# PUBLIC SPENDING AND POVERTY: THE MEDIATING ROLE OF SOCIAL AND PHYSICAL INFRASTRUCTURE IN DEVELOPING COUNTRIES

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**NATIONAL UNIVERSITY OF MODERN LANGUAGES, ISLAMABAD**

**January, 2024**

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MS, Economics, International Islamic University Islamabad, 2015

A THESIS SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF

**DOCTOR OF PHILOSOPHY**

In **Economics**

To

FACULTY OF MANAGEMENT SCIENCES


NATIONAL UNIVERSITY OF MODERN LANGUAGES, ISLAMABAD

January, 2024

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Thesis Title: Public Spending and Poverty: The Mediating Role of Social and Physical Infrastructure in Developing Countries

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Candidate of **Doctor of Philosophy** at the National University of Modern Languages do hereby declare that the thesis **Public Spending and Poverty: The Mediating Role of Social and Physical Infrastructure in Developing Economies** submitted by me in partial fulfillment of PhD degree, is my original work, and has not been submitted or published earlier. I also solemnly declare that it shall not, in future be submitted by me for obtaining any other degree from this or any other university or institution.

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# Abstract

The basic purpose of this research is to study the relationship between poverty and public spending through the mediating role of social and physical infrastructure. Social infrastructure consists of literacy rate and health expenditures and physical infrastructure includes access to electricity as energy and rail line as transportation. This study analyzes panel data for 52 developing countries for the period of 1981-2020. To investigate the relationship between poverty and public spending, mediation and moderation methodologies have been used following Hayes, A. F. (2017) and Latif et al., (2017). Empirical analysis for mediation analysis is subject to seemingly unrelated regression (SUR) developed and suggested by Biorn, (2004) and that is the most suitable technique for unbalanced panel data so far while moderation analysis is carried out using fixed and random effects models for panel data.

Based on empirical analysis carried out to find the impact of public spending on poverty for the panel of developing countries through the channel of social infrastructure i.e. literacy rate and health expenditures, this study finds that public spending reduces poverty directly as well as indirectly. The mediating and moderating role of social infrastructure i.e. literacy rate and health expenditures, was also found significant. Similarly, the empirical analysis carried out to find the impact of public spending on poverty for the panel of developing countries through the channel of physical infrastructure i.e. energy (access to electricity) and rail lines, it is concluded that public spending reduces poverty directly as well as indirectly. The mediating role of physical infrastructure i.e. energy and rail lines, it is concluded that this channel is also significant in the case of panel developing countries. Energy plays a moderating role in reducing poverty but rail lines do not help to reduce poverty as a moderator.

This study further concludes that some control variables like foreign remittances, unemployment, trade openness, population growth, GDP growth rate, and inflation rate also affect poverty in developing countries. From the results of this study, it is concluded that foreign remittances, trade openness, and GDP growth reduce poverty in developing countries. Based on the results, it is also concluded that unemployment, population growth, and inflation are responsible for high levels of poverty in the panel countries.

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# Dedication

*To the one who is no more yet never gone,*

*for he lives in my heart,*

*my father:*

*who happily sacrificed what he had to realize what we dreamt for*

*my mother:*

*by whose prayers, I am alive today and achieved what I wanted to*

*my beloved wife:*

*her patience and courage always encouraged me and never let me down*

# Acknowledgment

I am thankful to Allah who taught Adam to speak, He blessed humans with knowledge, Allah the Sublime and without his “Kun” nothing can come into existence. My humblest gratitude and love to our beloved Prophet Hazrat Muhammad (ﷺ) Who is the eternal fountain of knowledge and guidance for the whole mankind.

My special gratitude goes to my admirable supervisor Dr. Sabahat Subhan assistant professor, department of economics, National University of Modern Languages Islamabad, Pakistan. I am grateful to her for supervising me. Her tenderness as teacher, disciplinarian attitude, strictness in punctuality and provision of friendly working environment in organized manner made it possible to complete my research work.

This acknowledgement is incomplete without expressing my deep thanks to my friends Dr. Imran Khan for his brotherly support, Mr. Hassan Mansoor for his extraordinary moral support, Dr. Haidar Farooq for exploring my inner ability, my fellows, Dr Sidra Yaqub for her countless support and of course doctor Arshad Ali Bhatti who have always been there for me whenever I was in need of them.

Last but not the least, I want to express my cardiac thanks and love to my dearest Parents who have always been praying for my success in this world and in the hereafter as well. I express my countless thanks to my affectionate brothers; Mr. Muhammad Qasim, Mr. Muhammad Ayaz, Mr. Ali Akbar and younger brother Mr. Muhammad Iqbal and my sisters for their encouragement, financial and moral support throughout my academic career and specially in getting my higher education. I also do appreciate their key role in my success all the way. I am also thankful to my beloved uncle Mr. Tahir Ali who has always been a source of joy and inspiration for me. May Allah the almighty give me the strength to serve them to my best and make their lives easy; Ameen.

Muhammad Akbar

# Chapter I

## Introduction

The period of 1990s defines some new methods for poverty alleviation focusing on the non-income dimensions of poverty and the emphases is on strengthening human capabilities, World Bank (1990). Public sector intervention follows a two-fold strategy in this regard where, on one hand promotion of a labor intensive growth by investing in the human capital through resource allocation to health care, primary and secondary education in order to cope with poverty. East Asian economies experienced huge investment in human capital by universalizing primary education followed by proper availability of the secondary level education and skill developing programs as reported, World Bank (1993). In the late years of the same decade, emphasis was focused upon public investment on physical infrastructure as a mean for poverty reduction by market access facilitation causing reduction in high costs of transportation incurred by poor households, World Bank (1994).

In 1990, poverty alleviation was given top priority by the United Nations Organization (UNO) in the list of Millennium Development Goals (MDGs) and the target was cutting down the extreme poverty ($1.25 a day) rate of 1990 i.e. 47% around the world to half by 2015 especially in developing countries. This target was achieved by 2010 and by then extreme poverty was brought down to 22% and was further lowered down to 14% in 2015, UNO MDGs report (2015). Around 1.9 billion people lived with $1.25 a day around the globe in 1990 and that was called extreme poverty while this number was cut down to 836 million by 2015. People in middle class i.e. $4 a day or more were 18% in 1991 and this number tripled in 2015 and now this group comprises of

more than fifty percent of the work-force in the developing countries, UNO report on MDGs (2015). Although, some progress has been made in the reduction of poverty but still people are facing sever poverty globally and to achieve the target to an end to extreme poverty by 2030 looks quite difficult with the predicted global growth, WB (2015). 35% of world population was living on or less than 1.90$ a day in 1990 and this ratio came down to 12.4% in 2012 and further this ratio was brought down to 10.7% in 2013. In numbers, about 1.85 billion people were living on less than 1.90 US$ a day and this number was reduced by 41.5% to 767 million in 2013, UNO MDGs report (2013). Poverty mostly declined in China and Indonesia, South Asia i.e. India and Sub-Saharan Africa and East Asia and the Pacific, WB (2016).

After successfully achieving the goal of bringing down extreme poverty level to 14% from 47%, the next target was to eradicate poverty around the world in all its forms by 2030. This goal was set by the United Nations while adopting the Sustainable Development Goals (SDGs) agenda in 2015, UN report (2015).

Now the main problem is that how poverty can be reduced and alleviated in developing countries and what steps to be taken for poverty alleviation and what factors are needed to be addressed to achieve this end. To eradicate poverty, from the country, several endogenous factors are responsible for poverty like high populations and lack of resources on government level to spend on public programs, low incomes of people due to less employment opportunities on one side and low productivity, lack of educational and healthcare facilities further leads to low income, lack of physical infrastructure, energy crises etc., all these factors are needed to be addressed so that poverty could be reduced in the country, Mundial, B. (2000).

One of main aims of economic policy is poverty alleviation, although no consensus is there about what poverty really means or how could it be best measured. Often, households falling below a certain income level are counted poor and numerous studies have been conducted addressing the role of government spending in poverty reduction, Nolan and Whelan, (1996). One of the main tool for tackling poverty is fiscal policy in the modern economic world because it is the policy that government implements. In this regard, public spending are used as tool to cope with poverty through different ways. Public sector can reduce poverty by investing in social as well as physical infrastructure where resources are allocated for educational purposes, healthcare facilities, roads and rail line infrastructure and power generation and availability to public. Government spending affects poverty directly and indirectly. Government spending directly affects poverty through different public poverty alleviation programs and employment creating projects. The effect of government spending on poverty could be seen indirectly by public investments on education, health and physical infrastructure, Fan et al. (2000); Aschauer D. (1989); Barro (1990); Tazi and Zee (1997).

Improvement is sought in education and health outcomes due to their intrinsic value in enhancing individual capabilities and freedoms, and also contributing towards higher incomes, and in reinforcing each other. Good education and better health are critical in preserving and raising the assets of the poor i.e. labor, and for this reason public investment in health and education has especial importance for the poor. The World Development Reports (1990; 2000), conclude that investments in basic health and education are an important element of a poverty reduction strategy especially in the developing countries. Asian Development Bank (2003) reported that in most of the developing countries almost 70% of investment in infrastructure was financed by federal governments either by borrowings or from their own resources, only 3% was financed from aid

and rest is by the private sector as reported by Department for International Development (DFID), (2002-03).

These investments were made in transportation covering roads, rail lines, highways, sea ports and ship yards, airports and also in railways, Asian Development Bank (2001). The main focus has always been about the public investments in the three major types of physical infrastructure i.e. roads and highways, irrigation system, and power generation. Government faces budgetary constraints in most of the developing countries and therefore, it is a matter of great importance to assess that how poverty could be reduced through physical infrastructure and what contributions are made by investments physical infrastructure, Lanjouw et al. (2002); Ali and Pernia, (2003).

Summarizing the role of public spending in the poverty reduction, study in hand focuses mainly on the direct and indirect impact of public spending on poverty through the channels of social and physical infrastructure. Social infrastructure comprises of literacy rate and health expenditures by the public sector while physical infrastructure includes energy i.e. access to electricity and rail line as transportation.

## 1.1 Problem Statement

It is top priority among the millennium development goals (MDGs) to alleviate poverty from the developing countries and for that purpose, different international and national poverty alleviation programs have been undergone so far. Each country is trying its best to make its masses more prosperous. Therefore, to study that how public spending affect poverty is not a new idea, but the problem is that despite all efforts, these public spending does not make a significant impact on poverty reduction.

After successfully achieving the goal of bringing down extreme poverty level to 14% from 47%, the next target was to eradicate poverty around the world in all its forms by 2030. This goal was set by the United Nations while adopting the Sustainable Development Goals (SDGs) agenda in 2015, UN report (2015).

Musharrat (2011), examined empirically that most of the time, public funds are allocated for some direct compensation programs towards the poor and therefore these funds sometimes do not make any positive outcomes due to poor governance and institutional quality. He concluded that better institutions play more effective role when poverty and inequality is targeted through public spending and poorly governed nations have more chances poverty and public policies for poverty are less effective in these nations. Further he suggested that institutional quality should be improved and good governance needs to be ensured and this is the only way to through which poor people could be made socially secured in these developing economies.

Thorat and Fan, (2007) found that public spending significantly helped the poor via different anti-poverty programs. It was also proved that anti-poverty programs along with different other public investments initiatives like social infrastructure i.e. education sector and healthcare sector as well physical infrastructure like energy sector and transportation were also responsible for poverty reduction.

To fill this gap, this study provides some indirect ways and channels that might be more affective. Allocating funds by public sector towards education sector will generate more human capital and enhance labor productivity and in the long run it leads to earn more and cross above the poverty line. Similarly, by investing in health sector leads to provide better health facilities to masses further leading to produce good health conditions and at the end there are less chances of being

poor. In the same way, when government invests in energy sector and transportation, it leads to produce employment opportunities and make common masses better off on one side and with better transportation system the overall economy boosts up leading to break the poverty circle.

Poverty is one of the major issues around the world therefore, the basic purpose of current study is to empirically investigate the relation between public spending and poverty in the developing countries under the umbrella of Millennium Development Goals (MDGs), listed by the UNO in 1990. How these developing countries allocate funds towards different sectors in order to eradicate poverty is a matter of great interest. This research tries to channelize public spending via social and physical infrastructure towards poverty reduction. Social infrastructure comprise of literacy rate and health expenditures, and physical infrastructure incorporates energy i.e. access to electricity and rail line as transportation. Examining these four channels one by one and expressing their vital role in poverty reduction.

## 1.2 Objectives of the Study

Keeping in view the crucial role that public spending plays directly and indirectly to alleviate poverty; the research objectives of this study are as follows:

I. To investigate the impact of public spending on poverty in the developing countries.
II. To explore the impact of public spending on poverty through the channel of Social Infrastructure i.e. Education and Health in the developing countries
III. To examine the impact of government spending on poverty through the channel of Physical Infrastructure i.e. Energy and Transportation in the developing countries

## 1.3 Research Questions of the Study

Following the above research objectives of this study, the main research questions to be addressed in this study are as follows:

1) What is the impact of public spending on poverty

2) What is the impact of public spending on poverty through social infrastructure (literacy rate and health expenditures) in the developing countries?

3) What is the impact of government spending on poverty through physical infrastructure (energy i.e. access to electricity and rail line as transportation) in the developing countries?

## 1.4 Research Hypotheses

This study attempts to test the main hypothesis that when there is an increase in public spending on social and physical infrastructure, it reduces poverty.

On the basis of our main hypothesis, we can define statistical hypothesis to be tested in this thesis and are as follows.

I. $H_0$: Public spending has no statistically significant impact on poverty reduction in the developing countries

   $H_1$: Public spending has statistically significant impact on poverty reduction in the developing countries

II. $H_0$: Public spending has no statistically significant impact on poverty eradication through the channel of education i.e. literacy rate in the developing countries

$H_1$: Public spending has statistically significant impact on poverty eradication through the channel of education i.e. literacy rate in the developing countries

III. $H_0$: Public spending has no statistically significant impact on reducing poverty through the channel of health expenditures in the developing countries

$H_1$: Public spending has statistically significant impact on reducing poverty through the channel of health expenditures in the developing countries

IV. $H_0$: Public spending has no statistically significant impact on poverty alleviation through the channel of energy i.e. access to electricity in the developing countries

$H_1$: Public spending has statistically significant impact on poverty alleviation through the channel of energy i.e. access to electricity in the developing countries

V. $H_0$: Public spending has no statistically significant impact on poverty reduction through the channel of transportation i.e. rail line in the developing countries

$H_1$: Public spending has statistically significant impact on poverty reduction through the channel of transportation i.e. rail line in the developing countries

VI. $H_0$: Public spending has no statistically significant impact on poverty eradication through the moderation effect of education i.e. literacy rate in the developing countries

$H_1$: Public spending has statistically significant impact on poverty eradication through the moderation effect of education i.e. literacy rate in the developing countries

VII. $H_0$: Public spending has no statistically significant impact on reducing poverty through the moderation effect of health expenditures in the developing countries

$H_1$: Public spending has statistically significant impact on reducing poverty through the moderation effect of health expenditures in the developing countries

VIII. $H_0$: Public spending has no statistically significant impact on poverty alleviation through the moderation effect of energy i.e. access to electricity in the developing countries

$H_1$: Public spending has statistically significant impact on poverty alleviation through the moderation effect of energy i.e. access to electricity in the developing countries

IX. $H_0$: Public spending has no statistically significant impact on poverty reduction through the moderation effect of transportation i.e. rail line in the developing countries

$H_1$: Public spending has statistically significant impact on poverty reduction through the moderation effect of transportation i.e. rail line in the developing countries

## 1.5 Significance of the Study

For the last two decades, poverty alleviation is the top priority in developing countries. Therefore, The United Nations (UNO) set its list of Millennium Development Goals (MDGs) in 1990 where it was decided to cut down the current level of extreme poverty (living on 1.25$ a day) i.e. 47% around the world to its half by 2015. After successfully achieving the goal of bringing down extreme poverty level to 14% from 47%, the next target was to eradicate poverty around the world in all its forms by 2030. This goal was set by the United Nations while adopting the Sustainable Development Goals (SDGs) agenda in 2015, UN report (2015).

To achieve this goal and alleviate poverty from the country is one of the main goals of the governments of developing countries around the world. Government spends major chunk of their

expenses in different poverty alleviation programs and allocates funds to all sectors of economy like, education, health and infrastructure etc., to make working population more productive and skilled in the form of human capital on one side while on the other side creating more employment opportunities for these skilled and educated labors. By getting better employment opportunities and with physically healthy as well as more productive labors, the individual income rises as well as the national economy develops and as a result people become more better off and poverty declines. Significance of the current study is that it channelizes two main things; one social infrastructure and second physical infrastructure and captures their mediating role when public spending is made for poverty reduction. When funds are allocated to social infrastructure comprising of literacy rate and health expenditures, and physical infrastructure comprising of energy i.e. access to electricity and transportation i.e. rail line, these sectors play their mediating role for poverty alleviation.

The logic is to examine that whether social and physical infrastructure could be used as mediators for poverty reduction in the developing countries or public spending could be used as a tool for poverty eradication with prior condition of social and physical infrastructure?.

Some control variables like; foreign remittances, trade openness, GDP growth rate, population growth rate, unemployment and inflation are also incorporated in the analysis as the determinants of poverty. Foreign remittances inflow helps poor households to spend more on food, health and education and the probability of being poor declines. Similarly, this inflow also contributes towards investment in the economy and helps economy grow faster reducing poverty. Trade openness can also expand the economy.

Motivation behind conducting this study is that from looking through the prior literature, no such study has been undergone where these channels have been used so far. Further, no such study exists in the literature, where the same channels of social and physical infrastructure have been used simultaneously which make with the same methodology which has been used in this study. These features make this study more significant among other research studies of the same nature. It is need of the day that such studies to be conducted where it is examined that what important role public spending plays in poverty reduction through social and physical infrastructure in developing countries and this study is an attempt to cover this gap.

## 1.6 Organization of the Study

This thesis will be comprised of nine chapters. Chapter 1, comprises of study background, statement of the problem, purpose of the study, main research questions, objectives of the research, hypothesis of the study to be tested and significance of the study. Chapter 2, comprises of prior literature reviewed for current study. Chapter 3, captures theoretical framework, data and variables description, estimation methodology, model, schematic model, econometric methodology, equations for each model, equations for indirect effect, estimation technique. Chapter 4, consists upon empirical results and discussions about model 1, where the direct as well as indirect impact of public spending on poverty through the mediator and moderator i.e. literacy rate are presented. Chapter 5, comprises of empirical results and discussions about model 2, where the direct as well as indirect impact of public spending on poverty through the mediator and moderator i.e. health expenditures are shown. Chapter 6, consists upon empirical results and discussions about model 3, where the direct as well as indirect impact of public spending on poverty through the mediator and moderator of the model i.e. energy (access to electricity) are presented. Chapter 7, comprises

of empirical results and discussions about model 4, where the direct as well as indirect impact of government spending on poverty through transportation i.e. rail line in kilometers as mediator and moderator are shown. Chapter 8, includes conclusion and policy implications on the basis empirical outcomes of the study and directions for future study.

# Chapter II

## Literature Review

An extensive review of prior literature is one of the main elements of research in every field of study. A sophisticated and thorough review of literature provides foundation and inspiration to conduct a substantial and useful research Bruce, (1994). Every research needs information regarding the existing knowledge in that subject area. A literature review basically elaborates summary of a subject field supporting to identify the specific research questions and it needs to be drawing on and evaluating different sources ranging from academics to professional journal articles, books and web-based sources. Searching and reviewing literature helps identifying as well locating relevant material and other sources in the subject field. Literature review is very important while conducting a research because firstly, it describes that how the undergoing research relates to prior studies. Secondly, it elaborates the originality as well as relevance of in-hand research problem but at same time how different it is from other studies. Thirdly, it must be justifying the proposed methodology. Finally literature must be showing the preparedness and competence of the researcher to accomplish the task, Rowley and Slack, (2004).

This chapter comprises of prior literature explaining about how public spending which is the main explanatory variable, affects explained variable i.e. poverty directly and indirectly. There is no extensive literature available on indirect relation between government spending and poverty and mostly direct relation has been explored in literature. This research study tries to link public spending to poverty directly as well as indirectly. Discussion encompasses three major segments. First segment shows relation between poverty and public spending directly. Second segment explains relation between poverty and public spending through the channels of Social

infrastructure and third segment elaborates relation between poverty and public spending through the channels of physical infrastructure. Social infrastructure further represents health and education sectors while physical infrastructure comprises of transport and communication and energy sectors. Therefore, linkage between independent variable i.e. public spending and dependent variable i.e. poverty is direct one and presented in first segment of the chapter. Second segment has been subdivided into two sections where, section one shows establishing and explaining relation between public spending and health and then further extending the impact of better health on poverty while section two, explains relationship between public expenditures and education along with the link between better education and poverty. Similarly, third segment has also been subdivided into two sections where, first section elaborates impact of public spending on transport and communication and then transport and communication further affect poverty while second section comprises of literature linking government spending to energy sector and then further energy sector to poverty.

## 2.1 Relation between Public Spending and Poverty: The Direct Link

One of the main objectives of economic policy is poverty alleviation, although no consensus is there about what poverty really means or how could it be best measured. Often, households falling below a certain income level are counted poor, Nolan and Whelan, (1996). The matter of what poverty really means or how it could be measured in a best way is a debate that has been addressed in chapter#3. The very same chapter shares views of social scientists and different theories of poverty along with counter narrative and proposed solutions presented by economists. Having said that, poverty still is one of the hot issues and needs to be encountered. Therefore, starting with how poverty alleviation was declared as the top priority listed in Millennium Development Goals

(MDGs). The evolution of Millennium Development Goals (MDGs) goes back to its historical antecedents like; conferences and summits of the UN that provided MDGs content; important role of the OECD's Development Assistance Committee (DAC) by formulating the International Development Goals (IDGs); the influential role played by United Nation (UN) Secretariat while drafting the Millennium Declaration (MD); the final negotiations among the UN, DAC, WB and the IMF leading to amend the IDGs into MDGs in 2001. This process reveals that global policymaking and involves complexity and unpredictability because all these negotiations were framed by political and economic powers and latterly, during UN General Assembly session in Sep, 2010, while having an assessment of the MDGs reflected on 'the chaos of accidents and purposes' that caused MDGs' generation in the first place Hulme, (2009).

