusion experience higher per capita income. The long-run coefficient implying that 1 % rise in financial inclusion causes 0.04 % improvement in income level of people or standard of living. In other words, inclusive financial system creates knowledge about a person's cash flow by allowing the poor to save. This will help the poor gain access to credit and make high return investments, therefore increasing their profits and income. This result is line with Aportela (1999), Jayachandran (2006), Dupas and Robinson (2013).

Table 4.9: Panel FMOLS and Panel DOLS estimations

Dependent Variable: lnGDPpc	FMOLS			DOLS		
	Coefficients	t-Statistics	Prob	Coefficients	t-Statistics	Prob
lnFII	0.143***	3.633	0.000	0.044***	2.394	0.018
lnEduin	0.698***	2.192	0.031	1.376***	5.986	0.000
lnEmp	-0.589	-1.329	0.187	-0.968***	-2.359	0.020
lnRemista	0.011	0.357	0.721	0.028	0.863	0.390
R^2		0.993			0.99	
Adj. R^2		0.992			0.989	

Notes: *** indicates 1 percent level of significance. Here, per capita GDP used as a proxy for per capita income or standard of living.

Source: Author's estimations

Furthermore, the development of successful financial related instruments, such as microfinance, to fund micro and small business would increase jobs, standard of living, health, and education. This result is consistent with Green, Kirkpatrick and Murinde (2006). Financial inclusion and per capita income or standard of living have a positive relation, implying that an increase in financial inclusion indicators like availability indicators (i.e demographic branch penetration, branches of commercial banks and demographic ATM penetration), accessibility indicators (i.e geographic ATM penetration, and geographic branch penetration) and usage indicators (i.e credit penetration and deposit penetration) can increase peoples living standard in South Asian countries.

FMOLS results show that education and per capita income are cointegrated. Here the positive sign of long-run coefficient shows that 1 percent increase in education (i.e. schooling and higher education) would increase 0.69 percent in per capita income or standard of living. Similarly, the DOLS result confirms that 1 % increase in the education leads to a 1.37 percent rise in per capita income. Furthermore, DOLS result indicates that employment and per capita income are cointegrated. The long run coefficient has a negative sign means that a 1 % decline in employment will increase per capita income by 0.96 percent. Here, results also indicate that remittances are not significantly related with per capita income.

Table 4.10: Descriptive statistics

	lnGINI	lnFII	lnGDPPC	lnEDUIN	lnINFLA	lnCREDIT	lnTRADEOPEN
Mean	3.669	1.016	7.387	0.77	1.739	3.312	4.112
Median	3.668	0.756	7.251	0.818	1.862	3.533	3.941
SD	0.125	0.97	0.822	0.243	0.706	0.733	0.532
Min	3.453	-6.008	5.9	-1.167	-0.688	1.202	3.231
Max	3.906	0	8.991	0.279	3.274	4.062	5.215
Skewness	0.191	2.471	0.42	0.697	1.006	1.584	0.403
Kurtosis	1.604	11.342	2.309	2.581	4.813	4.654	2.033
Observation	101	101	101	101	101	101	101

Source: Author's estimations

4.9.3 Findings on the long-run connection between FI and income inequality

4.9.3.A. Descriptive statistics and correlation result

In Table 4.10, the summery statistics indicates that the dependent variable, income inequality (i.e. Gini coefficients) varies from 3.45 to 3.90 having a mean value of 3.66 and SD of 0.15. The coefficient of our key independent variable, financial inclusion (i.e. FII) ranges from -6.00 to 0, maintaining a mean value of 1.01 and SD of 0.97. In Table 4.11, the correlation matrix result shows that a negative correlation exists between FI and income inequality (i.e. -0.057). This implies that increase in formal financial services (i.e. access and use of formal financial services at an affordable cost) leads to increase income inequality (details in Table 4.10 and Table 4.11).

Table 4.11: Correlation matrix

	lnGINI	lnFII	lnGDPPC	lnEDUIN	lnINFLA	lnCREDIT	lnTRADEOPEN
lnGINI	1						
lnFII	-0.057	1					
lnGDPPC	0.54	0.228	1				
lnEDUIN	0.722	0.31	0.599	1			
lnINFLA	0.071	-0.149	-0.188	-0.063	1		
lnCREDIT	0.634	-0.025	0.567	0.412	0.189	1	
lnTRADEOPEN	0.098	0.077	0.589	0.086	0.189	0.041	1

Source: Author's estimations

Table 4.12: IPS Panel Unit root test

Variables	lnGini	lnFII	lnGDPpc	LnEduin	lnInfla	lnCredit	lnTradeop
<i>Level</i>							
	1.119 (0.868)	1.052 (0.146)	1.478 (0.930)	1.213 (0.112)	0.302 (0.381)	0.720 (0.235)	0.806 (0.210)
<i>Firt differences</i>							
	- 4.991*** (0.000)	- 4.035*** (0.000)	-1.386*** (0.082)	-1.530** (0.063)	-5.084*** (0.000)	-1.499* (0.06)	- 4.918*** (0.000)

Note: *, ** and *** indicates 10 %, 5 % and 1 % level of significance.

Source: Author's estimations

4.9.3.B. *Panel unit root results*

The unit root test shows that variables such as lnGini, lnFII, lnGDPpc, lnEduin, lnInfla, lnCredit and lnTradeop are integrated of order one I(1) (for details see Table 4.12).

4.9.3. C *Cointegration result*

Above unit root tests shows that after controlling the effect of lnGDPpc, lnEduin, lnInfla, lnCredit and lnTradeop, two key variables, lnFII and lnGini may be cointegrated. Pedroni (1999, 2004) test is used to determine cointegration. Pedroni cointegration test statistics are reported in seven different ways, as shown in Table 4.13. Out of seven, four Pedroni cointegration tests statistics rejects the null hypothesis. This result confirms the cointegration between financial inclusion (i.e lnFII) and income inequality (i.e lnGini) across the panel countries. The null hypothesis of non-cointegration is rejected by four Pedroni test statistics. It means that FI and income inequality have a long run relationship. Furthermore, we believe that if financial inclusion is prioritized in the short run, it will help to reduce income inequality in South Asian countries in the long run.

Table 4.13: Pedroni panel cointegration estimation

Cointegration statistics	Statistics	Prob.
<i>With Dimensions</i>		
Panel v -Statistics	-3.088	0.999
Panel ρ Statistics	3.646	0.999
Panel Phillips-Perron t	-8.053***	0.000
Panel Augmented Dickey Fuller t	-5.554***	0.000
<i>Between Dimensions</i>		
Group ρ Statistics	4.062	1.000
Group Phillips-Perron t	-5.494***	0.000
Group Augmented Dickey-Fuller t	-1.370*	0.085

Note: *** and * indicate 1 % and 10 % level of significance.

Source: Author's estimations

4.9.3.D Panel FMOLS and DOLS estimation

The result of DOLS shows that financial inclusion (i.e lnFII) and income inequality (i.e lnGini) are cointegrated and has a negative sign. It shows that 1 percent increase in financial inclusion across the South Asian economies would decrease income inequality by 0.08 percent (For details see Table 4.14). This finding is line with Khandker (2005), Mahjabeen (2008), Dabla-Norris et al. (2015b), Zhang and Posso (2019). However, Honohan (2007, 2008), and Dimova and Adebawale (2018) who found a positive link between key variables. These contradictory results may be due to the variations in economic growth, organizational efficiency, financial institution nature, different measurement methods of financial inclusion, time periods, and sample sizes.

Table 4.14: Panel FMOLS and Panel DOLS estimation

Dependent Variable: lnGini	FMOLS			DOLS		
	Coefficients	t-Statistics	Prob	Coefficients	t-Statistics	Prob
lnFII	- 0.014	- 0.240	0.810	- 0.086***	3.025	0.004
lnEduin	- 0.723***	- 4.322	0.000	- 0.178	1.517	0.138
lnTradeop	- 0.084	- 0.752	0.453	- 0.078	1.008	0.320
lnGDPPC	0.420***	5.527	0.000	0.478***	13.533	0.000
lnInfla	0.182***	3.099	0.002	0.087***	2.450	0.019
lnCredit	- 0.008	- 0.112	0.910	0.002	0.033	0.973
R^2		0.900			0.921	
Adj. R^2		0.992			0.840	

Note: *** indicates 1 percent level of significance. Here, Income inequality is measured by the Gini coefficients.

Source: Author's estimations

Additionally, in FMOLS results, it is observed that education and income inequality (i.e. Gini coefficients) are cointegrated. The long-run coefficient is negative and significant at 1 percent level. This negative sign indicates that one percent increase in education (i.e. schooling and

higher education) would decrease 0.73 percent in income inequality. The FMOLS result reveals that per capita GDP and income inequality are cointegrated and has a positive sign. This positive sign indicates that one percent improvement in per capita GDP would increase 0.42 percent in income inequality. Similarly, DOLS result also has indicated that per capita GDP and income inequality are cointegrated. Here, positive sign indicates that 1 percent increase in per capita GDP would increase 0.47 percent in income inequality. In addition, FMOLS result show that inflation and income inequality are cointegrated. This positive sign indicates that 1 percent increase in inflation would increase 0.18 percent in income inequality. Similarly, DOLS result also has indicated that inflation and income inequality are cointegrated. The long run coefficient is positive and significant at 1 percent level. This result shows that one percent increase in inflation would increase 0.08 percent in income inequality. However, both FMOLS and DOLS result shows that trade openness and credit is not significantly cointegrated with the income inequality.

Table 4.15: Effects from financial inclusion on each key variables

		Income inequality (Gini)	Per capita income or standard of living
Effects of financial inclusion	FII ↑	↓	↑
	FII ↓	↑	↓

Note: FII: Financial Inclusion Index

Source: Based on the Authors findings

4.10 Summary and policy recommendations

The main focus of this chapter was to determine the influence of financial inclusion (FI) on per capita income or standard of living and income inequality for a set of seven South Asian countries. For this purpose, study has used annual panel data of 15 years from 2004 to 2018. Moreover, this study constructed a new multidimensional FII using availability accessibility and usage indicators of financial inclusion.

Using the FII, first this study tried to find out the major factors that influence the level of FI in seven South Asian economies. The fixed effect estimates indicate that rule of law, education, internet users, GDPpc, and age dependency ratio are all positive influences on financial inclusion. But income inequality and population size have an insignificant relation with financial inclusion. The random effect result show that population size, rule of law, education, ratio of internet users, and age dependence ratio are all positive and have a large impact on financial inclusion. On the other hand, per capita GDP and income inequality have a negative impact on financial inclusion. But to compare the usual fixed effect and random effect estimates, this study then used robust Hausman test. The result accepted the alternative hypothesis of fixed effect model.

This empirical research then examined the effect of *FI on per capita income* and *income inequality* in South Asian countries. The FMOLS and DOLS result confirms that there exists a long-run connection between FI and per capita income or standard of living in South Asian economies. This result implying that financial inclusion has a positive and statistically significant effect on per capita income or standard of living. That means access to finance can increase the living standard of people or per capita income. This study supports Aportela (1999), Jayachandran (2006), Green, Kirkpatrick and Murinde (2006), Dupas and Robinson (2013) work, which shows that inclusive financial system creates knowledge about a person's cash flow by allowing the poor to save. This will help the poor gain access to credit and make high return investments, therefore increasing their profits and income. Furthermore, the development of effective financial related services (such as savings, deposits and loans) and instruments like microfinance provide credit to micro and small business, which will produce more jobs and improve the standard of living.

Again, the results of the FMOLS and DOLS estimates indicate that there exists a long-term connection between FI and income inequality. Further the result indicates that FI have a negative effect on income inequality. That means FI can reduce income inequality in South Asian countries. This study supports Khandker (2005), Mahjabeen (2008), Salazar-Cantu et al. (2015), Zhang and Posso (2019) work, which shows that increase in banking services and access to microfinance contributes to poverty reduction and further it reduces income inequality. These

results support the notion that FI is an important factor to reduce income inequality and increase living standard of people in South Asian economies.

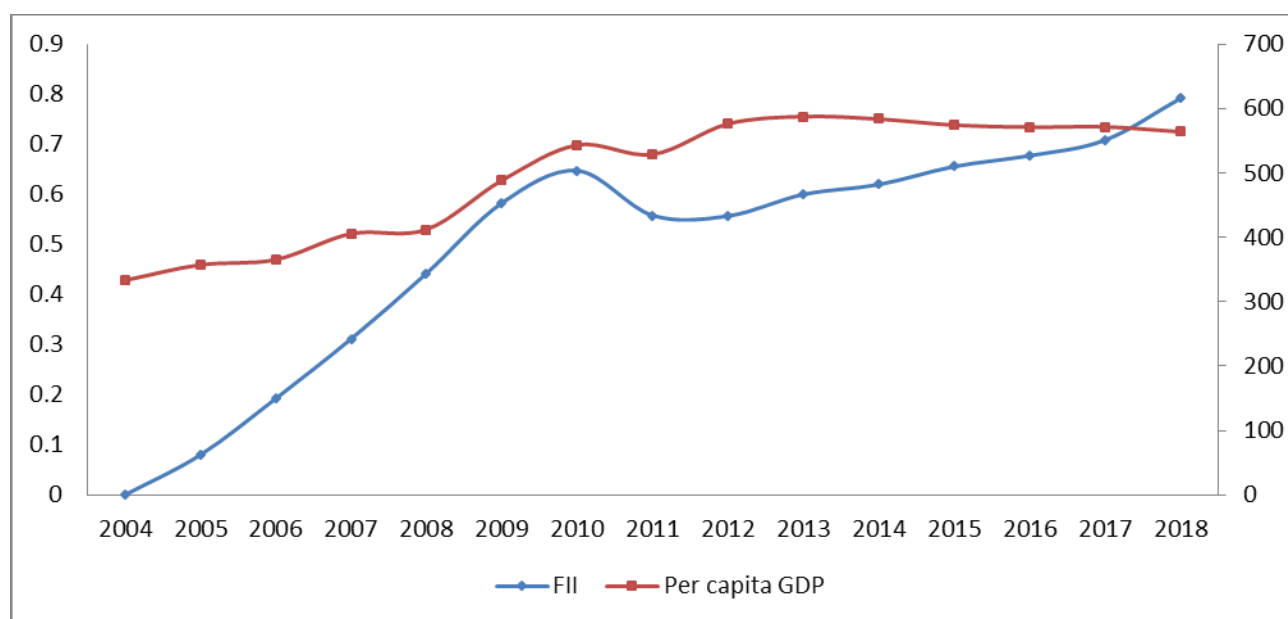
Based on the empirical findings, this study suggests that important policymaking should focus on financial sector reforms in order to increase per capita income or standard of living and reduce income inequality in the long-term. Furthermore, South Asian policy makers must address financially excluded population to achieve inclusive growth.

Appendix

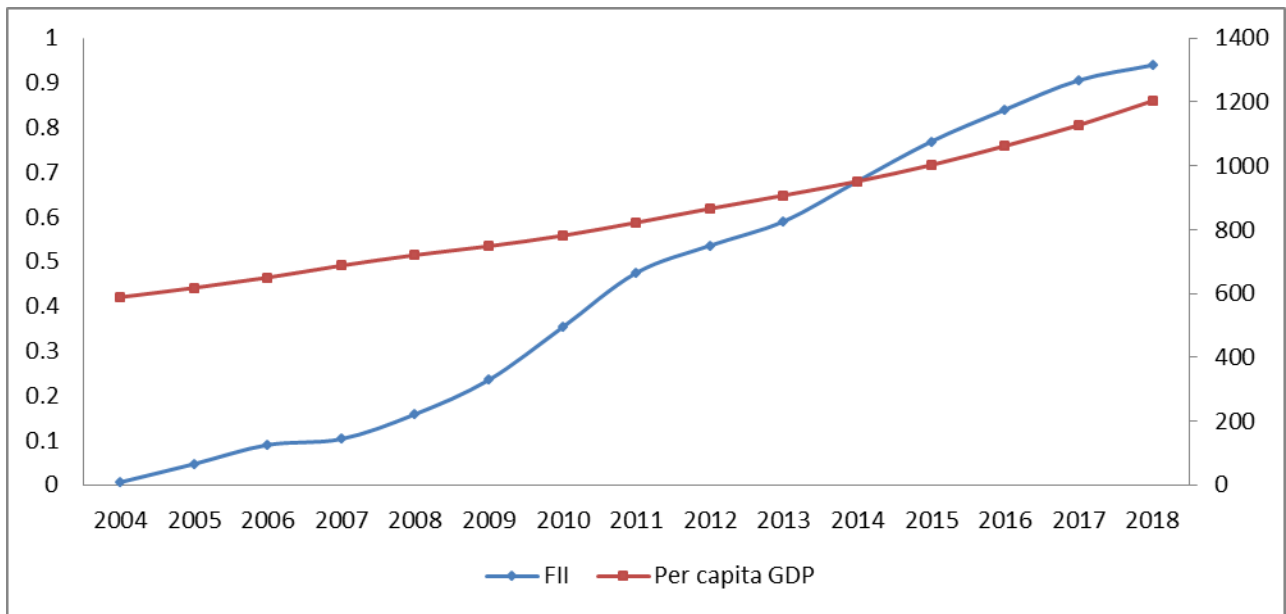
Country-wise comparative statistics: Financial inclusion and living standard of people or per capita income

Figure A.4.1: Financial inclusion index (FII) and per capita GDP in South Asia countries from 2004 to 2018