Now we proceed briefly towards how MDGs were drafted because as Wisor, (2012) stated that these goals did not come out of participatory and inclusive processes at all but "only a few key civil servants and development experts were involved in this process". In year 2000, United Nations General Assembly (UNGA) formally adopted the Millennium Declaration (MD) and it was believed that this declaration contained these MDGs as a result of global effort identifying a set of goals and indicators in order to guide global developmental policies for next fifteen years (Assembly, U. G. 2000). This is how these MDGs came into existence and more importantly, the declaration did not contain such goals. In fact some creative reading as well as negotiating processes subsequently extracted some eight goals from that declaration of the United Nations General Assembly (UNGA). Beginning with the process that led setting these goals focusing on the global participation in this very process as Hulme, (2007) elaborated. This story began in early 1990s when 12 conferences with agenda of global challenges took place in 6 years under the organization of United Nations published by (UNDESA, 2007). These summits resulted in some

brief declarations enlisting areas of priorities and challenges along with the policy instruments to cope with them. These declarations consisted; Declaration on Environment and Development resulted from Rio de Janeiro, (1992); Vienna Declaration on Human Rights (1993); the World Summit on Social Development (1995) that provided base for MDGs. The Copenhagen Declaration came out with list of ten commitments like, social development, poverty eradication, full employment, social integration as well as human rights protection and so on. This declaration explicitly emphasized the need of adopting some international development goals with special focus on meeting the basic needs and poverty eradication. The idea of summarizing these commitments along with all other ones in accordance with rest of the summits and conferences held was to formally enlist some limited set of development goals. This idea came out form Development Assistance Committee (DAC) of the (OEDC). Development Assistance Committee, being part of the (OECD), it does not represent the UN system and could not be claimed of speaking on behalf of all the UN's member states.

In the late 1990s, UN started preparation for the Millennium Summit and the ambition was to draft a Millennium Declaration and the UN Secretariat publicly invited input across the board from NGOs and social movements, states and business communities etc.-on what to include in this very declaration. MDGs are; eradication of extreme poverty and hunger, To achieve universal primary education, To promote gender equality and empowerment of women, To reduce child mortality, To improve maternal health and, To combat with HIV/AIDS, Malaria and other fatal diseases, ensuring environmental sustainability and, establishing and developing a global partnership for development (UN Millennium Declaration, 2000). To cope with income poverty, authorities put more emphasis on income support to poor while making public policy. Empirical evidence supports this idea when tested using a panel data for developing economies. However, no such

evidence was found regarding reduction in non-monetary deprivations of human capabilities, Bourguignon et al. (2010). Public policy related to social infrastructure like health and education should be based on deprivations in human capabilities, targeting reduction in stresses poverty through social intervention. When we talk about implementing a policy, if a policy is targeted towards income poverty alleviation but not addressing human capability building, such policy may not be helping to achieve the target and the non-poor can fall into the vicious circle poverty again. On the other hand if implementing a policy that is targeted towards income poverty alleviation and addressing human capability building, such policy will definitely help achieving the target and the non-poor may not fall into the vicious circle poverty again because those people or families who have been brought out of poverty through social policy and they having acquired education and health facilities as well as some other basic capabilities, will have less chances of falling into poverty, Drèze and Sen (2013). And as long as they obtain a good education, the prior poor will be having the chances to bring themselves out of poverty and improve their social inclusiveness and mobility.

All this was made possible by the committed governments and states to their people. Resources were allocated and Poverty alleviation programs were initiated by the governments of these countries. In this regard, to accomplish the task of poverty alleviation, it is the public sector that comes forward plays its key role by utilizing its limited resources in an efficient way to break the vicious circle of poverty. Government spending potentially affects growth and poverty in two possible ways: on one side it raises growth performance of economy while on the other side; it increases chances for the poor to contribute to the process of growth by strengthening and enhancing human capabilities and declining transaction costs. The challenge of balance between

the spending having primary focus on economic growth and spending aiming towards poverty alleviation is quite big in such situation, Wilhelm and Fiestas (2005).

When poverty alleviation is the target of public policy then being poor is good thing because such a nation, a state having access to national and international funds in direct and indirect way. Now who define and provide information regarding poverty is having a strong and powerful role to play. They are responsible for the provision of the basis upon which the evaluation of policies is to be made in order to meet poverty alleviation targets. All the evaluation processes are concerned with such role in one or another way. While measuring poverty, comparison among different studies is fundamental pre-requisite so information regarding poverty could be provided from contextual perspective and a solid basis to formulate policy. Talking in a traditional way, all such studies have always rely on income as measuring rod for poverty and alleviation of income poverty is attached with the increase in income so there will be less chances of people to be poor. This idea has been attacked consistently and even today and so many alternative aspects of measuring poverty and at the same time several welfare effects of public policy outcomes have been suggested by Greeley, M. (1994). He also argued that absolute poverty has always been the main concern through which information is provided and poverty lines are drawn. Such information and poverty line is itself source of attraction for the flow of public resources through public policies in the form of poverty alleviation programs.

Studying the direct relation between public spending and poverty, a comprehensive study was conducted under World Bank Institution Social Safety Nets Premier Series. Its main focus was that how Social Transfer programs could be designed and implemented in poor economies. They endorsed that financial assistance should be provided to those are poor and face any kind of risk and in absence of these cash transfers these poor probably fall below poverty line. They found

quite small number of these cash transfer programs in the developing countries but in transition economies and middle income countries, these statuary level cash transfer programs were found commonly and they existed mostly in form of cash assistance and insurance schemes. Most commonly in Organization of Economic Cooperation and Development (OECD), social safety net protection comprised of cash transfer programs. Cash transfer programs may have less prices distorting affect than in-kind transfer programs because individuals are given cash with all the choices they can make unlike in-kind transfer ones where individuals are given exactly what they as supposed to be given by the government. These programs typically require extensive information while administering them regarding targeting as well as management but after targeting the most vulnerable groups and individuals by determining program eligibility and income tests many difficulties could be avoided easily. It was conclude that cash transfers do not provide complete and effective protection if receivers totally rely on these transfers. Cash transfers are more effective for low income households who derive some portion of their incomes from other channels because these transfers could be utilized to cover the poverty gap partly instead replacing incomes fully. Outcomes showed that these cash transfer programs were helpful combating gender discrimination and family cash allowances, social pensions as well as other cash transfer programs improved school enrolment, attendance all were improved by these transfers, Tabor (2002).

Now we incorporate some specific studies where the relationship between public spending and poverty has been explored. These studies might be micro-level or macro-level but the role of public spending is crucial when poverty alleviation programs have been launched.

A panel data research study was conducted where the link between government spending and poverty reduction was investigated for regional developing economies in Asia, South America and

Africa. This link was made conditional with institutional quality. In case of developing economies poor targeting and implementation of social and public policies, inefficient and poor handling of public funds, the corruption factor, public services quality and delivery and lack of participation of general people in the process of development normally represented with the term 'institutional quality', is key factor explaining theme of public spending' effectiveness for poverty as well as inequality reduction. Therefore the main objective of this study was examining the vital role that institutional quality plays while talking about the public spending effectiveness in poverty and inequality reduction in the above mentioned regions. Empirical results indicated that better institutions play more effective role when poverty and inequality is targeted through public spending and poorly governed nations have more chances poverty and public policies for poverty are less effective in these nations. It was suggested that institutional quality should be improved and good governance needs to be ensured and this is the only way to through which poor people could be made socially secured in these developing economies, Musharrat (2011).

O'Donnell et al. (2007), examined the link between public spending and poverty for eight Asian economies (Bangladesh, India, Indonesia, Malaysia, Nepal, Sri Lank, Thailand and Vietnam along with three region or provinces of China including Gansu, Heilongjiang and special administrative region Hong Kong), and evidence on public healthcare spending incidence was tried to find. Empirical estimates revealed that public spending may help reducing poverty to some extent. The issue was that the incidence of healthcare spending was pro-rich which means more benefits were given to rich segments of society in these countries. If these distributions are corrected and directed and pro-poor then the incidence of public spending can surely make the difference and can reduce poverty in a tremendous way in the mentioned economies. In case of Malaysia, Sri Lanka and Thailand, results suggested that user fees need to be limited or poor segments should be protected

from them. At the same economic growth is also necessary to relax budget constraint on government behalf while targeting public and pro-poor social policies to cope with poverty.

Zaman et al. (2011) conducted a study research for SAARC economies where public spending for poverty reduction was made conditional towards economic growth. As these economies are poor ones and they cannot spend much on poverty alleviation programs due to lesser resources. So in order to spend more on poverty alleviation programs, these economies need a faster growth and that is why public spending for poverty reduction was made conditional towards higher economic growth. Results suggested an inverse impact of increase in public spending on poverty. It was concluded that an increase in public spending conditional to a 1% economic growth led to 0.05% decline in overall poverty in SAARC economies.

Exploring the link between public spending and poverty alleviation in India, a study was conducted for 14 states using panel data in 2009. Along with some other public goods provision by the government like health, education and basic infrastructure, the effects of public investments on per capita national income was mainly addressed. It was investigated that whether public investments lead to poverty reduction in the form of high per capita national income. This study was found consistent with prior studies and it was concluded that public investments have positive and significant impact on poverty alleviation. More specifically, it was also concluded that reallocation of government expenditures on public goods lead to grow per capita national income by 2.7 percentage points on average. Whereas, reallocation of government expenditures towards social infrastructure lead to reduce poverty head count index by 6.6 percentage points, Hong and Ahmed (2009).

To alleviate poverty in Mexico, an innovative approach was adopted and a program was launched named PROGRESA in 1998. It was a transfer program for poor and its target performance resulted 58% of transfers reached to the bottom 20% in the national income distribution and more than 80% reached to the 40% category in national income distribution. So, target was achieved by allocating funds and transfers to the "poor" households and it was twice as much as of without targeting these households. It was such an impressive performance that suggested other low income countries to adopt this approach towards poverty alleviation. During 1998-99 the monthly transfer to each targeted household was about 20% of their average consumption which was zero before this program. It was seen that the ration of households receiving funds from other governmental programs declined especially in case of under aged children who used to get those transfers. Results showed that poverty gap index was brought down by 30% while sever poverty index came down by 45% and all this was made possible via PROGRESA. Empirical analysis did not find any evidence of crowing out effects of any private transfer program regarding this program, Coady (2003).

A study was conducted for China and India in order to observe the returns of public investments in the form of poverty reduction. On the basis of empirical outcomes, it was found that both in China and India public spending significantly helped the poor via different anti-poverty programs. It was also proved that anti-poverty programs along with different other public investments initiatives like health and education were also responsible for poverty reduction (Thorat & Fan, 2007). A similar study for Pakistan was conducted based on a time series analysis to find the impact of public expenditures on poverty reduction in short run as well as long run. Empirical outcomes proved the existence in both short run and long run (Mehmood & Sadiq, 2010).

Chemingui, (2007) carried out a research study on poverty reduction and public policy in Arab region in collaboration with the international food policy research institute (IFPRI) and Arab planning institute (API) in Kuwait. Basic objective of the study was to establish relationship between government spending in prioritized areas targeting economic growth and reducing poverty in Yemen. To achieve this objective, a time series analysis for year 1998-2016 was undergone to get empirical outcomes. Results revealed that the impact of prioritized allocation of funds by public sector towards poverty reduction and economic growth was tremendous than solely spending funds on agriculture sector. Agriculture sector was also recommended as a crucial part of the economy because being an oil based economy, the additional spending by the public sector on health and education will not increase the oil sector productivity beyond a certain level.

## 2.2 Relationship between Poverty and Public Spending through the Channel of Social Infrastructure i.e. Literacy Rate and Health Expenditures

This section explains that how public spending affect poverty through the channels of social infrastructure, the indirect impact. Social infrastructure represents health and educational facilities contributing towards poverty reduction. This section is further subdivided into two sections i.e. Relation between poverty and public spending through the channels of social infrastructure (Public Health spending and poverty reduction) and Relation between poverty and public spending through the channels of social infrastructure (Public Educational spending and poverty reduction)

### 2.2.1 Relationship between Poverty and Public Spending through the Channel of Social Infrastructure i.e. Literacy rate

This section displays the link between poverty and public spending through the channel of social infrastructure i.e. education. Here all the prior literature represents the relation between public spending on education and then the relation between education and poverty. Some prominent research studies have been presented here to explore this link.

World Bank, (2000), states that being poor is deprivations in wellbeing which results a state of inability of meeting basic needs of an individual or a family. Therefore, the measuring rod of poverty is basically income measurement or measuring consumption that is necessary while meeting and fulfilling basic needs (i.e. poverty line), and these in include food and nonfood necessities (Haughton and Khandker, 2009). Here, generally poverty is link with caloric needs (2100 calories per person per day) of individuals and that's why poverty line is drawn on the basis of market price of these caloric needs of humans and if people can afford these caloric needs they are considered to be non-poor and if they cannot afford they are considered as poor. The prominent Engel coefficient for a poor is 60%, which was presented by famous statistician Ernst Engel in 1857 and it states that as income of the individuals rises their spending on food declines. While non-food basic needs include, the need of wearable like clothing and shoeing, shelter and basic education etc (Ravallion, 2012).

Wang et al. (2016) on the other hand believe that being poor or lacking of well-being comprises of both monetary as well as non-monetary aspects of individuals. As the Nobel Laureate Amartya Sen strongly believes poverty is not just the non fulfillment of basic needs due to lack of income, but poverty actually exists human beings are deprived of their basic capabilities like being unhealthy and unable to work and uneducated or illiterate (Sen, 1992).

Glick and Menon, (2009) undergone a time series analysis based research study in Republic of Chile to examine the recent variation in poverty level in general and particularly to investigate the crucial role that public spending has on social infrastructure (i.e. health and education) plays in poverty reduction. Public investment in social infrastructure leads to equip people with good health and education, which means they get more chances of securing opportunities for higher income. As suggested by (Contreras & Larranaga, 2001) that poverty is the lack of sufficient income to support minimum needs but poor might be lacking assets for income generation or they might be earning low return on their assets. Health and education are considered main sources for enhancing productive capabilities and knowledge of humans and converting this human resource into human capital. This human capital is so vital for poor households because it is the only asset for them associated with their earning. Therefore, investment in education and health by the public sector plays very crucial role in the process of transforming human resource into human capital. This role of public spending has been acknowledged so far for poverty reduction in developing nations, where better health and educational facilities have enhanced the earning potential of individuals and enabled them to bring themselves out of the vicious circle of poverty. In another study where (Helwege, 1995) explored the link between poverty and public spending and he advocates that public social investments help engaging economies into a virtuous cycle leading towards social equality and further stimulating economic growth which in both cases result in poverty reduction. Results confirmed that public spending on social infrastructure has strong and significant mitigating impact on poverty. Further it was concluded that some provinces which received more funds on social infrastructure showed quite low level of poverty as compared to other provinces. Outcomes revealed that if public per capita spending on health increases by (10,000 pesos about

23$ at that time), leads to reduce poverty by 0.48%, while if same amount is spent on education leads to reduce poverty head count ratio by 0.59%.

A common feature of developing countries is that households in these countries lack access to healthcare facilities as compared to rich countries while within countries the poor have lesser access to health facilities. The reasons might be less financial resources and having no or less information as barriers to access better health services. But the causal link between health services accessibility and poverty can also be the other around. Like; if healthcare facility is needed and it is not obtained or delayed, it can lead to worsen health conditions of people and it will further lead a loss of income and higher healthcare cost and in both the cases result in poverty [(Narayan-Parker & Patel, 2000); (Smith, 1999)]. As World Bank states that ill health caused by deprivations are very common low and middle income countries and poor in these countries are at high risk, World Bank report (2000). Link between access to healthcare and poverty could be seen as a part of the larger picture where poverty causes poor health conditions and poor health conditions maintain poverty, (Wagstaff, 2002).

Peters et al. (2008) explored the idea that which factors actually affect access to healthcare facilities in the low and middle income economies. They came with four factors mainly responsible for access to health services and poverty which are: (i) geographical location and accessibility where, distance makes it difficult to access healthcare services, (ii) availability of healthcare services where, it is seen that whether right type of healthcare service is available to needy or not like operation hours, waiting times compatible with demand of those who can wait and avail a particular service as well as the appropriateness of type and materials of the service by the providers, (iii) financial access where, if the healthcare service is located nearby and available but one cannot afford it in terms of its price or willingness of the users to pay for any particular service

and (iv) acceptability where it is checked that how the service providers respond towards the cultural and social expectations of the service users as well as communities. They concluded that above factors actually determine the demand for and supply of healthcare services and that access to healthcare and poverty are linked through these factors.

Similarly, when income is taken as measuring rod for poverty line, it captures totally the monetary aspects of an individual to be considered as poor or non-poor. So, it is beyond any doubt that in normal conditions as individuals' incomes rise, it will lead to enhance their well-being. While under abnormal circumstances where we talk about deprivations of human capabilities like a person being illiterate (deprived as unable to read and write) will remain illiterate even that person lives above the poverty line measured in terms of income; or an individual person physically disabled or handicapped (unhealthy and or unable to work) will be needing more income in order to maintain his/her life and mobility as compared to someone having no such difficulties. Good health and basic education may not be able to make a person non-poor but they make people participate in socioeconomic activities and make their lives more meaningful (Sen, 1999), while keep improving non-monetary wellbeing like healthcare and education leads to improve public goods and services (Bourguignon and Chakravarty, 2003).

Existing literature on the incidence of poverty clearly indicates that any country's development process often gets disturbed by poverty and hence every society has faced it although its incidence might differ across countries. It is believed that no country is surely happy and flourishing always if a certain number of poor and miserable situation exists (Smith, 1972). Poverty is considered as one of the major problems of developing nations, it might be quite complicated to explain, the absolute, the relative or the multidimensional poverty is being discussed widely. According to (World Bank report 2000), 'poverty is pronounced deprivation in wellbeing' and as (Sen, 1987)

argued human wellbeing is driven from functioning capability. Poverty comes into being if common people are deprived and do not have better health and education leading to lack the capabilities to earn enough income and accomplish their basic needs. Poverty by all means is a miserable and despondent situation and poor segment of every society faces hurdles of fulfilling their basic needs and it is one of the major obstacles while trying to improve an individual's living standard.

Janjua and Kamal, (2014), examined this relationship of social expenditures and level of poverty for 40 developing economies using time span of 1999-2007 in order to check the impact of public social spending on poverty reduction. Obtained results showed certain findings: (i) this study do not confirm the trickle-down theory where high growth rates ensure less poverty and if there is some evidence of this theory, the pace of reduction in poverty is not similar in this case, (ii) public spending on social infrastructure was found significantly correlated to poverty and a strong impact of better health services on reduction of poverty headcount ratio was reported. It was concluded that efficient use public funds for better social infrastructure can be used as tool to reduce poverty incidence.

Fan et Al. (2003) tried to review the causes of changes and current trends in public expenditures in 43 developing countries of Asia, Africa and Latin America from 1980-1998 with the purpose to explore the effect of public spending on growth, social infrastructure and poverty. This study did not confirm the common belief that structural adjustments or economic reform programs increase the size of public expenditure but found that all sectors were not treated equally. In African region; share of agriculture spending, and education as well as share of physical infrastructure in total public spending declined. In Asian region; share of agriculture and healthcare services got reduced and similar decline was also captured in educational as well as infrastructure for Latin American

region due to structural adjustments by the concerned governments. Impact of public spending on economic growth was found mixed like in Africa; public spending on agriculture sector and healthcare services was significantly strong and promoted economic growth, in Asia; investments in educational services and agriculture as well as expenditures on defense positively affected economic growth but in case of Latin America; all such investments promoted economic growth but this link was positive but insignificant for healthcare services. It was concluded that public investment on social infrastructure like healthcare and education, and physical infrastructure like agriculture and irrigation, and roads can contribute to reduce poverty but this link was conditional to economic growth.

In a research study conducted by (Roberts, 2003) review the social sectors' MDGs, especially poverty reduction, educational achievements and reduction child mortality for Sub-Sharan Africa and how these objectives could be achieved through public social expenditures. Over the last 40 years, in Sub-Saharan countries poverty level is high, they have low education status and child mortality is rising as compared to middle income countries where child mortality declined to half, in Middle East it came down by almost 70%. Health status in low and middle income countries is still very poor although they are rising health spending. Health status depends upon wide range of factors i.e. social, economic, geographical, cultural and environmental along with interventions in health sector by the public sector. Evidences have shown that cross country variances in results is due to poverty level differences based on per capita GDP. Public spending are mostly misallocated in case of poverty reduction and child mortality programs. Although some programs have been successful so far like immunization and vaccination of children to protect them from certain diseases but these programs share only a minor part of health budgets. Therefore such programs have not been so much influential in case of overall healthcare services in the sampled countries.

They suggested that the crucial role of state while making public policies is, allocating resources for public social spending to provide public healthcare services to her subjects. So the deprived segment of society could be brought out of poverty through obtaining good health and education leading to enhance their earning potential.

The allocation of financial resources towards healthcare was agreed at the international conference on population, growth and development in 1994. But this commitment has not been fulfilled by the governments so far as required resources have not been allocated to healthcare services and that is why poor health enhanced the level of poverty in developing countries and there are further chances of higher poverty levels. (Greene & Merrick, 2005) in a review study examined the link between public social spending and poverty but the healthcare was taken as reproductive health where they studied early age childbearing, unintended pregnancy and maternal survival and link this was link with poverty.