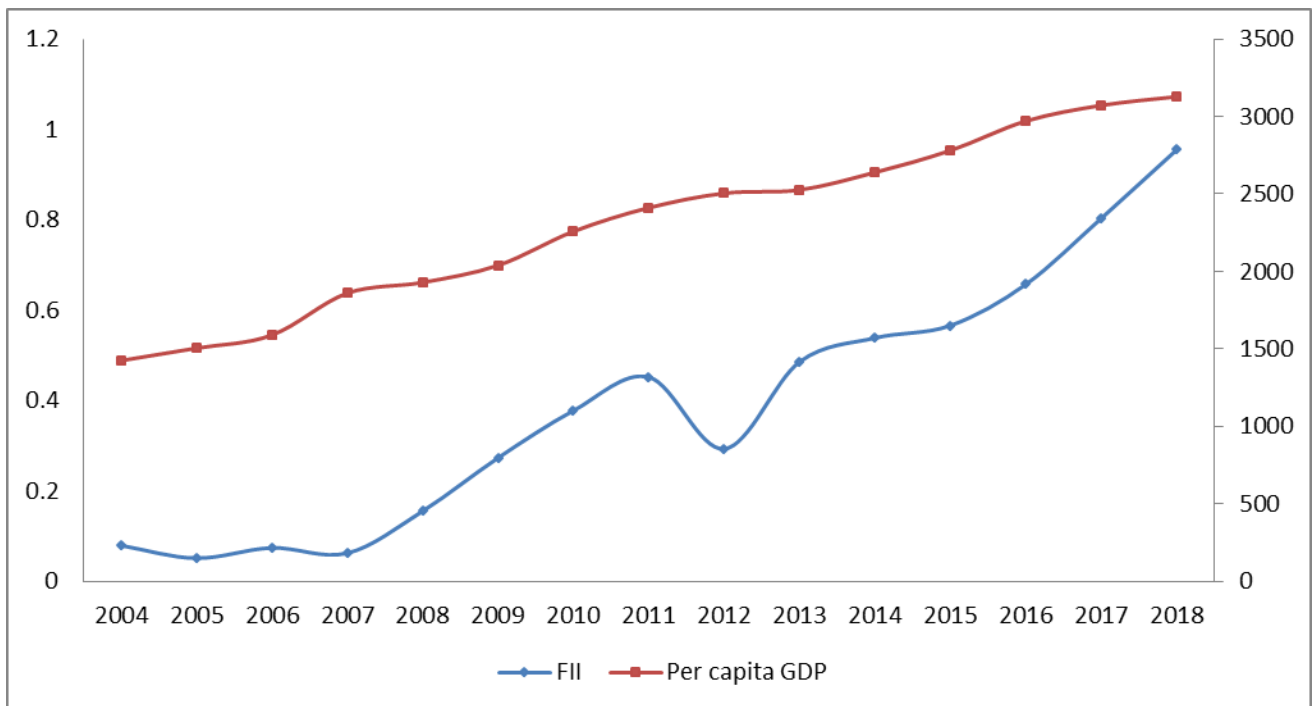
Afghanistan



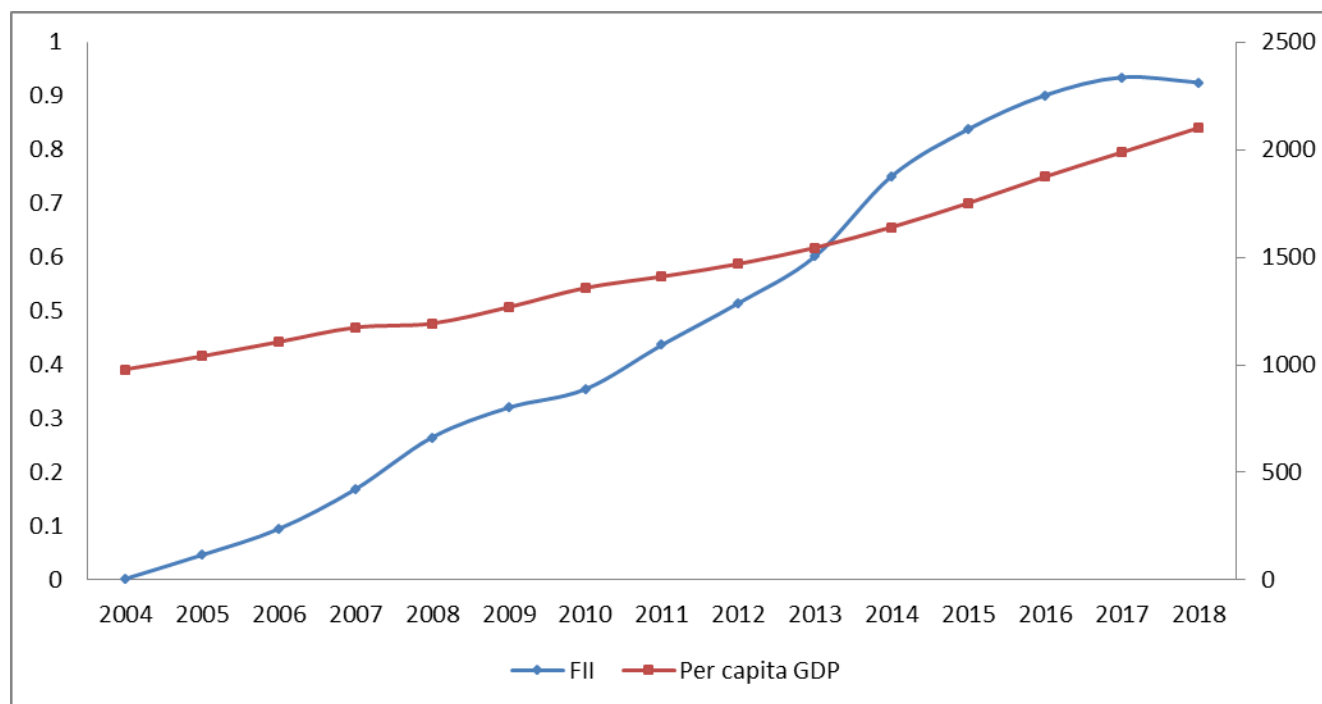
Bangladesh



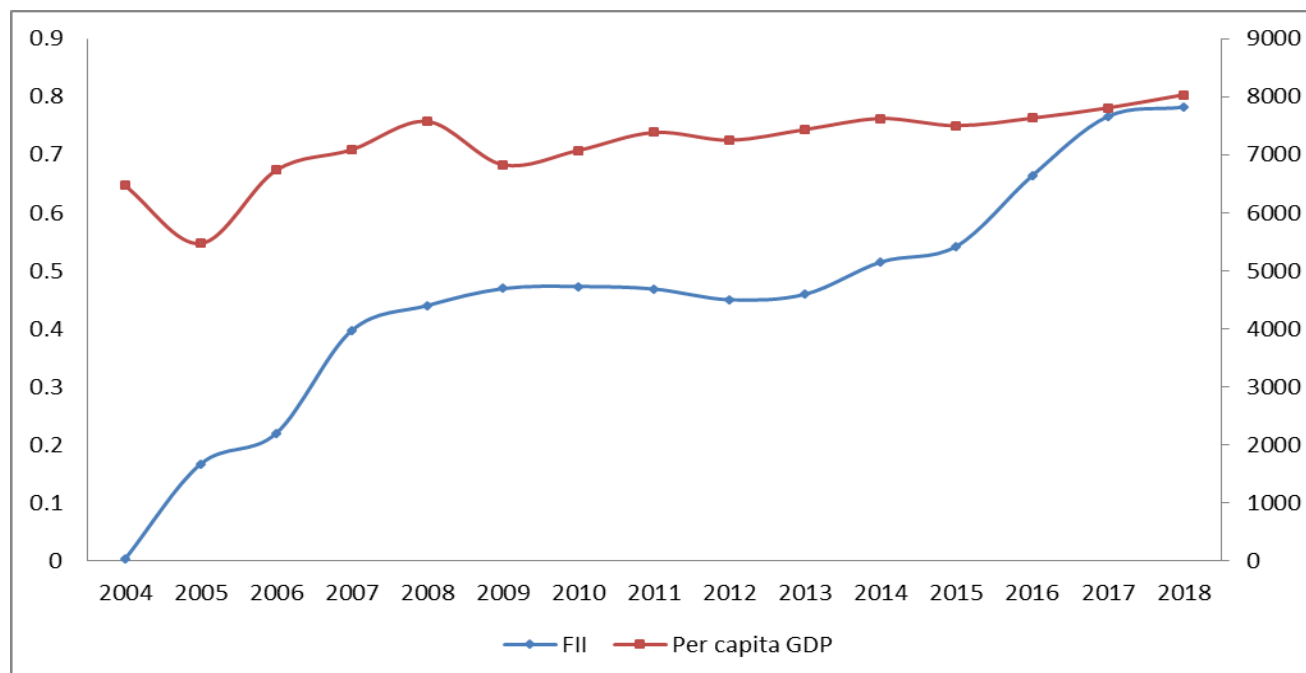
Bhutan



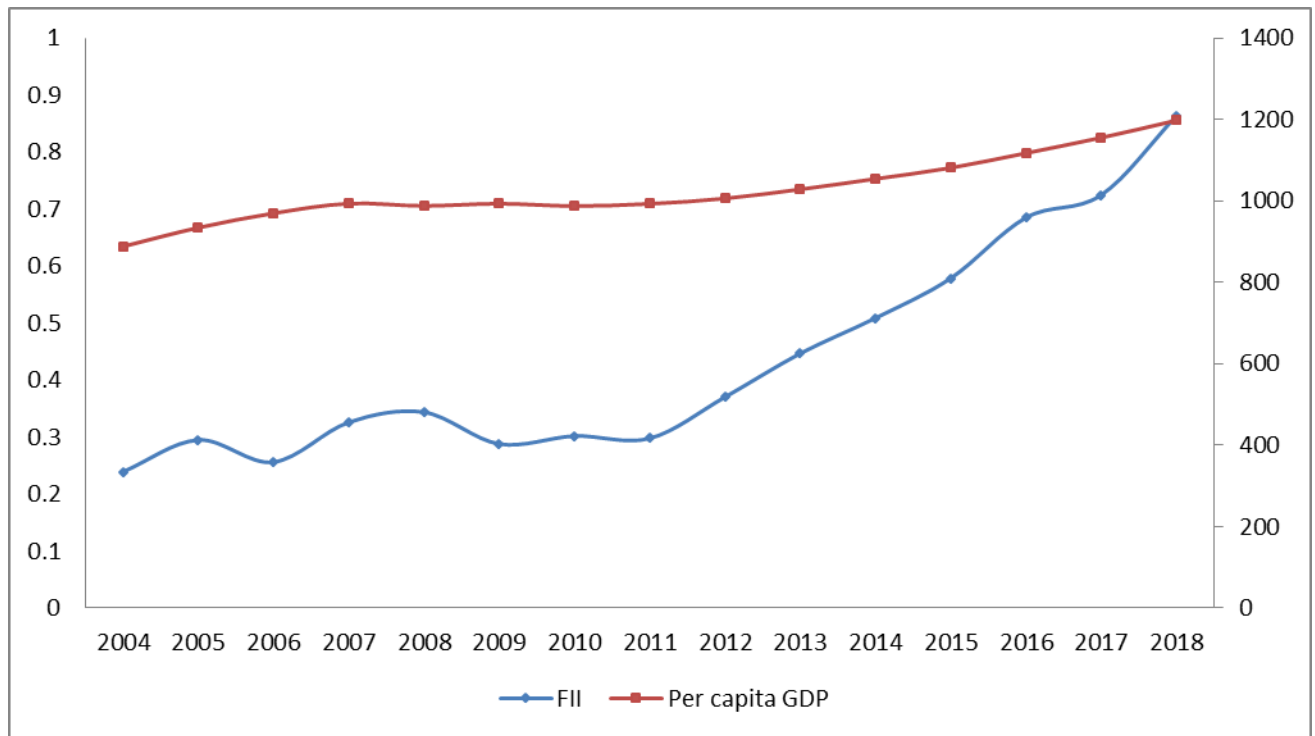
India



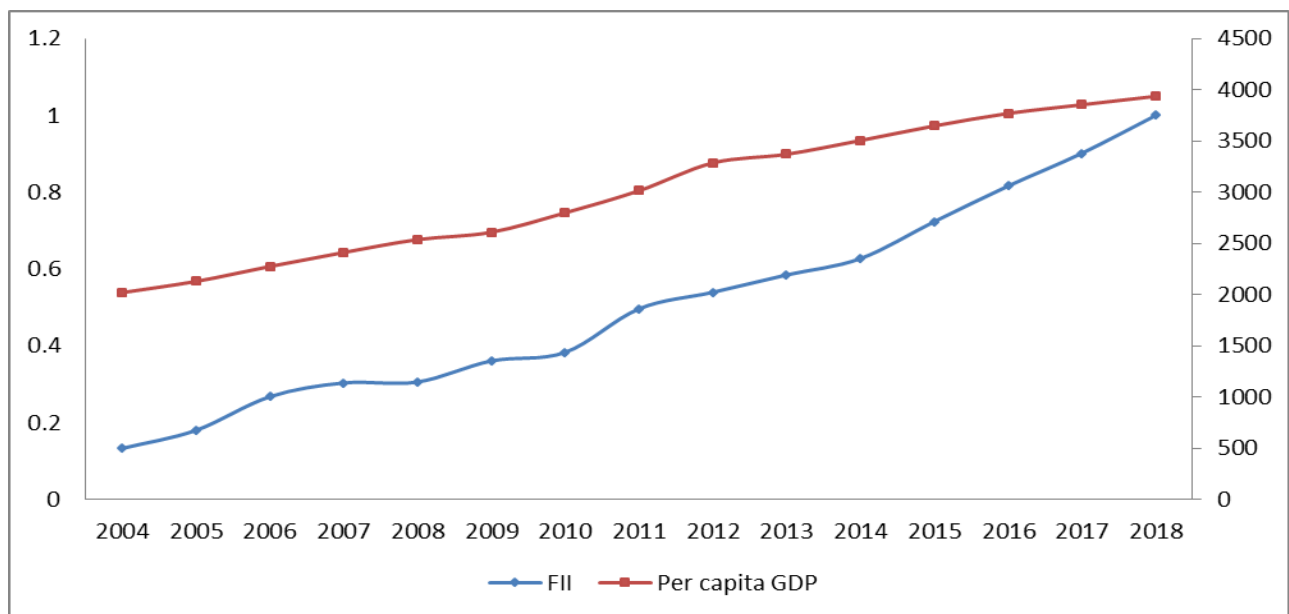
Maldives



Pakistan



Sri Lanka

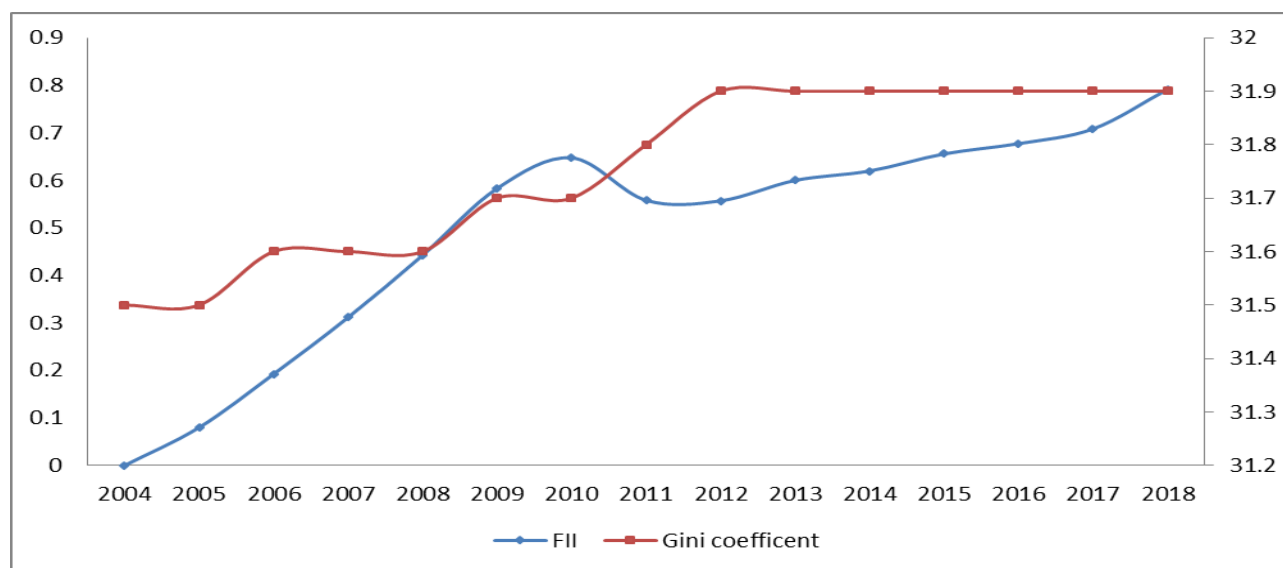


Source: FAS, IMF and WDI, World Bank

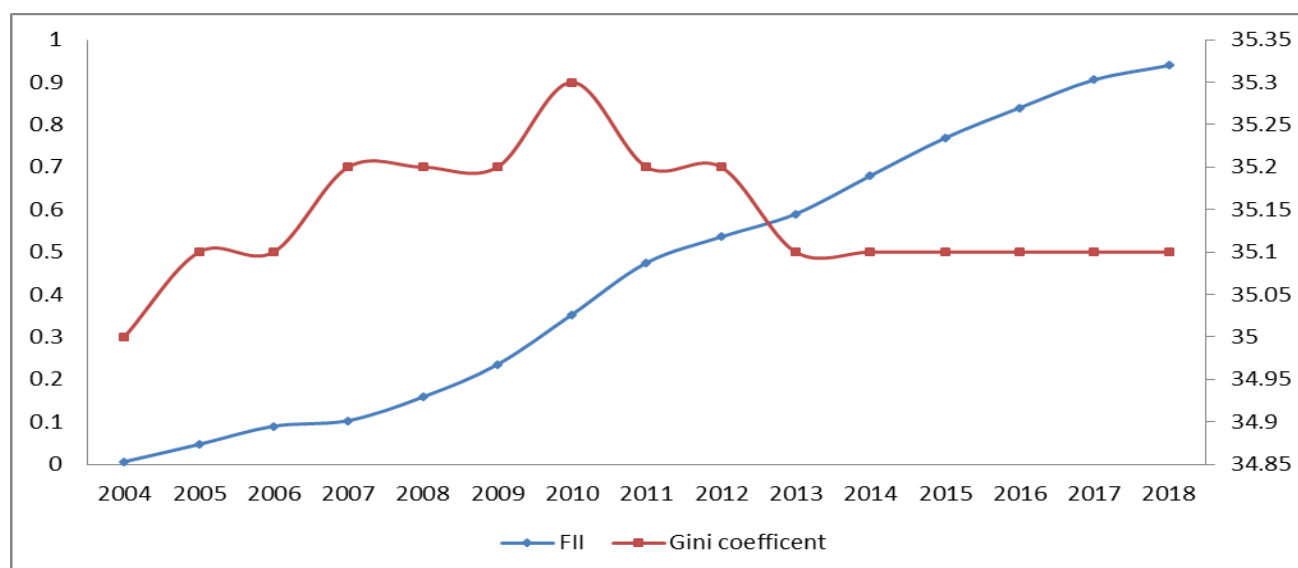
Country-wise comparative statistics: FI and Income inequality

Figure A.4.2: FII and income inequality (Gini coefficients) of South Asia countries from 2004 to 2018

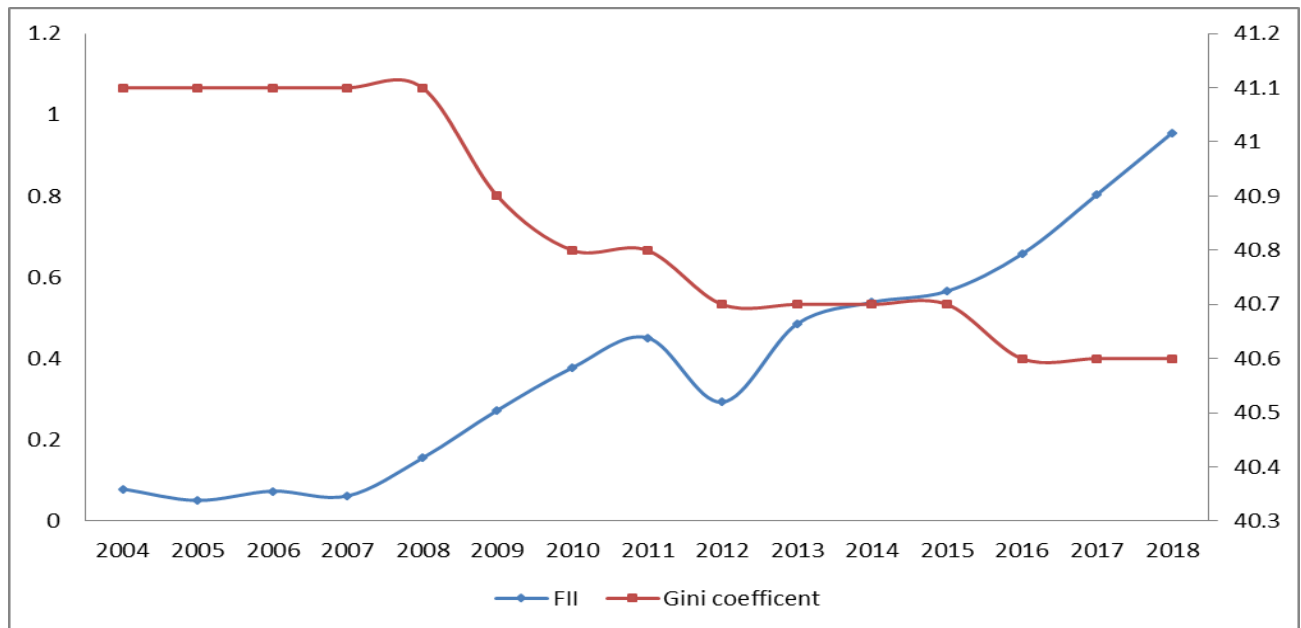
Afghanistan



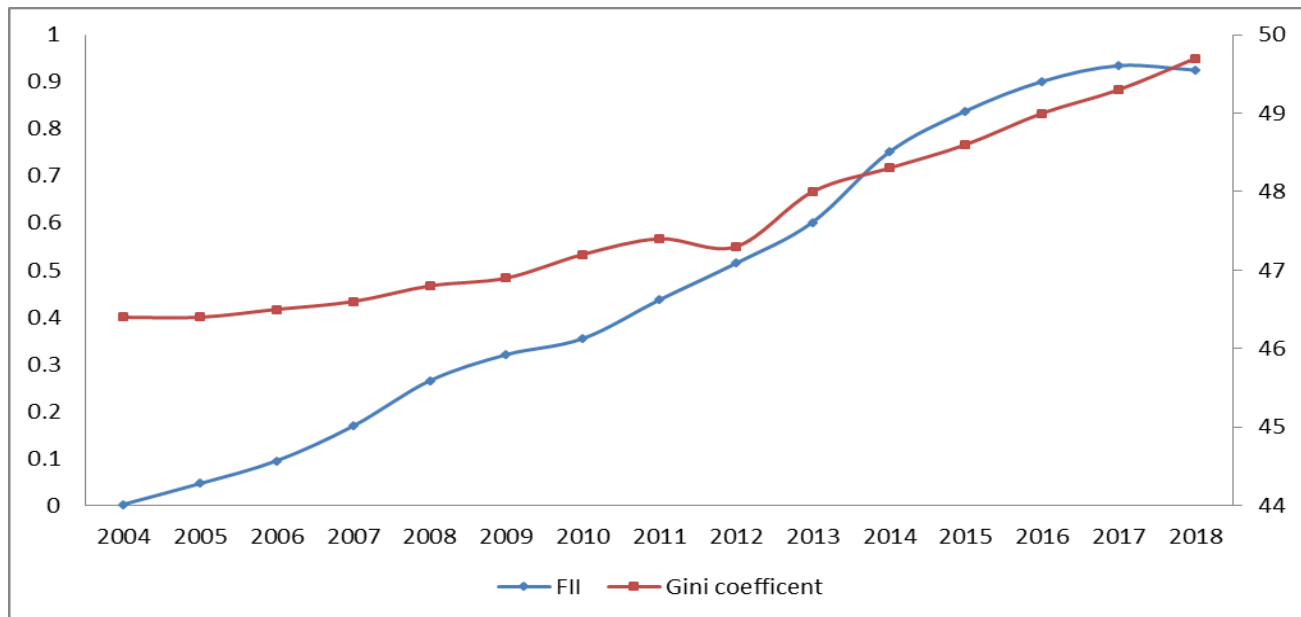
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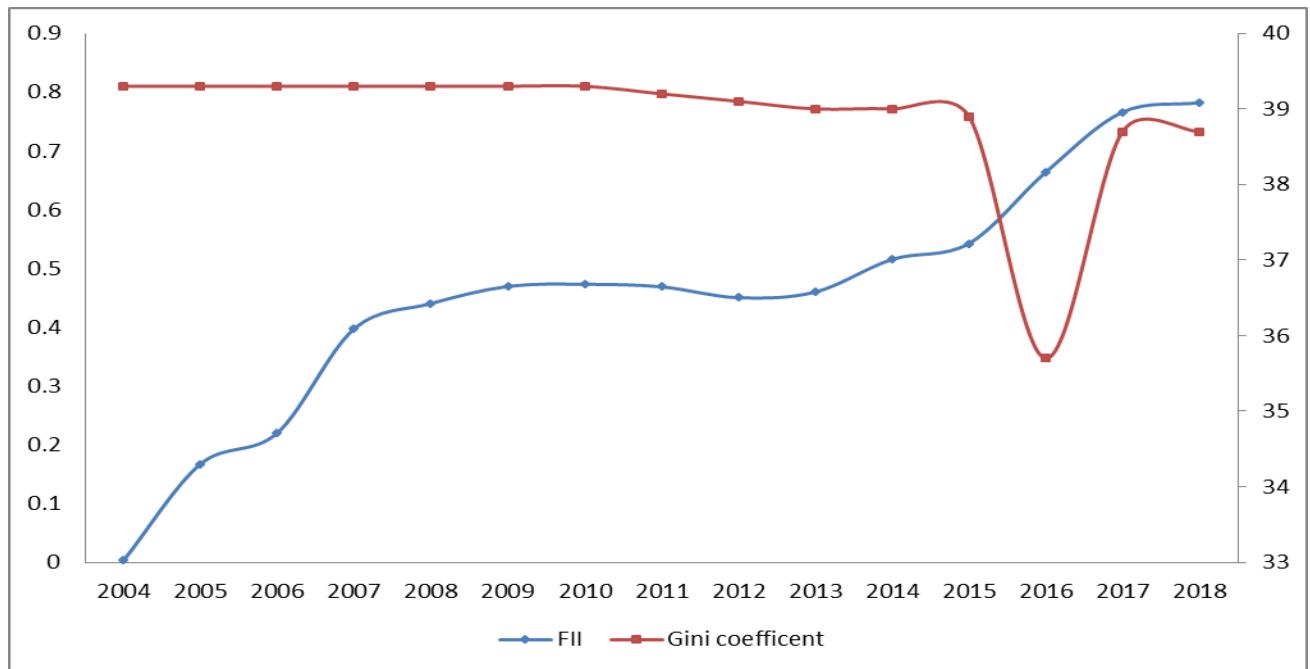
Bhutan



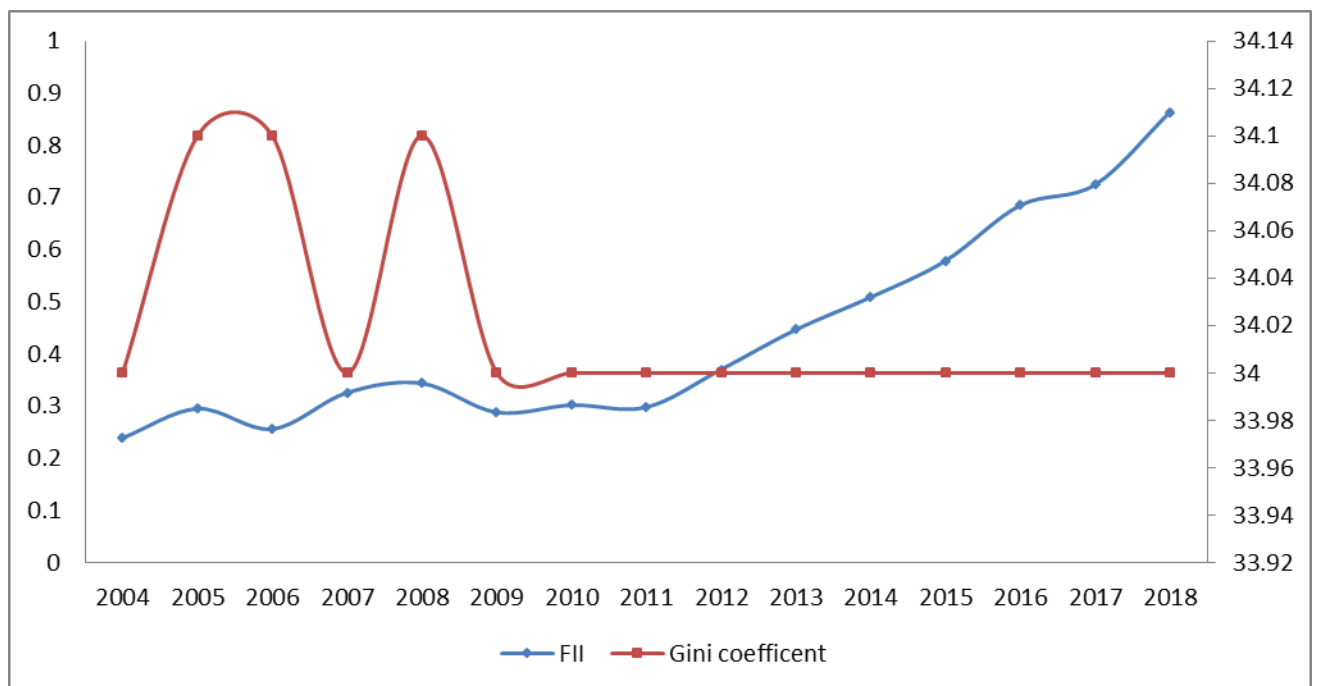
India



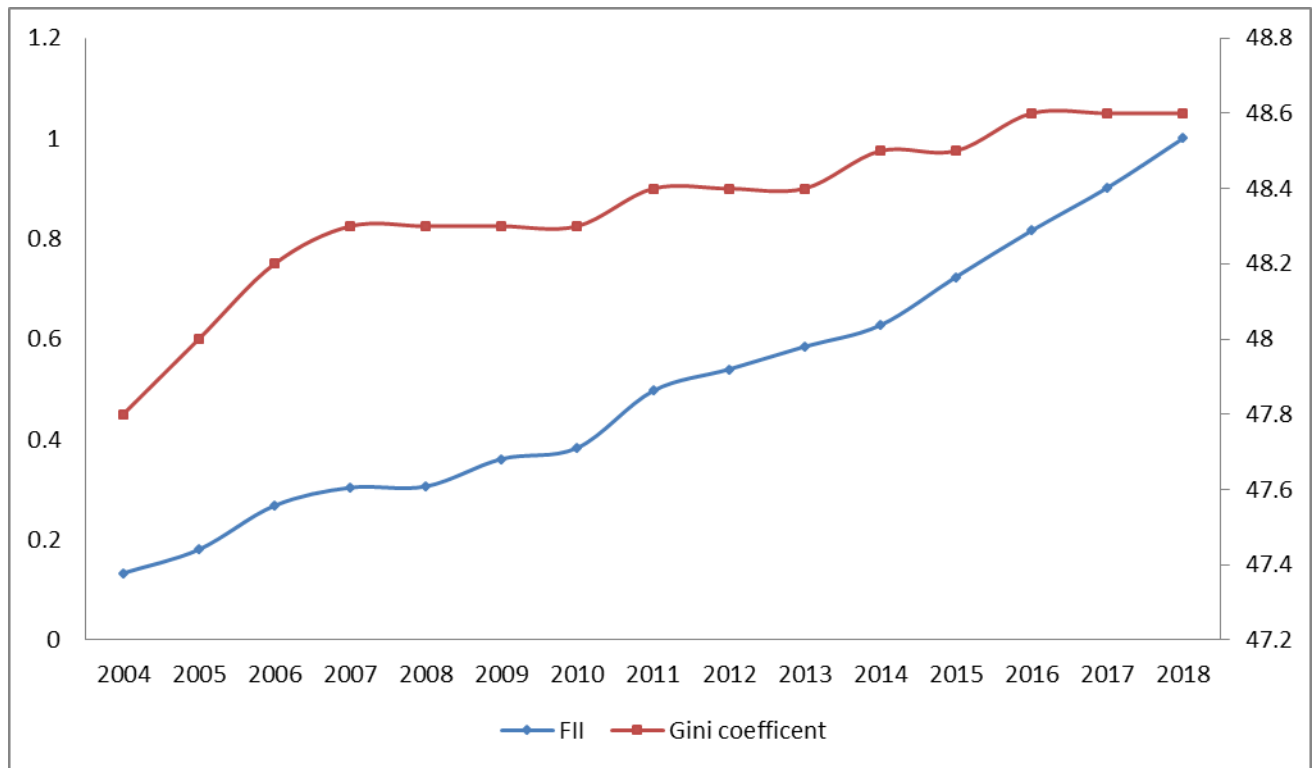
Maldives



Pakistan



Sri Lanka



Source: Authors calculations based on FAS, IMF and SWIID database

Chapter 5

Examining Financial Inclusion-Agricultural Productivity Connection in South Asia Countries: Evidence from FMOLS and DOLS Approaches

5.1 Introduction

Around the globe, agriculture is and will remain to be a key component in the achievement of the Millennium Development Goals. According to one study, agricultural production must increase to 70% by 2050 to feed the world, despite population expansion, climate change, and urbanization putting pressure on available cultivable land (International Finance Corporation and World Bank, 2011). Furthermore, according to GAFSP¹ and World Bank (2007a), agricultural growth is multiple times more effective than any other sector of the economy to reduce poverty.

“Most of the World’s poor people earn their living from agriculture, so if we knew the economics of agriculture we would know much of the economics of being poor” (Shultz², 1979).

Agriculture is the backbone of South Asian economies. It supplies food and jobs to rapidly increasing population and still contributing significantly to overall economic growth. Despite increased focus on industrial growth, agriculture remains a substantial contributor to the country's GDP. Furthermore, the overall significance of the agricultural sector is also strong in South Asian countries, where it makes a major contribution to GDP and is a major source of jobs³. Agriculture sector roughly contribute 20 percent of GDP in India, Bangladesh, Pakistan, and Bhutan, as well as 33.1 percent in Nepal. In India, Bangladesh and Pakistan, agriculture sector hires roughly half of the total work force⁴, 31 percent in Sri Lanka⁵, and highest (i.e. 65.6%) in Nepal, hence these statistics indicating the significance of the agriculture sector in absorbing these countries’ growing labour force.

Maximum theory has recognized the important role of inclusive financial system in agricultural improvement, especially in developing nations. Increasing agricultural productivity is a key

¹GAFP: Global Agriculture and Food Support Program

²<https://www.nobelprize.org/prizes/economic-sciences/1979/schultz/lecture/>

³SAARC Secretariat. *Best Practices in Poverty Alleviation and SDGs in South Asia: A Compendium*; SAARC Secretariat: Kathmandu, Nepal, 2014.

⁴International Labour Organization. *Key Indicators of the Labour Market Database*; International Labour Organization: Rome, Italy, 2015.

⁵Central Bureau of Statistics of the Central Bank of Sri Lanka. *Economic and Social Statistics of Sri Lanka 2014*; Statistics Department: Colombo, Sri Lanka, 2015.

source of achieving a significant reduction in poverty and improving the wellbeing of rural farmers. According to Kuznet (1961), an increase in agricultural productivity, will promote and facilitate industrial growth in a variety of ways. It allows the agricultural sector to supply labour to the non-agricultural sector while also meeting the non-agricultural sector's food demand. It also increases agricultural income and gives rural residents the buying power they need to buy manufactured goods. It allows agricultural sector to provide low price food to industrial workers, thus increasing the industries profitability. Furthermore, the literature has identified a number of factors that affect agriculture growth and productivity, including the environment, productive human capital, GDP, agricultural fertilizer, capital use, trade openness, industrialization, and agricultural terms of trade etc. Despite, inclusive financial system is one of the major factor for agricultural productivity. Financial inclusion allows farmers to invest and accept new agricultural innovations in the agriculture sector, which helps to increase agricultural productivity. It provides money to helpless farmers to purchase agricultural inputs such as fertilizers, pesticides, and seeds, which increase agricultural productivity. Therefore, affordable costs of formal financial services are important to increase agricultural productivity.

In general, higher agricultural productivity can help developing countries reduce poverty and improve food safety, which requires farmers to have access to formal financial services in order to adopt higher-quality technologies (Bashir et al., 2010). There are many research scholars who believes in a positive linkage between banking products and productivity (Awunyo-Vitoret al. 2014a). In addition, various research scholar(Sial et al., 2011; Baffoe et al. 2014; Chandio et al. 2016a; Chandio et al.2016b), studied the effect of agricultural finance on agricultural productivity in different counties around the world and their study evidence that agricultural finance had a favorable effect on agricultural productivity.

The remaining sections are prepared as follows: Section 2 is on the theory, review of literature and research gap. Section 3 reveals the theoretical argument between financial inclusion and agricultural productivity. Section 4 presents a brief agrarian history and formal financial services in South Asian countries. Section 5 presents construction of the multidimensional financial inclusion index. Section 6 presents model specification. Section 7 presents variables and data sources. Section 8 presents empirical methodology. Section 9 explains empirical results and analysis, and Section 10 presents conclusion.

5.2 Theory and review of literature

5.2.1 *Agrarian credit market structure in South Asian countries*

Rural finance markets in developing countries are characterized by the coexistence of formal and informal lending markets (Barslund and Tarp, 2008; Boucher and Guirkinger, 2007; Anderson and Malchow-Moller, 2006; Hoff and Stiglitz, 1990). Hart was the first person who coined the term ‘informal sector’, i.e., non-institutional agencies (Hart, 1971).

According to Badiru (2010) there are three types of financial institutions: (i) formal financial institutions (i.e. microfinance institutions, commercial banks, and government-owned credit organizations), (ii) Semi-formal institutions (i.e. NGO-MFI), and (iii) Informal institutions (money lenders and credit associations). Bell (1990), money lenders are still a large source of loans for farmers in India. Rajeev and Deb (1998) conducted a study on the agriculture credit structure in Hugh district in West Bengal. According to them, small and medium farmers depend heavily on the informal credit market and finally, they came to the conclusion that the informal credit market provides credit for farmers to purchase fertilizers and pesticides, thereby meeting their working capital needs. Around 39 percent of the total credit necessity of agricultural were met by institutional agencies or formal sources of which, commercial banks share was a merger one percent and the rest being that of the cooperatives recording 38 percent (Satish, 2007).

Puhazhendhi and Mohandoss (1998) conducted a study on the institutional credit structure and its effect on agricultural development. They found that the institutional credit structure had a strong growth performance and credit enabled farmers to obtain capital than they needed for production.

The structure of cooperative credit in India is divided into two categories such as (i) agricultural credit (they provide short term, medium term and long term credit) (ii) non-agricultural credit. NABARD promotes agricultural and rural prosperity in India by providing effective credit support, institution development, and other creative initiatives. The deterioration in the status of the rural credit system, according to Majumdar (2002), is not due to default, but rather to design. In India, formation of Self Help Groups (SHGs) will ensure the highest level of satisfaction for the poor in a credit programme by providing employment and economic empowerment to rural

women who do not have access to formal financial institutions (Human Development Center, 2004).

Rural borrowers are not appealing to formal financial institutions because they are unable to meet the minimum necessities and are regarded as high risk borrowers (Onumah, 2003). According to Agnet (2004), small-scale farmers have the least understanding of the complicated system of commercial banking, which limits their access. The constraints found by Rahji and Fakayode (2009) are incomplete and costly knowledge issues in financial markets, credit rationing approaches, and banks' perception of rural or agricultural credit as a high-risk venture.

5.2.2 *Linkages between credit and agricultural productivity*

It is impossible to underestimate the importance of credit in agricultural production. As per the view of Carter and Weibe (1990), ex-ante credit access is used to cover important manufacturing cost such as labour and purchase inputs that should have been paid ex-ante, or before the actual production of the product. On the other hand, credit obtained after the completion of a production process, is particularly important as many low income agriculture based economy lacks a proper insurance market.

Feder et al. (1989) examined the agricultural finance and farm performance in China based on the china's farmer surveys data. According to their findings, availability of credit may have an impact on agricultural productivity because farmers who are short on money may employ lower levels of agricultural inputs in their production activities.

South Asian governments, like many other developing countries, used to subsidize agricultural credit through specialized banks; results found are unsatisfactory and unsustainable with massive default rates, poor performance of specific banks, and credit being distributed to wealthier borrowers. The reasons behind for failure of past credit disbursement programmes are found in some research work such as big landlords use formal credit unproductively (Khandker and Faruquee, 1999), a culture of non-repayment increases due to political favor (Nagarajan and Mayer, 2005), highly funded interest rates (Khandker and Faruquee, 1999; Harper, 2005; Christen and Douglas, 2005; Nagarajan and Mayer, 2005).

Various research scholar studied the effect of agricultural finance on agricultural productivity in different nations around the globe (such as Sial et al., 2011; Chandio, et al. 2016), and their study evidence that agricultural finance had a favorable effect on agricultural productivity. Furthermore, some research scholar also found a positive connection between micro-credit availability and farm outcomes (such as Petrick, 2004b; Blancard et al., 2006; Guirkingner and Boucher, 2008; Dong et al., 2012; Ciaian et al., 2012). As a result, agricultural productivity can be increased by ensuring that credit is available when it is required, this allowing farmer to buy agricultural inputs such as fertilizers, pesticides, high yield seeds, and advance agricultural equipment.

5.2.3 Nexus between financial inclusion (FI) and agricultural productivity

The mission of increasing agricultural productivity has been a dream the beginning of agriculture, and it remains to despite technological progress. However, other sectors such as mining, services, and manufacturing have been remarkable development, but most developing countries still have low agricultural productivity. Finance is the backbone of Agriculture, which has a huge impact on the incentive to produce. Furthermore, empirical evidence confirms that credit accessibility is more important than subsidized interest rates, with the banking sectors growth having a greater effect on agricultural production through increased fertilizer use than increased investments (Binswanger et al 1993). This explanation indicates that increased agricultural investment will significantly improve the well-being of the majority of the World's population.

Laha and Kuri (2014) examined the connection between FI and agricultural productivity based on the primary data of rural West Bengal. Finally, their study concluded that financial inclusion could increase agricultural productivity through multiple impacts on cropping patterns, cropping intensity and irrigation intensity, etc.

Maitra et al. (2014) theoretically and critically examined the role of FI for agricultural growth. They suggested that to increase rural financial inclusion which further increases agricultural incomes and productivity through modify the existing microcredit model.

Awunyo-Vitor, et al. (2014) examined the effect of formal financial market participation on farm inputs expenditure. Their study was based on the primary data of 595 maize farmers in Ghana and they used the propensity score matching (PSM) method. The study concluded that formal financial market participation has significantly increased expenditure on agricultural inputs and improved technology which further increases agricultural productivity.

Using the ARDL approach, Olaniyi (2017) investigated the effect of FI on agriculture based on the time series data of Nigeria from 1981 to 2014. He concluded that the usage of banking products has a positive effect on agriculture in short and long run.

Onoja (2017) examined the financial sector development and agricultural productivity based on 115 countries from 1991 to 2013. To check whether the errors are linked to the regressors, he used the Hausman test. His study reveals that agricultural finance has a positive influence on agricultural production in 75 developing economies but positive and minor impact in developed countries. Awunyo-Vitor (2018) concluded his study with some suggestions that both quantitative and qualitative analyses are essential to identify variables influencing access to banking products and its effect on farmer's productivity.

A study conducted by Zakaria et al. (2019) on agriculture productivity from 1973 to 2015 in South African countries. They used a cross-sectional dependence test, panel co-integration test, and panel unit test to find out the impact of financial development on agricultural productivity. Finally, they came to the conclusion that financial development plays a vital role for the improvement of agricultural productivity. Agbodji and Johnson (2019) investigated agricultural credit on agricultural productivity based on the National Census of Agriculture of Togo from 2012 to 2013. They used PSM and ESR method. They confirm that agricultural credit has a positive influence on cereals in Togo.

Increased agricultural productivity and income of farmers are linked to the availability or accessibility of finance. According to Nathan Associates⁶ (2015), financial inclusion can have a two-fold effect on agriculture: *first*, it can *increase agricultural productivity*. Credit delivery makes it easier to buy agricultural inputs and hire workers and machinery, which helps to

⁶Nathan is a private multinational economic and analytics consulting company that provides realistic solutions and long run results to government and commercial clients around the world.

increase agricultural productivity. *Second*, finance makes it easier for farmers to diversify their livelihoods and raise their profits

Nakano and Magezi (2020) examined the effect of microcredit on agricultural productivity based on baseline survey data in Tanzania. They estimated the intention-to-effect (ITT) and LATE of microcredit. According to their findings, increasing banking products access alone may not be enough to boost small-scale farmers' agricultural productivity because other factors are also responsible for agricultural productivity.

A recent study conducted by Fowowe (2020) on the association between FI and agricultural productivity for 2010-2011, 2011-2013, and 2015-2016 in Nigeria. He used simple panel data estimation and his empirical results reveal that FI has a positive influence on agricultural productivity. Atakli and Agbenyo (2020) used Ghana Living Statistical Survey and OLS and multiple regression models. Their result confirms that FI has a positive association with agricultural productivity. Using dynamic panel model, Shuaibu and Nchake (2021) concluded that advanced credit market conditions positively contribute more agricultural productivity in Sub-Saharan Africa.

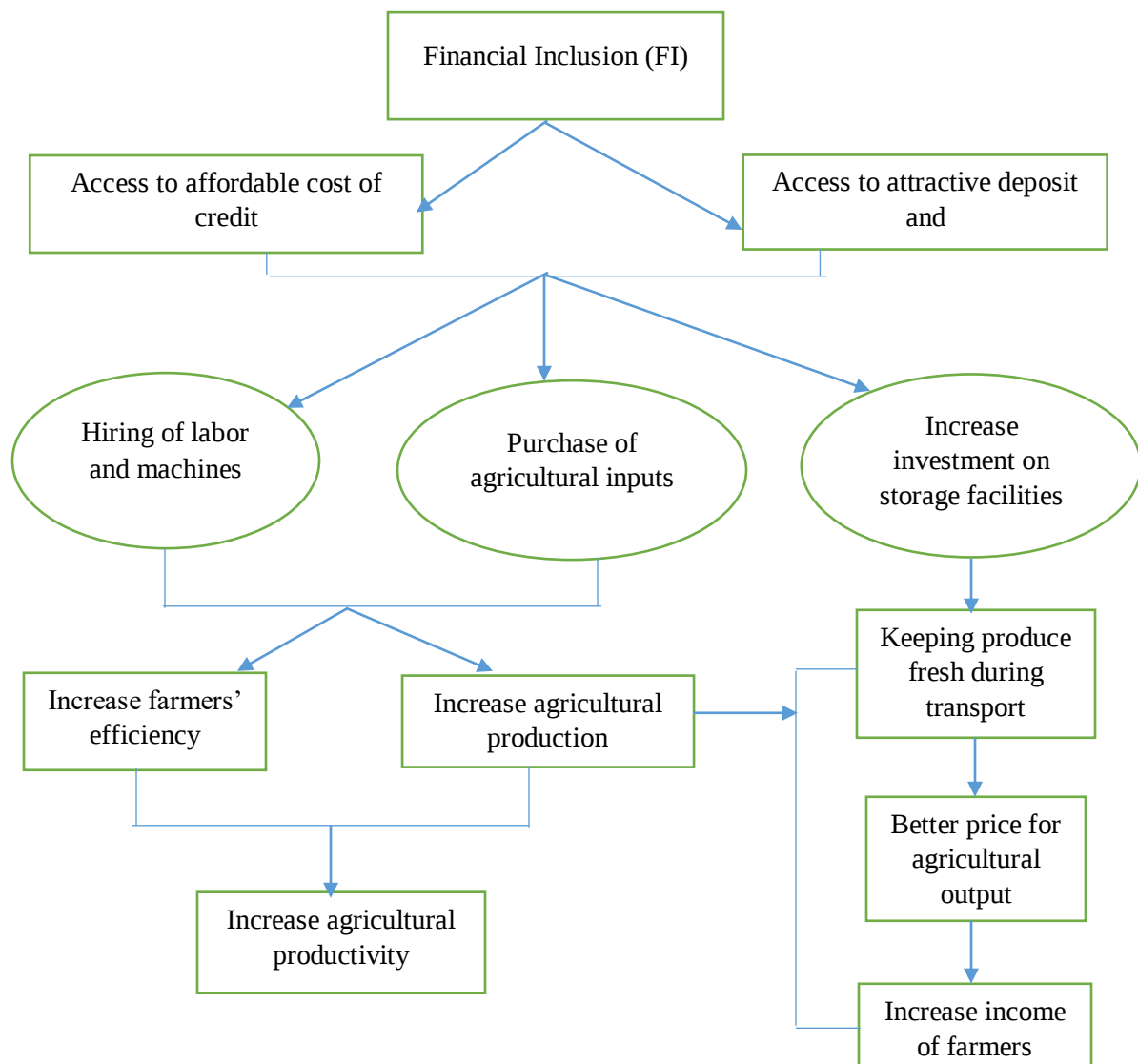
5.2.4 Research gap

Empirical research on the linkages between financial inclusion and agricultural productivity in South Asian economies is scarce and none exists to the best of the authors' knowledge. This means that there is already a gap that needs to be filled.

Few researches have been conducted in South Asia countries to find out the influence of agricultural credit on the agricultural sector. These research were carried out for specific countries, i.e. Afghanistan (Saiti et al. 2018; USAID 2018; Moahid and Maharjan 2020), Bangladesh (Navin 1988; Rahman et al. 2011; Alauddin and Biswas 2014; Sarker et al. 2015; Khandker and Koolwal 2015; Patwary 2017), Bhutan (Hussein 2009; Pathak 2010; Banerjee and Duflo 2010; Gyeltshen 2012; Wang et al. 2019;), India (Sidhu et al. 2008; Das et al. 2009; Kumar et al. 2010; Narayan 2016; Misra et al. 2016, Chavan and Sivamurugan 2017), Pakistan (Iftikhar et al. 2017; Shahbaz et al. 2013;Iqbal et al. 2003). But, these researches have not examined the influence of financial inclusion on agricultural productivity. Furthermore, no

research has been performed for the entire region of South Asia. This research aims to close that research gap. *First*, this study constructed a FII and investigates the effect of financial inclusion on agricultural productivity in South Asian countries using Pedroni cointegration to check long-run among considered variables, FMOLS and DOLS approach to show the long-run connection between independent variables and dependent variables for the period 2004 to 2018.

Figure 5.1: Linkages between financial inclusion and agricultural productivity



Source: Designed by the author based on the available literature

5.3 Nexus between financial inclusion and agricultural productivity: Theoretical argument

In recent times, FI has been playing a vital role for agricultural productivity (Nathan Associates, 2015). Furthermore, greater access of formal financial services or banking services has a positive influence on agricultural productivity (Laha and Kuri, 2013; Nakano and Magezi, 2020; Fowowe, 2020). A theoretical connection between FI and agricultural productivity is explained in Figure 5.1. Figure 5.1 indicates that financial inclusion can help to boost agricultural productivity through access to affordable cost of credit and, access to attractive deposit and insurance products. The following is how the logic works. Access to affordable and low cost of credit facilitates the purchase of agricultural inputs (such as agricultural equipment, fertilizer, quality seeds) and employing labour, which in turn increase farmer's efficiency and increase agricultural productivity.

5.4 A brief agrarian history of South Asian countries

In South Asian countries, majority of the population still depends on agricultural sector. Over 70 % of the population lives in rural areas, the most of whom depend on the natural resources that surrounded them- freshwater, land and coastal fisheries. Since a large part of agriculture in South Asia is rain fed, so there is a major dependence on seasonal rains. Because of this dependence, heavy rainfall, no rainfall, too early, too late- these types of changeability predicted to increase as global temperatures rise- will have significant impact on the country's agricultural production.

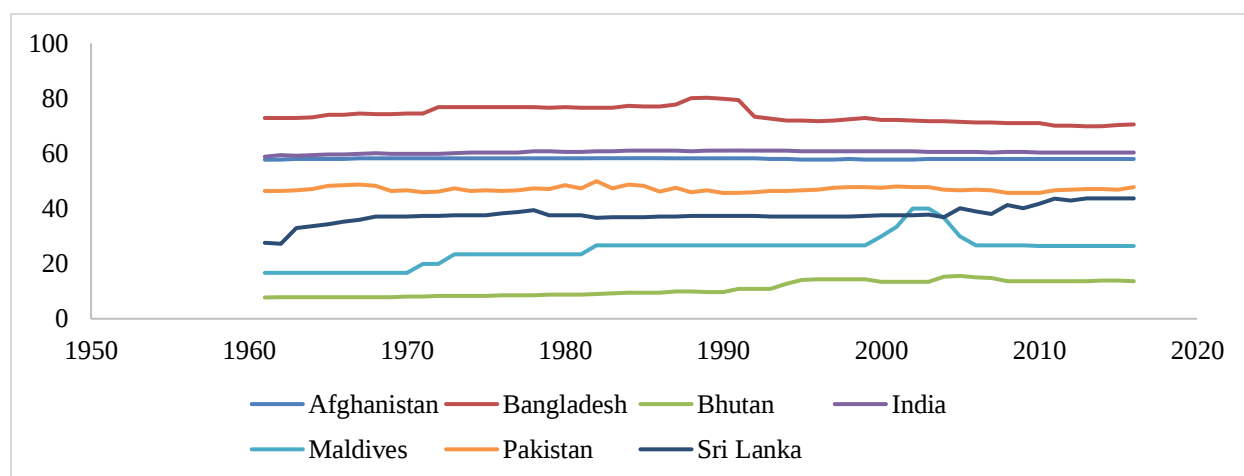
5.4.1 Overview of agricultural sector in South Asian countries

Agriculture sector has been playing an important role for every country's economy in the World. In addition, agriculture sector can significantly contribute to increasing farm income, creating jobs opportunities in rural regions and meeting the food requirement. Some of the indicators plotted in Figures 5.2, 5.3 and 5.4 provide a clear picture of recent developments in the agriculture sector in South Asian countries.

These figures show the agriculture land (percentage of land area), employment in agriculture (percentage of total employment) and agriculture, forestry and fisheries as a percentage of total value added. Figure 5.2 reveals that the growth rate of agriculture land (percentage of land area) in Afghanistan, India and Pakistan remain constant but agriculture land in Sri Lanka and Bhutan are increasing from 1960 to 2019. Furthermore, growth rate of agriculture land in Bangladesh

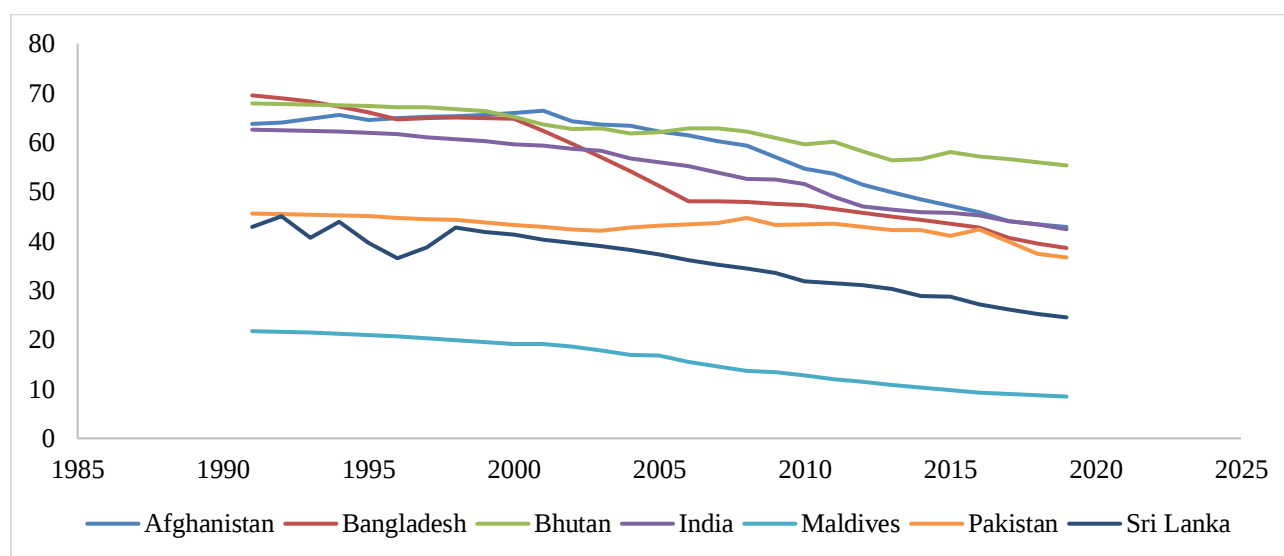
has been increasing from 1980 to 1990 and in Maldives, agriculture land increasing from 1970 to 2000.

Figure 5.2: Agriculture land (% of land area)



Source: World Development Indicator (WDI)

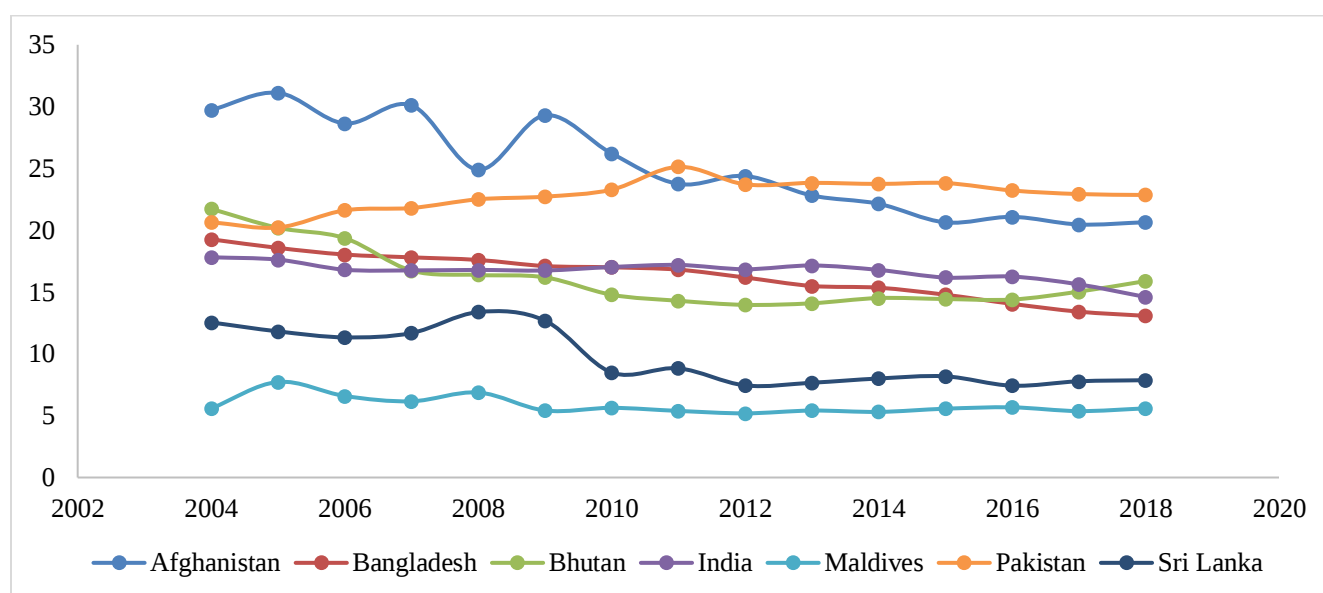
Figure 5.3: Employment in Agriculture (% of total employment)



Source: World Development Indicator

Figure 5.3 reveals that the total number of people employed in agriculture sector across select South Asian countries from 1990 to 2019. Over this period and in particular since 1995, we have seen an overall decline in agriculture employment in all South Asian countries. This result may be due to the rapid growth of industrialization and urbanization in South Asian countries. The percentage of value added in forestry, agriculture and fishing have been declined in Afghanistan, India and Bangladesh from 2010 to 2018 and increased in Maldives, Pakistan, Sri Lanka and Bhutan from 2012 to 2018 (for details see Figure 5.4).

Figure 5.4: Agriculture, Forestry and Fishing, Value added (% of GDP)



Source: WDI

5.4.2 Sources of agricultural credit in South Asian countries

The rural credit market in South Asia is a dynamic and complex subject. All the agencies in the rural credit market can be grouped into: (1) Institutional agencies (formal sector) and (2) Non-institutional agencies (Informal sector).

Afghanistan

In Afghanistan, just 20 percent citizens participate in formal banking, with remaining 80 percent excluded due to religious concerns. Recently, 7 out of the 17 banking institutions used the

window system to sell Islamic financial goods, primarily through Murabahah (mark-up sale), Ijarah (leasing), Mudarabah (profit sharing) and Musharakah (partnership) in Afghanistan (Saiti et al. 2018).

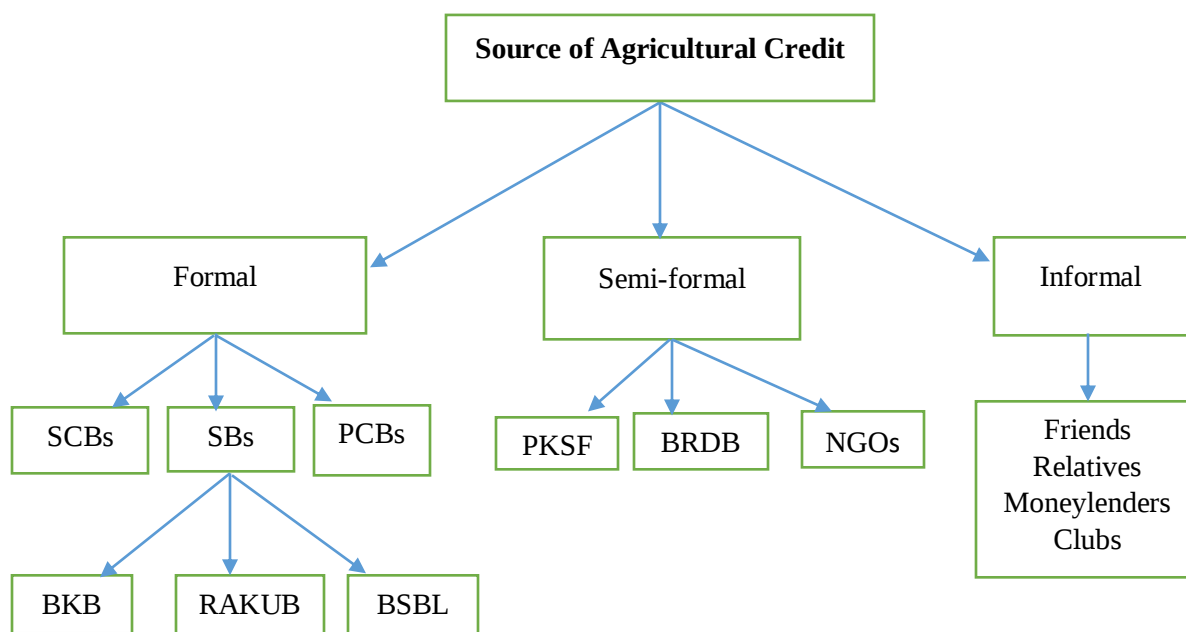
Table 5.1: Sources of Agricultural credit in Afghanistan

Institutional sources	Non-institutional sources
1. Commercial Banks (Afghan United Banks, Bakhtar Bank, Ghazarfar Bank) 2. Co-operatives 3. Microfinance Institutions (MFIs)	1. Money lenders 2. Traders and commission agents 3. Relatives

Bangladesh

Bangladesh Krishi Bank is the prime source of agricultural credit. In addition, formal and semi-formal credit sectors are playing a significant role in rural economic development by generating growth and providing employment through agricultural credit disbursement.