Sen, (1987) advocated Capacities building approach to assess poverty and this framework includes social infrastructure i.e. health and education so if households having poor health and no or less education would not be able to accomplish their basic needs and will be considered as poor. Therefore, good health and better education can be used as tools to buildup capacities of individuals and households enabling them to earn more and fulfill their basic needs. Mostly studies relied on cross-sectional data sets that's why the link between poor reproductive healthcare and poverty has not been addressed properly. In this context time-series data sets provide more promising results. (Frankenberg et al. 2005) also identified 40 surveys programs and recommended them useful for linking healthcare services and poverty. Research can be more productive if it focuses firstly on socioeconomic change in countries over time, secondly it its focus is on differences that persist in healthcare between rich and poor and thirdly it is focused on data sets

which should be feasible and reliable to be obtained for empirical analysis. Pursuing causality between poor healthcare and poverty should not disturb the efforts and strategies made for resources allocation to reduce poverty.

A study conducted for poverty reduction strategy paper (PRSP) for international monetary fund the (IMF) in 2003 especially to address that how much vulnerable the poor are due to lack of healthcare facilities. A semi-quantitative approach was used assessing pro-poor social policies in general and health policy in particular. 23 most poor countries were selected to be checked for establishing the link between lacking healthcare facility and poverty. Outcomes revealed that in most of the selected countries lacked data on composition and distribution of disease burden, there was no clarity in health system issues and no potential assessment method in these countries to link healthcare services with poverty and vulnerability. Importantly, these nations did not make any effort analyzing issues related to poor people. Very few countries addressed issues related to poor health while designing social policies and less attention was given to healthcare spending by the public sector. This study concluded that these poor countries need assistance and necessary inputs so they can be enabled to make social policies targeting better healthcare services so the poor and vulnerable segment of society can be protected from potential poverty.

Baldacci et al. (2003) conducted a research study for developing and transition economies to analyze the link between public social expenditure and some social indicators. Results indicated that public social spending is a crucial determinant of better social status in general and for better health and education in particular. It was suggested that social indicators like health and education, with higher elasticity for income and consumption will show strong positive response to an increase in public social spending. If public spending on social infrastructure is increased, it will lead to make poor better off and further leading to reduce the chances of potential poverty.

In another study (Gupta et al. 2003) investigated the impact of public health spending on poor using panel data set from 1990-1999 in seventy developing countries. It was concluded that as compared to rich, poor people have worsen health conditions in these countries and public spending on healthcare affect them more favorably. In low income countries, this relationship was even stronger as compared to high income countries. Researchers suggested that although higher public spending on healthcare improve health status of poor and lowers chances of poverty but it might not be sufficient to accomplish international commitments of promoting health status.

Heltberg et al. (2003) carried out a research study explaining strategies reduce poverty through public spending improving healthcare services in Mozambique. These strategies focus on social policies where investments are made to transform human resource into human capital through better health and education and enhancing their productive capabilities to earn more and reduce the chances of poverty. In this context, Mozambique adopted the strategy for poverty reduction which is based on public expenditure. A survey based data was collected and then combined with provincial level data regarding the cost of providing service and used for empirical estimation. In case of Mozambique, it was observed that regional as well as gender imbalances with respect to health were more significant than the differences in incomes. But still it was concluded an increase public spending on healthcare showed a strong negative and significant impact on poverty in Mozambique.

### 2.2.2 Relationship between Poverty and Public Spending through the Channel of Social Infrastructure i.e. Literacy rate

Public spending on education has also been addressed and many studied have concluded that public investment is not necessary only in instructional and salaries but also in basic educational

institutional infrastructure. Findings also confirm that the marginal incidence is relatively more progressive in nature of public spending in both junior as well as in senior secondary schooling than what static analysis does suggest that is more consistent with a process of "early capture" by the non-poor of education spending. Same conclusion has been drawn in case marginal and average incidence analysis of health which means that the highest benefit to the poor would come when spending is increased in primary health care. Similarly, the global community for health has also recognized that public spending made on health in the developing countries is very essential to meet the Millennium Development Goals (MDGs), i.e. poverty reduction, fighting major fatal diseases like HIV/AIDS, malaria and tuberculosis. Public spending on health care facilities indicates government's commitment towards the health of its masses, and it is an essential tool for the sustainability of health care programs. In almost all developing countries, public spending on health care from domestic sources has increased by nearly 100%, reported by (IMF 120%; WHO 88%) since 1995-2006. Overall, this increase was made due to three main reasons: rising GDP, slight declines in the share of GDP that is spent by government as government expenditures, and also an increase in the share that government spends on health care. At the country level, reports highlight that shares of public expenditures on health care increased in many regions but there has been a decline in many sub-Saharan African countries as well. With better off in health more chances of high earnings and greater productivity and the overall economic situation becomes better off and leads to less chances of poverty prevalence in the country [(Lanjouw et al. 2002); (Lu et al. 2010); (Ablo and Reinikka, 1998)].

Poverty reduction also requires higher economic growth and when this growth is accompanied by a better macroeconomic management along with good governance, definitely results in a sustainable as well as inclusive social development and poverty reduction (ADB 1999). Poor

segment of the country needs greater access to education and health care services, clean water and sanitation, better employment opportunities, credit facilities, and easy access to markets for their produce. Public policy reforms and investment in physical infrastructure will significantly contribute to the pursuit of socially inclusive development and poverty reduction.

There have been split views between two schools of thoughts that emerged in the 1990s regarding the relationship between physical infrastructure development and poverty reduction. One school argues that to reduce poverty, physical infrastructure needs to be developed by the public sectors of developing countries, while on the other hand, some skeptical views were shared by international development community for physical infrastructure on three grounds listed below, reported by World Bank, Department for International Development (WB, DFID 2002). Firstly, although physical infrastructure is important for endogenous economic growth but infrastructure investment has a little relevance with poverty reduction. Secondly, it was viewed that actual benefits received from physical infrastructure were less than expected. Thirdly, in case weak governance and institutional mismanagement, gives ways to corruption, distorted and misleading choices in public investment, and neglected project maintenance, thereby vanishing infrastructure's contribution towards economic growth therefore, diverting benefits intended to be pass on to the poor. Nevertheless, there is now day a wider recognition also by the international donor community, that with good governance and strengthened institutional frameworks, the link between physical infrastructure and poverty reduction becomes stronger, (Ali & Pernia, 2003).

World Bank (2000), describes that being poor is not only the absence of money but it is the deprivations in well-being like being unhealthy and illiterate that results in a state of in-ability to meet the basic food and non-food needs of an individual person or a family. Therefore, the measuring rod of poverty could be income measurement or measuring consumption that is

necessary while meeting and fulfilling basic needs (i.e. poverty line), and these in include food and nonfood necessities (Haughton and Khandker, 2009).

But here, generally poverty is indirectly linked with income factor through caloric needs (2100 calories per person per day) of individuals and that's why poverty line is drawn on the basis of market price of these caloric needs of humans and if people can afford these caloric needs they are considered to be non-poor and if they cannot afford they are considered as poor. The prominent Engel coefficient for a poor is 60%, which was presented by famous statistician Ernst Engel in 1857 and it states that as income of the individuals rises their spending on food declines. While non-food basic needs including upon the need of wearable like clothing and shoeing, shelter and basic education, etc (Ravallion 2012).

Literature on the incidence of poverty clearly explains that a country's process of development often gets slow by poverty and hence each every society has faced it so far although its incidence could be different across countries. It is widely believed that not a single country can surely be happy and keep flourishing while a number of poor individuals and they face some miserable situation (Smith, 1972). Poverty has been considered one of the major problems of developing nations so far, explaining it might be quite complicated, the absolute, the relative or the multidimensional poverty is being discussed widely. In a report of World Bank (World Bank report 2000), 'poverty is pronounced deprivation in wellbeing' and as (Sen, 1987) also argued with different words that human wellbeing is driven from functioning capability. (Janjua & Kamal, 2014), investigated the impact of social spending on the level of poverty for 40 no developing economies from 1999-2007. Estimated results expressed firstly that, there is no confirmation of trickle-down theory where high growth rates ensure poverty reduction and even if some evidence is there, the speed of reduction in poverty varies country to country, secondly, social spending

made public sector was found pro-poor and a strong negative impact of education on poverty headcount ratio was reported. They concluded that if public expenditures are used efficiently for better educational services, it is a good tool to reduce poverty incidence in developing countries.

Wang et al. (2016) on the other hand believe that being poor or lacking of well-being comprises of both monetary as well as some non-monetary aspects of individuals. As the Nobel Laureate Amartya Sen strongly advocates that poverty is not just the non fulfillment of basic food and non-food needs due to lack of income, but poverty actually exists if human beings are deprived of their basic capabilities like being unhealthy and unable to work and uneducated or illiterate who cannot read and write (Sen, 1992). To explore the relationship poverty and public spending social infrastructure i.e. education, a panel study was carried out for 14 districts of India for the time period of 1960-2002. This research study tested the hypothesis which states that productive cooperation between the political representatives from working class and elite capitalists may lead inducing these dominant elite capitalists to favor higher spending on education while the feudal elite has always opposed such investment in basic education. Reason behind this contrasting position is that these landed elite consider such pro-poor social policies especially investing in education leading to poverty reduction, as threat for them and having the fear that their political dominance shall be diluted by the educated poor segment of the society. Results showed supportive outcomes for such hypothesis and further revealed that although minority elite do favor this redistributive spending, investment in social infrastructure like education, effectiveness of social policies, but such effectiveness has been limited by the landed elite through under-representativeness of the minority elite (Ghosh & Pal, 2010).

Similarly, when we take income as a measuring rod for poverty line, it captures totally the monetary aspects of an individual to be considered as poor or non-poor. So, it is beyond any doubt

that in normal conditions as individuals' incomes rise, it will lead to enhance their well-being. While under abnormal circumstances where we talk about deprivations of human capabilities like a person being illiterate (deprived as unable to read and write) will remain illiterate even that person lives above the poverty line measured in terms of income; or an individual person physically disabled or handicapped (unhealthy and or unable to work) will be needing more income in order to maintain his/her life and mobility as compared to someone having no such difficulties. Good health and basic education may not be able to make a person non-poor but they make people participate in socioeconomic activities and make their lives more meaningful (Sen, 1999), while keep improving non-monetary wellbeing like healthcare and education leads to improve public goods and services (Bourguignon and Chakravarty, 2003).

Contreras and Larranaga, (2001) suggested that poverty exists if there is lack of sufficient income to support minimum needs but this might be due to the reason that poor households lack assets for income generation or if they own any assets, their return is very low. Therefore, health and education are main sources responsible for enhancing productive capabilities of humans as well as their knowledge leading to convert this human resource into human capital. This human capital is so important for poor households because it is their only asset associated with their earning. Keeping in mind this crucial role of investment in education and health by the public sector in the process of transforming human resource into human capital, public spending should be diversified towards social infrastructure. This role of public spending has been acknowledged so far for poverty reduction in developing nations and as a matter of fact, better health and educational facilities have enhanced the earning potential of households and enabled them to bring themselves out of the vicious circle of poverty. In another similar study, Helwege (1995) also verified the link between public spending and poverty. His analysis revealed that social investments by the public

sector engage economies into a virtuous cycle that results social equality and further stimulating economic growth. Both social equality and economic growth lead to achieve the ultimate goal of reducing poverty.

A time series analysis based research study by Glick and Menon (2009) for Republic of Chile examined the recent variation in poverty level at that time in general and in particular they investigated the crucial role that public spending has on social infrastructure (i.e. health and education) plays in poverty reduction. Public investment in social infrastructure helps people obtaining good health and education which mean they get more chances of securing opportunities for higher income. Empirical results confirmed that public spending on social infrastructure has strong and significant mitigating impact on poverty. Further it was suggested that those provinces where more funds were allocated to be spent on social infrastructure, showed quite low level of poverty as compared to other provinces where less funds were allocated. Estimates obtained revealed that if per capita spending on education by public sector increases by (10,000 pesos about 23$ at that time), will reduce poverty head count ration by 0.59%.

Formal as well as informal education and learning is recognized widely as an essential to development process and poverty reduction in any society. Especially, in developing countries where, there are issues of access to education, equity in education and obviously quality of education are considered main hurdles in achieving the goal of education for all and it is one of the main reasons behind sever poverty in these countries and therefore, the ultimate objective of development has not been achieved so far. A study conducted by Aref (2011) with the objective to explore educational contributions towards poverty reduction in rural areas of the Islamic Republic of Iran. A cross sectional data set was used for empirical estimation and obtained results revealed that although better education attainment leads to poverty reduction in rural areas but

some structural hurdles responsible for not achieving this objective were pointed out. These structural hurdles were lack of targeted social policy, cultural practices and social norms etc. Similarly, to examine the relationship between investment in education and poverty a panel research study was carried out for Latin-American countries by Bonal (2007). Analysis was made on two ideas; one was to highlight the failings that show the importance of positive relationship between educational investment and poverty reduction, and second is to demonstrate that how an under-estimated inverse relationship between educational investment and poverty reduction is an attribute of high number of such failings which that less investment if education leads to more poverty and vice-versa. It was concluded that the later aspect was clear from the analysis in case of Latin-American countries.

A general presumption that many of the policy makers make is that primary education and general literacy are crucial while secondary as well as higher education is not that much important for growth and development in any country. One of the main MDGs 'Education for all' adopted on international level led to neglect secondary as well as higher education all over the world and especially in developing countries and scarcity of resources as a major problem also added to this negligence. It is the reason that secondary as well higher education has never been on agenda for poverty reduction in developing countries. This was experienced in India where both secondary and higher education were neglected by the state and as a result the situation regarding not only on elementary level but also on secondary and higher level is unsatisfactory. Some recent as well as new research based evidences have been presented here that the role of secondary level education as well as higher education is so vital in the process of development and further that post elementary education plays an important role in poverty reduction. Post secondary education also reduces infant mortality rate and even improves life expectancy and of course helps higher

economic growth. It was suggested that public social policies should be targeted for post elementary education along with the elementary education so the objective of poverty reduction as well as higher economic can be achieved, Tilak (2007).

Kenyan government has established poverty reduction strategy paper (PRSP) in accordance to provide guideline make poverty reducing efforts. Although there lack of proper information and further implementing as well as monitoring issues in this strategy as explained by Government of Kenya (2001); Alemayehu et al. (2001). This study will help Kenyan authorities realizing their goals regarding poverty reduction, providing basis for analytical framework to understanding poverty and monitoring strategies in this regard. For analysis, household level survey based data set for 1994 was used to explain factor determinants of poor status of households. Empirical outcomes showed that poverty and education are associated; similarly household size and poverty are linked as well as poverty also depends upon agricultural activities. It was suggested that as all these above factors are associated with poverty so public policies should be diversified towards social infrastructure like education, population control and planning and also rural agriculture sector should be focused while designing policies, Geda et al. (2001).

## 2.3 Relationship between Poverty and Public Spending through the Channels of Physical Infrastructure i.e. Transportation and Energy

This section explains that how public spending affect poverty through the channel of physical infrastructure, the indirect impact. Physical infrastructure represents transport and communication, and energy sector contributing towards poverty reduction. This section is further subdivided into two sections i.e. Relation between poverty and public spending through the channel of physical infrastructure (Public spending on transport and communication, and poverty reduction) and

relation between poverty and public spending through the channel of physical infrastructure (Public spending on energy and poverty reduction).

### 2.3.1 Relationship between Poverty and Public Spending through the Channel of Physical Infrastructure i.e. Transportation

This section displays the link between public spending and poverty through the channel of physical infrastructure i.e. transport and communication. Here all the prior literature represents the relation between public spending on transport and communication, and then its impact on poverty. Some prominent research studies have been presented here to explore this link.

To reduce poverty and bring prosperity in the countries is the objective of every nation but economic growth and development is a prerequisite to it. Economic growth and development needs good governance, proper macroeconomic planning and management, improving social infrastructure like better healthcare and educational services, physical infrastructure like better transport and communication network, and of course adequate, reliable and affordable energy to people so that employment opportunities be created in the economy and living standards of population can be enhanced while poverty can be reduced in the long run, ADB (1999).

There has never been more consensus than today regarding what needs to be done for poverty reduction. Experts agree that poverty can be alleviated through several channels where public policy can be designed targeting poverty in the country. Pro-poor public policies to expand employment opportunities, adequate provision of social infrastructure like better healthcare and educational services as well as improved physical infrastructure networks like transport and communication etc can help reduce poverty in the country. Another idea is transfer programs from public sector including food stamps, provision of subsidized food and other nutrition programs

that could be used as key strategies for poverty reduction, WB, (1990); Killick (1995); Fishlow (1995); Bardhan (1995) and UNDP (1996, 1997).

Focusing on the importance of physical infrastructure for poverty reduction, there are two schools of thought that emerged in early 1990s. According to one of them, physical infrastructure has greater importance when efforts are made to reduce poverty especially in developing economies. The other school of thought showed its skepticism on several grounds as reported by Department for International Development, (2002). Firstly, they argued that although physical infrastructure is very crucial for growth and development but its relevance with reduction in poverty was little. Secondly, they viewed that the actual benefits gained from physical infrastructure were less than the anticipated one in a significant way. Lastly, they believed that poor and bad governance lead to give way to corruption that further distorts government investments choices, negligence in maintenance and thereby lowers contribution of physical infrastructure to growth and development, and at the end these factors divert benefits from poor which were intended towards the poor. In modern world, the crucial role of physical infrastructure for poverty reduction has been widely recognized and it is accepted that strengthened institutions and good governance can play their role to transfer the benefits of public investments in physical infrastructure like transport and communication to the poor segments of country in the form of better and more employment opportunities. Reforms in public policies and diverting resources towards physical infrastructure like transport and communication that can improve living standards and reduce poverty in developing countries, Ali and Pernia (2003).

According to reports of ADB (2001); DfID (2002), about 70% of investments in infrastructure in the developing world are state financed, only 3% are from international aid and rest is from the private sectors of the concerned economies. Till the end of 2000, Asian Development Bank

provided 15.9bln dollars to member nations for transportation, roads, seaports and shipping, aviation and airports and railways and out of this amount 11.2bln dollars were provided for road infrastructure. In most of developing economies, governments face financial resource constraints regarding investments in physical infrastructure to reduce poverty and that are why there has been sever poverty in many of these developing countries.

In modern world the role of physical infrastructure has been recognized as *sine qua non* to achieve economic growth and reduce poverty in policy making as well as academia. There have been considerable evidences where efforts were made to evaluate theoretically as well as empirically the contribution that physical infrastructure has made to economic growth and development. Attention from the impact of infrastructure on growth has shifted to inequality and poverty reduction, Ariyo and Jerome (2004); Calderon (2008); Ogun (2010); Estache and Wodon (2010). There has been consensus among researchers that under suitable conditions, investments in physical infrastructure like roads and transportation plays a vital role to promote growth and development, and equity in societies and both these channels lead to poverty reduction in developing countries. In Sub Saharan Africa, poverty has been the hot issue and one of the major reasons behind such high level of poverty is absence of modern physical infrastructure like transport and communications sources. World Bank reported in 2009 that in the list of countries trading across boarder made through an indicator, many countries of the Sub Saharan region fall in the bottom 40% due to lack of proper transport and communication networks. Therefore, these regional countries need a modern transport and communication networks to enhance regional and international trade, obtain economic growth and reduce poverty, Jerome (2011).

It is generally accepted that physical infrastructure is vital for growth and reducing poverty and income disparities in developing countries. It plays its important role to improve competition,

facilitates domestic as well as foreign trade and helps integrating an economy to regional and global communities and markets. Therefore, transport and communication enhances economic activities and create greater employment opportunities, enables rural producers to access markets and ultimately helps reduce poverty. To explore the relationship between road infrastructure and poverty reduction, a panel data study was conducted for 33 African countries including Sub-Saharan and North Africa using time span from 1990-2005. As a matter fact, in African region there is lack of road infrastructure in both quantity and quality. Only 34 percent of people have access to roads compared other less developing countries where about 50 percent people having access to roads. This has been one of the reasons of low economic growth and development and high rates of poverty in Sub-Saharan and North Africa as they have lesser facilities of transport and communications, low level of domestic, regional and foreign trade and of course low level of competition in markets. High level of transportation costs that further affect these economies adversely and rise chances of poverty. Empirical outcomes revealed that physical infrastructure in the form of paved roads reduced poverty in the sampled economies but magnitude of this impact depends upon the poverty estimates. It was found that increasing roads infrastructure by 10% reduced poverty headcount ratio by 5.16%. A similar increase in roads led to decline poverty gap (depth of poverty) by 6.14% and poverty severity which is estimated as square of poverty gap reduced by 6.91%. It was suggested that road infrastructure can be made further pro-poor by proper policy design and regulating as well as institutional reforms can help strengthening this impact and the ultimate goal of less poverty in the country can be achieved, Anyanwu and Erhijakpor (2009).

Improved opportunities such as (access to national resources, better utilities services, better employment), security enhancement (lesser vulnerability against shocks) and empowering facilities (greater participation of deprived and poor segments of society in making decisions)

along with provision as well as accessibility of poor to transport and communication infrastructure can reduce poverty in the country. It is firmly believed that all these opportunities and especially rural roads and transportation greatly contribute reducing poverty. But not much literature can be found on the subject in case of developing countries as World Bank rightly puts it in its report, Poverty Reduction Sourcebook (2001), 'Little evidence exists on the direct impact and final incidence of net benefits of transport projects'. In the existing literature work on poverty and physical infrastructure is mostly concerned with roads and transportation and especially rural roads. It is so because in most of the developing countries rural population exceeds urban population and people having fewer opportunities lead greater chances of poverty in rural areas while urban areas have not been focused much in this regard. In this context a panel study was conducted for 20 less developed economies undertaking time period from 1980-2005. Empirical outcomes confirmed that improved infrastructure i.e. rural roads and transportation reduced poverty in the sampled economies although this link was not revealed by results in case of urban roads and transportation. It was suggested that subsidies on transport and communications are used widely to help the poor out but these subsidies cannot be limited to poor due to the dispersion of poor in urban areas which further makes it quite difficult for them to accomplish their needs regarding transportation. Therefore, some alternate schemes and programs be identified and implemented in urban areas to target urban poor in these countries, Seetanah et al. (2009).

Alleviating poverty is one of the main challenges in modern world and therefore it was given top priority in the Sustainable Development Goals enlisted by the UN and 193 nations agreed to alleviate extreme poverty by 2015. In a report on poverty by UN in 2016, poverty was again highlighted as the main hurdle in the way to achieve SDGs and about 836 million people still living under extreme poverty conditions, UNDP (2016). Taking under consideration the main causes of

poverty within a country like lack of social and physical infrastructure like health and education facilities, electricity service, quantity and quality of transport and communication facilities, a quantitative study was conducted for Indonesia. In this panel study, Prawesti (2017), explored the impact of physical infrastructure on poverty in Java island where empirical analysis was conducted for time period 2002-2012 and results were obtained. Results showed that access to basic social and physical infrastructure significantly reduce poverty but effective formulation of resources allocation and investments on these public goods was suggested as in case of Java Island, this impact was somewhat weaker and ambiguous. It was further suggested fiscal decentralization may help proper allocation of resources and pro-poor growth in rural and remote areas can create more employment opportunities and reduce poverty in the study area.

In developing countries most of the poor households live in rural areas and lack access to physical infrastructure especially roads and transportation. Lesser facilities of roads both in quantity and quality cause higher transportation cost, limiting access to markets for their agriculture and other production, unavailability of consumption goods and off farm employment opportunities. Lack of road infrastructure also limits access to healthcare and educational facilities, and other social activities. Lao PDR (Lao People's Democratic Republic) is one of those countries where these problems are in severe form and causing poverty in rural areas. Poverty in Lao PDR was 46% in 1992-93 which came down to 39 in 1997-98 and further declined to 31% in 2002-03. In 1992-93, 52% of households were having low consumption expenditures than poverty level which came down to 43% in 1997-98 and further declined to 33% in 2002-03. Urban poverty was recorded 27%, 22% and 23% respectively in the same time period. Therefore, Warr (2005) checked the impact of road infrastructure on poverty in Lao People's Democratic Republic (Lao PDR), between 1997 and 2003. Obtained results for Lao PDR revealed that 13% decline in rural poverty

was attributed to better roads and transportation facilities alone. And almost 32% households who have no access to dry weather roads and if they are given access to roads, poverty level can further be brought down to 29.6% from 33%. This figure can further be brought down to 26% if all the households in rural areas are given access to all weather roads. Provision of roads and transportation in rural areas is quite difficult and costly but if government wants to target rural poverty then this is the best option to divert resources towards rural roads in the form of public investments so poverty could be reduced future in case of Lao PDR..

Many researchers have studied the link between physical infrastructure and poverty around the globe. In a time series study conducted for Nigeria from 1970-2005 the impact of physical infrastructure on poverty reduction was examined. Empirical analysis showed an inverse relation between infrastructure development and poverty which means that good infrastructure reduces poverty. It was concluded that although physical infrastructure reduced poverty in Nigeria but the impact of social infrastructure on poverty reduction was even greater. This study suggested that while designing public policies regarding investing in public projects, attention should be given to social and physical infrastructure like, healthcare and education, energy and especially the rural and urban transport and communication networks because all of them have strong negative impact on poverty in Nigeria, Ogun (2010).

Public investments physical infrastructure especially roads and roads and transportation has been one of the top priorities of governments in developing world with the view that it contributes to poverty reduction. But as a matter of fact this direct link has been weak historically and if such investments by the public sectors are made primarily for growth purpose and then growth can be made responsible for higher output, greater productivity of economy, adequate social and physical infrastructure and last but not the least the expanded employment opportunities for poor to have

jobs, high incomes and bring themselves out of poverty. In this context roads and transport if not sufficient condition for poverty reduction but it could be a necessary one. There are evidences where public investments in roads and transport might not be successful to pass on its benefits to poor but its impact on income and productivity has always been gainful. Therefore, need of the day is that there are chances that roads infrastructure can be made more pro-poor. Some empirical evidences showed macro level impact of roads and transport infrastructure on poverty reduction through growth in incomes, output, employment opportunities which are considered as prerequisites for a reduction in poverty in the long run. In a study for Indonesia, it was revealed that 1% in out of provinces where roads were good, led to reduce poverty by 0.33% and same increase in output of provinces with not good roads reduced poverty by 0.09%, Kwon (2005a). Almost similar results were obtained from another study conducted for People's Republic of China where improved road infrastructure contributed towards high growth and ultimately the objective of reduction in poverty was achieved. It was concluded that once road infrastructure in the form of physical capital is accumulated, the impact of growth on poverty reduction gets stronger, Setboonsarng (2006).

Public development policies since 1980s have emphasized on privatization, more liberalized markets and reforms in regulations. There are studies (like Parker and Kirkpatrick, 2005) where the effects of privatization, regulatory reforms and more liberalized markets have been explored but less emphasis has been kept on the impact that state regulations and privatization has on poverty reduction. In a review article, Parker et al. (2007) studied the role of state regulations regarding infrastructure on reduction in poverty in some developing nations. There were patchy as well as contradictory evidences obtained by different researchers. It was concluded that while introducing reforms and regulations by the authorities, lesser attention is given to poverty

reduction the developing countries. It was suggested that public understanding should be improved regarding poverty reduction strategies while privatizing public entities, introducing reforms and regulations, and liberalizing markets in the developing economies.

Cambodia also made some efforts in this regard. Physical infrastructure is one of the vital sources that can contribute to achieve the goal of poverty reduction in Cambodia. Public investments in pro-poor physical infrastructure like roads and transportation, rural irrigation, electrification of rural and remote areas increases production, improves productivity as well as facilitate labor mobility and domestic trade (RGC 2003). Cambodia is one the poorest countries where poor households have very little access to social and physical infrastructure. World Bank reported in 2004 that on average the poor households travel seven kilometers for healthcare services, poorest people, on average, live away from roads as twice of the rich ones. 60% of the high income class having access to electricity provided by the government sector and less than 15% of the poorest having access to electricity. It was also reported that access to piped water was 2% among the poorest consumption level and 90% of the same segment did not have access to toilet facility. The vital role of infrastructure to economic growth and development and reduction in poverty has been recognized widely that is why public investments in physical infrastructure is on the top in the priority list of Cambodian government. The importance of road and transportation along with some other ones like irrigation, energy and electricity power to promote growth and reduce poverty is so crucial for Cambodia (RGC 2004). To examine the impact of physical infrastructure on poverty reduction in Cambodia, a survey based data set (data collected from 1159 households in two provinces; Meanchey and Rieng (2006) was used for empirical analysis. Results revealed that four variables representing infrastructure strongly affected poverty. These four variables are rural road infrastructure, irrigation and water management, provision of adequate electricity to rural

households and interventions should be made on the basis of locality which can be more effective in terms of distribution.

### 2.3.2 Relationship between Poverty and Public Spending through the Channel of Physical Infrastructure i.e. Energy

This section displays the link between public spending and poverty through the channel of physical infrastructure i.e. energy. Here all the prior literature represents the relation between public spending on energy and its impact on poverty. Some prominent research studies have been presented here to explore this link.

Extreme poverty reduction is the top listed goal in Millennium Development Goals (MDGs) and all nations are committed to achieve this goal. In this regard, energy sector has been one of the major sources to achieve the goal of sustainable growth and development. Economic growth and development is achieved through public policy where funds are allocated and investments are made in physical infrastructure especially in energy sector where jobs are created and income poverty is reduced which is the ultimate objective of all the countries. United Nations and other forums around the world have highlighted this matter so far in their reports and conferences like World Energy Council, London, (2000, 2001), Department for International Development (2002) and World Energy Outlook, International Energy Agency (2002). Importance of energy sector regarding creating employment opportunities and poverty reduction has also drawn attention on global level at the Johannesburg Summit on sustainable development held in (2002). Access to energy has been one of the major challenges in developing countries and provision of energy in terms of affordability, reliability and social acceptability is not possible without government intervention. Therefore, access of low income segment of society to energy and through energy sector the reduction of poverty are the goals listed in MDGs as Water, Energy, Health, Agriculture and Biodiversity, WEHAB (2002) stated.

Answering the above concerns that how public investments in energy sector contribute reducing poverty, the Asian development bank (ADB) undertook a project named regional technical assistance (RETA) in collaboration with (department for international development, DfID, UK), (Japan bank for international cooperation, JBIC) and the World Bank (WB). Regional technical assistance (RETA) had the basic objective to explore the effect of energy and transport infrastructure on poverty reduction. This project was carried out in three Asian economies i.e. China, India and Thailand. This project was implemented stage-wise where in first stage, the current knowledge and understanding on the impact of physical infrastructure like transport and energy on poverty reduction and exploring the knowledge gap on the subject and also to encourage developing proposals and conducting country based case studies to supplement the existing understanding. In second stage, research institutions in these countries carried out domestic field research and data analysis to construct case studies for the mentioned countries. At the third and final stage of the project, the comparison of these country based case studies' outcomes and further specification about policy making and operational implications in these countries. Results showed that investments in energy sector by the governments benefited both poor and non-poor although outcomes were not similar in all sampled countries because of some contextual differences in these countries. Poor as well as non-poor were benefited but not proportionately. It was observed that investments in energy is public good and poor people welcome it because they benefit the most from it although non-poor also get benefits from it. Within well-off communities poverty exists as well as even in poor communities some households may not be poor so investing in energy sector create job opportunities for these communities and enable them especially the poor households to take advantage from these opportunities and bring themselves out of the vicious circle of poverty, Cook et al. (2004).

The relationship between any country's economy and its energy services is definite and obvious and an adequate electricity services definitely boost the economy. No business setups locate in those areas where electricity supply is inadequate because businesses cannot use electric machinery and technology without it. Areas without proper electrification have labors with lower health and education levels leading to poor living standards in those areas. Similarly, the existing businesses in areas with lack of adequate electricity cannot grow and expand their production activities due to limited local customer base. In localities where mostly poor live, businesses cannot expand as they are unable to use advanced technologies of information and communication, they can only operate in daytime. On the other hand, proper electrification significantly affect production by using advanced technologies, electric machinery, producers can go for more than one shift by operating at nighttime. It also boost local agriculture produce by using electric tube wells for irrigation while inadequate electricity supply leads to deforestation by using wood as fuel, lowers agriculture as well as non-agriculture production. When overall economic activities contract leading a down turn in economy, level of potential GDP declines affecting mostly the poor by deteriorating business as well as employment opportunities. Here comes the role of government because provision of adequate and reliable electricity and other energy sources is the basic responsibility of state and therefore, appropriate energy policy, planning and investing in energy sector by the public sector can make it possible that all the citizens of a country can access and use electricity as basic need. Similarly, access to proper electricity and other energy services for domestic use on one hand improves lives of poor households while on the other hand provision of adequate energy sources raises business activities, improves production of small and cottage industries and creates employment opportunities for poor increasing their incomes that further

leads to reduce the chances of poverty in any economy, Sangco (2002); Herrin (1979); Barnes (1988).

Saghir (2004), discussing a report of the International Energy Forum (IEF), revealed that 1.6 billion people do not have access to electricity while 2.4 billion having their reliance still on biomass fuels. This deprivation of poor in electricity affects them enormously. A strong and significant link between energy i.e. electricity and reduction in poverty through high income, better health and education, and environment elaborates the crucial role that energy sector plays in socioeconomic development of a country. Energy sector reduces poverty and deprivation by working with other sectors like agriculture, industries and transportation where employment opportunities are created and income poverty declines. But here the role of public sector is of great importance in the form of appropriate energy policy and commitment for provision of cheaper and reliable energy especially electricity to its citizens. Energy sector requires enough subsidies and proper financing so adequate electricity can be generated with no distortions and poor can access as well as afford it. It also requires best designed policies and implementation for expansion regarding accessibility and it is possible by the removal of institutional as well as regulatory restrictions and barriers, subsidizing it carefully and through involvement of local authorities while designing projects, delivering energy services and protecting poor in any situation of reforms. Implementing such policies can work under the varying socioeconomic conditions domestically as well as internationally. In this regard, World Bank pioneered most of the innovation in research in designing public energy policies where focus has been on the collaborative projects with organizations, state governments and public private partnership in investments in energy sectors to boost economic activities, creating employment opportunities and lowering the chances of poverty in its member countries.

Poverty and low standard of living is one of the most burning issues around the world these days which has to be addressed through socioeconomics development. Precisely defining poverty in terms of material wellbeing as lacking access to enough quantity of food, clothing, shelter, clean drinking water and sanitation, better healthcare facilities and of course not able to get basic education. But this situation can be more easily elaborated by saying that people are considered poor if they do not have enough income to meet their basic needs. Every human being has the right to live better life and fulfill all his aspirations with high living standards but talking of billions of people still do not have access to basic needs of life like food, shelter, health and education. Provision of almost all these basic needs is related with the energy because energy especially electricity is the most important input for sustainable livelihood as without it survival is quite difficult in modern world. No production activity is possible without energy, no health and educational facilities can be provided without it and lack of adequate energy is basic cause of poverty these days. Despite these facts, little efforts have been made to explore the link between energy and poverty in under developed economies as James and Hidieki, (2007) explained. To investigate the relationship between energy availability and better living standards and reduction in poverty, a panel data study was carried out by Hussein and Filho, (2012) for Sub Saharan Africa. They came with outcomes that modern energy sources are necessary for better standard of living which is possible by creation of job opportunities with productivity boost. More energy production for domestic consumption as well as exporting it (electricity producers in general and oil exporters in specific) can earn revenues leading to sustainable development and reducing poverty. Domestically, provision of better energy sources like electricity can improve life of people in terms of home lighting; more efficient production with adequate and reliable energy and better healthcare and educational services that further improves labor productivity on one hand

and providing employment opportunities on the other hand, so poverty and deprivation can be reduced. This study further conclude that modern energy sources like electricity had significant impact on living conditions of rural and remote areas and in areas where this access is not possible, renewable energy like solar power contributed the most towards better lives of people. Through economic and environmental sustainability poverty can be reduced with the help of modern energy sources as poor in rural and remote areas mostly rely on natural resources in the Sub Saharan Africa.

Reforming power sector according to the new developments if the field is quite necessary and in this regard the African countries have put this on public agenda for more than a decade. Efforts have been made by different countries in Africa for improving financial as well as technical performance of the power sector, proper allocation and release of funds for investments in power projects, expanding electricity services and adequate supply as well as making accessibility easy for poor communities especially in rural areas. Similarly, structural, operational and financial reform plans have been adopted by several nations regarding public electricity utility. To assess these reforms and explore the link between public sector investment in power sector and its impact on poverty in six African economies including Ghana, Mali, Namibia, South Africa, Tanzania and Uganda, a research study was conducted by Clark et al. (2005). Several aspects of this link between public spending on electricity utility and poverty were examined like accessibility of poor to electricity, affordability of the service, reliability and quality of power supply, access to electrified social infrastructure like health centers and educational institutes etc. To check for empirical results and obtaining the impact that public spending on power sector has on poverty can be best judged by conducting surveys and directly interviewing the poor households. Therefore, survey based data was collected on sector level through group discussions and direct questioning. Results

suggested that power sector reforms and investment by the public sector does not affect poor people directly but indirectly. It is quite possible that if private sector gets involved in power sector, prices might go up and expansion in service provision and accessibility by the poor may not necessarily occur but reforms in this regard can create opportunities of improving quality, reliability and expansion in networks diverting public policy and resources to the rural and especially the poor communities instead of big businesses. This study revealed that in case of Namibia as when private sector was involved in power sector, prices actually fell and rates of electrification got increased. In case of Tanzania, private company showed improvements in terms of efficiency and reliability along with the financial performance of the public sector power company and a price rise of only 4.3% was observed. All this led to transform power sector into public private partnership and created business and employment opportunities which poor benefitted from. This study also concluded that access to service and quality of service improved in Ghana and South Africa where programs for electrification of rural communities have been implemented. Although, these programs were separately implemented but were successfully providing broader and reliable access to poor households and can be more efficient if properly planned and targeted towards deprived communities, Clark et al. (2005).

Primarily, energy sector consists upon coal, oil and gas, heat and electricity and all these components have experienced a great experiment through introduction of reforms in concerned markets especially in electricity and renewable energy around the globe since 10980s. These reforms were in collective form of political and economic as well as technological as Ljung, (2007) stated in his book. Reforms were made with aim of designing energy policies, law making on such recommendations and introducing proper regulations and forming institutions to break the monopoly of government owned utilities services as well as facilitate private sector with

opportunities of level playing ground so they can participate in market. These reforms were made both high as well as low level. Reforms made at high level were horizontal addressing the competition level both in wholesale and retail markets in which energy is supplied, unbundling and separating of incumbents regarding energy generation, provision and supply, maintenance etc to boost competition, creation of regulating bodies that were independent and autonomous as well as the process of privatization. These reforms allowed for corporatization in several segments of supplying energy, facilitated separation in competitive and natural monopoly and also helped integrating different segments that were solely owned or managed by the states prior to reforms as Joskow (2006) argued. These separations were made on vertical level like separation in functions, accounting, and legal as well as separation in ownership and all these reforms introduced competition in electricity and gas sectors mostly while a rise in energy trade facilitated to introduce emissions markets, Pollitt (2012). Reforms made on low level addressed the pricing that reflect the cost related aspects of energy like providing subsidies and removing or restructuring them, increasing or decreasing tariffs as well as setting prices, availing latest technologies, financial programs and schemes and of course involvement of communities, Prasand (2008). The main reason behind all these reforms was facilitating energy sector and making it more competitive and efficient on one side and to provide adequate and reliable as well as affordable energy especially electricity to the poor segments and communities. In this regard, Jamasb et al. (2014) reviewed literature both theoretical as well as empirical to examine the relationship between reforming energy sector and reduction in poverty for developing economies. They argued that different countries' reforms levels are different in terms of structural changes in the markets, state role and regulating energy sector, yet these reforms improved productivity and efficiency in many of these reforming nations. However, the benefits of efficiency did not reach the consumers due to

improper and inadequate regulations. They concluded that energy sector reforms impacted poverty in a negative way by promoting welfare of the poor households when they get access to adequate, reliable and affordable energy especially electricity on which most of the poor families rely. They further suggested that reforms should be targeted for poverty reduction by enhancing living standards of poor households especially in developing economies.

The availability and expansion in the quantity as well as quality of physical infrastructure along with accessibility especially in energy (electricity) is a prerequisite for rapid and sustainable economic growth and development, and reduction in poverty around the world, Adenikinju, (2005). In last three decades, the availability of and accessibility to energy services has been a problem in Nigeria where majority of people live below the poverty line. In Nigeria, state owned company dominates the supply of power i.e. (national electric power authority) which has replaced the previous one named (power holding company of Nigeria). This state owned company has failed in provision, accessibility and maintaining the minimum service reliability standards so far. There are several reasons behind electricity crises in Nigeria although this country is endowed with plenty of oil and gas reserves, lot of coal reserves, huge amount of resources for hydro, solar, wind and biomass energy. Nigeria is also one of the major exporters of LNG but electric grid running on gas still faced inadequate supply of gas and frequent breakdowns and collapse. Nigerian government has invested billions of dollars for power generation as well as enhancing transmission capacity in the last decade but still there is a need of proper planning and policy making for better outcomes. Electricity problem in Nigeria has undermined significantly the effort of achieving sustainable growth and development, competing in regional as well as international markets, employment creation and of course alleviation of poverty. Persistent electricity crises in Nigeria led to affect adversely the socioeconomic development and standards of living. In recent times the

problem of energy crises got attention and was reflected in policy making regarding liberalization of electricity markets. Reforms were brought in power sector through law making where electric power sector reform act was passed in (2005) and some significant results were seen in the form of establishing regulatory body named Nigerian electricity regulatory commission and by division of power industry into six generations, separating transmission and distribution companies in (2007). At the end of the day, partnership between public and private sector was forged so the new challenges of investing in power sector were met and electricity curse in Nigeria ended somehow. Further investment in electricity generation and provision created more employment and poor people were enabled bringing themselves out of poverty, Iwayemi (2008).

Energy sector contributing significantly to the growth of rural non-farm sector in China leading to reduce poverty by 0.42 estimated elasticity, Fan et al. (2002). Energy investment has a strong positive and quick impact on poverty reduction, such that by spending every 10,000 Chinese Yuan, for electricity development program, 2.3 persons were brought out of the poverty. Balisacan et al., (2002) concluded that in Indonesia, access to electricity reflects access to technology that contributes directly to increased employment and incomes of the poor people and also leading to reduce poverty. In the Philippines also, electricity positively affects incomes of the poor people through higher growth, but as far as direct effects are concerned, they are somehow unclear for the poorest segment while clearer for the upper segments of the income levels, Balisacan and Pernia (2002). Ali and Pernia (2003) also suggested that some minimum level of income along with some complementary facilities is necessary requirement to benefit from electricity.