Figure 5.5: Sources of agricultural credit in Bangladesh



Notes: SCBs = State Owned-Commercial Bank, SBs = State Banks, PCBs = Private Commercial Banks, BKB = Bangladesh Krishi Bank, RAKUB = Rajshahi Krishi Unnayan Bank, BSBL = Bangladesh Samabay Bank Limited (BSBL), PKSF = Palli Karma Sahayak Foundation, BRDB = Bangladesh Rural Development Board, NGOs = Non-Governmental Organization

Source: The Report of World Bank, 1996

Bhutan

In Bhutan, out of five commercial banks (Bank of Bhutan, Bhutan National Bank, Bhutan Development Bank (BDB) Limited, Druk PNB Limited, and T-Bank Limited) today, only BDB is involved in active credit lending to agricultural sector. Bhutan's financial sector is small and offers a limited range of financial products and services. Just two commercial banks exist in Bhutan. The Bank of Bhutan plays an important role for agricultural sector development such as irrigation project (Hussein, 2009).

Table 5.2: Sources of Agricultural credit in Bhutan

Institutional sources	Non-institutional sources
1. Commercial Banks (Bhutan National Banks and Bank of Bhutan) 2. Co-operatives 3. Bhutan Development Finance Corporation 4. Royal Insurance Corporation of Bhutan	1. Money lenders 2. Traders and commission agents 3. Relatives

Figure 5.6: Institutional sources of agricultural credit in India

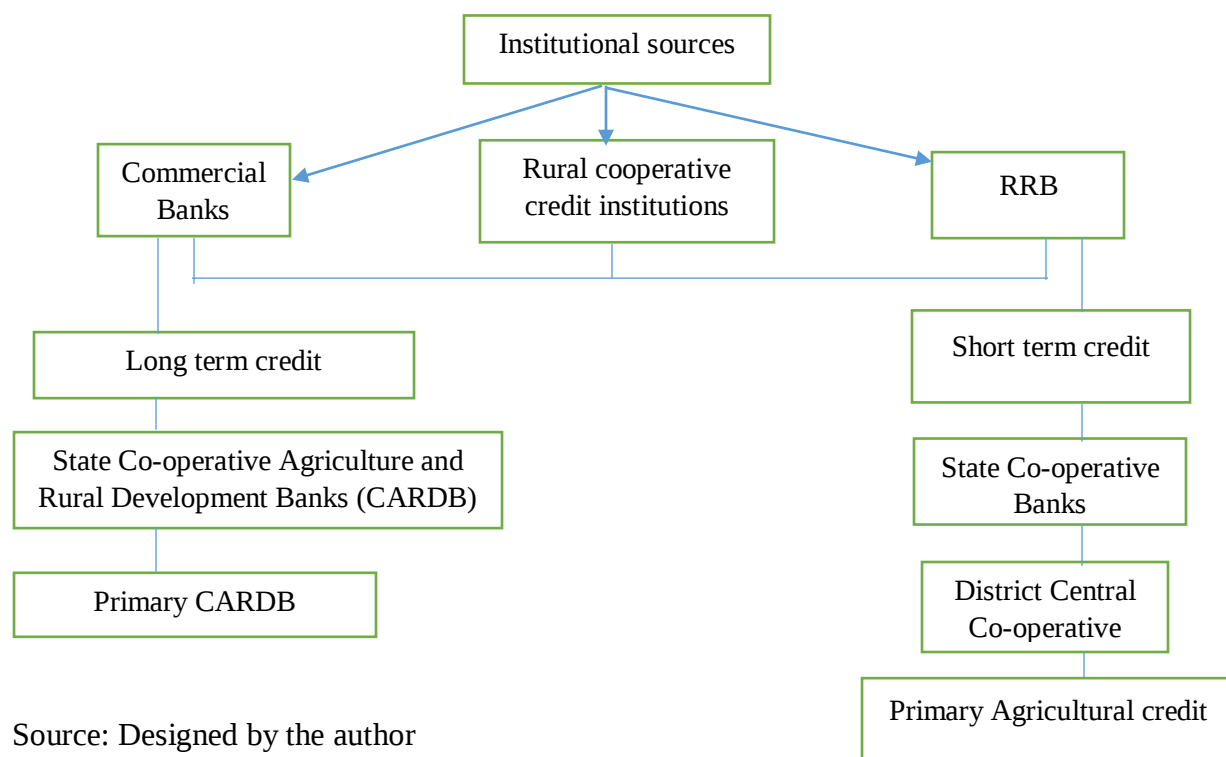
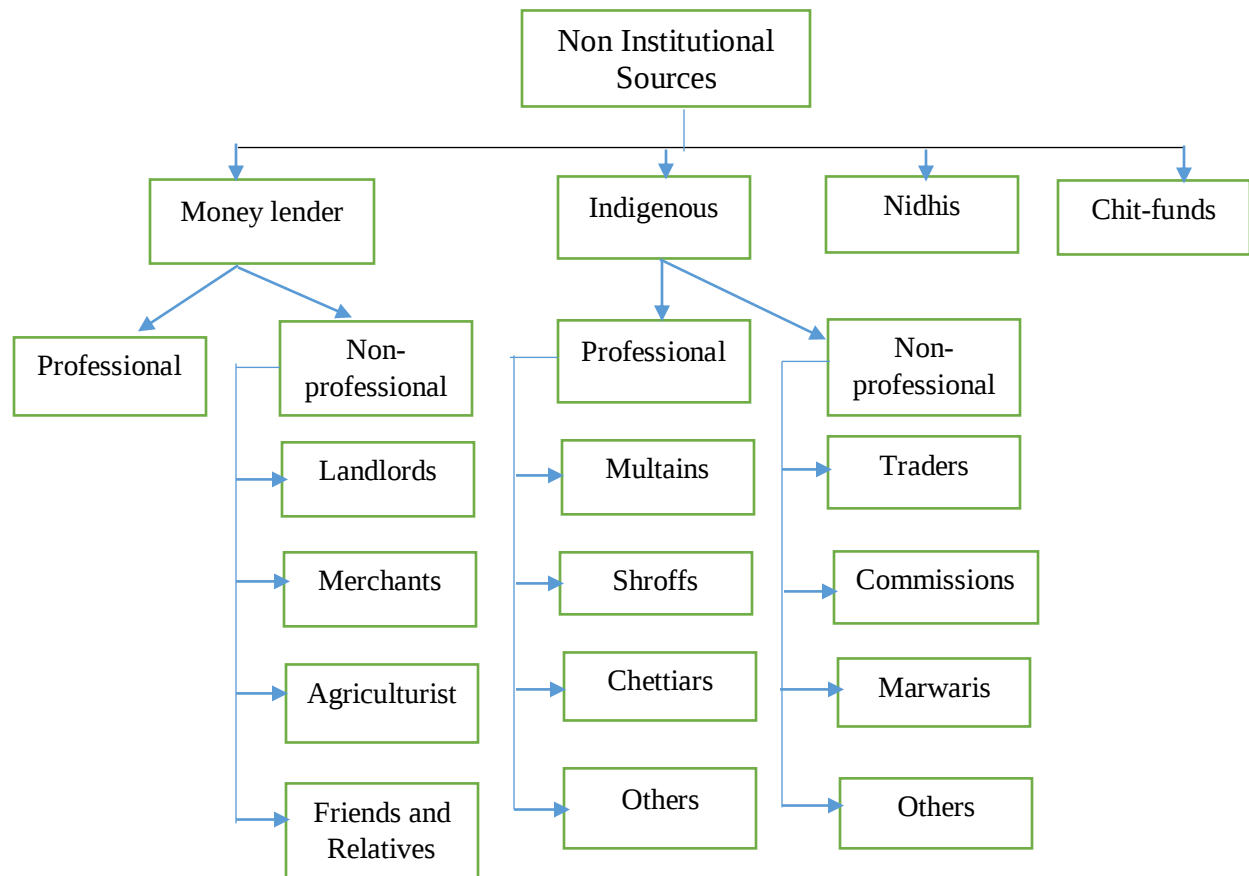


Figure 5.7: Non-Institutional sources of agricultural credit in India



Sources: Rural credit in India (1982)

India

Sources of credit in India had been dominated by informal sector. However, informal sector share has been declining over time. According to a working group formed by the RBI, institutional sources provided 72 percent of farm households' credit needs in 2016-17, and non-institutional sources such as family and money lenders met the remaining 28 percent. Furthermore, the working group discovered that short-term crop loans have grown their share in agricultural credit from 51 percent in 2000 to 75 percent in 2018 (RBI, 2019).

Maldives

Maldives economy is dependent primarily on tourism and fisheries. Fisheries used to be the largest contributor to the Maldivian GDP. Different institutions, including the government agencies, Bank of Maldives, and multifaceted agencies like UNDP have initiated credit programmes in Maldives. In addition, clients are being targeted by the Bank of Maldives (BML) in order to get them into the formal banking system. IFAD is collaborating with Maldivian Govt. for the development of agriculture and fisheries sector in Maldives.

Table 5.3: Sources of Agricultural credit in Maldives

Institutional sources	Non-institutional sources
1. Commercial Banks 2. Atolls Credit and Development Banking Project (ACDBP) 3. International Fund for Agricultural Development (IFAD) 4. NGOs 5. Bank of Maldives (BML)	1. Money lenders 2. Traders and commission agents 3. Relatives and Friends

Sources: Different research paper on institutional and non-institutional credit in Maldives

Pakistan

In Pakistan's rural areas, landlord farmers have better access to institutional credit than small farmers, and the majority of small farmers rely on non-institutional loan sources such as money lenders, shopkeepers, landlords, and input suppliers (Jan et al. 2012). In addition, five commercial banks including ABL, HBL, MCB, NBP and UBL as well as two specialized banks (ZTBL and Co-operative Limited) are the main institutional sources of agricultural credit (also see Table 5.4).

Table 5.4: Sources of Agricultural credit in Pakistan

Institutional sources	Non-institutional sources
Commercial Banks: 1. ABL 2. HBL 3. MCB 4. NBP 5. UBL 6. NGOs	1. Money lenders 2. Traders and commission agents 3. Relatives and Friends 4. Input suppliers 5. Land lords

Source: Different research papers on institutional and non-institutional credit in Pakistan

Sri Lanka

The formal banking provides just 10 percent of total credit requirements for the rural sector, with the remaining 90 percent coming from the non-formal financial markets in Sri Lanka. In addition, recent evidence indicates that in Sri Lanka, state banks are more popular with having more than 75 percent of household savings in state banks (GTZ, 2008).

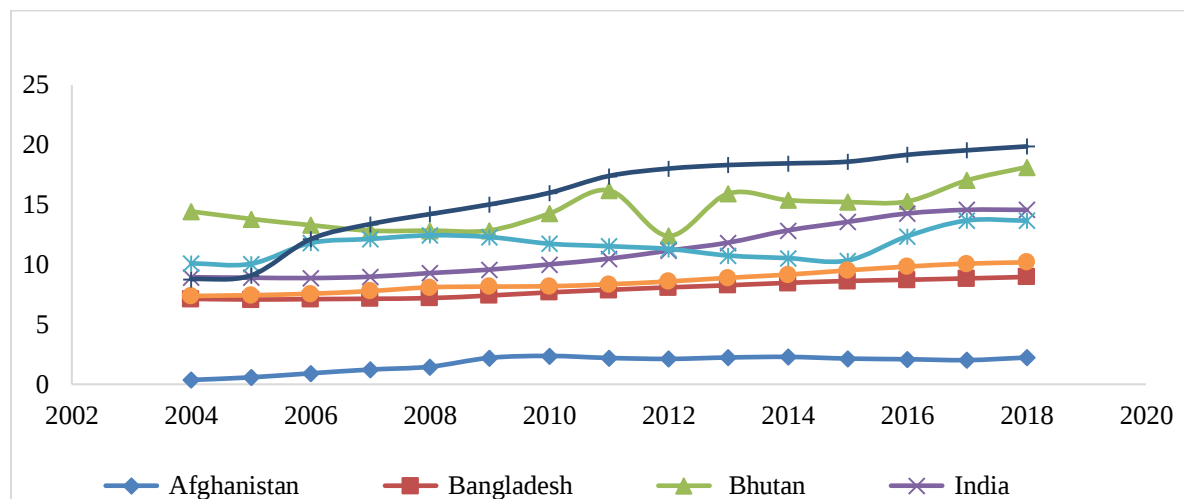
Table 5.5: Sources of Agricultural credit in Sri Lanka

Institutional sources	Non-institutional sources
1. Commercial Banks 2. NGOs 3. Other institutions	1. Money lenders 2. Traders and commission agents 3. Relatives and Friends 4. Shopkeepers 5. Pawn brokers 6. Land lords 7. Employers

5.4.3 Current status of formal financial services and agricultural credit in South Asia

Financial inclusion has been a crucial policy priority for SAARC countries and also for other developing countries. For the past few years, South Asian Government and their central banks found financial inclusion as an important instrument to achieve higher agricultural productivity and sustainable economic growth. In addition, different initiatives have been taken by the South Asian government in recent times to increase the speed of financial inclusion.

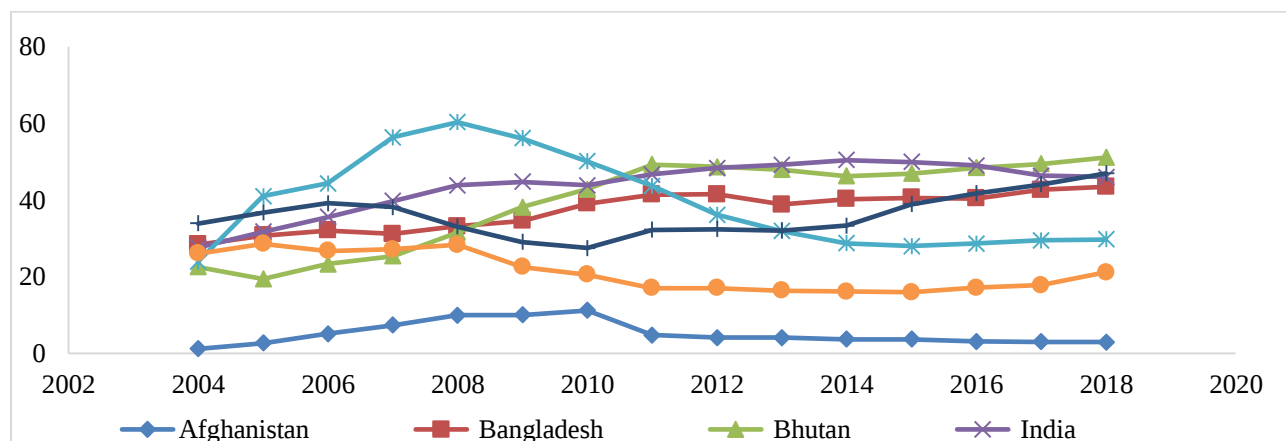
Figure 5.8: Branches of commercial banks per 1,00,000 adults



Source: FAS, IMF

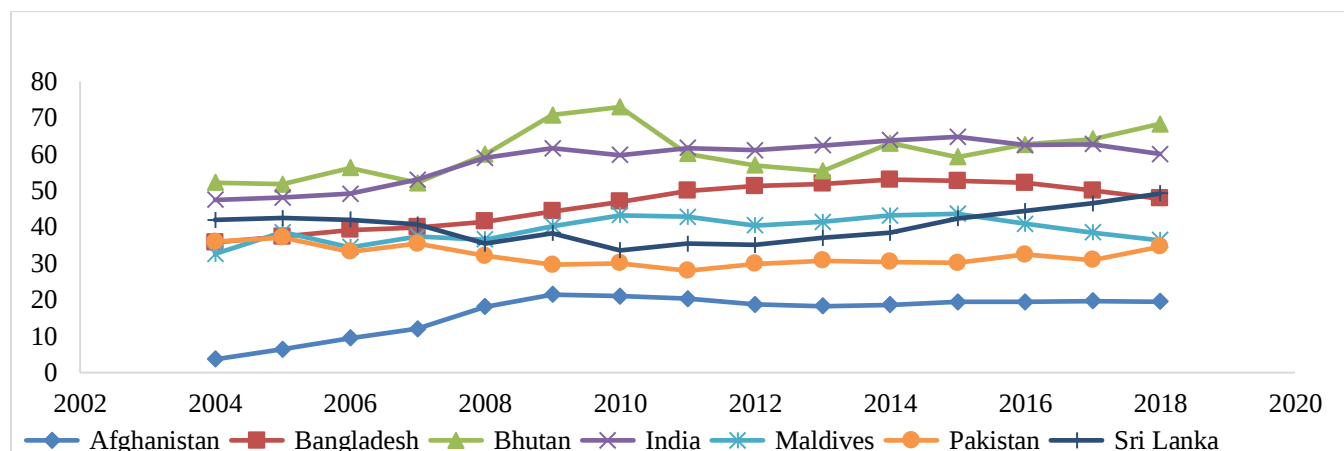
To have a clear picture of financial services in SAARC countries, some of the indicators are plotted in Figure 5.8, 5.9, 5.10 and 5.11. These figures indicate that the extent of financial inclusion in SAARC countries. Figure 5.8 shows that commercial banks branches per 1 lakh adults are increasing over time. Figure 5.9 reveals that the indicator such as loans with commercial banks (percentage of GDP) are increasing in Bangladesh, Bhutan, India, Pakistan and Sri Lanka but decreasing in Maldives and Afghanistan from 2004 to 2018.

Figure 5.9: Loans with commercial banks (% of GDP) from 2004 to 2018



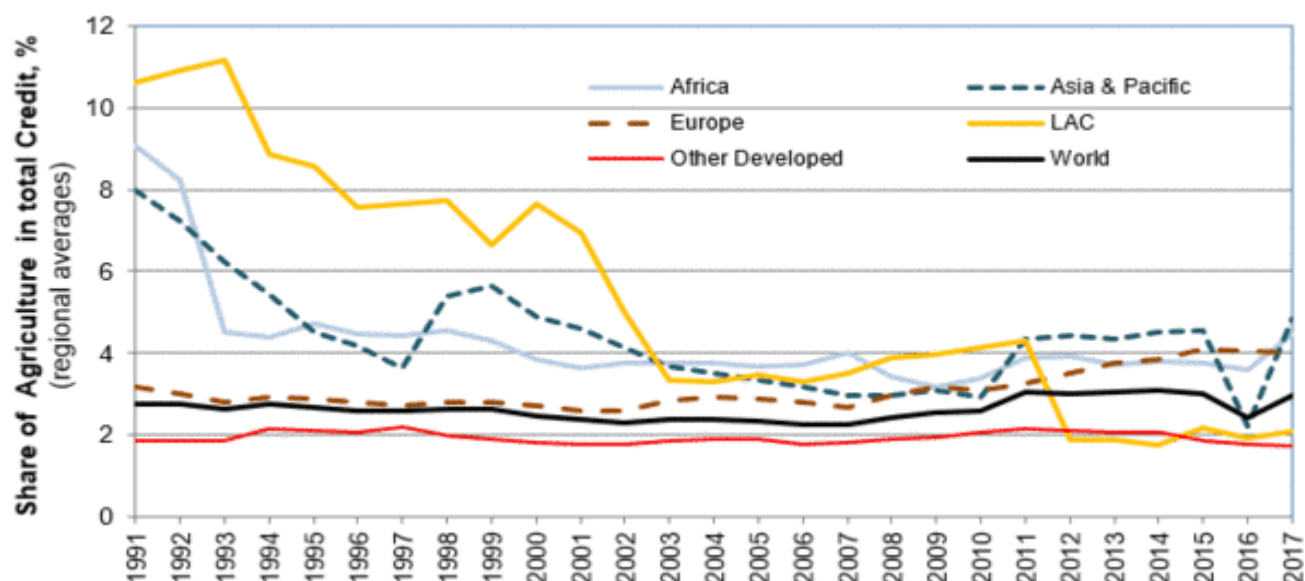
Source: Financial Access Survey (FAS), IMF

Figure 5.10: Deposits with commercial banks (% of GDP) from 2004 to 2018



Source: Financial Access Survey (FAS), IMF

Figure 5.11: Share of agriculture in total credit flow to economy in region-wise



Source: FAO of United Nations

During the 1990s, Latin America provided higher percentage of agricultural credit than other countries, but this percentage dropped from more than 10 percent in 1991 to less than 4 percent in 2011. During this period, Asia and Africa have experienced a sharp decline. In Europe and other developed countries, agriculture has traditionally received a small share of total credit,

varying from 3 to 4 percent of total credit. Despite the fact, agriculture accounts for a larger share of global credit flows in Latin America, Asia, and Africa, the global percentage of credit to agriculture is very low. Since 2003, the agriculture sector has received between 2 to 4 percentages of total credit in many countries. Following the 2007-2008 food price crisis, credit to agriculture recovered slowly in most countries, with higher growth witnessed in Asia, the Pacific and Africa (Figure 5.11).

5.5 Measuring financial inclusion (FI) for South Asian countries

This section proposes an econometric model to investigate the influence of FI on agricultural productivity, as well as conditional relationships of FI in increasing agricultural productivity in SAARC countries, based on existing theoretical and empirical studies. The study then has discussed data collection from various sources. This research also explain how proxy variables were used to derive the three dimension of financial inclusion, as well as how FII was developed and used in various regression model.

Construction of Financial Inclusion Index (FII)

Methodology regarding calculation of FII can be found in Section 2.6 in Chapter 2.

5.6 Model specification

Generally, the traditional *Cobb-Douglas (CD)* production function consists with two inputs: capital and labor, and constant returns to scale are commonly used in productivity analysis. But according to Echevarria (1998), production function can be included more factors of production.

The functional form of CD production function is as given below:

$$Y_{i,t} = AK_{i,t}^{\alpha} L_{i,t}^{\beta} e^{\mu_{i,t}} \quad (5.1)$$

Where, agricultural productivity is denoted by Y , Capital is denoted by K , and Labour is denoted by L . The parameters α and β are marginal impact of capital and labor on agricultural productivity and they are in the range between 0 to 1. Here, $i \dots n$, $t \dots T$, and the error term is represented by μ .

This study investigated *the impact of FI on agricultural productivity*. So when FI is included in the model, the Equation (5.1) becomes:

$$Y_{i,t} = AK_{i,t}^{\alpha} L_{i,t}^{\beta} FI_{i,t}^{\rho} e^{\mu_{i,t}} \quad (5.2)$$

Where, *FI* is represents financial inclusion which measured by the multidimensional financial inclusion index, the parameters ρ must be in the range between 0 and 1 and it indicates that the marginal influence of FI on agricultural productivity. After taking logarithm, the above Equation (5.2) becomes

$$Y_{i,t} = \alpha_0 + \alpha(\ln K)_{i,t} + \beta(\ln L)_{i,t} + \rho(FII)_{i,t} + \alpha_i + \mu_{i,t} \quad (5.3)$$

Besides financial inclusion (i.e. FII), agricultural productivity is influenced by the number of other economic variables such as trade openness, lending interest rate, and CO_2 emission.

The above equation can be written as follows:

$$\ln(Agripro)_{i,t} = \alpha_0 + \beta_1(\ln K)_{i,t} + \beta_2(\ln L)_{i,t} + \beta_3(FII)_{i,t} + \beta_4(\ln Trade)_{i,t} + \beta_5(\ln Interest)_{i,t} + \beta_8(\ln CO_2)_{i,t} + \alpha_i + \mu_{i,t} \quad (5.4)$$

Where, *Agripro* is agricultural productivity defined as agriculture, forestry, and fishing, value added per worker (constant 2010 US\$), $\ln Agripro$ = log of agriculture productivity and independent variables are $\ln K$ = log of physical capital; $\ln L$ = log of labor (human capital); *FII* = a multidimensional financial inclusion index; $\ln Trade$ = log of trade openness; $\ln Interest$ = log of lending interest rate; $\ln CO_2$ = log of carbon emissions; α_i = unseen effects and $\mu_{i,t}$ = error term, $t = 1, 2, 3, \dots, 15$ years and $i = 1, 2, 3, \dots, n$.

Here, financial inclusion (FI) expected to increase agricultural productivity or it is positively associated with agricultural productivity because easy access to affordable formal financial services and micro credit increase agricultural investment. As a result, it increases agricultural productivity and agricultural incomes.

The following regression equation is used to examine *the conditional effect of FI on agricultural productivity* in South Asian countries.

$$\ln(Agripro)_{i,t} = \alpha_0 + \beta_1(FII)_{i,t} + \beta_2(\ln K)_{i,t} + \beta_3(\ln L)_{i,t} + \beta_4(FII * \ln X)_{i,t} + \alpha_i + \mu_{i,t} \quad (5.5)$$

Where, the interaction of a multidimensional FII with other particular control variables (i.e. $\ln X$) that can impact the result of FI in terms of increasing agricultural productivity is denoted by $FII * \ln X$. The other specifications are same as the equation the above. Theoretical explanation of independent variables:

Physical capital: Physical capital plays an important role for agriculture sector. In this study, physical capital is measured by the gross fixed capital formation (% of GDP). The contribution of physical capital is observed as one of the important factors for agricultural growth (Zakaria et al., 2019; Kataria et al. 2012; Looney, 1994).

Labour: Human capital is represented by labour, which is determined by the secondary school enrolment rate (Barro and Lee, 2010). Human capital has a positive effect on agricultural productivity (Lockheed et al. 1980; Philips 1994; Mohapatra and Sen, 2013; Djomo, 2012).

Financial inclusion (FI): FI or Inclusive finance measured by the financial inclusion index (Sharma, 2008; Sethy, 2016; Sethi and Sethy, 2018). Availability of affordable financial services leads to increase agricultural productivity (Nathan Associates 2015 and GFDR 2015). Financial inclusion enhances agricultural incomes (Maitra et al. 2014); generate agricultural technology (R&D) (Anandajayasekeram, 2011); helps to purchase machinery, equipment and other assets related to agricultural production (World Bank 2009). Financial inclusion and financial development has positive impact on agricultural productivity (Onoja, 2017; Olaniyi, 2017; Zakaria et al., 2019; Fowowe, 2020).

Trade openness: Agricultural productivity is increased by trade openness due to specialization, economies of scale, and capacity utilization. Trade openness increases productivity (Smith, 1937; Alcala and Ciccone, 2004; Markheim, 2007) and increase technical efficiency in agriculture (Alam et al., 2008; Hart et al. 2015).

Lending interest rate: Interest rate is measured by the lending interest rate and it has a significant influence on agricultural productivity (Olaniyi, 2017; Adebayo et al., 2017; Seven and Tumen, 2020).

CO₂ Emissions: Climate change has a significant impact on agricultural production and productivity (Aggarwal and Sinha 1993; Molua 2002; Parry et al. 2004; Muamba and Kraybill 2010; Lal 2011; Knox et al. 2012; Panda et al. 2013; Nkegbe and Kuunibe 2014; Lobell and Tebaldi 2014; Rasul et al. 2019, Aryal et al. 2020).

5.7 Variables and data sources

The study is based on 15 years of annual panel data from 2004 to 2018. By excluding one South Asia country like Nepal (because of data availability issues of formal financial services), rest of the seven South Asia countries are taken for the analysis. Here, majority of the variables were selected from empirical literature, with some changes and additions. The data set was collected using the FAS of IMF and WDI.

Table 5.6 offers a comprehensive overview of the variables and their sources. For details list of indicators for constructing FII, see Table 2.3 in Chapter 2.

Table 5.6: Definition, description and sources of the variables

Variables	Unit	Source
Agricultural productivity (<i>Agripro</i>)	Constant 2010 US\$	WDI, World Bank
Financial inclusion (<i>FII</i>)	Index	Financial Access Survey (FAS), IMF
Capital (<i>K</i>)	(% of GDP)	WDI, World Bank
Labor (<i>L</i>)	(% gross)	WDI, World Bank
Trade openness (<i>Tradeopen</i>)	Trade percentage of GDP	WDI, World Bank
Lending interest rate (<i>Interest</i>)	(%)	WDI, World Bank
Carbon emission (<i>CO₂</i>)	Metric tons per capita	WDI, World Bank

Source: Authors' compilation

5.8 Empirical methodology

Here we have used panel unit root tests, Pedroni cointegration tests, FMOLS and DOLS approach. Detailed methods of these econometric tests can be found in Section 4.8 in Chapter 4.

Table 5.7: Descriptive statistics

	lnAgripro	lnK	lnL	lnFII	lntrade	lnInterest	lnCO ₂
Mean	7.175	3.275	4.041	1.077	3.386	2.507	0.404
Median	7.149	3.268	4.011	1.794	3.739	2.56	0.298
SD	0.345	0.417	0.381	1.032	1.127	0.213	0.754
Min	6.302	2.527	2.924	-6.008	0.758	1.939	-2.961
Max	7.941	4.248	4.608	0.001	4.758	2.938	0.722
Observation	89	89	89	89	89	89	89

Source: Author's estimations

Table 5.8: Correlation matrix

	lnTrade	lnK	lnInter	lnFII	lnCO ₂	lnAgripro	lnL
lnTrade	1						
lnK	0.548	1					
lnInter	0.531	0.136	1				
lnFII	-0.159	-0.139	-0.083	1			
lnCO ₂	-0.26	0.285	-0.482	0.228	1		
lnAgripro	-0.608	-0.169	-0.319	0.461	0.572	1	
lnL	-0.085	0.492	-0.153	0.309	0.448	0.293	1

Source: Author's estimations

5.9 Empirical findings

5.9.1 Descriptive statistics and correlation matrix

Table 5.7 explains the descriptive statistics and Table 5.8 explains the correlation matrix. The descriptive statistics shows that the dependent variable, agricultural productivity (i.e. Agripro) varies from 6.30 to 7.94, with an average value of 7.17 and SD of 0.34. The coefficients of financial inclusion (i.e. FII) range from -6.008 to 0.001, with an average value of 1.07. The correlation matrix result indicates a positive correlation between agricultural productivity and FI (0.46) and vice-versa (for details see Table 5.8). This result indicates that access of banking services leads to increase agricultural productivity in South Asian countries.

5.9.2 Empirical results on the conditional impacts of FI on agricultural productivity

It is important to examine the conditional impact between financial inclusion and other micro and macroeconomic variables on agricultural productivity. Furthermore, simple econometric models cannot confirm the factors and conditions under which FI enhances agricultural productivity in South Asian countries.

From the Table 5.9, in specification 1 the time fixed effect estimates of financial inclusion and agricultural productivity coefficients are positive. Furthermore, results also confirm that there is a positive association between FI and agricultural productivity (see columns 2, 4, 5 and 6, Table 5.9). This shows that inclusive financial system, creates more efficient investment in the agricultural sector which leads to more agricultural productivity. But only column 3 shows the negative relationship between key variables. Similarly, the coefficients of carbon emissions and interest rate are indicates that there is a positive relation between CO_2 emission, interest rate and agricultural productivity. Furthermore, the coefficients of trade openness are found to be negative and significant, which indicate a negative connection between trade openness and agricultural productivity.

The conditional impact of FI on agricultural productivity in South Asian nations is presented in Table 5.9. To assess the independent impact of particular variables on agricultural productivity, here this table examines control variables and their links with financial inclusion independently.

Table 5.9: Conditional impacts of FI on agricultural productivity (Time fixed effect estimation)

Variables	(1) lnAgripro	(2) lnAgripro	(3) lnAgripro	(4) lnAgripro	(5) lnAgripro	(6) lnAgripro
lnFII	0.150 *** (0.001)	0.889*** (0.002)	- 1.014*** (0.019)	0.147*** (0.002)	1.584*** (0.000)	0.846*** (0.000)
lnK	0.033 (0.755)	- 0.204 (0.134)	- 0.080 (0.464)	0.039 (0.723)	- 0.153 (0.170)	- 0.252*** (0.022)
lnL	0.333 (0.725)	2.640 (0.999)	0.334*** (0.041)	0.036 (0.703)	0.104 (0.274)	0.147* (0.101)
lnCO ₂	0.230*** (0.000)	0.235*** (0.000)	0.258*** (0.000)	0.221*** (0.000)	0.267*** (0.000)	0.292*** (0.000)
lnInter	0.468*** (0.004)	0.449*** (0.004)	0.445*** (0.005)	0.466*** (0.005)	- 0.021 (0.913)	0.049*** (0.000)
lnTrade	- 0.179*** (0.000)	- 0.174*** (0.000)	- 0.155*** (0.000)	- 0.180*** (0.000)	- 0.138*** (0.000)	- 0.248*** (0.000)
lnFII*lnK		- 0.216*** (0.008)				
lnFII*lnL			0.295*** (0.007)			
lnFII*lnCO ₂				- 0.007 (0.834)		
lnFII*lnInter					- 0.590*** (0.000)	
lnFII*lnTrade						- 0.176*** (0.000)
Constant	6.889*** (0.000)	7.586*** (0.000)	5.760*** (0.000)	6.890*** (0.000)	7.989*** (0.000)	7.362*** (0.000)
Observations	89	89	89	89	89	89
R ²	0.690	0.720	0.722	0.690	0.741	0.774
Number of Id	6	6	6	6	6	6

Note: *** and * indicate 1 and 10 % level of significance.

Source: Author's estimations

Table 5.9 indicate that the interaction term of FI with physical capital, human capital (i.e. labour), interest rate and trade openness are significant, however the interaction term of FI with CO_2 emissions are not statistically significant for agricultural productivity.

Financial inclusion and physical capital have an adverse effect on agricultural productivity when they are combined, implying that higher physical capital increases the marginal effect of FI in reducing agricultural productivity. This empirical finding is consistent, in this sense that increase fixed capital (i.e spending on machinery and equipment purchase etc.) creates less demand for labour, decreases real wages and lower standard of living. This leads to an inefficient inclusive banking system, which reduces agricultural investment and further reduces agricultural productivity.

Financial inclusion and human capital (i.e., proxied by the secondary school enrollment) have a positive impact on agricultural productivity when they are combined, implying that when the number of students enrolled in secondary school rises, the marginal effects of financial inclusion on growing agricultural productivity increases. This empirical evidence is valid in the logic that higher the education level in poor families, increases general work force skills and farmers become better ‘manager’ by enhancing their decision-making skill (Asadullah and Rahman, 2009), which leads to higher agricultural productivity (Nguyen, 1979; Kawagoe et al. 1985; Fulginiti and Perrin, 1993; Reimers and Klasen, 2013).

Financial inclusion and interest rate have a negative impact on agricultural productivity when they are combined. This result is valid in the sense that higher interest rate charged by the formal financial institutions largely restricted farmers from seeking credit from these institutions and it creates less investment in the agricultural sector. Finally, it leads to decrease the agricultural productivity.

The interaction between *financial inclusion and trade openness* negatively related to agricultural productivity. This result consistent in the sense that openness to trade has a negative effect on technical efficiency in the agricultural sector (Hart et al. 2015) and economic growth (Kim, 2011; Rigobon and Rodrik, 2005; Vamvakids, 2002; Ulasan, 2015; Fenira, 2015) creates

Table 5.10: Conditional impacts of FI on agricultural productivity (Time random effect estimation)

Variables	(1) lnAgripro	(2) lnAgripro	(3) lnAgripro	(4) lnAgripro	(5) lnAgripro	(6) lnAgripro
lnFII	0.103 *** (0.000)	0.803*** (0.003)	- 0.933*** (0.017)	0.102*** (0.000)	1.142*** (0.002)	0.487*** (0.000)
lnK	0.060 (0.558)	- 0.165 (0.209)	- 0.040 (0.698)	0.062 (0.563)	- 0.079 (0.457)	- 0.100*** (0.312)
lnL	0.056 (0.532)	0.030 (0.725)	0.256* (0.041)	0.057 (0.533)	0.050 (0.577)	0.035 (0.667)
lnCO ₂	0.212*** (0.000)	0.216*** (0.000)	0.239*** (0.000)	0.209*** (0.001)	0.238*** (0.000)	0.240*** (0.000)
lnInter	0.378*** (0.009)	0.371*** (0.008)	0.410*** (0.003)	0.377*** (0.010)	- 0.018 (0.920)	0.372*** (0.003)
lnTrade	- 0.186*** (0.000)	- 0.183*** (0.008)	- 0.168*** (0.000)	- 0.186*** (0.000)	- 0.155*** (0.000)	- 0.237*** (0.000)
lnFII*lnK		- 0.207*** (0.015)				
lnFII*lnL			0.258*** (0.008)			
lnFII* lnCO ₂				- 0.002 (0.944)		
lnFII*lnInter					- 0.433*** (0.004)	
lnFII*lnTrade						- 0.110*** (0.000)
Constant	7.084*** (0.000)	7.736*** (0.000)	5.997*** (0.000)	7.085*** (0.000)	7.952*** (0.000)	7.432*** (0.000)
Observations	89	89	89	89	89	89
R ²	0.673	0.701	0.703	0.673	0.705	0.717
Number of Id	6	6	6	6	6	6

Note: *** indicates 1 % level of significance.

Source: Author's estimations

less demand for labour, reduce real wages, decrease standard of living, and generates negative cycles opportunity. This leads to inefficient inclusive banking system that reduce agricultural investment and ultimately decrease agricultural productivity. In addition, interaction term between *FI* and *carbon emission* have a negative impact on agricultural productivity (for details see Table 5.10).

Table 5.10 reports similar results as Table 5.9, which implies that the collaboration between *FI* and *K (physical capital)* have an adverse effect on agricultural productivity. The collaboration between *FI* and *L (human capital)* has a positive linked with agricultural productivity (For details see Table 5.10).

Table 5.11: IPS panel unit root test

Variables	lnAgripro	lnK	lnL	lnFII	lnCO ₂	lnInter	lnTrade
<i>Level</i>							
	1.400(0.919)	0.120(0.547)	-2.113 (0.017)	- 0.660 (0.254)	2.043 (0.979)	- 1.360 (0.086)	0.612 (0.729)
<i>First differences</i>							
	- 3.527*** (0.000)	- 2.734*** (0.003)	-2.641*** (0.004)	-2.770*** (0.002)	-1.989*** (0.023)	-3.455*** (0.000)	- 3.118*** (0.000)

Note: *** indicates 1 % level of significance.

Source: Author's estimations

5.9.3 Panel unit root results

Table 5.11 reveals that the unit root test. The unit root test shows that variables such as lnAgripro, lnK, lnL, lnFII, lnCO₂, lnInter and lnTrade are integrated of order one[I(1)].

Table 5.12: Pedroni panel cointegration estimation

	Statistics	Prob.
<i>With Dimensions</i>		
Panel v -Statistics	-3.037	0.996
Panel ρ Statistics	3.512	0.999
Panel Phillips-Perron	-12.654***	0.000
Panel Augmented Dickey Fuller t	-4.187***	0.000
<i>Between Dimensions</i>		
Group ρ Statistics	4.140	1.000
Group Phillips-Perron	-7.512***	0.000
Group Augmented Dickey-Fuller t	-4.108***	0.000

Note: *** indicates 1 % level of significance.

Source: Author's estimations

5.9.4 Cointegration result

Here, $I(1)$ process is followed by the variables. This suggests that after controlling the effect of $\ln K$, $\ln L$, $\ln CO_2$, $\ln Inter$ and $\ln Trade$, our two key variables: $\ln FII$ and $\ln Agripro$ are cointegrated. Table 5.12 shows seven test statistics of Pedroni cointegration.

This cointegration result indicates that $\ln FII$ and $\ln Agripro$ are cointegrated across the panel countries. At the 1 percent level of significance, four Pedroni test rejects null hypothesis of non-cointegration. It means that financial inclusion and agricultural productivity have a long run relationship. Furthermore, this implies that if financial inclusion prioritized now, it would help South Asian countries in the long run.

Table 5.13: Panel FMOLS and Panel DOLS estimations

Dependent Variables: LnAgripro	FMOLS			DOLS		
	Coefficients	t-Statistics	Prob	Coefficients	t-Statistics	Prob
lnFII	0.137***	4.270	0.000	0.106***	5.148	0.000
lnK	0.014	0.126	0.899	0.044	0.350	0.720
lnL	0.506***	2.863	0.005	0.343**	2.122	0.037
lnCO ₂	0.250***	3.279	0.001	0.240***	2.894	0.004
lnInter	- 0.168*	- 1.668	0.099	- 0.086	-0.828	0.410
lnTrade	- 0.086**	- 1.983	0.051	- 0.087*	-1.838	0.069
R ²		0.940			0.932	
Adj.R ²		0.930			0.922	

Notes: ***, **, and * indicate 1, 5, and 10 % level of significance, respectively.

Source: Author's estimations

5.9.5 Panel FMOLS and DOLS estimations

The FMOLS result indicates that financial inclusion (i.e lnFII) and agricultural productivity (i.e lnAgripro) are cointegrated. The coefficient is positive and statistically significant at 1 percent level and it has the expected sign. This positive sign shows that 1 percent increase in access and usage of banking products across the selected nations would increase agricultural productivity by 0.13 percent. Similarly, the DOLS result confirms that financial inclusion and agricultural productivity have a long-run connection. The long run coefficient is positive which confirms that a 1 percent increase in financial inclusion will result in 0.10 percent increase in agricultural productivity. This result is consistent with Binswanger et al. (1993), Magri (2002), Akudugu et al. (2009), Olaniyi (2017), Awunyo-Vitoret al. (2014, 2018), Fowowe (2020), Atakli and Agbenyo (2020) who found that availability and usage of formal financial services: loan, savings, and deposits at an affordable cost leads to increase in credit which ultimately leads to increase agricultural productivity through efficient investment on fertilizer, pesticides, quality

seeds and irrigation etc. Therefore, financial inclusion can help poor farmers to have more suitable livelihoods.

There is a strong association between human capital and agricultural productivity. The long run coefficients indicate that 1 percent increase in L (i.e. human capital) would lead to 0.50 per cent (FMOLS) and 0.34 percent (DOLS) increase in agricultural productivity. Similarly, the result also has indicated that there is a positive association between CO_2 emissions and agricultural productivity. The long run coefficients indicate that 1 percent increase in CO_2 emissions would lead to 0.25 percent (FMOLS) and 0.24 percent (DOLS) increase in agricultural productivity. But only two variables such as interest rate and trade openness negatively cointegrated with agricultural productivity (for details see Table 5.13).

5.10 Summary and policy implications

This chapter has attempted to determine the impact of financial inclusion on agricultural productivity in selected SAARC countries from 2004 to 2018. The findings are as follows. *First* in this study we have proposed a multidimensional FII for South Asian countries. Empirical findings suggest that the performance of all the South Asian countries on financial inclusion has been increasing from 2004 to 2018. *Second*, the study examines the correlation between the considered variables and the correlation result indicate that a positive correlation between FI and agricultural productivity. *Third*, this empirical study examines some important conditions under which FI has a favorable effect on agricultural productivity. The time fixed effect and time random effect results indicate that the collaboration term of financial inclusion with physical capital, interest rates, trade openness and carbon emission are negatively associated with agricultural productivity. Only the collaboration term of financial inclusion with human capital is statistical significant and positively associated with agricultural productivity. Similarly, the random effect estimates evidence the same result as time fixed effect estimates.

Fourth, this study then found out the long-run connection between FI and agricultural productivity. Using Pedroni cointegration approach presents robust evidence that a long-run association between financial inclusion and agricultural productivity across panel countries.

Fifth, the FMOLS and DOLS result confirms that there exists a positive and long run connection between our key variables such as FI and agricultural productivity. This result indicates that financial inclusion would increase agricultural productivity in the long run. This result is consistent with Binswanger et al. (1993), Magri (2002), Laha and Kuri (2013), Olaniyi (2017), Awunyo-Vitor, et al. (2014, 2018), Fowowe (2019), Atakli and Agbenyo (2020). This finding confirms that expanding banking services such as savings, loan, deposit, and microfinance, increases agricultural productivity in the long run. These outcomes support that financial inclusion is the most vital factors for increasing agricultural productivity in South Asian countries.

According to this result, policymakers should focus on financial sector reforms in order to boost agricultural productivity in the long run. To improve agricultural productivity, the government and policymakers must resolve the issues surrounding access of banking services. In addition, the research has important policy implications. To increase agricultural productivity, government should make more investment in both human and physical capitals so that skilled labour and better infrastructure facilities are available to increase agricultural productivity.

Chapter 6

Does Financial Inclusion Reduce CO_2 Emissions in South Asia Countries? Evidence from Co-integration and Dumitrescu-Hurlin Causality Approaches

6.1 Introduction

One of the World's most urgent concerns is to reduce carbon emissions (*i.e.*, CO_2). Environmental activists, economists, and policymakers around the World are now more aware of environmental pollution and its adverse effects on climate change. The extreme release of GHS, particularly, CO_2 emissions, is widely believed to be the major contributor to global warming. As a result, various countries have proposed policies and regulations to combat global warming when pursuing economic growth.

Many studies have focused on the factors that influence CO_2 emissions, such as population growth, urbanization and trade openness. According to some recent studies, financial development is another important factor that has a direct effect on CO_2 emissions. The impact of financial development may be positive (Jiang and Ma, 2019; Lu, 2018; Bekhet et al. 2017; Shahbaz et al. 2016) and negative effect (Sadorsky, 2010; Saide and Mbarek, 2017; Dogan and Seker, 2016; Zaide et al. 2019) on carbon emissions. Furthermore, financial inclusion is an essential indicator of financial development since it encourages banking institutions to expand. A recent study evidence that people who excluded from banking services as a main reason of poverty and financial inclusion can help to alleviate poverty (Burgess and Pande, 2005; Banerjee and Newman, 1993; Yunus, 1997). Number of studies examines the positive and negative effect of financial development on climate change but due to the lack of data on financial inclusion (FI), studies on the importance of FI in combating climate change is very rare

The influence of FI on CO_2 emissions can be both positive and negative. On the one side, inclusive financial system and financial inclusion make it easier for business and individuals to access appropriate and affordable financial products, making green technology investment more feasible. In this regard, FI has a positive impact on the environment as a tool for increasing access to, availability of, and use of cleaner technologies and better environment practices, which reduces climate change contributions (Innovations for Poverty Action (IPA), 2017).

Promoting financial inclusion programs and providing ‘green loan’ (i.e., credit to use environmentally friendly products such as solar energy, eco-friendly seeds and fertilizer etc.) especially important for poor farmers who may not have access to credit to invest in better environmental practices and renewable energy technologies, such as solar technology which is not only cheap but also emits less CO_2 emissions (Innovation for Poverty Action, 2017). According to Baulch et al. (2018), financial limitations (such as restricted access to credit, lack of government subsidies, and limited bank financing option) are important obstacle to the adoption of solar systems in Vietnam. These are the some of the ways that affordable financial products and services (i.e. green loan) will encourage the use of renewable energy technology and the introduction of environmental friendly services which reduce CO_2 emissions.

Better financial systems and improved access to the banking services, on the other hand, increase industrial activities in the country, which could lead to higher CO_2 emissions (Jensen, 1996). In addition, higher inclusive finance allows consumers to bear the cost of energy consumption consumer goods: automobiles and air conditions etc.; however, these energy-intensive consumer goods are now posing a threat to the environment (Frankel and Romer, 1999). According to a recent study, financial inclusion increase CO_2 emissions in Asia from 2004 to 2014 (Le et al., 2020).

Despite important achievements in financial inclusion in SAARC countries, people those who are financially excluded continues to be a serious threat to the region. In addition, now South Asia is one of the world's most sensitive regions for global warming (World Bank, 2019 and Asian Development Bank, 2017). Recently, climate change is estimated to impact over 800 million people directly by 2050, which will continue to burden South Asian economies (World Bank, 2019). In this background, it is important to carry out a study on the present topic.

6.1.1 Contribution of the study

This study investigated the impact of FI on CO_2 emissions in South Asia. Particularly, this study addresses the following question: Does financial inclusion (FI) reduce CO_2 emissions in South Asia countries? *First*, it constructs a multidimensional FII using Availability, Accessibility and Usage of formal financial services data set from 2004 to 2018, following UNDP method. *Second*, it identifies the factors that influence CO_2 emissions and examines the effect of financial inclusion on CO_2 emissions, focusing on South Asia countries. Another novel aspect of this research work is its methodological approach. *Third*, to the best of our knowledge, there is no empirical research that examines the impact of FI on CO_2 emissions in South Asia countries which observes the long-run association between FI and CO_2 emissions using Pedroni panel cointegration test, FMOLS and DOLS approach to show the long-run connection between independent variables and dependent variable. *Fourth*, this study uses the Dumitrescu-Hurlin panel causality tests to determine the causal relation between two key variables: FI and CO_2 emissions.

The remaining of the research is structured as follows. Section 2 presents literature reviews. Section 3 reveals the theoretical linkages between FI and CO_2 emissions. Section 4 presents the current status of carbon emissions in South Asian countries. Section 5 presents construction of a multidimensional financial inclusion index. Section 6 presents model specification. Section 7 presents variables and data sources. Section 8 presents empirical methodology. Section 9 presents the empirical results and analysis, and the conclusions are presents in Section 10.

6.2 Theory and review of literature

6.2.1 *The role of financial development (FD) and financial inclusion (FI) for carbon emissions*

Number of studies examines the positive and negative effect of financial development on climate change but studies that considers the impact of FI on CO_2 emissions is very rare, due to lack of data on formal financial services indicators.

A. Theoretical perspective

Researchers have proposed mixed views on the impact of financial development on CO_2 emissions from a theoretical point of view.

According to a few researchers (Dasgupta et. al.2001; Islam et al. 2013; Dogan and Seker 2016), financial development can reduce CO_2 emissions due to the following factors: (a) to minimize manufacturing expenses and improve product market effectiveness, business must periodically upgrade production technologies and equipment, which requires sufficient funding. Financial organization may enable business to complete these projects by efficiently easing their funding limitations, lowering energy costs and reducing carbon emissions indirectly. (b) to combat environment degradation, governments generally initiate a variety of environment friendly programmes, encourage overall industrial renovation, and promote the use renewable energy. Formal financial institutions supply sufficient funds for the action of environmentally friendly initiatives, which could help to enhance environmental friendly infrastructure and, in turn, minimize carbon emissions.

Other researchers (Sadorsky, 2010; Zhang, 2011) believe that financial development contributes to increased CO_2 emissions due the following factors: (a) a well-functioning banking system can efficiently expand funding networks, allowing business to take capital at much lower prices, allowing to expand their production size, further it leads to increase carbon emissions. (b) Similarly, it will be able to offer more and better consumer credit services, allowing them to engage in spending habits and encouraging them to buy more goods: cars, refrigerators etc. These will have a significant impact on the growth of social consumption, resulting in increased carbon emissions.

B. Empirical research

Financial development reduces carbon emissions:

Studies conducted by Claessens and Feijen (2006) and Tamazian and Rao (2010) evidence that financial sector development is expected to provide better banking services for environmental friendly initiatives at a lower costs and as a result it reduces energy pollution. Similarly, some

studies also evidence that financial development reduce CO_2 emission and so increase the environmentally quality (King and Levine 1993; Tadesse 2005; Jalil and Feridum 2011; Kumbaroglu et al. 2008).

Dasgupta et al. (2001) examine the population and capital markets in developing countries like Argentina, Chile, Mexico and Philippines from 1990 to 1994. They used event-study methodology and capital asset price model (CAPM) to find out the reaction of investors to positive and negative information. Their empirical results indicate that announcement of incentives and clear acknowledgement of superior environmental performance in developing countries have a positive impact on capital markets (i.e. increase in firm's market value), while citizen's complaints have a negative impact. Overall, they conclude that capital market reduce environmental risk.

Claessens and Feijen (2007) examined the financial sector development and its impact on millennium development goals (MDGs). They conclude that a firm can grow by the help of financial sector development which perform better in terms of effective use of their resources and further it encourages efficient use of energy. As a result it reduces carbon emission.

Kumbaroglu et al. (2008) in their results suggest that financial development can lead to technological changes (i.e. technological innovation) and further it contributes significantly reduction in emissions particularly through energy sector in Turkey. Tamazian and Rao (2010) conducted a study from 1992 to 2004 on the relationship economic development, financial development and environmental degradation in BRICS counties. They conclude that the financial development plays a major role and can reduce to CO_2 emissions in BRICS countries.

Zagorchev et al. (2011) evidence that financially developed countries invest more in technological innovation that reduce carbon emissions. Similarly, Zafar et al. (2019) used panel co-integration test to examine the long run connection among the variables and also used CUP-BC and CUP-FM methods to examine long-term output elasticities of the variables. Their empirical findings show that financial development has a potential to minimize CO_2 emissions in OECD countries from 1990-2014.

Using the ARDL method, Shahbaz et al (2013a) examined the impact of financial development on CO_2 emissions with the time series data of Malaysia from 1971 to 2011. Their results revealed

that improvement in financial system could reduce CO_2 emissions. Omri et al. (2015) used the extended Cobb-Douglas production function and a simultaneous equation panel data model. Their findings evidence that advanced financial institutions will boost energy conservation R&D, resulting technical advancement and, ultimately lower carbon emissions in 12 MENA economies.