To assess the energy poverty nexus in East Africa, a research study was carried out by Karekezi et al. (2005). According to national statistics, 48% of population of Kenya lived in poverty 1990 while this percentage rose to 56% in 2001, while 60% of rural and 39% urban population was poor

in Tanzania. Most of the poor population (87%) live in rural areas mostly relying on agricultural practices in both countries and have been facing sever poverty being unable to meet their basic needs. To eradicate extreme poverty has been the top priority of nations but adequate efforts have not been made by the governments of both Kenya and Tanzania in this regard that is why poverty in both countries increased instead of decrease (Tanzania Traditional Energy Development Organization TaTEDO, 2004). The crucial role of energy services in reduction of poverty has been obvious as agriculture productivity, small and cottage industry and agro-processing totally depend on energy especially the electricity power. But due to limitations of rural population in accessibility to adequate, reliable, affordable energy, rural communities lack socioeconomic wellbeing and live at low living standards. In Kenya and Tanzania electrification in rural areas is very low and where electricity services are provided, its beyond the purchasing power of poor due to higher prices. One reason behind low electrification is the cost of provision of electricity to far away and dispersed rural communities. All these reasons are hurdles in way of using improved and modern energy options like electricity and solar systems in rural and remote areas. But proper electrification and provision of adequate, affordable and reliable energy can help reducing poverty in rural communities in these countries. Renewable energy technologies (RETs) like solar and thermal, animate and mechanical power which are non-electrical in nature along with proper electrification are very useful energy sources for rural areas not only in terms of job creation for poor and revenue generation for country but they are environment friendly in most of the cases therefore, socioeconomic development can be achieved and probability of poverty in the region can also be reduced.

Privatizing public entities especially the ones providing utilities like electricity and gas etc has been one of the most controversial issues while designing public policies. In most of the developing

countries, main reason behind privatizing public enterprises is improving efficiency that leads to minimizing cost and proper recovery of revenues but this process of privatization caused higher prices that further led to emerge socioeconomic and political disturbances, Estache (2005a); Birdsall and Nellis (2003). Although in African region, the process of privatizing public utilities' services is sluggish but evidences showed that similar problems have emerged. A research study conducted by Estache (2005b) and in another similar study carried out by Boccanfuso et al. (2008), investigated this link of energy services and poverty reduction in Senegal having the most prominent experience regarding utilities reforms in African region and where absence of adequate and reliable electricity supply has been one of the major hurdles to economic development (AFDB/OECD, 2004). In Senegal, electricity demand grew by 7%-10% annually and in 2001 electricity provision in rural areas was only 8% which was targeted to increase to 30% by 2015. Achieving this goal of expansion and reforming energy sector needed hundreds of millions of dollars (report by Senegal government, 2002). In this regard since 1990s, government of Senegal attempted twice privatizing electric power company owned by state as it was in poor state of condition at that time as well as the improper billing methods and practices along with the faulty defective electric meters were major problems with the company, Gokgur and Jones (2006). Analysis made about the distribution of electric power in Senegal by income category from 1995-2001, revealed that poor households and rural communities did not benefit from these expansion and transmissions of networks. Results further suggested that direct effects of changes in prices were weaker as compared to general equilibrium effects on inequality and poverty. It was advised that some compensating policies may help attenuate the effects in the form of high prices etc.

Okwanya and Abah, (2018) conducted a research assessing the impact that energy consumption has on reduction of poverty for 12 African economies from 1981-2014. Empirical outcomes

suggested the existence of unidirectional inverse relationship between consumption of energy and poverty which reveals the crucial role of energy in the reduction of poverty in the sampled nations. Some other factors like stock of capital along with political stability can also play significant role in poverty reduction. This study suggested that countries in African regions need to improve physical infrastructure especially in energy sector and maintain political stability so poverty can be reduced through maximum energy consumption.

Several other studies are there where researchers investigated the impact of energy on poverty in a direct and indirect way. In a direct way, poverty can be reduced by enabling poor households to benefit from modern energy services and enriching their lives while in an indirect way, these services first contribute to economic growth and further sharing the benefits of high incomes and greater employment opportunities to reduce poverty. Most of the studies focused on indirect way as Ravallion and Chen (1997), concluded that in developing nations a one percent increase in average income or expenditures of people led to reduce poverty by three percent. World Bank (2000) reported that reduction in poverty responded as 3 percent to a rise in economic growth by 1 percent. In an another study conducted by Ravvalion (2012) for 90 developing economies, he concluded that lower level of development and higher level of inequality declines the elasticity of poverty which means poverty cannot be reduced with lesser growth and high inequality. Bourguignon (2003) suggested that reducing poverty is linked with high growth and poverty targeting policy in the long run should be based on sustainable growth and development but a decrease in inequality must be a pre condition to reduce poverty through economic growth.

In modern world global warming and climate change have changed the dimensions of policies and strategies about growth and development. Focus has been made on low emissions of carbon and other dangerous gases, innovations in industries and of course sources of renewable energy around

the world while designing policies. Renewable energy production can achieve the target of provision of adequate and reliable energy as well access to energy by the poor segments of countries. To assess this idea, a study was conducted in India to explore that how poverty can be reduced by creating employment opportunities through renewable energy production in rural and poor communities of India. India is second most populous nation in the world where till 2012, about 270 million have no or very little access to health and educational facilities, and they were living in extreme poverty. These people have neither access to clean water and sanitation nor to energy, Narayan and Murgai (2016). According to a report of International Energy Agency (IEA, 2015), more than 237 million people do not have access to electricity and about 840 rely on biomass to cook meal. To achieve the objectives of poverty reduction, decreasing energy insecurity, enhancing energy accessibility, renewable energy was targeted as the main source for job creation especially in rural and poor communities of India. It was targeted that by the end of 2022, India will produce 160 giga watts of solar and wind energy which can create 330,000 jobs different fields like construction, project designing, business development, maintenance and operations. These employment opportunities will help reduce poverty in rural areas of India, Jairaj et al. (2017).

## 2.4 Summary

This study tries to explore literature on the link of public spending to poverty directly as well as indirectly. Literature has been subdivided into three segments. First segment shows link between public spending and Poverty directly, second segment explains relation between poverty and public spending through the channel of social infrastructure and third segment elaborates relation between poverty and public spending through the channel of physical infrastructure. Social

infrastructure further represents health and education sectors while physical infrastructure comprises of transport and communication and energy sectors.

Several studies came with the conclusion that poverty alleviation is possible through the direct impact of public alleviation programs where poor segment of countries are directly targeted through such programs. To cope with income poverty, authorities put more emphasis on income support to poor while making public policy. Some studies focused on Social Transfer programs that could be designed and implemented in poor economies endorsing that financial assistance should be provided to those are poor and face any kind of risk and in absence of these cash transfers these poor probably fall below poverty line. They found quite small number of these cash transfer programs in the developing countries but in transition economies and middle income countries. Outcomes of such studies showed that these cash transfer programs were helpful combating gender discrimination and family cash allowances, social pensions as well as other cash transfer programs improved school enrolment, attendance all were improved by these transfers. Few other ones focused on institutional quality and reforms that should be improved and good governance needs to be ensured and this is the only way to through which poor people could be made socially secured in these developing economies. Some of the studies suggested that pro-poor growth is to be focused by the public sector so poverty can be reduced through improved productivity and greater employment opportunities.

Some studies examined the indirect impact of public spending on poverty reduction and several channels were used to bridge this link in most of the developing countries. Many studies on indirect relation between public spending and poverty explained that the primary cause of poverty is deprivation of human capabilities and poor being unable to fulfill their basic needs. Poor do not have proper access to social infrastructure like health and education and if they get access to

adequate healthcare and education facilities it will enhance human capabilities and will further lead to reduce poverty. In this context, research studies are there where the impact of healthcare facilities on poverty in developing economies on micro and macro level has been explored. Public policy in this regard is the most crucial one because resource diversion towards healthcare services in the form of availability and accessibility. Healthcare services should be among the top priorities in public social spending especially in the developing world because poor segments of the society live mostly in rural and remote areas and they do not have appropriate healthcare services. Almost all the studies have concluded that better healthcare services improve human capabilities and enable poor and deprived people to participate in economic activities and earn their basic needs so they can bring themselves out of poverty.

On the other hand it is believed that being poor or lacking of well-being comprises of both monetary as well as some non-monetary aspects of individuals. In developing nations, poor segment of the country needs greater access to education and health care services, clean water and sanitation, better employment opportunities, credit facilities, and easy access to markets for their produce.

Along with the social infrastructure, physical infrastructure has also been recognized pretty important while designing public policies to reduce poverty in developing economies. Many of the developing nations lack the adequate physical infrastructure like electricity and roads. Rural and remote areas where most of the poor people reside have no or very little electrification and roads. Experts have the opinion that if roads and transportation are provided built to connect rural and remote areas of the country where most of the poor reside, it can create greater employment on local base and more accessible markets for rural farmers and other small and cottage industrial produce as well as making poor more mobile to get jobs hence enhancing their earning

opportunities and enabling them to come out of poverty and this has been theoretically as well as empirically proved in certain studies.

On the other hand researchers have also the opinion that if adequate, reliable and affordable energy in the form of electricity service is provided to the poor in rural areas, it can create greater employment and making poor more productive hence enhancing their earning capabilities and enabling them to come out of poverty and this has been theoretically as well as empirically proved in certain studies. In developing countries, there has been a consecutive energy crisis that affected these economies in several fields like lesser agriculture produce where electricity is used for tube-wells irrigation. Energy crises and electricity shortfall also led industrial production to decline due to regular load shedding mostly in day times in most of the developing countries. Such crises and electricity shortfall also affected household consumption of electricity and made life of common masses miserable. It has been suggested by many of the researchers that proper electricity provision to households, agriculture sector and industrial sector can help reduce poverty through creation of better and more employment opportunities, enhancing agriculture and industrial production, increasing income levels of poor to accomplish their basic needs and having less chances of poverty.

Focus of this study is to channelize public spending towards poverty alleviation through social and physical infrastructure. This study explores the relation between poverty and public spending through four channels and most of these channels show the expected results where public spending reduces poverty in a significant way.

# Chapter III

# Research Methodology

This chapter discusses the conceptual framework and research methodology of this study. This chapter is divided into four subsections. Section 3.1 explains the conceptual framework of the study. Section 3.2 describes about the data and variable description; where details about the main dependent, mediating, explanatory and control variables of the study; and data source(s); names of the countries and time span of the study are given. Section 3.3 describes the schematic and econometric models of study. Section 4.4 discusses the estimations technique(s) of the study.

## 3.1 Conceptual Framework

This section describes the details about conceptual framework of the current study while. Conceptual framework is based on theories and empirical evidences provided in literature about the research being carried out and these concepts and ideas are used to establish relationship with the research study. There are different theories of poverty where theorists present different factors as determinants of poverty.

One of the major contributors to poverty as well as development literature is Amartya Sen who casts light on the still ongoing debate between the advocates of relative and absolute poverty. He criticizes both views as suffering from several shortcomings. Amartya Sen's capability theory approach is a theoretical framework that involves two core normative claims. First, the assumption that freedom to achieve well-being is of primary moral importance. And second, that freedom to achieve well-being must be understood in terms of people with capabilities. The capability approach, developed by Sen, (1999) and Nussbaum, (2000), provides the theoretical underpinning

of much discussion of human development. It is essentially individualistic. Development consists of the expansion of individuals' capabilities or freedoms.

In his opinion, "absolute" Deprivation in terms of a person's capabilities relates to relative deprivation in terms of commodities, incomes, and resources" Sen A. (1983). Amartya Sen envisages a fixed (i.e., invariant across both societies and time) set of capabilities that every human being should be able to exercise for one not to be considered poor. The idea is that to fulfill this requirement, the level of material needs/resources necessary to develop these capabilities may change over time and across societies (as opposed to the capabilities themselves). Thus, poverty is context-dependent on the means to end it, but it is not context-dependent on the non-material goals whose fulfillment characterizes poverty. Thus, the socio-economic environment surrounding the individual gives this notion of poverty a sense of relativity. In his own words, "poverty is an absolute notion in the space of capabilities but very often it will take a relative form in the space of commodities or characteristics", Sen A. (1983). The need for certain absolute levels of capabilities/capacities may in turn translate into relative needs in terms of material commodities, resources, and incomes.

He elaborates poverty as human deprivation and therefore he advocates and focuses on human capabilities and freedom. This approach has two claims; one is freedom and other is human capabilities. First, by freedom he means the freedom to individuals to achieve lives and wellbeing that they value rather only having the right to freedom which further means to claim freedom of access to publicly provided goods and services like social infrastructure including education and health facilities and physical infrastructure like access to electricity and transportation, equal employment opportunities etc. Second claim in this approach is that wellbeing should be

understood in terms of human capabilities like how much people are educated and healthy, and how much they are capable to achieve their goals.

According to Amartya Sen's approach;

Poverty = f (Human Capabilities i.e. Health and Education)

It means that poverty could be reduced by enhancing human capabilities and bringing them out of deprivation.

The theory of individual deficiencies of poverty state that poverty asserts that the individual is responsible for their own poverty situation. Now the question to be answered is that how people could be enabled to overcome their deficiencies and brought them out of deprivation and enhanced their capabilities? Here comes the role of government where resources should be diverted towards providing goods and services to its people. This study uses above approach where the role of public sector is crucial for poverty alleviation by expanding human capabilities and freedom through education and health facilities to the people. This study uses human capabilities like education and health as mediators to capture their impact on poverty when public sector diverts resources towards poverty alleviation in the panel developing countries.

Contribution of this study; firstly, this study empirically investigates the role of public sector in poverty reduction through the mediating role of social infrastructure i.e. education and health. Secondly, this study extends the above approach and incorporates two channels of physical infrastructure consists upon energy i.e. access to electricity and transportation i.e. rail line in kilometers. No such study has been found in the literature where such channels are used for poverty alleviation as well as all these four channels have been explored simultaneously for developing countries which makes current study more significant.

The extended form of theoretical framework of this study, where human capabilities are used as social infrastructure comprising of education and healthcare, and physical infrastructure comprising of energy and transportation, is of the following form;

Poverty = f (Social Infrastructure, Physical Infrastructure)

Social infrastructure; i) Education i.e. literacy rate

ii) Health i.e. health expenditures

Physical infrastructure; i) Energy i.e. access to electricity

ii) Transportation i.e. rail line in kilometers

## 3.2 Data and Variables Description

This study uses panel data analysis for the middle and low-income countries; listed in the MDGs for the time period of 1981-2020. Selection criteria for countries is the GDP per capita through which World Bank gives status to a country as high income, upper middle income, middle income and lower middle income. In this study takes into account the low and middle income countries as developing countries for empirical analysis. Annual data has been obtained for all the variables from secondary data sources such as World Development Indicators (WDI), World Bank (WB) and the (IMF) for the developing and developed countries and the number of countries is subject to the availability of data according to the above-mentioned criteria.

Dependent variable of this study is poverty where as Poverty Headcount ratio has been used as a measure for this variable, Dhrifi (2013); Odhiambo (2009a). Explanatory variable of the study is public expenditures as the % of GDP. Mediating variables are social infrastructure and physical infrastructure. Social infrastructure further comprises of two variables i.e. Literacy rate and public

expenditures on health. Physical infrastructure further comprises of energy i.e. access to electricity as percent of the total population and rail lines in kilometers as a transportation variables. These determinants of poverty are also used and endorsed by other researchers like Okwanya and Abah (2018), where they use energy sector i.e. access to electricity as a determinant of poverty. Clark, et al. (2005) also uses energy as poverty determinant while energy, transport, telecommunications, water and sanitation are also used as determinants of poverty in developing countries by the World Bank (2008). Wu et al. (2022) and Fan et al. (2022) used rail line as physical infrastructure and as a determinant of poverty.

This study also incorporates some control variables as the determinants of poverty. These control variables are as follows: real GDP growth rate instead of GDP per capita as it is a core indicator of economic performance and commonly used as a broad measure of average living standards or economic well- being; despite some recognized shortcomings. For example average GDP per capita gives no indication of how GDP is distributed among citizens, trade openness (X+M as a ratio of nominal GDP), population growth rate and inflation rate. Control variables like foreign remittances, unemployment level, trade openness, population growth, GDP growth and inflation have also been used as the determinants of poverty. Ambia and Irwan (2018) use infrastructure expenditures, population, education and health as determinants of poverty while Mujeri (2002) uses unemployment as the major determinant of poverty. Complete definitions and construction of the dependent variable, mediators, moderators, explanatory variables as well as control variables have been provided in table Appendix-9C.

## 3.3 Estimation Methodology

This section is divided into two subsections i.e. 3.3.1 and 3.3.2. Section 3.3.1 explains about the schematic models of the study while section 3.3.2 represents the econometric models to be estimated empirically to obtain results.

### 3.3.1 Schematic Models of the Study

This section comprises of the schematic models of the study. Schematic models show the direct and indirect relationship among the dependent and explanatory variables through mediators and moderators. To investigate the relationship between dependent variable poverty and independent variable public spending, through the mediating and moderating role of social and physical infrastructure, the methodology known as moderated mediation has been used which is suggested by Muller et al. (2005) and Preacher et al. (2007). This methodology identifies the intervening variables between dependent variable poverty and independent variable public spending and this study applies both methods i.e. mediation and moderation separately in order to get more clear picture that whether the mediation impact is more profound or the moderation impact is profound.

Figure 3.1; explains the direct and indirect impact of public spending on poverty through the mediator i.e. literacy rate. In this schematic model, (a) represents the direct link between poverty and public spending while, (b) + (c) represents the indirect impact of public spending on poverty, where, in the first stage public spending affects education shown by (b) and in the second stage literacy rate affects poverty shown by (c).

**Figure 3.1**

**Schematic Model for Mediation Analysis**

**Direct and Indirect relation between Poverty and Public Spending through Social and Physical Infrastructure**

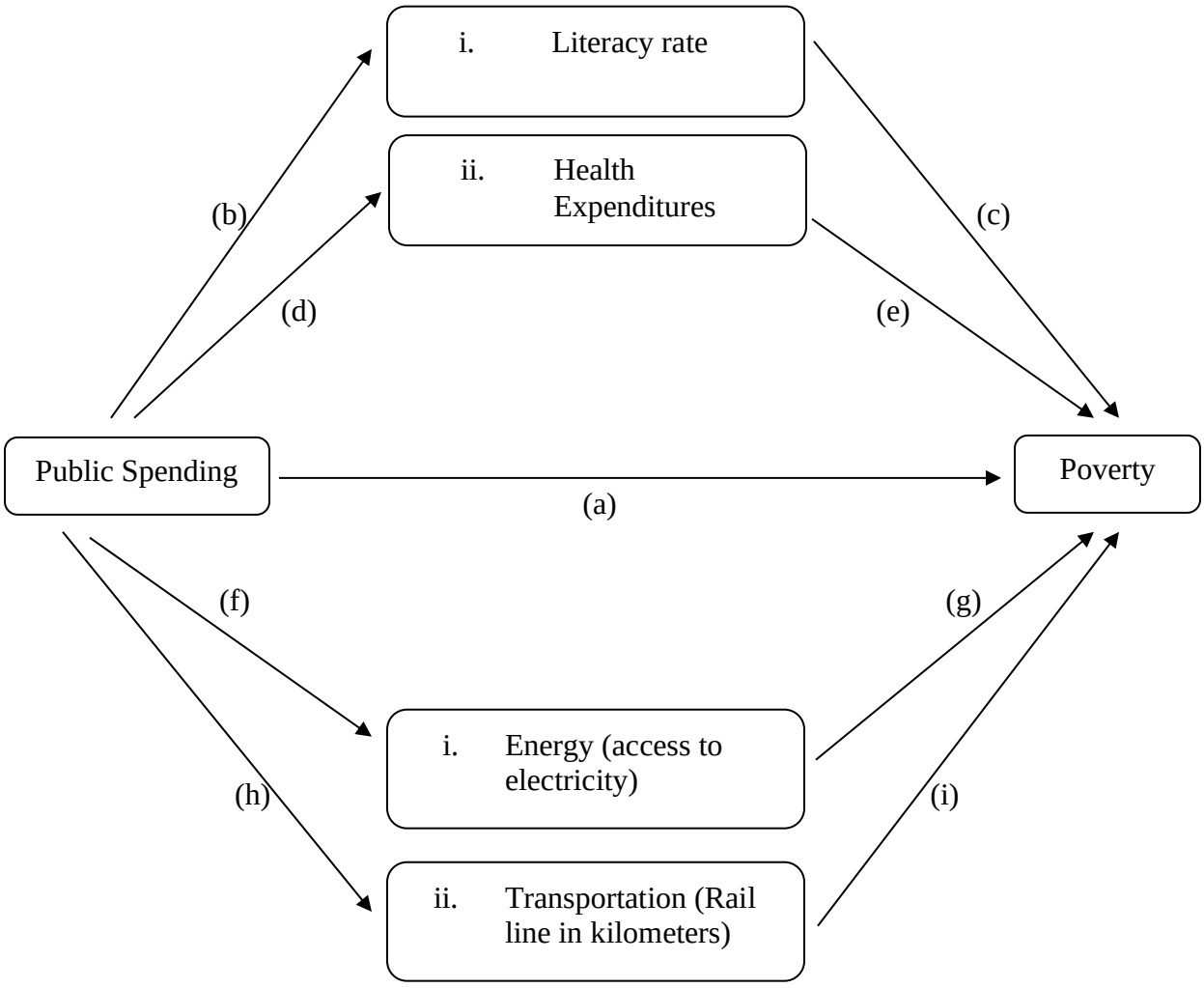



Figure 3.1; also elaborates direct and indirect impact of public spending on poverty through the mediator i.e. health expenditures. In this schematic model, (a) represents the direct link between poverty and public spending while, (d) + (e) expresses the indirect impact of government spending

on poverty and it elaborates that in the first phase public spending affects health expenditures shown by (d) and in the second phase health expenditure affects poverty shown by (e).