A study conducted by Dogan et al. (2016) on CO_2 emissions from 1960 to 2010 in USA and they used ARDL, VECM and granger causality test. Their empirical results revealed that different improvement in financial sector has a little influence on CO_2 emissions. In addition, their findings confirm that financial development plays a major role to reduce CO_2 emissions.

Using GMM model Saidi et al. (2017) proved the influence of control variables on CO_2 emissions in 19 emerging economies. Their empirical result confirms that financial development minimizes environmental degradation from 1990 to 2013. Zhou et al (2019) had evidenced that loan size had a negative effect on CO_2 emissions in high energy industries in China. Similarly, Zaidi et al. (2019) conducted a study on CO_2 emissions in 17 APEC countries from 1990 to 2016. They used CUP-BC and CUP-FM methods and their empirical findings showed that financial sector improvement has the potential to minimize CO_2 emissions in the long-term.

C. Financial development (FD) increases carbon emission

Some studies also evidence that financial development increase CO_2 emissions (Sadorsky 2010; Zhang 2011; Gokmenoglu et al. 2015; Chang 2015; Bekhet et al. 2017). Using GMM method, Sadorsky (2010) conducted a study on energy consumption based on 22 emerging nations from 1990 to 2006. He concluded that there exist a positive linkage between financial development and energy consumption. Finally, the result shows that financial development increases the demand for energy in emerging countries.

Chang (2015) used the panel threshold regression approach and CD test to find out the linkages between financial development (FD) and energy consumption in 53 countries from 1999 to 2008. His findings indicates that the energy consumption increase with financial development. Using the panel pooled FMOLS model, Bekhet et al. (2017) examined the linkages between CO_2 emissions and financial development of GCC countries from 1980 to 2011. They used ARDL model, and their empirical findings revealed that in UAE, Oman and Kuwait, there

is a one-way causality from financial development to CO_2 emissions. Using causality test, Lu (2018) concluded that financial development plays an important role for increasing carbon emission from 1993 to 2013 in 12 Asian countries.

Using ARDL, VECM and causality test by the Cetin et al. (2018), their empirical research evidence that there exists a positive association between FD and CO_2 emissions in Turkey. Shah et al. (2019) observed the association between FD, institutions and environment in 101 countries over the period of 1995-2017. They used CIPS and CADF technique for panel unit root test, Westerlund test for long-term affiliations and FMOLS for long run coefficients. Finally, their study confirms that a positive association between FD and CO_2 emissions.

Some recent studies also evidence that financial development increase CO_2 emissions (Ahmed et al. 2020; Gok 2020). Bayar et al. (2020) conducted a study on 11 post-transition European countries from 1995 to 2017. They used Wasterlund and Edgerton's LM bootstrap co-integration test and dynamic seemingly unrelated co-integration regressions (DSUR). Their empirical study shows that financial sector development positively impacts on carbon emissions. In addition, financial sector development could significantly increase CO_2 emissions.

Shoaib et al. (2020) used PCA method to develop financial development index. Their empirical result of ARDL technique showed that a positive influence of FD on CO_2 emissions from 1991 to 2013 in the long-term. Using the cross sectional dependence tests, unit root analysis, co-integration test and causality test, Ahmad et al. (2020) revealed that financial development deteriorates the environmental quality by increasing the CO_2 emissions but FDI improves environment quality from 1990 to 2017.

As per the above analysis of literature, the effect of financial development (FD) on CO_2 emissions is still a topic of discussion. The connection between FD and CO_2 emissions is a complex matter because it is very difficult to explain. Particularly, theoretical analysis shows that FD has both positive and negative consequences for carbon emissions. However, according the empirical studies, the impact of FD on CO_2 emissions differs across nations and states. In fact, it partially validates the theoretical studies point of view, since it is fair to understand how both positive and negative effects vary across countries.

D. Financial inclusion (FI) and CO₂ emissions

From the above review of literature, we know that there are a number of theoretical as well as empirical studies which have examined the influence of FI on CO₂ emissions in different countries of the World. But the number of studies on the impact of FI on CO₂ emissions is very rare, due to lack of data on formal financial services. In theory, the effect of FI may be positive and negative on CO₂ emissions.

Till now, there are limited empirical studies that investigated the effects of FI on CO₂ emissions in South Asian countries. Using the PCA technique and Hoechel (2007) procedure, Le et al. (2020) investigated the influence of FI on CO₂ emissions in 31 Asian countries from 2004 to 2014. Their empirical studies evidenced that FI could increase more CO₂ emissions in Asian countries. But Usman et al. (2020) conducted a study on 15 top carbon emitters' countries and their result indicating that, financial development decreases CO₂ emissions.

Similarly, a recent study conducted on the influence of FI on CO₂ emissions for 26 countries in Asia. Using PCA technique, study evidenced that there exists a positive influence of FI on CO₂ emissions in the long-run (Hussain et al. 2021). A study conducted by Zaidi et al. (2021) on the effects of FI on CO₂ emissions in OECD countries from 2004 to 2017. They used PCA technique and CS-ARDL technique and results confirms that there exists a positive links between FI and carbon emissions. That means FI increases carbon emissions. Using panel quartile regression analysis and cointegration tests, Qin et al. (2021) investigated the effects of FI on carbon emissions in E7 countries from 2004 to 2016. Their findings confirm that FI reduces carbon emissions.

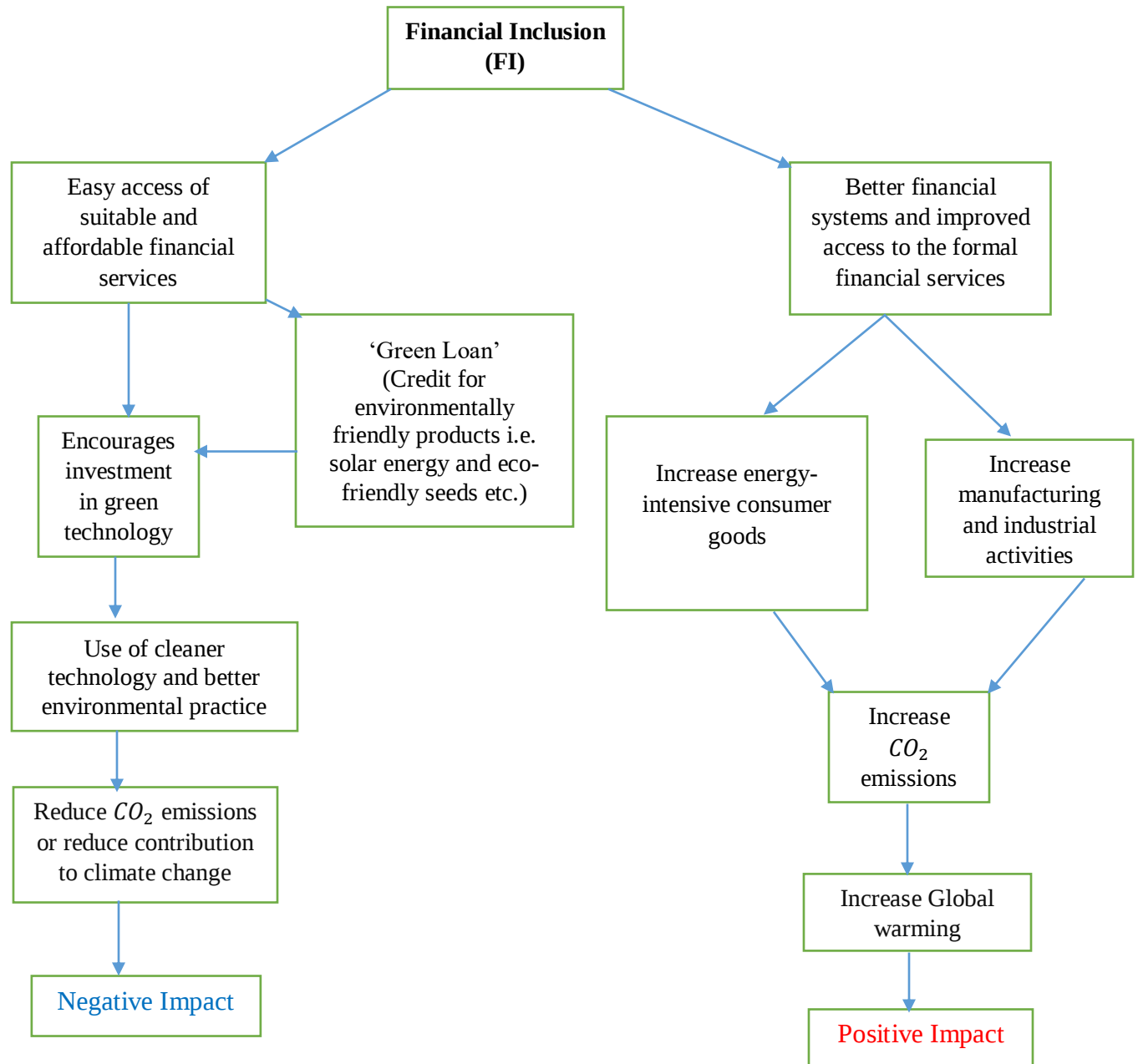
The present study suggests two hypotheses based on the above arguments and theoretical supports.

Hypothesis:

H_0 : FI decreases the carbon emissions

H_1 : FI increases the carbon emissions

Figure 6.1: Positive and negative impact of FI on CO_2 emissions

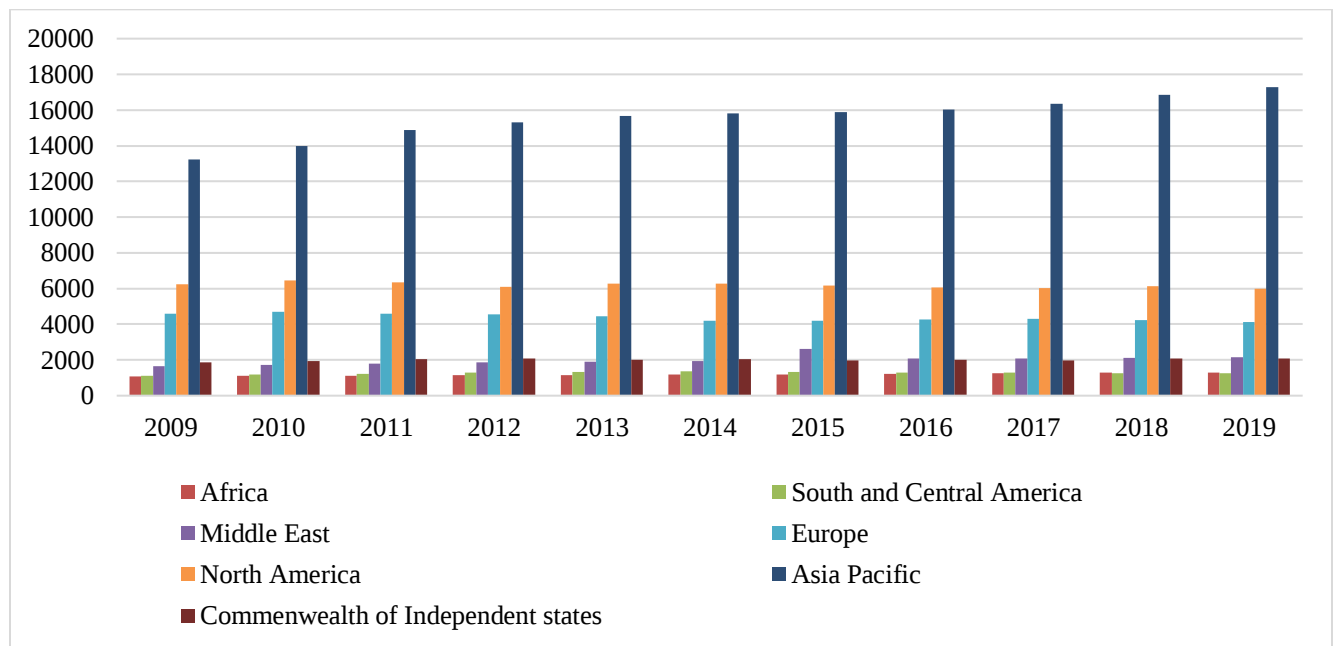


Source: Designed by the author based on the available literature

6.3 Financial inclusion (FI) on carbon emissions: Theoretical argument

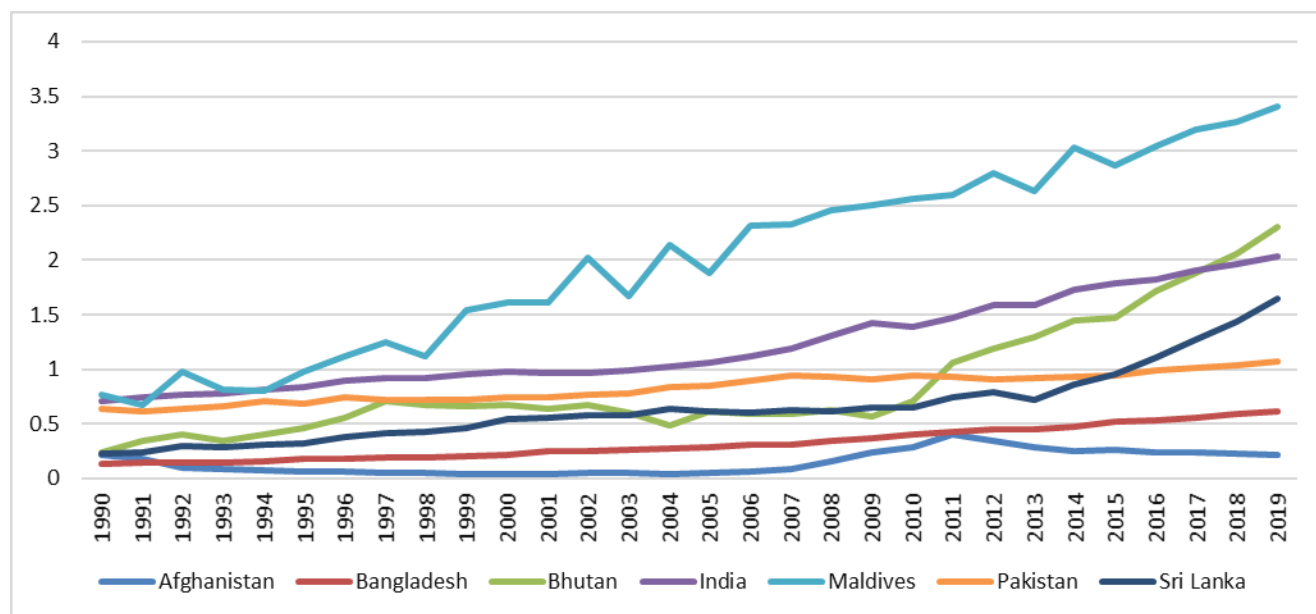
A theoretical connection between financial inclusion and CO_2 emissions is explained in Figure 6.2. Financial inclusion can increase or decrease CO_2 emissions through access to affordable cost of credit and access to attractive financial products. The logic goes in the following ways. First, easy access of suitable and affordable financial services (i.e. green loan) encourages investment in green technology, and eco-friendly products such as solar energy, wind energy and eco-friendly seeds etc. which further reduce CO_2 emissions. On the other hand, better financial system or inclusive financial system can improve the accessibility of banking products, which in turn increase energy consuming goods like automobiles, refrigerator and air conditions etc. and manufacturing and industrial activities. Finally, it increases CO_2 emissions and global warming.

Figure 6.2: CO_2 emissions during 2009-2019 by region-wise (in million metric tons of CO_2)



Source: Statista (<https://www.statista.com/statistics/205966/world-carbon-dioxide-emissions-by-region/>)

Figure 6.3: CO_2 emissions (metric tons per capita) in South Asian countries during 1990-2019



Source: World Bank

6.4 Current status of carbon emissions in South Asian countries

Figure 6.2 shows that Asia is the World's largest CO_2 emitter, contributing for nearly one-third of all global CO_2 emissions during 2009 to 2019. Figure 6.3 shows that the rising trend in carbon dioxide (i.e. CO_2) emissions in SAARC countries from 1990 to 2019. The trend line of carbon emissions has been increasing in all South Asian countries due to rapid growth of urbanization and increasing energy consumption by industries and transport.

6.5 Calculating financial inclusion index (FII)

Methodology regarding calculation of FII can be found in Section 2.6 in Chapter 2.

6.6 Model specification

Empirical model for estimating the effect of FI on CO_2 emissions in South Asia is described in this section. This study adopted a theoretical and empirical model that extends the “Stochastic impacts by regression on Population, Affluence and Technology (STIRPAT)” model developed by Dietz and Rosa (1997)¹ as given:

$$I = P \cdot A \cdot T \quad (6.1)$$

Where, I represents Environmental impact, P represents Population, A represents Affluence and T represents Technology or the environmental impact per unit of economic activity which determined by the technology. Further, reformulation assumes a stochastic version of model (6.1) as follows:

$$I_{i,t} = \alpha_{i,t} P_{i,t}^{\beta_1} A_{i,t}^{\beta_2} T_{i,t}^{\beta_3} \epsilon_{i,t} \quad (6.2)$$

Where I represents the environmental effects, P represents population, A represents affluence and T represents technology, for county i . α represents specific effect. β_1 , β_2 , and β_3 are represents the elasticities of the impact of environment (proxied by CO_2 emissions) with respect to P , A and T .

Mathematically, model (6.2) transformed into logarithmic form:

$$\ln I_{i,t} = \alpha_{i,t} + \beta_1 \ln P_{i,t} + \beta_2 \ln A_{i,t} + \beta_3 \ln T_{i,t} + \epsilon_{i,t} \quad (6.3)$$

This study expands the basic STIRPAT model in (6.3) by taking into account different additional determinants that have been identified to have an impact on CO_2 emissions, such as financial inclusion (i.e. FII): access to banking services (Prabhakar et al, 2014; Le et al, 2020),

¹ Thomas Dietz and Eugene Rosa (1997). “Effects of population and Affluence on CO_2 emissions”, *Proceedings of National Academy of Sciences, USA*, Vol.94, No.1, pp. 175-179.

urbanization (Cole and Neumayer, 2004; Shen and Saijo, 2008; Dhakal, 2009; Martinez-Zarzoso and Maruotti, 2011; Dash et al, 2020), trade openness (Sharma, 2011; Le et al,2020), industrialization (Dash et al, 2020) and energy intensity (Le et al,2020).

The base line model of this study is thus following.

$$\ln(CO_2)_{i,t} = \alpha_0 + \beta_{i,t}(\ln FII)_{i,t} + \sum_{t=1}^{t=n} \beta_{i,t} Controls_{i,t} + \alpha_{i,t} + \varepsilon_{i,t} \quad (6.4)$$

$$\ln(CO_2)_{i,t} = \alpha_0 + \beta_1(\ln FII)_{i,t} + \beta_2(\ln URB)_{i,t} + \beta_3(\ln Tradeop)_{i,t} + \beta_4(\ln Industri)_{i,t} + \beta_5(\ln Enerin)_{i,t} + \alpha_{i,t} + \varepsilon_{i,t} \quad (6.5)$$

Where, the dependent variable is $\ln CO_2$ = log carbon dioxide emissions metric tons per capita. The independent variables are FII = a multidimensional financial inclusion index, $\ln URB$ = log of urbanization, $\ln Tradeop$ = log of trade openness, $\ln Industri$ = log of industrialization, $\ln Enerin$ = log of energy intensity, α_i = unseen effects and $\mu_{i,t}$ = error term, $t = 1, 2, 3, \dots, 15$ years and $i = 1, 2, 3, \dots, n$.

Here, FI is expected to reduce CO_2 emissions or it is negatively associated with CO_2 emissions because easy access of suitable and affordable formal financial services encourages investment in green technology and environmentally friendly products such as solar energy, eco-friendly seeds etc. which reduce CO_2 emissions.

6.7 Data sources and variables

The study is based on 15 years of annual panel data from 2004 to 2018. By excluding one South Asia country like Nepal (because of data availability issues of formal financial services), rest of the seven South Asia countries are taken for the empirical research. The data set was collected using the FAS of IMF and World Development Indicator (WDI). Table 6.1 offers a comprehensive overview of the variables and their sources. For detailed list of indicators for constructing FII, see Table 2.3 in Chapter 2.

Table 6.1: List of the variables used for empirical analysis

Variables	Unit	Source
Carbon dioxide emission	Metric tons per capita	WDI, World Bank
Financial inclusion (<i>FII</i>)	Index	Financial Access Survey, IMF
Urbanization (<i>URB</i>)	% of total population	WDI
Trade openness (<i>Tradeopen</i>)	Trade percentage of GDP	WDI
Industrialization (<i>Industri</i>)	% of total economic growth	WDI
Energy intensity (<i>Energ</i>)	It is calculated as units of energy per unit of GDP.	WDI

6.8 Empirical methodology

Here we have used panel unit root tests, Pedroni cointegration tests, FMOLS and DOLS approaches. The detailed methodology of these econometric tests can be found in Section 4.8 in Chapter 4.

6.8.1 Dumitrescu-Hurlin (D-H) causality test

Dumitrescu Hurlin (2012) panel causality test is the methodology which detects causal relationship between the panel variables. So, it is accepted as the extension version of Granger causality test. It works better with unbalanced panel data and cross section dependency between countries. The equation of DH panel causality test is demonstrated below.

$$Y_{i,t} = \alpha_i + \sum_{k=1}^k \gamma_i^k Y_{i,t-k} + \sum_{k=1}^k \beta_i^k X_{i,t-k} + \varepsilon_{i,t} \quad \text{with } i = 1, \dots, N \text{ and } t = 1, \dots, T \quad (6.6)$$

Where $X_{i,t}$ and $Y_{i,t}$ represent the stationary variables that observed over $t = 1, \dots, T$ time periods, now for individuals $i = 1, \dots, N$ a panel data set. So, the main purpose of this methodology is to find out whether X is the main cause of Y . In addition, α_i represents the time constant individual

effects, γ^k is autoregressive parameter and β^k is the coefficient of the variables. k represents the optimum lag interval.

The hypothesis statements used for DH causality test are following:

$$H_0 : \beta_i = 0, \forall_i = 1, \dots, N$$

$$H_1 : \beta_i \neq 0, \forall_i = 1, \dots, N_1$$

$$\beta_{ii} \neq 0, \forall_i = N_1+1, N_1+2, \dots, N$$

Table 6.2: Descriptive statistics

	$\ln CO_2$	$\ln FII$	$\ln Enerin$	$\ln Industri$	$\ln Tradeop$	$\ln URB$
Mean	0.2	1.0	1.4	3.2	4.1	3.4
Median	0.1	0.8	1.3	3.3	4.0	3.5
SD	0.8	1.0	0.6	0.4	0.5	0.2
Min	-3.0	-6.0	0.2	2.1	3.2	2.9
Max	1.2	0.0	2.8	3.8	5.2	3.7
Skewness	0.7	2.4	0.7	1.0	0.4	0.9
Kurtosis	3.7	10.8	3.2	3.7	2.0	2.5
Observation	102	102	102	102	102	102

Source: Author's estimations

Table 6.3: Correlation matrix

	$\ln CO_2$	$\ln FII$	$\ln Enerin$	$\ln Industri$	$\ln Tradeop$	$\ln URB$
$\ln CO_2$	1					
$\ln FII$	0.2602	1				
$\ln Enerin$	0.3824	-0.2394	1			
$\ln Industri$	-0.3377	-0.1755	0.3896	1		
$\ln Tradeop$	0.2362	0.0628	0.1817	-0.2524	1	
$\ln URB$	0.4871	0.1011	0.6009	-0.2466	0.1252	1

Source: Author's estimations

6.9 Empirical findings and discussion

6.9.1 Descriptive statistics and correlation matrix

Table 6.2 describes the descriptive statistics and Table 6.3 explains the correlation result of the considered variables of the study. The descriptive statistics indicates that CO_2 emission varies from -3.0 to 1.2, with an average value 0.2 and SD of 0.8. The coefficient of our key independent variable, financial inclusion (i.e FII) ranges from -6.0 to 0, with an average value of 1.0 and SD of 1.0. The correlation matrix result shows that a positive correlation exists between financial inclusion and CO_2 emissions (i.e. 0.26). This implies that FI (i.e access and use of banking products) leads to carbon emissions, which threatens to decrease the air quality (for more details see Table 6.2 and Table 6.3).

Table 6.4: Factors influence CO_2 emissions (Fixed effect estimation)

Variables	(1) $\ln CO_2$
lnFII	0.132*** (0.000)
lnEnerin	0.772*** (0.000)
lnIndustri	-0.738*** (0.002)
lnTradeop	- 0.478*** (0.000)
lnURB	2.786*** (0.000)
Constant	- 6.292*** (0.001)
Observations	102
R^2	0.959
Number of Id	7

Notes: The dependent variable is CO_2 emissions and *** indicates 1 % level of significance.

Source: Author's estimations

6.9.2 Panel regression results (on the factors that influence CO_2 emissions)

Table 6.4 presents empirical results on important variables that impact the carbon emissions (i.e CO_2 emissions) in South Asian countries. Model 1 included different macroeconomic variables. Model 1 includes financial inclusion (i.e FII), energy intensity, urbanization, industrialization and trade openness.

Here, the results indicate that financial inclusion, energy intensity and urbanization, positive and significantly influence CO_2 emissions. Our key variables of interest, *financial inclusion* is positive and highly significant impact on CO_2 emissions, that means 1 percent increase in financial inclusion leads to 0.13 percent increase in carbon emissions. This result is suggesting that countries with better inclusive financial system experience higher CO_2 emissions in South Asian countries. This finding is consistent with Le et al. (2020); Hussain et al. (2021) work, which shows that financial inclusion could increase more CO_2 emissions. Furthermore, this finding indicates that, inclusive financial systems and improved access to the banking services leads to increase energy consuming consumer goods.

The positive effects of *energy intensity* on CO_2 emissions, that means 1 percent increase in energy consumption leads to 0.77 percent increase in carbon emissions. This indicating that economies with more energy consumption (i.e quantity of energy required to produce per unit of output) increase the CO_2 emissions. This result support the empirical findings of Saboori et al. (2017), Bhat (2018), Le and Quah (2018), Le et al. (2020) who found that energy intensity has a positive effect on CO_2 emissions.

Interestingly, *industrialization* exhibits a bad impact on CO_2 emissions. This result suggests that industrial-led growth in the region lead to less carbon emission. As expected, industrialization likely to increase CO_2 emissions. But our result is negative and significant. This result is consistent in the sense that serious environmental protectionism and strong monitoring of the industries activity can help to reduce energy consumption and further it leads to decrease CO_2 emissions.

Trade openness is negative and significant impact on the CO_2 emissions, implying that higher openness to trade has strongly lower CO_2 emissions rates. This result supports the empirical result of Sohag et al.(2017) and Le et al. (2020) who found a negative relation between trade openness and CO_2 emissions.

Another control variable, *urbanization* is favorable and significant impact on the CO_2 emissions. This result suggests that urbanization leads to carbon emissions in South Asian countries, which threats to decrease the air quality. This result line with Liddle and Lung (2010), Poumanyvong and Kaneko (2010), Liu and Bae (2018), Le and Quah (2018). This result indicating that rapid

growth of urbanization process in different nations across South Asia increased the demand for energy for transportation, manufacturing and electricity etc. (for details, see Table 6.4).

Here, the random effect result show that FI, energy intensity and urbanization, positive and significantly influence carbon emissions, while industrialization and trade openness have a negative relation with carbon emissions. Here random effect estimates results are similar with fixed effect estimates (for details see Table 6.5).

Table 6.5: Factors influence CO_2 emissions (Random effect estimation)

Variables	(1) $\ln CO_2$
lnFII	0.182*** (0.000)
lnEnerin	0.671*** (0.000)
lnIndustri	-0.780*** (0.000)
lnTradeop	- 0.414*** (0.000)
lnURB	1.774*** (0.000)
Constant	- 2.798** (0.053)
Observations	102
R^2	0.684
Number of Id	7

Note: *** and ** indicate 1 and 5 % level of significance.

Source: Author's estimations

Table 6.6: Hausman Test (Fixed effect and Random effect)

Chi-Square stat	33.09 (0.000)***
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Note: *** indicates 1 % level of significance.

Source: Author's estimations

Table 6.6 presents the Hausman Test results and it reveals that the alternative hypothesis of the fixed effect estimates was selected. That means we can accept the fixed effect results.

Table 6.7: IPS panel unit root test

Variables	$\ln CO_2$	$\ln FII$	$\ln Enerin$	$\ln Industri$	$\ln Tradeop$	$\ln URB$
<i>Level</i>	1.747 (0.959)	- 1.052 (0.146)	2.438 (0.992)	- 0.956 (0.169)	- 0.806 (0.210)	0.125 (0.550)
<i>First differences</i>	- 2.697*** (0.003)	- 4.035*** (0.000)	-4.651*** (0.000)	-5.023*** (0.000)	-4.918*** (0.000)	-23.333*** (0.000)

Note: *** indicates 1 percent level of significance.

Source: Author's estimations

6.9.3 Panel unit roots results

Table 6.7 reveals the Im-Pesaran-Shin (IPS) unit root test. The unit root test results shows that variables such as $\ln CO_2$, $\ln FII$, $\ln Enerin$, $\ln Industri$, $\ln Tradeop$ and $\ln URB$ are integrated of order one $[I(1)]$. Here, the finding confirms the use of panel cointegration (for details see Table 6.7).

Table 6.8: Pedroni panel cointegration estimation

	Statistics	Prob.
<i>With Dimensions</i>		
Panel v -Statistics	-2.128	0.997
Panel ρ Statistics	2.589	0.992
Panel Phillips-Perron t	0.867***	0.004
Panel Augmented Dickey Fuller t	0.728***	0.015
<i>Between Dimensions</i>		
Group ρ Statistics	3.533	0.999
Group Phillips-Perron t	-4.691***	0.000
Group Augmented Dickey-Fuller t	-1.888**	0.029

Note: *** and ** indicate 1 and 5 % level of significance, respectively.

Source: Author's estimations

6.9.4 Cointegration result

Here, our two key variables such as financial inclusion (i.e. FII) and carbon emissions (i.e. CO_2) may be cointegrated after adjusting the impact of energy intensity, industrialization, trade openness and urbanization. The cointegration result confirms that financial inclusion and carbon emissions are cointegrated. Four Pedroni cointegration test statistics rejects the null hypothesis of non-cointegration at 1 and 5 percent level of significance. It means that financial inclusion and CO_2 emissions in South Asian economies have a long run relationship. In addition, we believe that an inclusive financial system and its services will minimize CO_2 emissions in the long run if given proper priority in current period (for details see Table 6.8).

6.9.5 FMOLS and DOLS estimations

Table 6.9 shows the FMOLS and DOLS results. The FMOLS result indicates that our key variables such as financial inclusion and CO_2 emissions are cointegrated and positive sign, implying that 1 percent increase in FI (i.e. access and uses of formal financial services) across the South Asian countries will result 0.18 percent increase in carbon emissions. Similarly, DOLS result indicates that FI and CO_2 emissions have a long-run connection. The long-run coefficient indicates that 1 percent increase in financial inclusion will result 0.13 percent increase in carbon emissions. On the basis of the results, we accept the H_1 (alternative hypothesis) that financial inclusion positive effect on carbon emissions.

This result is indicating that, with improved inclusive financial system, and affordable cost of availability and usage of financial services, citizens in South Asian countries can afford to purchase more energy consumption items like televisions, air conditioners, refrigerators, and automobiles, whose large number of uses increase the CO_2 emissions in the South Asian countries. This result is consistent with Le et al. (2020), Hussain et al. (2021) and Zaidi et al. (2021) work, which shows that financial inclusion could increase more CO_2 emissions.

In FMOLS results, it is observed that *energy intensity* and *urbanization* are cointegrated and positive sign with CO_2 emissions shows that 1 percent increase in energy intensity (i.e. energy consumption) would increase 0.76 percent in carbon emissions and the positive sign also shows that 1 per cent increase in urbanization would increase 2.33 percent in CO_2 emissions. Similarly,

the DOLS result evidence that energy consumptions and urbanization are cointegrated and positive sign with CO_2 emissions. This result indicates that one percent increase in energy consumption would increase 0.77 percent in CO_2 emissions and one percent increase in urbanization would increase 2.78 percent in CO_2 emissions.

Table 6.9: FMOLS and Panel DOLS estimations

Dependent Variable: $\ln CO_2$	FMOLS			DOLS		
	Coefficients	t-Statistics	Prob.	Coefficients	t-Statistics	Prob.
$\ln FII$	0.183**	2.291	0.024	0.132***	2.775	0.006
$\ln Enerin$	0.764***	3.836	0.000	0.772***	4.230	0.000
$\ln Industri$	-0.785**	2.274	0.025	-0.738**	2.117	0.037
$\ln Tradeop$	- 0.569**	- 2.762	0.007	- 0.478***	- 2.492	0.014
$\ln URB$	2.333**	2.471	0.015	2.786***	3.779	0.000
R^2		0.959			0.959	
Adj. R^2		0.954			0.954	

Note: *** and ** indicate 1 % and 5 % level of significance.

Source: Author's estimations

Furthermore, result of FMOLS indicates that *industrialization* and CO_2 emissions are cointegrated. Surprisingly, the long run coefficient of this variable is negative. This negative sign indicates that 1 percent increase in industrialization reduces CO_2 emissions by 0.78 percent. Similarly, in DOLS result indicate that one percent increase in industrialization would decrease 0.73 percent in carbon emissions. The result of FMOLS indicates that *trade openness* and carbon emissions are cointegrated. The negative sign shows that 1 percent increase in openness to trade would result in a 0.56 percent reduction in carbon emissions. Additionally, the DOLS result also confirms that 1 percent increase in trade openness would decrease 0.47 percent in carbon emissions.

6.9.6 Dumitrescu-Hurlin panel granger causality results

Table 6.10 explains DH granger causality test results. Table 6.10 indicates that null hypothesis of “financial inclusion does not cause CO_2 emissions” can be rejected for lag 2 since the probability value is 0.0006 and accepted the alternative hypothesis. This indicates that financial inclusion is the main cause of CO_2 emissions in South Asian countries. In addition, the null hypothesis of “ CO_2 emission does not cause financial inclusion” can be accepted for lag 2 since the probability value is 0.7037. Finally, the findings show that there is a unidirectional causality between FI and CO_2 emissions. Furthermore, no causality is confirmed between *energy intensity* and CO_2 emissions because the probability values are 0.2433 and 0.8043. Therefore, we can accept the null hypothesis. That means energy intensity does not cause CO_2 emissions and vice-versa.

Table 6.10: Dumitrescu-Hurlin causality results

The way of the relationship	Lag	W-Stat	Prob. values	Results
FI $\rightarrow$ CO_2	2	9.243***	0.0006	Financial inclusion is the main cause of CO_2 emissions
$CO_2 \rightarrow$ FI	2	2.133	0.7037	CO_2 emissions does not cause financial inclusion
ENERIN $\rightarrow$ CO_2	2	4.33	0.2433	Energy intensity does not cause CO_2 emissions
$CO_2 \rightarrow$ ENERIN	2	2.313	0.8043	CO_2 emissions does not cause energy intensity
TRADEOPEN $\rightarrow$ CO_2	2	3.266	0.7155	Trade openness does not cause CO_2 emissions
$CO_2 \rightarrow$ TRADEOPEN	2	2.345	0.8073	CO_2 emissions does not cause trade openness
INDUSTRI $\rightarrow$ CO_2	2	5.194*	0.0762	Industrialization is the main cause of CO_2 emissions
$CO_2 \rightarrow$ INDUSTRI	2	8.263***	0.0005	CO_2 emissions is main cause of Industrialization
Urbanization $\rightarrow$ CO_2	2	8.627***	0.0005	Urbanization is the main cause of CO_2 emissions
$CO_2 \rightarrow$ Urbanization	2	8.014***	0.0002	CO_2 emissions is the main cause of urbanization

Notes: ***, ** and * are statistical significance at the 1%, 5% and 10% level. The p-values are based on the asymptotic normal distribution. FI: Financial inclusion

Source: Author's estimations

Similarly, no causality is found between *CO₂ emissions* and *trade openness* because the probability values are 0.7155 and 0.8073. That means *CO₂ emission* does not cause trade openness and vice-versa. But the above causality result reveals that a bidirectional causality is found between *CO₂ emissions* and *industrialization*. That means industrialization is the main cause of *CO₂ emissions* and *CO₂ emissions* is also main cause of industrialization. Therefore, we can reject null hypothesis for lag 2 since the probability values are 0.0762 and 0.0005. Similarly, a bidirectional causality is found between *urbanization* and *CO₂ emissions*.

6.10 Summary

The central focus of this chapter was to examine the impact of financial inclusion on *CO₂ emissions* in South Asian countries. For this, study has used annual panel data of 15 years from 2004 to 2018. In the first step, UNDP method was used to develop a multidimensional Financial Inclusion Index (FII) for South Asian countries. In the second step, it has investigated the crucial factors that influence *CO₂ emissions* across seven South Asian countries. In this study, the fixed effect estimates have shown that financial inclusion positively effects on *CO₂ emissions*. This result is implying that better inclusive financial system and its services could increase *CO₂ emissions* in South Asian countries. This result is in line with Le et al. (2020) and Hussain et al. (2021). This finding does not mean that, we can reduce financial inclusion. Instead, governments should work to improve inclusive finance system and access to credit in a more precise way. In addition, this study has evidenced that during the period from 2004 to 2018, other considered factors such as energy consumption, and urbanization have a positive influence on *CO₂ emissions* while industrialization and trade openness have a negative influence on *CO₂ emissions*. This study then has assessed the long-term relationship between FI and *CO₂ emissions*. Using panel cointegration techniques, a long-term relationship between FI and *CO₂ emissions* was found across the panel countries.

Additionally, it is observed that energy consumption and urbanization have positive and long run relationship with *CO₂ emissions*. Finally, we have investigated DH panel granger causality between considered variables. The result has indicated that, financial inclusion is found to be harmful for the environment with one way causality from financial inclusion to *CO₂ emissions*.

Chapter 7

Conclusions, Policy Implications and Scope for Future Research

7.1 Overall conclusions and policy implications

Financial inclusion (FI) is the process of including the unbanked people into the formal financial system. Despite the present focus of policies and regulations dedicated to increasing access to formal financial services in SAARC countries, there have been a number of factors which are causing financial exclusion. This present study proceeded to examine five main objectives (in chapter 2 to 6) as mentioned below. The study was organized into seven chapters.

The first objective and the central focus of this research was to examine the level of financial inclusion and it also tried to investigate the multiple effects of financial inclusion on macroeconomic goals in South Asian countries. In connection to this main purpose of this study, this study constructed a new multidimensional FII for selected South Asian countries from 2004 to 2018. For this FII, study used availability, accessibility and usage indicators of financial inclusion; and UNDP methodology for computation of HDI and HPI, and also closely followed Sarma (2008) methodology for financial inclusion index.

Overall cross country evidences suggested that the performance of all the South Asian countries on financial inclusion (i.e., Financial Inclusion Index) has been increasing from 2004 to 2018 but it is interesting to note that among seven South Asian countries, India is the only country which performed better with the highest value of FII from 2013 to 2017. In addition, the result also indicated that all the South Asia countries were included in the high financial inclusion category in 2018 justifying some recent steps taken by South Asian governments.

Policy implications: Findings of the first objective will be helpful to many researchers and policy makers. They can explore the major hindrances for having low financial inclusion in South Asian countries; specifically the result will be relevant to the individual study countries. This study further can be extended to incorporate some socio-economic determinants in their analysis to understand the linkage of the determinants on financial inclusion.

The second objective of this study was to examine the relationship between financial inclusion and human development. For this, first, the study had proposed a new HDI and called it modified Human Development Index (i.e., HDI_M) for seven SAARC countries. Empirical findings suggested that only five (Bangladesh, Bhutan, India, Maldives and Sri Lanka) of the seven South Asian countries were classified as high human development category (i.e., HDI_M). While two other South Asian countries (Pakistan and Afghanistan) fell in the category of medium and low human development. This study also included a comparative analysis to determine the linkages between the extent of FI and human development. The result indicated that the ranking of human development (calculated by the UNDP) followed a similar trend to the new human development index (i.e., modified Human Development Index). Second, using the modified HDI and FII, this study examined the important variables that impact the level of human development in South Asian countries. The time fixed effect results indicated that financial inclusion, health expenditure, rule of law positively influence the human development, while INTSCI (i.e. technological progress), political stability negatively influence the level of human development. But there is no evidence of significant impact of GDP growth on human development. The time random effect results indicated that FI and health expenditure have a positive impact on the level of human development, however, other control variables: INTSCI, law, credit, GDP growth, and political stability are not having significant impact on human development. Third, this study then investigated the effect of financial inclusion on human development in SAARC countries. The time fixed effect and random effect results confirmed that higher financial inclusion helps to increase human development. This set of results is in line with other studies like Kuri and Laha (2011); Bihari (2011); Ababio et al. (2019), Dutta and Singh (2019); Matekenya, Moyo and Jeke (2020).

Policy implications: Based on these research results from second objective, some policy implications can be drawn as follows. Overall, the study indicated that FI has a positive effect on HD. Therefore, the study suggests that policymakers in South Asian countries should promote or encourage effective investments in the financial sector in order to increase access to and usage of banking services. Further, policymakers should focus on to create more awareness about the banking services. Lack of usage of banking services may be due to lack of awareness of their

availability, particularly in remote and rural areas. Availability of banking products at a reasonable cost may encourage the use of banking services, which in turn will increase the level of human development.

Third objective of this study was to investigate the role of financial inclusion (FI) on increasing per capita income or living standard of people and reduce income inequality. For this, first, this study examined the important variables that impact the level of FI in South Asian nations using the FII. The fixed effect results evidenced that GDPpc, law, internet operators, education, and age dependency ratio are having all positive influences on financial inclusion. There is no proof that income inequality and population size has a significant impact on the level of financial inclusion. The random effect result indicated that population size, rule of law, internet users, education, and age dependence ratio all have a positive impact on financial inclusion. On the other hand, the impact of GDP per capita and income inequality is negative. Then to compare the usual fixed effect and random effect estimates, this study used the robust Hausman test. The test showed that the null hypothesis of random effect be rejected and hence the fixed effect model was selected.

The effects of FI on per capita income and income inequality were then examined in this study. The panel Pedroni cointegration method provided strong evidence of a long run connection between FI and per capita income across the panel countries. Additionally, cointegration approach presented an evidence of a long run connection between FI and income inequality.

The FMOLS and DOLS results confirmed that there exist a long run connection between FI and per capita income in South Asian countries. This result implied that financial inclusion has a positive and statistically significant effect on per capita income. That means, access to finance would increase the per capita income. This study supports findings of other studies like Aportela (1999), Jayachandran (2006), Green, Kirkpatrick and Murinde (2006), Dupas and Robinson (2013) which show that inclusive financial system creates knowledge about a person's cash flow by allowing the poor to save. This will help the poor to gain access to credit and make high return investments, therefore, increasing their profits and income.

In addition, development of effective financial related services (such as savings, deposits and loans etc.) and instruments like microfinance provide credit to micro and small business, which will produce more jobs, increase income and improve the standard of living. Again, the findings of FMOLS and DOLS results confirmed that there existed a long-run connection between FI and Income inequality. This result also confirmed that FI has a negative effect on income inequality. That means, FI would reduce income inequality in South Asian countries. This is consistent with findings of some studies like Khandker (2005), Mahjabeen (2008), Salazar-Cantu et al. (2015), Zhang and Posso (2019) which shows that increase in banking services and access to microfinance contributes to poverty reduction and further it reduces income inequality.

Policy implications: Findings of the third study objective indicated that important policy making should focus on financial sector reforms in order to increase per capita income or standard of living and reduce income inequality in the long-run. Furthermore, identifying the connection between financial inclusion-per capita income-income inequality, economic development, and poverty would help policymakers in designing and implementing policies that would increase per capita income and reduce income inequality by increasing access to financial services.

Fourth objective of this study was to find out the impact of financial inclusion (FI) on agricultural productivity. Using financial inclusion index (FII), this empirical research investigated some essential conditions under that lead to financial inclusion having a positive impact on agricultural productivity in South Asian countries. The time fixed effect and time random effect results indicated that the collaboration term of financial inclusion with physical capital, interest rates, trade openness and carbon emission are negatively associated with agricultural productivity. Only the collaboration term of financial inclusion with human capital is positively related with agricultural productivity. Similarly, the random effect estimates evidenced the same result as time fixed effect estimates. Secondly, this study assessed the long run connection between FI and agricultural productivity in South Asian nations. Third, the FMOLS and DOLS results confirmed that financial inclusion and agricultural productivity have a positive and long-term connection. That means, financial inclusion would increase agricultural productivity in the long run. This result is consistent with findings of some studies like Binswanger et al. (1993), Magri (2002), Das et al. (2009), Olaniyi (2017), Awunyo-Vitor, et al.

(2014, 2018), Fowowe (2019), Atakli and Agbenyo (2020) who found that availability and usage of banking products (loan, savings, and deposits at an affordable cost) lead to increase in credit which ultimately leads to increase agricultural productivity through efficient investment on fertilizer, pesticides, quality seeds and irrigation etc.

Policy Implications: According to this set of results from the fourth objective, policymakers should focus on financial sector reforms in order to boost agricultural productivity in the long run. To improve agricultural productivity, the government and policymakers must resolve the issues surrounding access of banking services. In addition, the research has important policy implications. To increase agricultural productivity, government should make more investment in both human and physical capitals so that skilled labour and better infrastructure facilities are available to increase agricultural productivity.

Fifth objective of this study was to examine the influence of financial inclusion (FI) on CO₂ emissions. In the first step, study tried to investigate the crucial factors that influence CO₂ emissions across seven South Asian countries. In this study, fixed effect estimates showed that financial inclusion has positive effects on CO₂ emissions. This result is implying that better inclusive financial system and its services could increase CO₂ emissions in South Asian countries. In addition, this study evidenced that during the period from 2004 to 2018, other considered factors such as energy consumption, and urbanization have a positive influence on CO₂ emissions while industrialization and trade openness have a negative influence on CO₂ emissions. This study then assessed the long-run connection between FI and CO₂ emissions. Using FMOLS and DOLS approach, results evidenced that there exists a long run association between FI and CO₂ emissions and this result also indicated that FI have a positive and statistically significant effects on CO₂ emissions. That means, access to finance would increase CO₂ emissions in South Asian countries in the long run. This result is consistent with findings of some studies like Le et al. (2020), Hussain et al. (2021) and Zaidi et al. (2021) which indicate that financial inclusion could increase more CO₂ emissions. In spite of that, governments should work to improve inclusive finance system and access to credit in a more precise way.

Furthermore, it is evident that energy consumption and urbanization have positive and long-run connection with CO₂ emissions. Finally, the study investigated DH panel granger causality between considered variables. The result indicated that, financial inclusion is found to be harmful for the environment with one way causality from financial inclusion to CO₂ emissions.

Policy Implications: Policy implications of findings from fifth objective can be summarized as follows. The findings of the study suggested important policy making needs to increase the availability and accessibility of climate finance in order to assist economically disadvantaged people in dealing with increasing CO₂ emissions. Micro, small, medium sized industries and individuals should be given proper access to formal financial services and products to allow them to take actions towards reducing CO₂ emissions. Additionally, policy makers need to emphasize on green loan (credit for environmental friendly products).

7.2 Limitations and scope for future research

Like other research works, the present study has some limitations, the first being the data constraints of study variables for all South Asian countries. This study was carried out only on the selected seven South Asian countries. Nepal had to be excluded due to lack of uniform and consistent data sets. Future empirical studies may be carried out by including more countries and by classifying countries based on some parameters (i.e., both developed and developing countries and comparing the impact separately and individually). In addition, this study used limited financial inclusion variables for constructing multidimensional Financial Inclusion Index (FII). Further, FII could be developed by including more important variables such as mobile banking and financial literacy. Moreover, this study used panel data (i.e., from 2004 to 2018) only. But analysis of time series data, if available may be more effective and useful or can supplement panel data results to provide specific policy recommendations.

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Some important websites:

Link for financial inclusion indicators data:

<https://data.imf.org/?sk=E5DCAB7E-A5CA-4892-A6EA-598B5463A34C>

World Development Indicator (WDI), World Bank:

<https://databank.worldbank.org/source/world-development-indicators>

The Standardized World Income Inequality Database (SWIID), Versions 8-9:

<https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:10.7910/DVN/LM4OWF>

Food and Agricultural Organization (FAO) STAT, UN:

<https://www.fao.org/faostat/en/#data>

For Region-wise Carbon dioxide emissions data:

<https://www.statista.com/statistics/205966/world-carbon-dioxide-emissions-by-region/>

Measuring Financial Inclusion of Indian States: An Empirical Study

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ABSTRACT

This paper examines the financial inclusion of Indian states by applying the financial inclusion index (FII) using the secondary data. The present study found that no state in India belongs to high financial inclusion ($0.5 \leq FII \leq 1$) group during the study period. Kerala (0.4116) secured the first rank in FII followed by Goa (0.4016), Delhi (0.356), Punjab (0.33), Tamil Nadu (0.3279) and West Bengal (0.31). These states were categorized under the medium financial inclusion ($0.3 \leq FII \leq 0.5$) and rest of the states had low financial inclusion ($0 \leq FII \leq 0.3$). Madhya Pradesh (0.1066) secured the last rank in comparison to other states of India. Regression results show that per capita income of households, literacy rate and the number of SHGs affect the FII positively and significantly. The study suggested that policymakers should increase banking penetration and availability of banking services to push the usage of the banking system. Moreover, there is need of a comprehensive financial inclusion plan for India as a whole along with region-specific inclusion plans.

Keywords

Financial inclusion, financial inclusion index, inclusive growth, India.

JEL Codes

O43, C12, G21.

INTRODUCTION

Financial inclusion is considered to be the core objective in many developing nations since the last decade because financial inclusion is no less important than social inclusion and inclusive growth. 'Financial inclusion' is the buzzword of the current era. It has generated a keen interest in the development circles. Policymakers and central bankers from around the world gather in different forums to discuss 'financial inclusion' and to build a more financially inclusive economic system.

Financial inclusion is defined as the process of ensuring access of financial services timely and adequately, and credits where needed by vulnerable groups such as weaker section and low-income groups at an affordable cost (Rangarajan Committee, 2008). From this, we can know that the inclusive financial sector development makes two complementary contributions to poverty alleviation – (i) it drives economic growth faster which indirectly reduces poverty and inequality, and (ii) by creating appropriate, affordable, financial services for

poor people, it can improve their welfare and living standard.

In India, many people are not considered for fair treatment either from the social institutions or from the financial institutions. The concept of financial inclusion can be traced back to the year 1904 when co-operative movement took place in India. It gained momentum in 1969 when 14 major commercial banks of the country were nationalized and lead bank scheme was introduced shortly thereafter. In India, the main slogan of the 11th Five Year Plan (2007-12) was “faster and more inclusive growth”. Financial sector inclusion is a very important component of inclusive growth because of poverty, deprivation and other socio-economic problems due to financial exclusion.

Measuring financial inclusion by the creation of an index or a set of Indices is a herculean task. The existing literature on measuring financial inclusion has not been too comprehensive and the present research makes an effort not only to study the policies of financial inclusion, and its role for inclusive growth but also to suggest the

construction of a new financial inclusion index of Indian states for a more inclusive policy on Financial Inclusion.

Literature Review

Different approaches have been proposed in the literature including the use of a variety of financial inclusion dimensions to econometric estimation. One of the first efforts at measuring financial sector outreach across countries was done by Beck *et al.*, (2006). The authors designed new indicators of banking sector outreach for three types of banking services-deposits, loan, and payments (access, affordability, and eligibility). Combining these elements to evaluate overall progress skilled by countries can be complicated. A well-developed financial system accessible to all reduces information and transaction costs, influence saving rates, investment decisions, technological innovation, and long-run growth rates (Beck *et al.*, 2007).

At the conceptual level, a range of theoretical models has been used to demonstrate that a lack of access to finance can lead to poverty traps and inequality (Aghion & Bolton 1997; Banerjee & Newman 1993; Galor & Zeira 1993). Honohan (2008) estimated the fraction of the adult population using formal financial intermediaries using the information on a banking and MFI accounts for more than countries and then correlated with inequality (Gini Coefficient) and poverty. Evidence from Binswanger & Khandker (1995); Pande & Burgess (2003) suggest that Indian rural branch expansion program significantly lowered rural poverty and increased non-agricultural employment.

For India, being a very well diversified economy and society, it is imperative to give adequate attention to measurement of financial inclusion. There are few scholars who have attempted to measure some aspects of financial inclusion. Sarma (2008) developed an index for financial inclusion using aggregate banking variables like number of accounts, number of bank branches and total credit and deposit a proportion of GDP for 55 countries. Mehrotra *et al.*, (2009) constructed a Financial Inclusion Index (FII) to measure the level of financial inclusion and then tried to find out the relationship between financial inclusion and economic growth. Their argument is that when people access to banking services it benefits them to park their money in the formal financial institutions. This results in high growth through multiplier effects which in other words helps to achieve an inclusive growth. Chakravarty & Pal (2010) have very recently presented a set of matrices for measuring financial inclusion. In what they call as an axiomatic approach, they consider data from Beck *et al.* (2007) which reported eight indicators of financial inclusion. They worked in two-folds. In the first stage, they calculated the level of financial inclusion in 21 countries including India for different income groups. They stated that to achieve the high level of financial inclusion, the factors of banking services have contributed equally to that success. At the state level, most of the states have experienced low financial inclusion

during the period of 1991 to 2001. Interestingly, for the period of 2001 to 2007, the level of financial inclusion has increased in Indian states.