Figure 3.1; further shows direct as well as indirect impact of public spending on poverty through the mediator i.e. energy (access to electricity). In this schematic model, (a) represents the direct link between poverty and public spending while, (f) + (g) shows indirect impact of public spending on poverty and from the figure in first phase public spending affects energy i.e. access to electricity shown by (f) and in the second stage energy i.e. access to electricity, affects poverty shown by (g).

Figure 3.1 also explains direct as well as indirect impact of public spending on poverty through the mediator i.e. transportation (rail line in kilometers). In this schematic model, (a) represents the direct link between poverty and public spending while, (h) + (i) shows indirect impact of government spending on poverty and in first phase, public spending affects transportation shown by (h) and in second phase transportation affects poverty shown by (i).

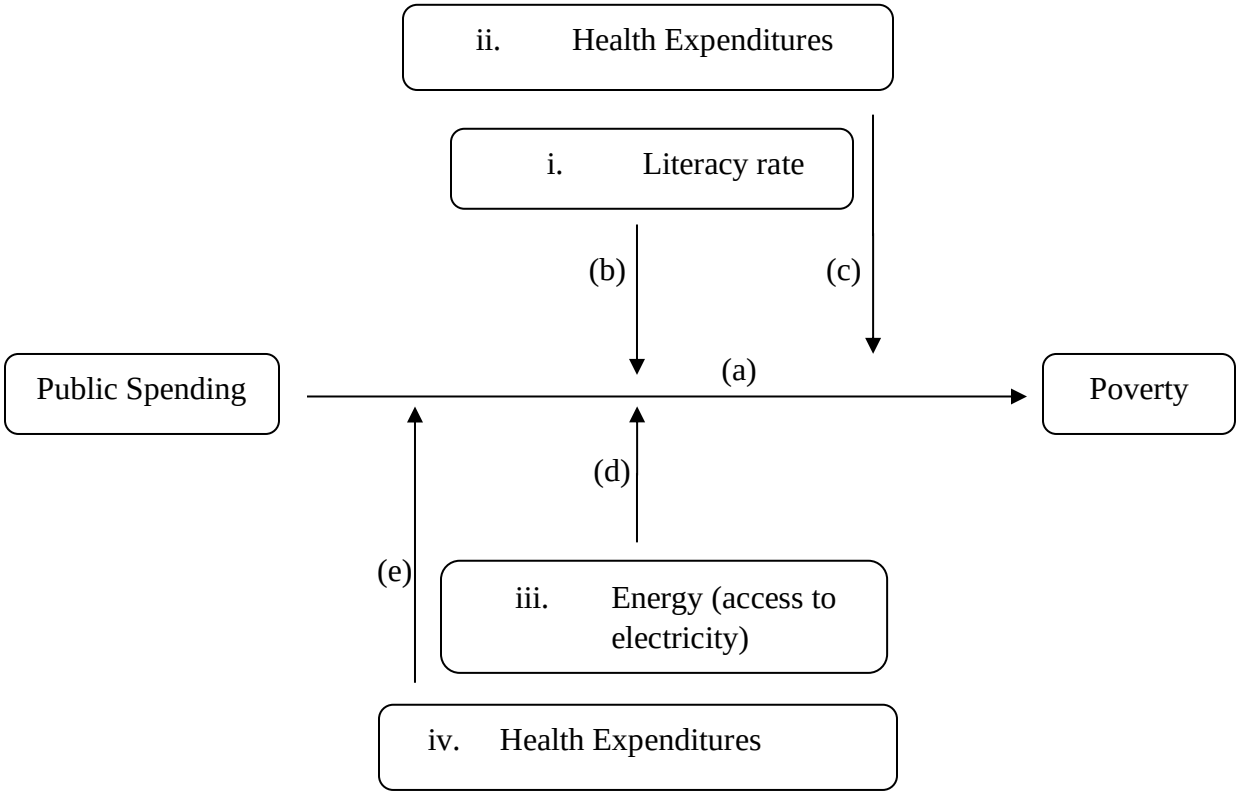
Figure 3.2; explains the impact of government spending on poverty through moderator i.e. literacy rate. In this schematic model, (a) represents the direct link between poverty and public spending while, (b) represents the moderating impact of literacy rate on poverty. It is to be examined that whether the direct impact of public spending gets stronger in the presence of moderator i.e. literacy rate or this link gets weaker.

Figure 3.2; elaborates the impact of government spending on poverty through moderator i.e. health expenditures. In this schematic model, (a) represents the direct link between poverty and public spending while (c) represents the moderating impact of health expenditures on poverty.

**Figure 3.2**

**Schematic Model for Moderation Analysis**

**Impact of Government Spending on Poverty through Moderators i.e. Social and Physical Infrastructure**




It is to be examined that whether the direct impact of public spending gets stronger in the presence of moderator i.e. health expenditures or this link gets weaker.

Figure 3.2; further shows the impact of government spending on poverty through moderator i.e. energy (access to electricity). In this schematic model, (a) represents the direct link between poverty and public spending while, (d) represents the moderating impact of energy i.e. access to electricity, on poverty. It is to be examined that whether the direct impact of public spending gets stronger in the presence of moderator i.e. energy (access to electricity) or this link gets weaker.

Figure 3.2; also explains the impact of government spending on poverty through moderator i.e. transportation (rail line in kilometers). In this schematic model, (a) represents the direct link

between poverty and public spending while (e) represents the moderating impact of transportation on poverty. It is to be examined that whether the direct impact of public spending gets stronger in the presence of moderator i.e. transportation or this link gets weaker.

### 3.3.2 Econometric Methodology

This section explains the econometric methodology of the study in hand. In this study the econometric model comprises of equation that is to be empirically estimated to obtain the results. Latif, et al (2017) also used this methodology to estimate the mediating and moderating effect. Econometric model comprise of two simultaneous equation system of the following form;

### 3.3.2.1 Model 1; The Direct and Indirect Impact of Government Spending on Poverty through the Mediator i.e. Literacy rate

$$EDU_{it} = \alpha_i + \alpha_2 PS_{it} + \alpha_3 X' + u_{1it} \quad (3.1)$$

$$POV_{it} = \beta_i + \beta_2 PS_{it} + \beta_3 EDU_{it} + \beta_4 Y' + u_{2it} \quad (3.2)$$

αi of equation 3.1. and βi of equation 3.2 represents the coefficients in each of these equations in the Model while X' and Y' represents the vectors for control variables in each equation of the model.

### 3.3.2.2 Indirect Effect of Public Spending on Poverty is computed as follows:

Constructing equation to capture the indirect impact of government spending on poverty through the mediator i.e. literacy rate using equations (3.1) and (3.2)

$$\frac{\partial POV}{\partial PS} = \frac{\partial POV}{\partial EDU} X \frac{\partial EDU}{\partial PS} \quad (3.3)$$

$$\frac{\partial POV}{\partial PS} = \alpha_2 * \beta 3 \quad (3.4)$$

Equations (3.1 & 3.2) have been used to calculate equation (3.3) showing the indirect impact of government spending on poverty. From equation 3.3, on the right hand side at first stage, public spending (PS) affects Education (EDU) i.e. literacy rate and then Education (EDU) affects POV. To construct Equation (3.4) by partially differentiating, equation (3.1) with respect to public spending (PS) to get ($\alpha_2$), and then differentiating equation (3.2) for EDU to get ($\beta_3$). And finally,

multiplying $\alpha_2$ and $\beta_3$ to get equation (3.4) representing indirect effects of government spending on poverty in the following form ($\alpha_2 * \beta_3$).

### 3.3.2.3 Model 1; Impact of Government Spending on Poverty through the Moderator i.e. Literacy rate

$$POV_{it} = \alpha_i + \alpha_2 EDU_{it} + \alpha_3 PS_{it} + \alpha_4 (EDU*PS)_{it} + \alpha_5 Y' + u_{1it} \quad (3.5)$$

$\alpha i$ in equation 3.5 are the coefficients in the Model. Y' is vector of control variables in the equation, $(EDU*PS)_{it}$ is the interaction term capturing the conditional effect of public spending on poverty, while $u_{1it}$ is the error term in the equation.

### 3.3.2.4 Conditional Effect of Public Spending on Poverty is computed as follows:

Constructing equation to capture the conditional effect of public spending on poverty through literacy rate using equations (3.5)

To capture the conditional effects of moderator i.e. education, equation 3.5 is differentiated with respect to public spending (PS) and equation 3.6 is obtained.

$$\frac{\partial POV}{\partial PS} = \alpha_3 + \alpha_4 EDU \quad (3.6)$$

### 3.3.2.5 Model 2; Direct and Indirect Impact of Public Spending on Poverty through the Mediator i.e. Health Expenditures

$$HLTHEXP_{it} = \alpha_i + \alpha_2 PS_{it} + \alpha_3 X' + u_{1it} \quad (3.7)$$

$$POV_{it} = \beta_i + \beta_2 PS_{it} + \beta_3 HLTHEXP_{it} + \beta_4 Y' + u_{2it} \quad (3.8)$$

αi of equation 3.7. and βi of equation 3.8 represents coefficients in the each equation in model while X' and Y' represent vectors of control variables in each of these equations.

### 3.3.2.6 Indirect Effect of Public Spending on Poverty is computed as follows:

Constructing equation to capture the indirect effect of public spending on poverty through the channel of health expenditures by using equation (3.7) and (3.8)

$$\frac{\partial POV}{\partial PS} = \frac{\partial POV}{\partial HLTHEXP} X \frac{\partial HLTHEXP}{\partial PS} \quad (3.9)$$

$$\frac{\partial POV}{\partial PS} = \alpha_2 * \beta 3 \quad (3.10)$$

Equations (3.7 & 3.7) are used to construct equation (3.9) shows indirect impact of government spending on poverty. From equation (3.9) on the right hand side at first stage PS affects health expenditures (HLTHEXP) and then Health expenditure (HLTHEXP) affects POV. To calculate Equation (3.10), equation (3.7) is partially differentiated for public spending (PS) to get ($\alpha_2$), and then by differentiating equation (3.8) for HLTHEXP to get ($\beta_3$). In the last, ($\alpha_2$) and ($\beta_3$) are multiplied to get equation (4.10), representing the indirect effect that public spending (PS) on POV.

### 3.3.2.7 Model 2; Impact of Government Spending on Poverty through the Moderator i.e. Health Expenditures

$$POV_{it} = \alpha_i + \alpha_2 HLTHEXP_{it} + \alpha_3 PS_{it} + \alpha_4 (HLTHEXP*PS)_{it} + \alpha_5 Y' + u_{1it} \quad (3.11)$$

αi in equation 3.11 are the coefficients in the Model. Y' is the vector of control variables used in the equation, $(HLTHEXP*PS)_{it}$ represents the interaction term that captures conditional effects of public spending on poverty, while $u_{1it}$ is the error term in the equation.

### 3.3.2.8 Conditional Effect of Public Spending on Poverty is computed as follows:

Constructing equation to capture the conditional effect of public spending on poverty through health expenditures using equation (3.11)

To capture the indirect effects of moderator i.e. health expenditures, equation 3.11 is differentiated with respect to public spending (PS) and equation 3.12 is obtained.

$$\frac{\partial POV}{\partial PS} = \alpha_3 + \alpha_4 HLTHEXP \qquad (3.12)$$

### 3.3.2.9 Model 3; Direct and Indirect Impact of Public Spending on Poverty through the Mediator i.e. Energy (access to electricity)

$$ENERGY_{it} = \alpha_i + \alpha_2 PS_{it} + \alpha_3 X' + u_{1it} \qquad (3.13)$$

$$POV_{it} = \beta_i + \beta_2 PS_{it} + \beta_3 ENERGY_{it} + \beta_4 Y' + u_{2it} \qquad (3.14)$$

αi of equation 3.13. and βi of equation 3.14 shows coefficients in each of these equations in Model while X' and Y' contains control variables in each equation as their vectors.

### 3.3.2.10 Indirect Effect of Public Spending on Poverty is computed as follows:

Constructing equation capturing indirect effect of government spending on poverty through energy i.e. access to electricity as the channel by using equation (3.13) and (3.14)

$$\frac{\partial POV}{\partial PS} = \frac{\partial POV}{\partial ENERGY} X \frac{\partial ENERGY}{\partial PS} \quad (3.15)$$

$$\frac{\partial POV}{\partial PS} = \alpha_2 * \beta 3 \quad (3.16)$$

Equations (3.13 & 3.14) are used to construct equation (3.15) showing indirect impact of government spending on poverty. From equation (3.15) on the right hand side at first stage PS affects energy i.e. access to electricity (ENERGY) and then energy i.e. access to electricity (ENERGY) affects POV. To calculate Equation (3.15), equation (3.13) is partially differentiated for public spending (PS) to get ($\alpha_2$), and then by differentiating equation (3.14) for energy i.e. access to electricity (ENERGY) to get ($\beta_3$). In the last, ($\alpha_2$) and ($\beta_3$) are multiplied to get equation (3.16), which represents indirect effect that public spending (PS) on POV.

### 3.3.2.11 Model 3; Impact of Public Spending on Poverty through the Moderator i.e. Energy i.e. access to electricity

$$POV_{it} = \alpha_i + \alpha_2 ENERGY_{it} + \alpha_3 PS_{it} + \alpha_4 (ENERGY*PS)_{it} + \alpha_5 Y' + u_{1it} \quad (3.17)$$

$\alpha i$ in equation 3.17 are the coefficients in the Model. Y' contains control variables in the equation, $(ENERGY*PS)_{it}$ in the equation is interaction term capturing conditional effects of public spending on poverty, while $u_{1it}$ is the error term in the equation.

### 3.3.2.12 Conditional Effect of Public Spending on Poverty is computed as follows:

Constructing equation to capture the conditional effect of government spending on poverty through energy i.e. access to electricity using equation (3.17)

To capture the conditional effects of moderator i.e. energy (access to electricity), equation 3.17 is differentiated with respect to public spending (PS) and equation 3.18 is obtained.

$$\frac{\partial POV}{\partial PS} = \alpha_3 + \alpha_4 ENERGY \qquad (3.18)$$

### 3.3.2.13 Model 4; Direct and Indirect Impact of Government Spending on Poverty through the Mediator i.e. Transportation (rail line in kilometers)

$$TRANSP_{it} = \alpha_i + \alpha_2 PS_{it} + \alpha_3 X' + u_{1it} \qquad (3.19)$$

$$POV_{it} = \beta_i + \beta_2 PS_{it} + \beta_3 TRANSP_{it} + \beta_4 Y' + u_{2it} \qquad (3.20)$$

αi of equation 3.19. and βi of equation 3.20 represents coefficients in each of these equations in Model while X' and Y' containing vectors of control variables in each equation of the model.

### 3.3.2.14 Indirect Effect of Public Spending on Poverty is computed as follows:

Constructing equation to capture indirect effect of government spending on poverty through transportation i.e. rail line in kilometers as a channel by using equation (3.19) and (3.20)

$$\frac{\partial POV}{\partial PS} = \frac{\partial POV}{\partial TRANSP} X \frac{\partial TRANSP}{\partial PS} \qquad (3.21)$$

$$\frac{\partial POV}{\partial PS} = \alpha_2 * \beta 3 \qquad (3.22)$$

Equations (3.19 & 3.20) are used to construct equation (3.21) shows indirect effects of government spending on poverty. From equation (3.21) on the right hand side at first stage PS affects transportation i.e. rail line in kilometers (TRANSP) and then transportation i.e. rail line in kilometers (TRANSP) affects POV. To calculate Equation (3.21), equation (3.19) is partially differentiated for public spending (PS) to get ($\alpha_2$), and then by differentiating equation (3.20) for transportation i.e. rail line in kilometers (TRANSP) to get ($\beta_3$). Lastly, by multiplying ($\alpha_2$) and ($\beta_3$) to get equation (3.22) which represents the indirect effect of public spending (PS) on POV.

### 3.3.2.15 Model 4; Impact of Public Spending on Poverty through the Moderator Transportation i.e. (Rail line in kilometers (TRANSP))

$$POV_{it} = \alpha_i + \alpha_2 TRANSP_{it} + \alpha_3 PS_{it} + \alpha_4 (TRANSP*PS)_{it} + \alpha_5 Y' + u_{1it} \qquad (3.23)$$

αi in equation 3.23 are the coefficients in the Model. Y' comprises of control variables as their vector in the equation, $(TRANSP*PS)_{it}$ represents interaction term in the model capturing the conditional effect of public spending on poverty, while $u_{1it}$ is the error term in the equation.

### 3.3.2.16 Conditional Effect of Public Spending on Poverty is computed as follows:

Constructing equation to capture the conditional effect of government spending on poverty through transportation i.e. rail line in kilometers using equation (3.23)

To capture the conditional effect of moderator i.e. transportation i.e. rail line in kilometers, equation 3.23 is differentiated with respect to public spending (PS) and equation 3.24 is obtained.

$$\frac{\partial POV}{\partial PS} = \alpha_3 + \alpha_4 TRANSP \qquad (3.24)$$

## 3.4 Estimation Technique

This section contains the estimation technique that is to be used for empirical estimation of the models given above.

### 3.4.1 Seemingly Un-Related Regression (SUR) Model for Unbalanced Panel Data

This study investigates the link between poverty and public spending using channels of social and physical infrastructure. Social infrastructure comprises of education and health while physical infrastructure includes energy and transportation. This study estimates system of equations to investigate these channels to examine their mediating effect. For each of these mediation analyses, this study uses the methodology used by Biorn (2004) for unbalanced panel data that estimates the system of equations and is the most prominent method so far. For estimation of unbalanced panel data and system of equations, several methods are there but the method developed by Biorn (2004) for estimating unbalanced panel data, is the most innovative and prominent among others. Biorn's (2004) method for estimating system of equations with random effects known as, Seemingly Unrelated Regression (SUR) for unbalanced panel data.

SUR technique is based on Maximum Likelihood (ML) and Generalized Least Square (GLS) estimation method. But in SUR method, Biorn (2004) used Monte Carlo Simulations to confirm that estimates provided by this method are more reliable in comparison with estimates provided by the FE and RE for a single equation model. This is the reason that this study uses SUR technique provided by Biorn (2004) for unbalanced panel data.

One other reason of choosing SUR method is that although this method is similar to three stage least square (3-SLS), where the assumption is that the error terms are correlated in mediation and main equations contrary to two stage least square (2-SLS) where the assumption is that shocks in equations are independent. It means that error terms are not correlated.

Advantages related to this method are like country level heterogeneity can easily be controlled avoiding biased estimates and it as it uses large size data containing more information and less co-linearity so it is more efficient, Biorn (2004); Baltagi (2005); Demirdogen et al. (2016).

This model has been used by many researchers to capture the mediating or channelized link between dependent and independent variables. Latif, K. et al (2017) also used this methodology to estimate the mediating effect. Some other researchers like Hayes (2013); Preacher et al. (2007); and Muller et al. (2005) who used this technique to channelize the relationship among variables.

To explore the moderation role that social and physical infrastructure plays while examining the link between poverty and public spending, this study uses fixed and random effect models. After estimating FE and RE the best suitable model between the two is chosen for further explanation using Hausman (1978) specification test. Kohler and Kreuter (2009) described that FE models are designed for studying the cause of change within the country (in this study case) and this estimator has been used to analyze the impact of variables varying over time. FE estimates the country specific variables are fixed presuming country specific characteristics do not have any correlation with error term or the explanatory variables.

# Chapter IV

## Empirical Results of Model 1; The Impact of Public Spending on Poverty in Developing Countries.

This chapter comprises of empirical estimation and their economic interpretations of Model 1; the impact of government spending on poverty through social infrastructure i.e. literacy rate as the channel. This chapter is subdivided into three sections. Section 4.1 comprises of graphical analysis; section 4.2 represents empirical outcomes of mediation analysis and indirect effect of government spending on poverty while section 4.3 shows empirical results of moderation analysis as well as the indirect effects of public spending on poverty. Subsection 4.3 also shows result of Hausman specification test where it is specified that whether Fixed effects model is appropriate or Random effects model is appropriate for the current panel data analysis. If Fixed effects model gets selected for current panel data, it means that although the intercept in the model is may differ across countries but it does not vary over time i.e. it is time invariant while selecting Random effects model suggests that intercept of the model is time variant i.e. it may change over time. At the end of each section, discussion has been made regarding empirical outcomes.

This study also incorporates some control variables that affect poverty in a positive or in a negative way. This study used six control variables in analysis which can affect poverty in a positive or in a negative way. These control variables are as follows: foreign remittances; which can help to reduce poverty as inflow of remittances rises it leads to reduce poverty, unemployment which has a positive relation with poverty as if unemployment rises it leads to increase poverty, trade openness; which can help to reduce poverty, population growth; which leads to more poverty, GDP

growth; that can reduce poverty and finally inflation; an increase in inflation further increases poverty. All of the above control variables are incorporated in each model and this study estimates final model by omitting the insignificant variables through Thiel's criteria backward elimination method. Omitted variables did not show their statistical insignificance in the analysis and therefore they are excluded from analysis.