Chattopadhyay (2011) studied the efficacy of financial inclusion in West Bengal (WB). For that, he compared the performance of WB among all other Indian states and then a survey was done in selected districts of WB. In comparing the performances, the WB scored a very low level of financial inclusion. In the Financial Inclusion Index, Maharashtra scored the highest level of achievement in financial inclusion. He argued that, after 2005 to 2006, there has not been any measure success in financial inclusion. Considering the district level study, it is confirmed that financial inclusion is not speeded over all the rural areas. Moneylender still dominates rural informal credit market. Gupte *et al.* (2012) used the more updated database to study the impact of financial inclusion India. By showing the major drawbacks in the previous studies, a Financial Inclusion Index (FII) was constructed. In the result, he found that the financial inclusion increased from the period of 2008 to 2009. This improvement has been mainly due to the contribution of some important demand-side factors. By comparing the results of Sarma (2008), concluded that the level of financial inclusion has declined for the same period. Yorulmaz (2013) used three dimensions of financial inclusion to measure the coverage of financial inclusion Turkey. He used similar kind of methodology as Sarma (2008), used to calculate FII. From the result, it is evident that the high-income region has performed well in the Index. In other words, high-income groups have better access to banking services in Turkey. In the Turkey region, Istanbul scored the highest rank in FII, whereas mid-east Anatolia performed the very low level of financial inclusion. Manuel (2013) studied the level of financial inclusion in 32 states of Mexico and its Municipality. Using principal component analysis, he found that around 36 percent of Municipality are financial inclusive whereas 29 percent of them are still excluded. He also found a direct relationship between education and financial inclusion and to some extent the high correlation between poverty and financial inclusion. Thus he suggested that in order to benefit a large mass of excluded population, Mexican government should encourage equitable growth and equal opportunities. Sethy (2016) developed two separate types of financial inclusion index such as - FII with demand-side indicators and FII with supply side indicators. To measure FII, he used both demand-side indicators such as: banking penetration, availability of banking services and usage of banking system as well as supply-side indicators such as: access to saving, access to insurance and bank risk. From the result it is found that during 2010 to 2012 (demand-side indicators), India is categorized under the high financial inclusion but during 1987-1988 and 1989-2009 (supply side indicators), India is categorized under the low financial inclusion.

Motivation of the Study

For developing countries like India, it is necessary to include the entire section of the society under a single roof of financial services. Still, money lenders in India dominate the rural credit markets. The people in rural areas lack knowledge about the entire range of financial services such as opening bank accounts and credit etc. Against the above backdrop, the main purpose of this present study is to examine the extent of financial inclusion in different states of India. The study attempts to take into account the different variables or indicators to construct a Financial Inclusion Index. This will enable us to know that the banking services development in different states of India.

Objectives of the Study

In the light of these above motivations and background, the specific objectives of the present study are: (i) to understand the present status of India's financial inclusion by applying the financial inclusion index (FII) and (ii) to estimate the financial inclusion index model to understand the influence of various variables on the FII.

METHODOLOGY

With the rising interest in financial inclusion among policymakers, a multiplicity of financial inclusion indicators has been developed. This study is also constructing a Financial Inclusion Index (FII). To construct an index, this study first is calculating a dimension index for every dimension of financial inclusion. Steps are explained below.

Formula 1:

$$d_i = w_i \times \frac{A_i - m_i}{M_i - m_i}$$

Where, w_i = weight attached to the dimension i , $0 \leq w_i \leq 1$

A_i = Actual value of dimension i , m_i = Minimum value of dimension i , M_i = Maximum value of dimension i , and d_i = Dimensions of financial inclusion i

Formula (1) confirms that $0 \leq w_i \leq 1$ and here, n dimensions of financial inclusion are represented by a point $X = (1, 2, 3 \dots)$. The point $0 = (0, 0, 0 \dots 0)$ represents the point indicating the worst situation and point $W = (1, 2, 3 \dots)$ represents an ideal situation. Here, both the worst point 0 and the ideal point W are the important factors to calculate an index for countries and states which indicate the position of financial inclusion. If the distance is larger between X and 0 , then it represents higher financial inclusion and similarly if the distance is lower between X and 0 , then it represents lower financial inclusion.

Formula 2:

$$X_1 = \frac{\sqrt{d_1^2 + d_2^2 + d_3^2 + \dots + d_n^2}}{\sqrt{w_1^2 + w_2^2 + w_3^2 + \dots + w_n^2}}$$

Formula 3:

$$X_2 = 1 - \frac{\sqrt{(w_1 - d_1)^2 + (w_2 - d_2)^2 + (w_3 - d_3)^2 + \dots + (w_n - d_n)^2}}{\sqrt{w_1^2 + w_2^2 + w_3^2 + \dots + w_n^2}}$$

Formula 4:

$$FII = \frac{1}{2} (X_1 + X_2)$$

In the formula (2) for financial inclusion index (FII), X_1 indicates average of the Euclidian distance between X and 0 . Higher value of X_1 implies more financial inclusion. In Formula (3), for FII, X_2 indicates inverse Euclidian distance between X and W and similarly, higher value of X_2 corresponds to be higher financial inclusion. The formula (4) is the simple average of X_1 and X_2 .

Depending on the value of FII, states are categorized into three categories such as:

- I. $0.5 < FII \leq 1$ indicates high financial inclusion
- II. $0.3 < FII < 0.5$ indicates medium financial inclusion
- III. $0 \leq FII < 0.3$ indicates low financial inclusion

Data Sources and Variables

This study is primarily based on secondary data on banking penetration (BP), availability of the banking services (BS) and usage of the banking system (BU). Here, various variables such as Bank branches, ATMs, Deposits and Credits are taken from RBI. All dimension data are taken from Census of India (2011), RBI, and IMF.

The Index of financial inclusion presented in formula 4 considers three basic dimensions of an inclusive financial system such as banking penetration (BP), availability of the banking services (BS) and usage of the banking system (BU). These dimensions are largely motivated by the availability of relevant and consistent data for Indian states to compute comparable FII. Here, the year 2011 is taken as the base for data representing indicators of financial inclusion for the computation of Financial Inclusion for 22 major Indian states. For an absolute measure of Financial Inclusion of India, the study period is spanning from 2006 to 2014. Dimensions of some important study variables are described below.

Banking Penetration (Dimension 1): An inclusive financial system should have as many as users as possible, that is, an inclusive financial system should penetrate widely amongst its users. The size of the “banked” population, i.e., the number of people having a bank account is called banking penetration. Thus, if every person in an economy has a bank account, then the value of this measure would be 1 (Number of deposit account with commercial bank per 1000 adults).

Availability of banking services (Dimension 2): The services of an inclusive financial system should be easily available to its users. Availability of services can be indicated by the number of bank outlets (per 100000 populations) and /or by the number of ATM per 100000 persons, or the number of bank employees per customer. In the absence of comparable data on the number of ATMs and number of bank staff, we can use the number of bank branches per 100000 persons to measure the availability dimension.

Usage of the banking system (Dimension 3): This dimension is motivated by the notion of “underbanked” or

“marginally banked” people. The bank account is not enough for an inclusive financial system, it is also imperative that the banking services are adequately utilized. Here, outstanding deposit with commercial banks as a percentage of GDP dimension is used in this present study. That is, outstanding deposit with commercial banks as a percentage of GDP.

Scope and Limitations of the Study

The study is particularly limited to construct a Financial Inclusion Index (FII) for Indian states. The study is trying to explain the different financial inclusion policies in India and its role in inclusive growth. Here the major limitation of this study is non-availability of data of some important variables which can help to understand the stated objectives.

RESULTS AND DISCUSSION

Present Status of Financial Inclusion in India

The number of commercial banks in the recent years declined from 183 to 152 in 2015, out of which 148 SCBs are operating. During the concerned years, the commercial banks spread its branches rapidly. The number of operating branches was 71839 in 2007 which increased to 125672 in 2015. The number of branches operating in the rural areas, although, increased during the period, its proportion in a total number of branches declined. The highest growth was achieved in the semi-urban areas where the proportion of branches increased from 22.8 percent in 2007 to 26.8 percent in 2015. The branches operating in the urban and metropolitan also increased significantly their share remains more or less stable. The percent deposits in SCBs had secular increasing trend so as the per capita credit but the credit-deposit ratio remains almost stable with a small fluctuation in between the period (Table 1).

The data collected from Status of Micro Finance in India, NABARD (2013-14) shows a total of 7429500

SHGs are operating in India out of which 6251678 exclusively by the women. There is a total of ₹989741.5 lakh of saving by the SHGs. 422810 number of SHGs are linked with commercial banks with a saving amounting ₹663145.6 lakh. Within the SHGs linked with commercial banks, 3483212 SHGs are exclusively by women groups having a saving amount of ₹565641.83 lakh. A significant number of SHGs are linked with Regional Rural Banks (RRB) and also with Co-operative Banks. The SHGs-Commercial Banks linkage is a major source of microfinance in India (Table 2).

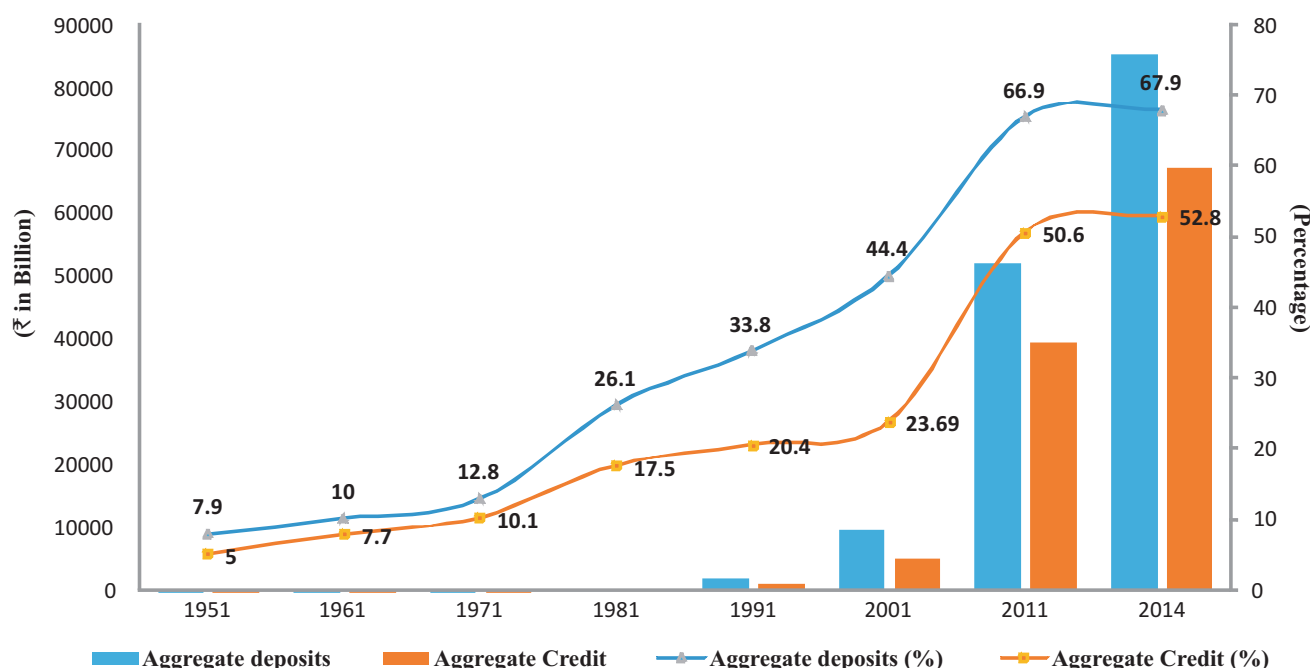
The India banking system has grown rapidly over the years. Over the last decade, India witnessed a credit boom with the share of Credit-Gross Domestic Product (GDP) increasing from 23.69 percent (₹5114 billion) in 2001 to 52.8 per cent (₹ 673521 billion) in 2014. The share of the Deposit-GDP was found to be increasing from 44.4 per cent (₹9629 billion) in 2001 to 67.9 percent (₹85331 billion) in 2014. From the above Figure 1, we can conclude that both the share of Credit-GDP and Deposit-GDP trend line increasing at a faster rate from 1951 to 2014 (For details see Fig. 1).

A perusal of Table 3 shows geographic branch penetration of SCBs in India at different periods of time. It is clear from the table that geographical branch penetration keeps on increasing from the year 1991. In 1991, geographical branch penetration score of India was 18.31, in the year 2001 it was 20.05 and in the year 2011, it reached 27.26. Geographical branch penetration scores indicate that there were about 18 branches per 1000 Km² in the year 1991, 20 branches per 1000 Km² in the year 2001 and around 27 branches per 1000 Km². Geographic branch penetration score of SCBs in India as on 31st March, 2011 indicates that people have to travel considerable distance to avail banking services in India.

Table 1. Progress of commercial banks in India (March 2007-March 2015)

Important indicators	2007	2008	2009	2010	2011	2012	2013	2014	2015
Number of commercial bank	183	175	170	169	169	173	155	151	152
(a) SCBs	179	171	166	165	165	169	151	146	148
(b) Non-SCBs	4	4	4	4	4	4	4	5	4
Number of offices of SCBs in India	71839	76050	80547	85393	90263	98330	105437	117280	125672
(a) Rural	30551 (42.53)	31076 (40.86)	31667 (39.31)	32624 (38.20)	336383 (37.20)	36356 (36.97)	39195 (37.17)	45177 (38.52)	48498 (38.59)
(b) Semi-Urban	16361 (22.77)	17675 (23.24)	18969 (23.55)	20740 (24.29)	22843 (25.39)	25797 (26.24)	28165 (26.71)	31442 (26.81)	33703 (26.82)
(c) Urban	12970 (18.05)	14391 (18.92)	15733 (19.53)	17003 (19.91)	17490 (19.38)	18781 (19.10)	19902 (18.88)	21448 (18.29)	22997 (18.30)
(d) Metropolitan	11957 (16.64)	12908 (16.97)	14178 (17.60)	15026 (17.60)	16247 (18.00)	17396 (17.69)	18175 (17.24)	19213 (16.38)	20474 (16.29)
Per capita deposits of SCBs (₹)	23468	28327	33471	38062	43034	48732	55445	62252	68576
Per capita credit of SCBs (₹)	17355	20928	24230	27489	32574	38033	43123	48294	50089
Credit deposit ratio (%)	73.9	73.9	72.4	72.2	75.7	78.0	77.8	77.6	73.0

Source: Compiled on the basis of RBI data. Note. SCB: Schedule Commercial Bank.



Source: Compiled by the Author (Data Source: Ministry of Finance (2015b), India).

Figure 1. Growth in deposits and credit in India's banking system (billion, as of 31 march)

The perusal of Table 4 depicts demographic branch penetration of SCBs in India at different periods of time. Table 4 it is evident that demographic branch penetration in India was 7.41 in the year 2011. The demographic branch penetration scores of India indicate that in the year 1991 and 2011, about 7 branches were available for every 1, 00,000 persons and about 6 branches were available for every 1, 00,000 people in the year 2001. Demographic branch penetration in India from 1991 to 2011 increased

slightly only. From this, it is evident that there has been a considerable increase in bank branch expansion in India, but it is not in the proportion to increase in population in India.

Computation of Financial Inclusion Index (FII)

The FII is a composite index of all three dimensions (Banking penetration, Availability of the banking services and Usage of the banking system) and emphasizes on the uniform development of the states across these three dimensions. It suggests a direction for policymakers to improve the performance. The purpose of this analysis is to find out the dimensions across which a particular state is doing well or is underperforming.

A perusal of Table 5 and Figure 2 show the state-wise Financial Inclusion Index (FII) in 2011. From the data given in the table, it is quite evident that Kerala (0.4116) has secured the first rank in FII followed by Goa (0.4016), Delhi (0.356), Punjab (0.33), Tamil Nadu (0.3279) and West Bengal (0.31). These states are categorized under the medium financial inclusion ($0.3 < \text{FII} < 0.5$). There is no state of the high financial inclusion. Madhya Pradesh (0.1066) has secured the last rank in FII among all other states in India. A state with low financial inclusion requires an increase in banking penetration, more availability of banking services and above all usages of the banking system. Even medium financial inclusion performing states essentially means that there is a lot to be done to improve the position.

From Table 5, the percentage of household using banking services is the highest in Himachal Pradesh (89.1) followed by Goa (86.8), Uttarakhand (80.7), Delhi (77.7), and Kerala (74.2). The percentage of households

Table 2. Progress under microfinance-savings of SHGs agency-wise positions

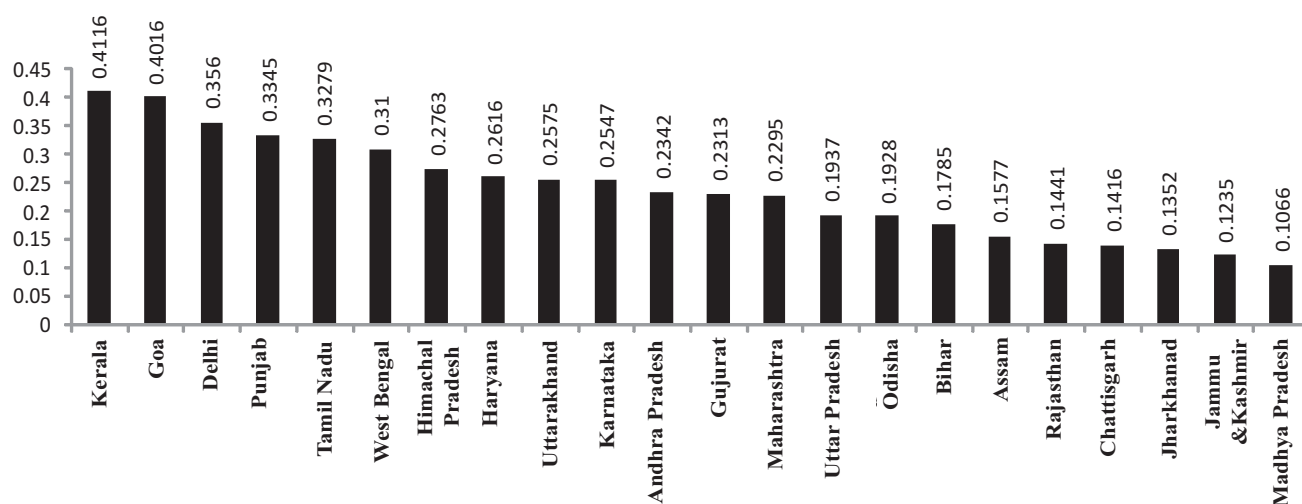
Name of the agency	(₹ Lakh)			
	Total savings of SHGs with banks as 31 March 2014		Out of total exclusive women SHGs	
	Number of SHGs	Savings	Number of SHGs	Saving Amount
Commercial Banks	4022810	663145.6	3483212	565641.83
Regional Rural Banks	2111760	195985.7	1753387	139081.96
Co-operative Banks	1294930	130610.2	1015079	96565.15
Total	7429500	989741.5	6251678	801288.94

Source: Status of Microfinance in India 2013-14, NABARD.

Table 3. Geographic branch penetration of SCBs in India

End-March	Total number of branches	Geographic branch penetration
1991	60220	18.31
2001	65919	20.05
2011	89622	27.26

Source: Compiled on the basis of RBI data.



Source: Author's Calculation (Data sources: RBI, NABARD, Census of India, 2011).

Figure 2. Financial inclusion index (FII) of Indian states in 2011

Table 4. Demographic branch penetration of SCBs in India

End-March	Total number of branches	Demographic branch penetration
1991	60220	7.17
2001	65919	6.46
2011	89622	7.41

Source: Compiled on the basis of RBI data.

using banking services is very low in Assam (44.1) in comparison to other states. Moreover, there is need of a comprehensive financial inclusion plan for India as a whole along with region-specific inclusion plans. Till now financial inclusion has not yielded the desired results but no doubt it is playing a significant role and is working on the positive side.

A perusal of Table 6 depicts that the classification of

Table 5. Financial inclusion index (FII) of Indian states

State	FII	FII rank	% of HH using BF* (2011)	Category
Kerala	0.4116	1	74.2	Medium financial inclusion (0.3 < FII < 0.5)
Goa	0.4016	2	86.8	
Delhi	0.356	3	77.7	
Punjab	0.3345	4	65.2	
Tamil Nadu	0.3279	5	52.5	
West Bengal	0.31	6	48.8	
Himachal Pradesh	0.2763	7	89.1	Low financial inclusion (0 ≤ FII < 0.3)
Haryana	0.2616	8	68.1	
Uttarakhand	0.2575	9	80.7	
Karnataka	0.2547	10	61.1	
Andhra Pradesh	0.2342	11	53.1	
Gujarat	0.2313	12	57.9	
Maharashtra	0.2295	13	68.9	
Uttar Pradesh	0.1937	14	72	
Odisha	0.1928	15	45	
Bihar	0.1785	16	44.4	
Assam	0.1577	17	44.1	
Rajasthan	0.1441	18	68	
Chhattisgarh	0.1416	19	48.8	
Jharkhand	0.1352	20	54	
Jammu & Kashmir	0.1235	21	70	
Madhya Pradesh	0.1066	22	46.6	

Source: Authors' calculation.

Per cent of households (HH) using banking facilities (BF) and FII calculation I using 3 dimensions of financial inclusion.

period 2006 to 2014 in India on the basis of the values of FII. It shows the FII has been increasing over the period in India. It is an absolute measure of financial inclusion. From 2006 to 2008, values of Financial Inclusion Index vary from 0 to 0.3. It indicates that, during this period, India is categorized under the low financial inclusion. There may be various reasons behind the achievement of low financial inclusion but the major reasons may be the lack of initiatives taken by the GOI and RBI, unawareness about the banking policies and financial crisis (2007-08) etc. For the period from 2009 to 2011, India is categorized under the medium financial inclusion. During 2012 to 2014, India is categorized under the high financial inclusion.

Regression Estimation Results

In this paper, the following model of the FII has been estimated to know the effect of different indicators on the FII for 22 Indian states. Due to data constraints of all variables, we have included only three explanatory variables in the model. They are per capita income (X1), literacy rate (X2) and the number of SHGs (X3). Data variables are given in Appendix Table 1.

$$FII = \alpha_1 + \beta_1(X_1) + \beta_2(X_2) + \beta_3(X_3) + \delta_i \quad (1)$$

$$FII = -0.40967 + 8.321514 (X1)_i + 0.007651(X2)_i + 4.811234 (X3)_i$$

$$(t\text{-stat})(-3.39479) (3.201959) (4.271964) (4.271964)$$

$$R\text{-square} = 0.805982, n = 22, F(22, 3) = 24.92498$$

Regression results in equation (1) show the variables of per capita income, literacy rate and number of SHGs affect the FII positively and significantly. All estimated slope coefficients are statistically significant at 5 percent level of significance. The regression results also indicate that the positive influence of the per capita income on the FII is higher than other two explanatory variables. This implies that by increasing the per capita income of people, literacy rate and the number of SHGs in the country, the financial inclusion can be improved. Here, the R^2 value shows the about 81 percent of the variation in the FII is explained the variations in the three explanatory variables included in the model.

CONCLUSIONS

The paper examined the financial inclusion by applying the Financial Inclusion Index (FII) for Indian states. The FII was computed for 22 states of India, using data for indicators of three dimensions such as banking penetration, availability of banking services and usage of the banking system. On the basis of the range of index, states were grouped into three categories, namely, high financial inclusion, medium financial inclusion and low financial inclusion. Kerala ranked at the top of FII followed by Goa, Delhi, Punjab, Tamil Nadu etc. and Madhya Pradesh came at the bottom. Out of 22 states, there was no state under the high financial inclusion category. Kerala, Goa, Delhi, Punjab, Tamil Nadu and West Bengal come under the medium financial inclusion category and all other states are under the low financial inclusion category, indicating the need for further

Table 6. Financial inclusion index (FII) of India (Using 6 indicators of financial Inclusion from 2006-14)

Year	FII	Category
2006	0.054343	Low financial inclusion
2007	0.079993	
2008	0.186544	
2009	0.332733	Medium financial inclusion
2010	0.324409	
2011	0.453523	
2012	0.520142	High financial inclusion
2013	0.626688	
2014	1	

Source: Author's calculation from Financial Access Service, IMF.

DACBA → Number of Deposits account with Commercial Bank per 1,000 Adults.

ATMA → Number of ATMs per 100000 Adults.

CBBA → Number of Commercial Bank Branches per 1,000 Adults.

ODCBG → Outstanding Deposits with Commercial Banks as percentage of GDP.

ATMKMs → ATMs per 1,000

development on financial inclusion measures. More opening of no-frills bank accounts is not the purpose or the end of financial inclusion while formal financial institutions must gain the trust and goodwill of the poor (Sharma & Kukerja, 2013).

Our regression estimation results reveal that per capita income is a major determinant of households' prosperity to use formal financial services because the per capita income positively affects the FII. The literacy rate also positively affects the FII because financial literacy plays a significant role in the efficient allocation of household savings and the ability of individuals to meet their financial services. There is a need to simultaneously focus on the financial literacy part besides delivery/access to better improvement. The SHGs-Bank linkage programme has been promoting microfinance facilities to ensure financial inclusion. It facilitates extending financial services to an unbanked disadvantaged section of society. It is also found in the analysis that the number of SHGs positively endorses financial inclusion. The policies of financial inclusion may not be yielding the expected results but the measures adopted by the governments must be speeded up in every state, particularly to those regions where FII is low.

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Appendix 1

Financial inclusion index, per-capita income, Literacy rate and numbers of SHGs in India

State	FII	Per capita income	Literacy rate	Number of SHGs
Kerala	0.4116	71434	93.9	493347
Goa	0.4016	168572	87.4	7926
Delhi	0.356	116886	86.43	3095
Punjab	0.3345	69737	76.7	40919
Tamil Nadu	0.3279	72993	80.3	943098
West Bengal	0.31	48536	77.1	666314
Himachal Pradesh	0.2763	65535	83.78	53113
Haryana	0.2616	94680	76.6	35319
Uttarakhand	0.2575	66368	79.6	44295
Karnataka	0.2547	60946	75.6	564545
Andhra Pradesh	0.2342	62912	67.7	1466225
Gujarat	0.2313	75115	79.3	192834
Maharashtra	0.2295	83471	80.1	760161
Uttar Pradesh	0.1937	26355	71.7	470157
Odisha	0.1928	40412	73.45	521152
Bihar	0.1785	20708	63.8	248197
Assam	0.1577	30569	73.2	245120
Rajasthan	0.1441	39967	67.1	233793
Chhattisgarh	0.1416	41167	71	118167
Jharkhand	0.1352	29768	67.6	87205
Jammu & Kashmir	0.1235	37496	68.7	5569
Madhya Pradesh	0.1066	32222	70.6	153817

Source: Authors' estimates based on the data from RBI, NABARD, and Census of India 2011.

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CERTIFICATE

December 15, 2017

This is to certify that Susanta Kumar Sethy, from University of Hyderabad presented the paper "Impact of Formal Financial Services on Households income and employment level in India" and participated as a discussant in the 2017 meeting of World Finance & Banking Symposium - Bangkok, Thailand, December, 14th to 15th.

Best regards,

João Paulo Vieito
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