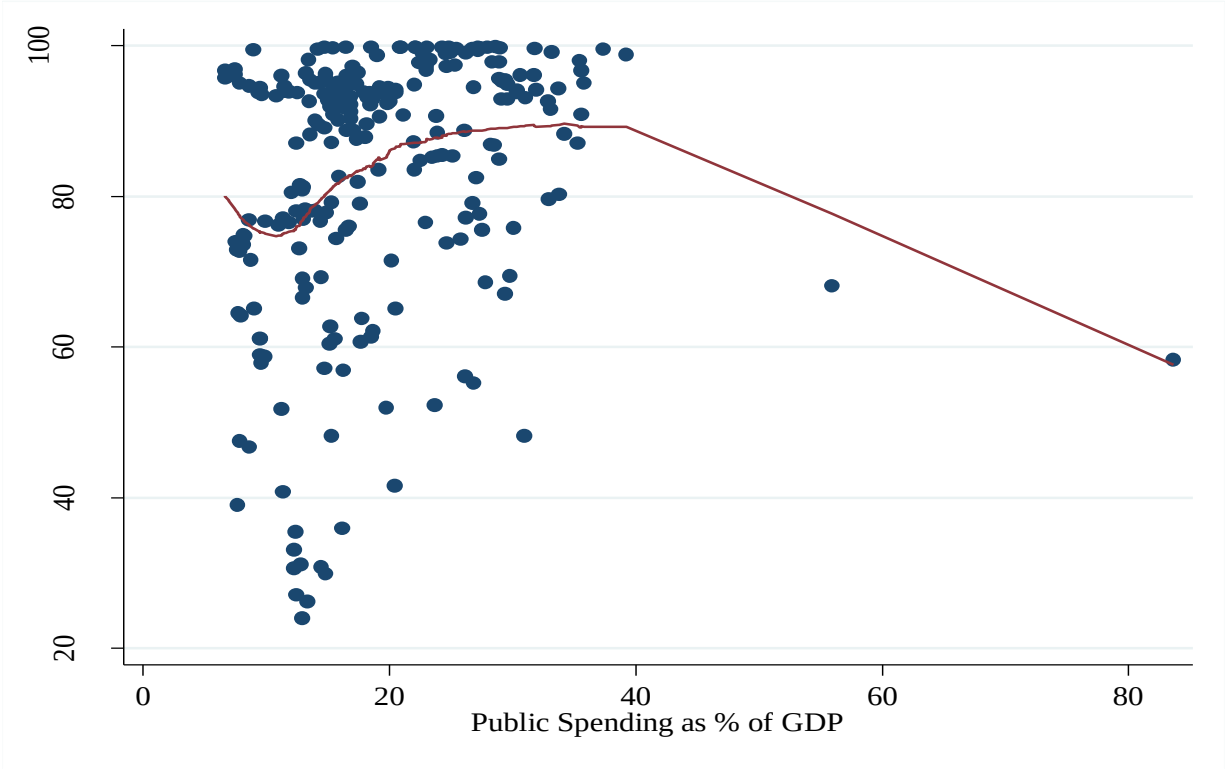
## 4.1 Graphical Analysis of Correlation

This section describes the graphical analysis of correlation for model 1; impact of government spending on poverty through the mediator i.e. literacy rate. This section comprises of three graphs describing the correlation between literacy rate and public spending; correlation between poverty and literacy rate; and correlation between poverty and public spending for 52 developing countries.

Figure 4.1 represents correlation between the main independent variable of this study i.e. public spending and social infrastructure i.e. literacy rate as the mediating variable for a panel of 52 developing countries. Independent variable i.e. public spending is represented on horizontal axis while social infrastructure i.e. literacy rate is shown on vertical axis. This figure reveals a positive correlation between public spending and literacy rate. Initially, as public spending increases, literacy rate is also rising suggesting that when public spending increases, it leads to improve social infrastructure i.e. literacy rate in the panel countries. When there is an increase in public spending on social infrastructure i.e. literacy rate, there is more availability and accessibility of common masses to public educational services and people can easily education themselves with these facilities.

**Figure 4.1**

**Correlation between Public Spending and Literacy rate**

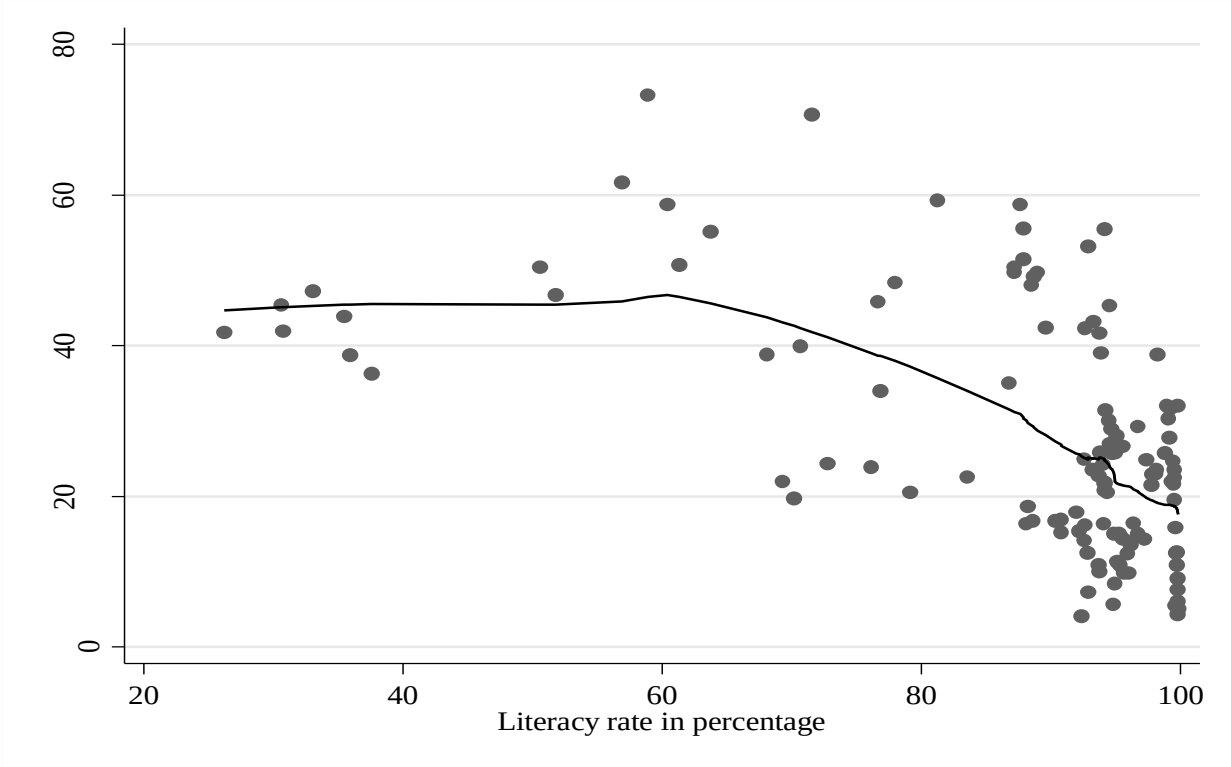



This figure also shows that the positive correlation between public spending and literacy in the panel countries.

Figure 4.2 represents correlation between social infrastructure i.e. literacy rate used as the mediating variable in this study for a panel of 52 and developing countries and the main dependent variable of this study i.e. poverty. Social infrastructure i.e. literacy rate is represented on horizontal axis while poverty is shown on vertical axis. This figure reveals a negative correlation between social infrastructure i.e. literacy rate and poverty. As literacy rate rises, poverty declines which suggests that when social infrastructure i.e. literacy rate improves, it plays its crucial role to reduce poverty in the panel countries. The more literate the people are; the less chances of being poor in these countries because educated and literate people can have better job opportunities.

## Figure 4.2

## Correlation between Literacy rate and Poverty

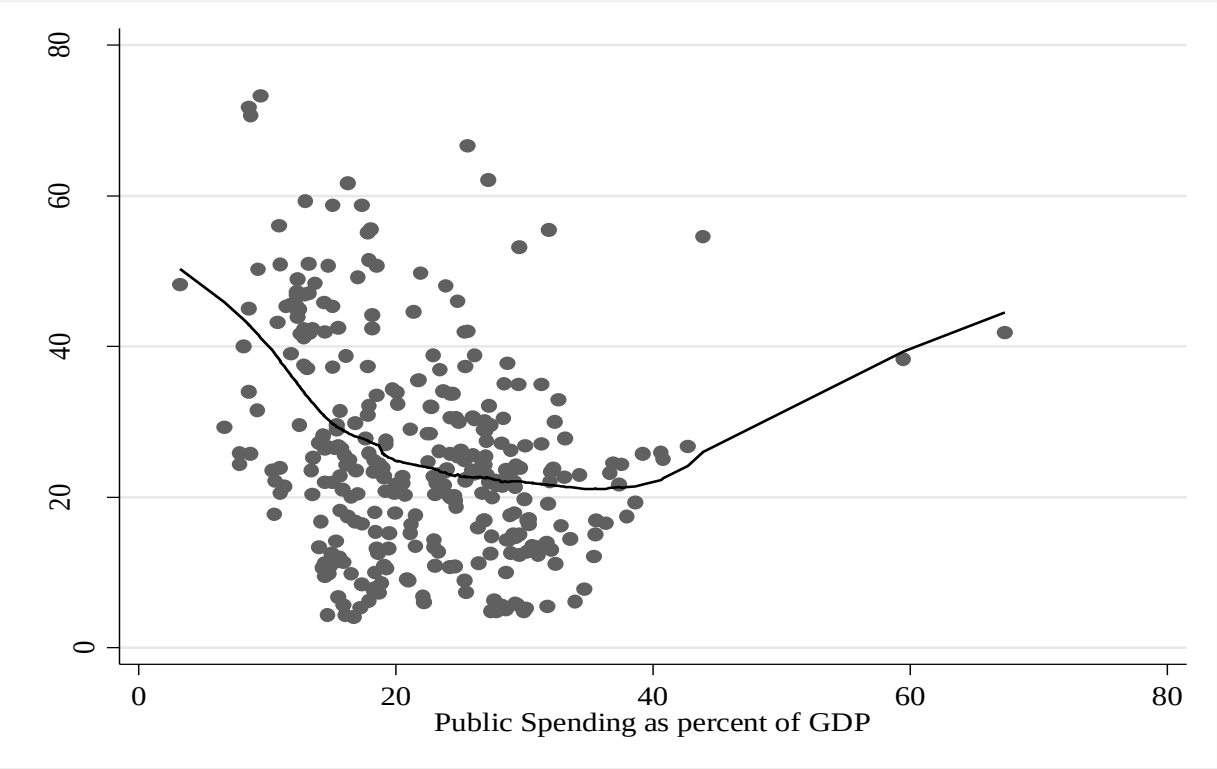



With better job opportunities, they can earn more income and can have more consumption on basic necessities of life and hence the chances of poverty could be reduced.

Figure 4.3 represents correlation between main independent variables of this study i.e. public spending and main dependent variable i.e. poverty for a panel of 52 developing countries. Public spending is represented on horizontal axis while poverty is shown on vertical axis.

## Figure 4.3

## Correlation between Poverty and Public Spending




This figure reveals a negative correlation between public spending and poverty. Initially, when public spending is low, the poverty level is high and with an increase in public spending causes a decline in poverty which suggests that more public spending reduces the chances of poverty in the panel countries.

Public spending affects poverty directly through transfer payments to the poor segment of country in the form poverty alleviation programs enabling them to fulfill their basic needs and taking them out of the vicious circle of poverty. Public spending can also affect poverty indirectly through social and physical infrastructure like more spending by the public sector on education, health, energy and roads etc. Education and health facilities can make people more productive and enable them to have better job and earning capacity, while energy and infrastructure create more employment opportunities to these people and hence reducing the chances of poverty.

## 4.2 Empirical Results of Model 1; The Impact of Public Spending on Poverty through Mediating effect of Social Infrastructure i.e. Literacy rate, for Developing Countries

This section shows empirical results of Mediation Model 1 for a panel of 52 developing countries to find the impact of public spending on poverty (Head Count Ratio as poverty level) through the channel of social infrastructure; i.e. literacy rate and indirect effects of government spending on poverty. This section is divided into two subsections; Section 4.2.1 shows Model 1 for a panel of 52 developing countries to find the impact of public spending on poverty (Head Count Ratio as poverty level) through the channel of social infrastructure; i.e. literacy rate while number of countries is subjected to availability of data. Subsection 4.2.2 elaborates the indirect impact of government spending on poverty using the mediator i.e. literacy rate.

### 4.2.1 Empirical Results of Model 1: Impact of Public Spending on Poverty through the Mediator i.e. Literacy Rate for developing countries

This section comprises of empirical outcomes of mediation analysis of model 1 where the impact of government spending on poverty is found through the mediator i.e. literacy rate for 52 developing countries.

Table 4.1 shows empirical results of Mediation Model 1 for a panel of 52 developing countries to find the impact of public spending on poverty (Head Count Ratio as poverty level) through the channel of social infrastructure; i.e. literacy rate. This model is obtained from equations 3.1 and 3.2 of chapter 3. Equation 3.1 shows the impact of government spending on social infrastructure i.e. literacy rate and equation 3.2 explains the impact of public spending and social infrastructure; i.e. literacy rate on poverty. Estimation technique used for this model is Seemingly Unrelated Regression (SUR) suggested by (Biorn, E. 2004; and Hayes, A. F. 2013) for unbalanced panel data to find the mediating effect that government spending has on poverty through social infrastructure; i.e. literacy rate as the channel, for an unbalanced panel data set of 52 developing countries.

One the basis of obtained results, we reject the null hypothesis which states that Public spending has no statistically significant impact on poverty in the developing countries and conclude that public spending reduces poverty directly in a significant way in the selected developing countries.

From Table 4.1, the public spending has an inverse (-0.656) and significant impact on poverty through social infrastructure; i.e. literacy rate in the panel countries. This outcome suggests that when public spending is increased by 1%, it reduces poverty by (0.656%). It means that when public spending is increased, it improves educational facilities and people acquire education. Educated people are more productive and have better chances of getting jobs. With better jobs,

people earn more income and consume more money on basic necessities which leads to reduce chances of poverty.

## Table 4.1

## The Impact of Public Spending on Poverty through the channel of Social Infrastructure; i.e. Literacy rate

| Variables | Model | |
|---|---|---|
| | Literacy rate | Poverty (HCR) |
| Public Spending | 1.653*** | -0.656*** |
| | (0.000) | (0.000) |
| Literacy rate | | -0.838*** |
| | | (0.000) |
| Unemployment | | 0.049*** |
| | | (0.000) |
| GDP growth | | -0.024*** |
| | | (0.000) |
| Inflation | | 0.053*** |
| | | (0.000) |
| No. of Observations | 305 | 305 |
| No. of Countries | 52 | 52 |

Note: P-value of each coefficient is given in the parentheses. ***, ** and * represents the significance at 1%, 5% and 10% levels respectively.

This result is in line with study of Drèze and Sen (2013), where they talk about human capabilities enhancement through educational and health facilities by the public sector.

Public spending can also be used as source of public welfare and poverty reduction as stated by Greeley M. (1994). Similar conclusions were also drawn by Zaman et al. (2011) and Hong and Ahmed (2009). Similarly, equation 3.1 from chapter 3 of this study shows the impact of

government spending on social infrastructure; i.e. literacy rate. From table 4.1, this relation is positive (1.653) and significant suggesting that as public spending goes up by 1%, it increases social infrastructure; i.e. education by (1.65%) which in the second phase will reduce poverty level. In the same way, social infrastructure; i.e. literacy has an inverse (-0.838) and significant impact on poverty level. If literacy rate goes up by 1%, it leads to reduce poverty by (0.84%) because educated people are more productive and have better chances of getting jobs. With better jobs, people earn more income and consume more money on basic necessities which leads to reduce chances of poverty. Some prior studies also support this outcome like Lanjouw et al. (2002) and Lu et al. (2010) where they concluded that education can play its vital role in poverty reduction.

This study further incorporates some control variables in general model to capture their impact on poverty. Control variables are incorporated in each model and this study estimates final model by omitting the insignificant variables through Thiel's criteria backward elimination method. Omitted variables did not show their statistical insignificance in the analysis and therefore they are excluded from analysis.

From the obtained results, unemployment has a positive (0.049) and significant impact on poverty which means that with a rise of 1% in unemployment level, poverty in these panel economies goes up by (0.049%). It means that with the rise in unemployment, people lose their jobs and their income fall. When income of the people fall they cannot fulfill their basic necessities and they fall under the poverty line. Therefore, unemployment is one the reasons of poverty in these panel economies. Ali and Pernia (2003) suggested that reforms in public policies and diverting resources towards physical infrastructure like transport and communication that can create employment opportunities for labors, improving their living standards and reduce poverty in developing countries.

Furthermore, result outcomes also show that GDP growth has a negative (-0.024) and significant impact on poverty. When GDP of the countries in the panel grows by 1%, poverty in these countries declines by (0.024%). If there is economic growth and GDP of these panel economies grows, on one hand it helps the governments of these countries to have more resources for public goods like social and physical infrastructure and more resources to allocate for poverty alleviation programs. On the other hand more economic activities mean more employment opportunities for labors leading to improve income levels of people. With more income and more consumption on basic necessities of life ensures lesser chances of poverty in the country. This result is also supported by the study conducted by Wilhelm and Fiestas (2005) in which they concluded that in the process of high economic growth, public spending can be helpful in poverty reduction. In a similar study by Helwege (1995), he also verified the link between public spending and poverty where his analysis revealed that social investments by the public sector engage economies into a virtuous cycle that results social equality and further stimulating economic growth. Both social equality and economic growth lead to achieve the ultimate goal of reducing poverty. Finally, inflation shows a positive (0.053) and significant impact on poverty suggesting that a 1% increase in inflation rate will lead to a rise of (0.053%) in poverty in the panel countries. Inflation has been one of the global economic problems for decades. When there is price hike in an economy, it deteriorates purchasing power of the people and they have to pay more money to get the same basket of goods. It compels people to spend larger part of their income on basic necessities of life and their living standards fall and a result they fall below the poverty line.

### 4.2.2 Empirical Results of Indirect Effects of Model 1: The Impact of Government Spending on Poverty through Mediator i.e. Literacy Rate for developing countries

This section comprises of empirical outcomes of indirect effects of model 1 where the impact of government spending on poverty is found through social infrastructure i.e. literacy rate as the channel for for 52 developing countries.

**Table 4.2**

**The Indirect Effect of Government Spending on Poverty through social Infrastructure; i.e. Literacy rate**

| Independent Variable | Channel | Dependent Variable | Indirect Effects | 95% Confidence Interval | |
|---|---|---|---|---|---|
| Public Spending | Social infrastructure (Literacy rate) | Poverty | -1.385*** (0.000) | -2.136 | -0.635 |

Note: P-value of each coefficient is given in the parentheses. ***, ** and * represents the significance at 1%, 5% and 10% levels respectively.

Table 4.2 represents the indirect effect of public spending on poverty and this indirect effect of public spending on poverty through social infrastructure is calculated using equation 3.4 from chapter 3.

Results show that we reject the null hypothesis which states that Public spending has no statistically significant impact on poverty through the channel of education i.e. literacy rate in the

developing countries and conclude that public spending significantly reduce poverty through the channel of education in the selected panel countries.

Table 4.2 shows that the indirect effect of public spending on poverty is negative (-1.385) and significant. It means that when public spending increases it raises literacy rate and when literacy level improves it reduces poverty and this indirect effect is more profound as compared to direct effect of public spending on poverty. These results are estimated through seemingly unrelated regression (SUR) technique for unbalanced panel data where equation 3.1 is differentiated partially with respect to public spending and equation 3.2 is differentiated partially with respect to social infrastructure i.e. literacy rate to get equation 3.4 from chapter 3.

These equations seem to be unrelated but they are actually related and can be calculated in a simultaneous way as suggested by Biorn (2004); and Hayes (2013). But as the figure 4.1 shows that public spending improves literacy rate there is no point where this correlation gets inverse. It means that with a rise in level of public spending brings further improvement in literacy level. Theoretically this result suggests that as the level of public spending goes up its impact on poverty reduction also rises. In other words it could be stated that whatever the level of public spending is, it reduces poverty in the panel economies but with a prior condition of improving level of social infrastructure i.e. literacy rate that leads to reduce poverty. This outcome of indirect effects is quite reasonable in case of developing countries because these countries do not allocate enough resources towards social infrastructure, i.e. literacy rate and as public spending is raised it also leads to allocate more resources towards education. With further increase in public expenditures on education, the poverty level declines and this process continues for a long time until and unless that country gets to the highest level of education and the lowest level of poverty.

## 4.3 Empirical Results of Model 1; The Impact of government Spending on Poverty through Moderating effect of Social Infrastructure i.e. Literacy rate, for Developing Countries

This section shows empirical results of Moderation Model 1 for a panel of 36 developing countries to find the impact of public spending on poverty (Head Count Ratio as poverty level) through the moderation effect of social infrastructure; i.e. literacy rate. This section is subdivided into two sections. Section 4.3.1 represents model 1 for 36 developing countries to find the impact of public spending on poverty through moderator i.e. literacy rate. This section also shows result of Hausman specification test where it is specified that whether Fixed effects model is appropriate or Random effects model is appropriate. If Fixed effects model is selected for current panel data, it means that although the intercept in the model is may differ across countries but it does not vary over time i.e. it is time invariant while selecting Random effects model suggests that intercept of the model is time variant i.e. it may change over time. Section 4.3.2 explains the conditional effects of government spending on poverty.

### 4.3.1 Empirical Results of Model 1: Impact of Government Spending on Poverty through the Moderator i.e. Literacy Rate for developing countries

This section comprises of empirical outcomes of moderation analysis of model 1 where the

impact of government spending on poverty is found through the moderator i.e. literacy rate for 36 developing countries.

**Table 4.3**

**The Impact of Government Spending on Poverty through Moderation of Social Infrastructure; i.e. Literacy rate**

| Variables | Models (Poverty HCR is dependent variable ) | |
|---|---|---|
| | **Fixed Effects** | **Random Effects** |
| **Constant** | 15.702*** | 14.949*** |
| | (0.000) | (0.000) |
| **Public Spending (PS)** | -5.667** | -6.455*** |
| | (0.016) | (0.001) |
| **Literacy rate** | -0.052** | -0.068*** |
| | (0.048) | (0.001) |
| **PS*Literacy rate** | 1.082** | 1.305*** |
| | (0.037) | (0.004) |
| **Remittances** | -0.281*** | -0.205*** |
| | (0.000) | (0.000) |
| **Unemployment** | 0.220** | 0.037*** |
| | (0.039) | (0.005) |
| **No. of Observations** | 307 | 307 |
| **No. of Countries** | 36 | 36 |
| **R-squared** | 0.371 | 0.413 |
| **Wald Chi$^2$** | | 75.21 (0.000) |
| **F-statistic** | 15.11 (0.000) | |
| **Hausman Test Chi$^2$ Statistic** | 13.980 (0.007) | |

Note: P-value of each coefficient is given in the parentheses. ***, ** and * represents the significance at 1%, 5% and 10% levels respectively.

Table 4.3 shows empirical results of the general and final Model 1 for a panel of 36 developing countries to find the impact of public spending on poverty (Head Count Ratio as poverty level) through the moderation effect of social infrastructure; i.e. literacy rate.

Fixed and random effects models are estimated to find the impact of public spending on poverty using social infrastructure i.e. literacy rate as moderator in this analysis.

Number of countries declined from 52 to 36 due to the feature of Fixed and Random effects technique that they estimate for balanced panel data and data set contains only 36 cross sections with balanced time series. This Table 4.3 also shows result of Hausman specification test where it is specified that whether Fixed effects (FE) model is appropriate or Random effects (RE) model is more suitable for the data set.

Hausman specification test has the null hypothesis that Random effects model is appropriate for the data set with alternative hypothesis that Fixed effects model is appropriate one.

From Table 4.3 result of Hausman test suggests that Fixed effects model is more appropriate because P-value is (0.007) which means that null hypothesis is rejected and it is concluded that fixed effects model is to be selected for the given data set. It means that although the intercept in the model is may differ across countries but it does not vary over time i.e. it is time invariant.

Table 4.3 contains results from estimation of equation 3.5 of chapter 3 of this study. From the obtained results in the Table 4.3, the intercept is positive (15.702) and significant which means that that expected mean value of the dependent variable i.e. poverty is positive if all the independent variables are zero or they are omitted from the model. Table 4.3 shows that public spending has an inverse (-5.667) and significant impact on poverty. It means that if public spending increases by 1%, it will lead poverty to decline by (5.66%). This outcome suggests that when public spending expands it leads to allocate more financial resources towards poverty alleviation programs that directly reduce poverty in the panel countries. Increase in public spending also helps to invest more in public goods like social infrastructure i.e. health and education, and physical infrastructure i.e. energy sector and roads, highways, irrigation and sanitation creating more employment opportunities for labors. Better job opportunity means higher income and high

consumption on necessities and lesser chances of poverty which is the ultimate goal of public policy.

The relation between social infrastructure i.e. literacy rate and poverty is inverse (-0.052) and significant. It means if literacy level rises by 1%, it will reduce poverty by (0.05%) in the panel countries. Literate labors have greater opportunities of better jobs and high income leading to high level of consumption reducing the chances of poverty. (Greeley, M. 1994) concluded that public spending can be used as a tool for public welfare and poverty reduction.

Public welfare can be enhanced through provision of public goods to people like, educational and health services, provision of energy and other infrastructure facilities such as roads, irrigation and sanitation etc. Similar conclusions were also drawn by Zaman et al. (2011); and Hong and Ahmed (2009).

The moderation or conditional effect is captured in this model via interaction term for public spending and social infrastructure, i.e. literacy rate (PS*Literacy rate). This interaction term (PS*Literacy rate) indicating the conditional effect has a positive as well as significant value. As public spending and poverty are inversely related so positive (1.082) interaction term suggests that the impact of public spending can reduce poverty in the panel countries but it would be more meaningful if it is seen with the total derivative. Therefore, conditional effect of public spending on poverty is given in next table. This conditional effect of public spending on poverty could be different in the countries with low, median and high levels of literacy. In other words, it can be stated that the impact of public spending on poverty is not only more profound but also significant in countries with high level of social infrastructure, i.e. literacy rate. Haughton and Khandker (2009) also found that with higher literacy as social infrastructure, poverty could be eradicated.

This study further incorporates some control variables in general model to capture their impact on poverty. Control variables are incorporated in each model and this study estimates final model by omitting the insignificant variables through Thiel's criteria backward elimination method. Omitted variables did not show their statistical insignificance in the analysis and therefore they are excluded from analysis.

In the final model, only foreign remittances and unemployment rate are found to have significant impact on poverty in the panel countries. Foreign remittances have an inverse (-0.281) and significant impact in the panel developing countries. This outcome suggests that when there is a 1% increase in the inflow of foreign remittances, it will lead to reduce poverty by (0.28%) in these developing countries. Remittances flow is more towards developing economies due to their major export of human resource. People who receive foreign remittances have more money to spend on basic necessities of life like food, clothing, shelter, basic health and education. When people have enough money from abroad and they can fulfill their basic needs, there are less chances of poverty. Similarly, unemployment is also found to have positive (0.220) and significant impact on poverty in the panel economies. It means that if unemployment rate rises by 1%, it will increase poverty level by (0.22%). Unemployment has been one of the major causes of poverty in most of the developing countries. When people are jobless, their income and consumption levels fall and as a result they fall below poverty line. Chemingui (2007) also came with the same results and concluded that unemployment needs to be addressed in order to cope with poverty.

### 4.3.2 Empirical Results of Conditional Effects of Model 1: The Impact of Government Spending on Poverty through the Moderator i.e. Literacy Rate for developing countries

This section comprises of empirical outcomes of conditional effects of model 1 where the impact of government spending on poverty is found conditional to social infrastructure i.e. literacy rate for 36 developing countries.

Table 4.4 represents the conditional effect of public spending on poverty and these conditional effects are calculated by evaluating equation 3.5 from chapter 3.

Table 4.4 represents conditional effects of government spending on poverty through social infrastructure, i.e. literacy rate for Model 1. To express the conditional effect, three categories of these effects are made i.e. low level, average level and high of social infrastructure, i.e. literacy rate. Coefficients, P-Values and values for 95% confidence interval are presented in respective columns. Logic behind these categories is that whatever the level of public spending is, if it does not have improved social infrastructure i.e. literacy rate as prior condition, it will not reduce poverty. These results are estimated through seemingly unrelated regression (SUR) technique for unbalanced panel data where equation 3.5 is differentiated with respect to public spending to get equation 3.6 of chapter 3.

## Table 4.4

## Conditional Effects of Government Spending on Poverty through social infrastructure, i.e. Literacy rate

| Independent Variable | Channel | Levels of Literacy rate | Conditional Effects | 95% Confidence Interval | |
|---|---|---|---|---|---|
| PS | Social infrastructure (Literacy rate) | Low level of Literacy | -0.859*** (0.000) | -1.245 | -0.472 |
| | | Average level of Literacy | -0.591*** (0.001) | -0.949 | -0.233 |
| | | High level of Literacy | -0.505*** (0.007) | -0.873 | -0.138 |

Note: P-value of each coefficient is given in the parentheses. ***, ** and * represents the significance at 1%, 5% and 10% levels respectively. Low means 25$^{th}$ percentile, average level is 50$^{th}$ percentile and high level shows 75$^{th}$ percentile levels of Public Spending respectively.

The conditional effect of government spending on poverty through social infrastructure, i.e. literacy rate as the channel at the low rate of literacy is (-0.859), at middle literacy level (-0.591) and at high literacy level is (-0.505). These results suggest that whatever level of public spending is, if it improves social infrastructure i.e. literacy rate in the first place, these high levels of literacy will reduce poverty in the next phase. In other words, impact of government spending on the reduction of poverty, gets stronger if the level of social infrastructure, i.e. literacy rate improves with a rise in the level of public spending and these conditional effects are significant in this study. So it is concluded that the inverse impact of public spending on poverty is not only more profound but also significant in countries with high level of social infrastructure, i.e. literacy rate.

This study further extends its empirical analysis for the whole world and therefore the panel data set is expanded to 77 countries. This panel data set includes both developed as well as developing countries subjected to data availability. The purpose of expanding data set to 77 countries is to find the impact of government spending on poverty through channels of social infrastructure and to compare these results with the developing countries. The objective behind this comparison is to investigate the role of public spending to alleviate poverty through the mediating and moderating effect of social infrastructure. Empirical results for 77 countries have been estimated for social infrastructure i.e. literacy rate. Estimation results comprise of graphical analysis for panel data set of 77 countries; empirical outcomes for the mediation and moderation analysis as well the indirect and conditional effects of public spending on poverty through social infrastructure i.e. literacy rate. All these graphical analysis and estimation results are reported in the appendix named appendix of chapter 4.

From mediation analysis, the public spending affects poverty inversely and significantly through social infrastructure; i.e. literacy rate in the panel countries. It means that when public spending is raised, it improves educational facilities and people acquire education. Educated people are more productive and have better chances of getting jobs. With better jobs, people earn more income and consume more money on basic necessities which leads to reduce chances of poverty. Similarly, this study shows the impact of public spending on social infrastructure; i.e. literacy is positive and significant in case of 77 panel countries. In the same way, social infrastructure; i.e. literacy affects poverty inversely and significantly. Some prior studies also support this outcome like Lanjouw et al. (2002) and Lu et al. (2010) where they concluded that literacy can play its vital role in poverty reduction.

This study further incorporates some control variables in general model of 77 developed and developing countries to capture their impact on poverty. From the obtained results, unemployment has a positive and significant impact on poverty which means that with a rise of low unemployment level leads to reduce poverty in these panel economies. Similarly, trade openness has an inverse and significant impact on poverty which means that if countries included in the study allow more international trade and open borders for regional trade by making less restrictions and tariffs on trade, poverty can be reduced in these economies. Trade openness and trade liberalization means that countries are either involved in free trade or they have minimum trade restrictions in the form of tariffs and quotas. With free or liberalized regional and international trade, on one hand more goods are produced and exported creating more employment opportunities for people in the economy enhancing earning possibilities for them. On the other hand it ensures the availability of cheaper goods and people of the trading countries can purchase them which leads to reduce chances of poverty. In the same way, population growth is also found to have positive and significant impact on poverty. If population grows there it leads to increase poverty in the panel countries. Furthermore, result outcomes also show that GDP growth has a negative and significant impact on poverty. When GDP of the countries in the panel grows in these countries, poverty declines. If there is economic growth and GDP of these panel economies grows, on one hand it helps the governments of these countries to have more resources for public goods like social and physical infrastructure and more resources to allocate for poverty alleviation programs. On the other hand more economic activities mean more employment opportunities for labors leading to improve income levels of people. With more income and more consumption on basic necessities of life ensures lesser chances of poverty in the country. Finally, inflation shows a positive and significant impact on poverty suggesting that as inflation rate rises it will lead to a rise in poverty

in the panel countries. Inflation has been one of the global economic problems for decades. When there is price hike in an economy, it deteriorates purchasing power of the people and they have to pay more money to get the same basket of goods. It compels people to spend larger part of their income on basic necessities of life and their living standards fall and a result they fall below the poverty line.

Indirect effects of government spending on poverty through social infrastructure i.e. literacy rate confirms that the channelized effect is more profound as compared to direct link between poverty and public spending.

From moderation analysis obtained results reveals that the intercept is positive and significant which means that that expected mean value of the dependent variable i.e. poverty is positive if all the independent variables are zero or they are omitted from the model. Results further show that public spending has an inverse and significant impact on poverty. This outcome suggests that when public spending expands it leads to allocate more financial resources towards poverty alleviation programs that directly reduce poverty in the panel countries. The relation between social infrastructure i.e. literacy and poverty is inverse and significant in this case. Educated labors have greater opportunities of better jobs and high income leading to high level of consumption reducing the chances of poverty. Greeley (1994) concluded that public spending can be used as a tool for public welfare and poverty reduction.

The moderation effect is captured in this model via interaction term for public spending and social infrastructure, i.e. literacy rate (PS*Literacy rate). This interaction term indicates that the conditional effect has a positive and significant value. Although this effect is positive but it would be more reasonable if it is explained with the total derivative.

This section of the study also incorporates some control variables and the final model is obtained. In the final model, only unemployment rate is found to have positive and significant impact on poverty in the panel economies. It means that if unemployment rate rises, it will increase poverty level in the panel countries.

In the same way the conditional effects of literacy rate as a moderator also confirms that public spending leads to reduce poverty in the presence of high literacy rate as prior condition in these panel countries. All of these results are consistent with the analysis conducted for developing countries and presented in this chapter.

Summarizing that the impact of government spending on poverty for developing countries through the channels of social infrastructure i.e. literacy rate, graphical analysis as well mediating and moderating analysis along with indirect effects, empirical results support that public spending can reduce poverty directly and indirectly in the panel of developing countries. Literacy rate plays its role as mediator when public spending is used to reduce poverty and this link is also confirmed by the indirect link between public spending on poverty where literacy rate is used as channel for poverty reduction. As far as the moderation analysis is concerned, it is also clear from the result outcomes that literacy rate also plays its role as moderator to reduce poverty in the developing countries and indirect effect of public spending on poverty also supports this link. All these above analysis are also carried out for the extended panel data set of 77 countries around the world and estimation results confirm that social infrastructure i.e. literacy rate plays its crucial role as mediator as well moderator to reduce poverty in the panel countries and these outcomes are consistent with the analysis made for developing countries as well.

# Chapter V

## Empirical Results of Model 2; The Impact of Public Spending on Poverty t in Developing Countries.

This chapter comprises of empirical estimation and their economic interpretations of Model 2; the impact of government spending on poverty through social infrastructure i.e. health expenditures. This chapter is subdivided into three sections. Section 5.1 comprises of graphical analysis; section 5.2 represents empirical outcomes of mediation analysis as well as indirect effect of public spending on poverty; and section 5.3 shows empirical results of moderation analysis as well as the indirect effects of public spending on poverty. Subsection 5.3 also shows result of Hausman specification test where it is specified that whether Fixed effects model is appropriate or Random effects model is appropriate for the current panel data analysis. If FE model is selected for current panel data, it means that although the intercept in the model is may differ across countries but it does not vary over time i.e. it is time invariant while selecting Random effects model suggests that intercept of the model is time variant i.e. it may change over time. At the end of each section, discussion has been made regarding empirical outcomes.

This study also incorporates some control variables that affect poverty in a positive or in a negative way. This study used six control variables in analysis which can affect poverty in a positive or in a negative way. These control variables are as follows: foreign remittances; which can help to reduce poverty as inflow of remittances rises it leads to reduce poverty, unemployment which has a positive relation with poverty as if unemployment rises it leads to increase poverty, trade openness; which can help to reduce poverty, population growth; which leads to more poverty, GDP

growth; that can reduce poverty and finally inflation; an increase in inflation further increases poverty. Control variables are incorporated in each model and this study estimates final model by omitting the insignificant variables through Thiel's criteria backward elimination method. Omitted variables did not show their statistical insignificance in the analysis and therefore they are excluded from analysis.

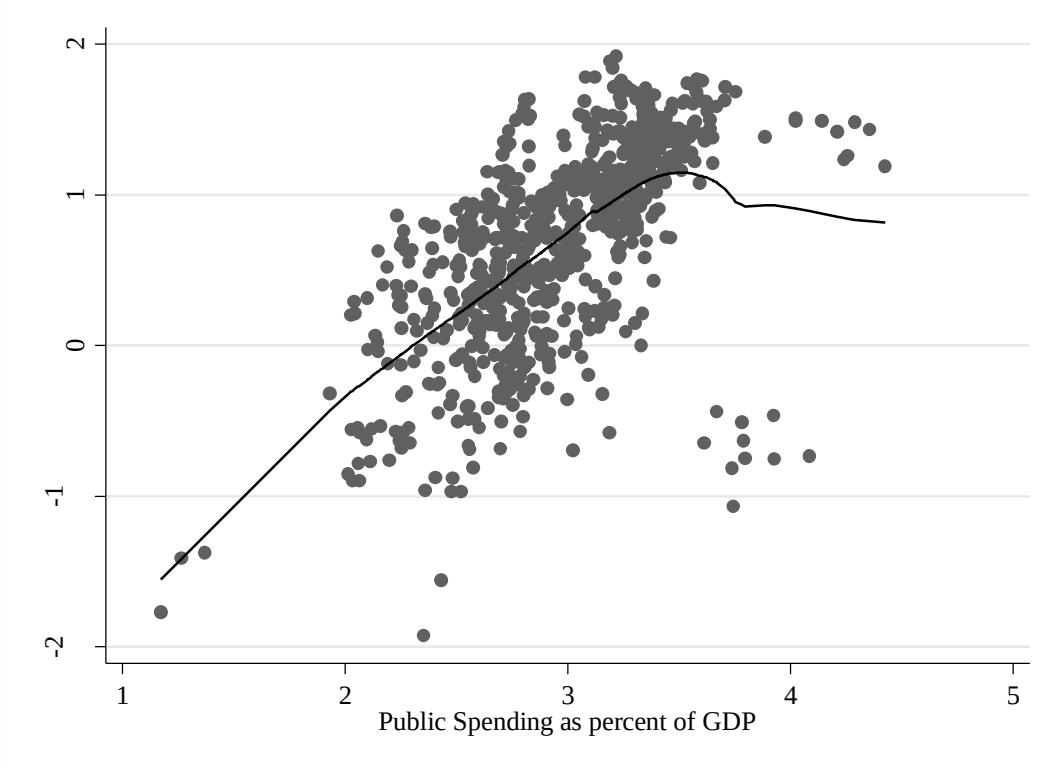
## 5.1 Graphical Analysis of Correlation

This section describes the graphical analysis of correlation for model 1; impact of government spending on poverty through the mediator i.e. health expenditures. This section comprises of three graphs describing the correlation between health expenditures and public spending; correlation between poverty and health expenditures; and correlation between poverty and public spending for 52 developing countries.

Figure 5.1 represents correlation between the main independent variable of this study i.e. public spending and social infrastructure i.e. health expenditures used as the mediator for a panel of 52 developing countries. Independent variable i.e. public spending is represented on horizontal axis while social infrastructure i.e. health expenditures is shown on vertical axis. This figure reveals a positive correlation between public spending and health expenditures. Initially, as public spending increases, health expenditures also rising suggesting that when public spending increases, it leads to improve social infrastructure i.e. health sector in the panel countries. When there is an increase in public spending on social infrastructure i.e. health expenditures, there is more availability and accessibility of common masses to public health services and people can easily avail these health facilities.

## Figure 5.1

## Correlation between Public Spending and Health Expenditures

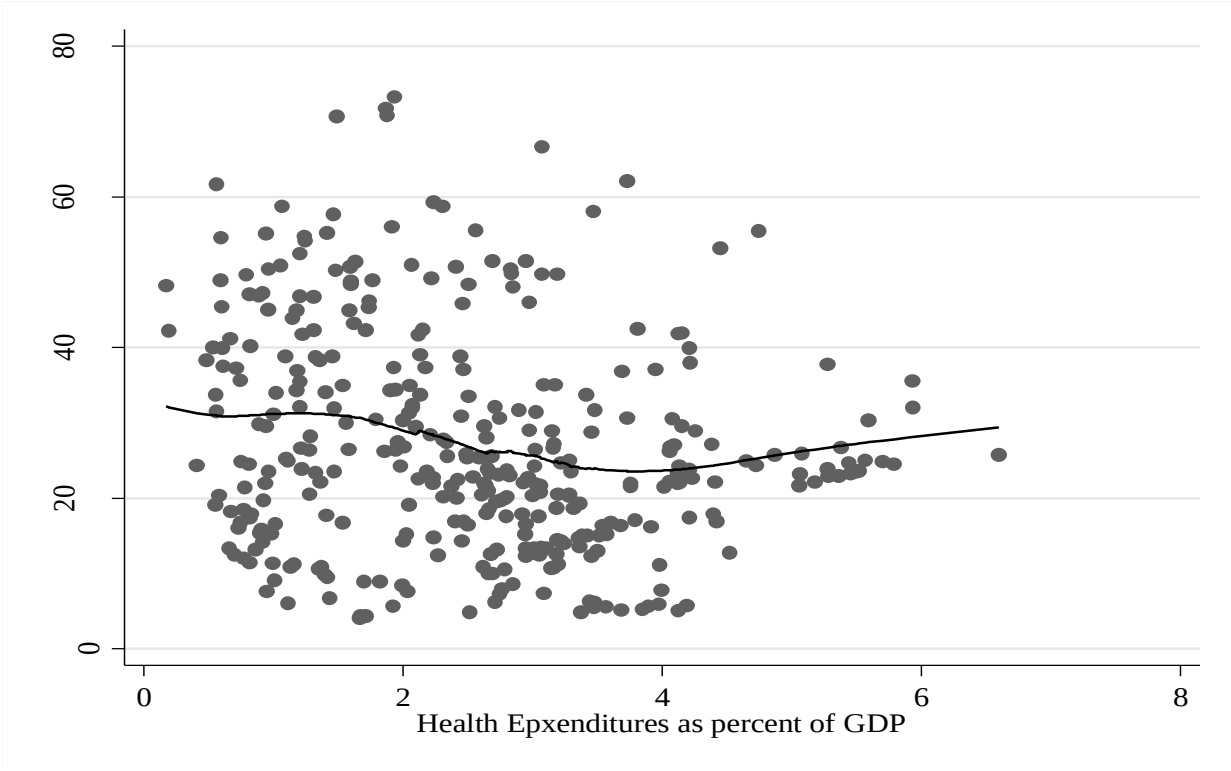



This figure also shows that the positive correlation between public spending and health expenditures in the panel countries.

Figure 5.2 represents correlation between social infrastructure i.e. health expenditures used as mediator in this study for a panel of 52 and developing countries and the main dependent variable of this study i.e. poverty. Social infrastructure i.e. health expenditures is represented on horizontal axis while poverty is shown on vertical axis. This figure reveals a negative correlation between social infrastructure i.e. health expenditures and poverty.

## Figure 5.2

## Correlation between Health Expenditures and Poverty



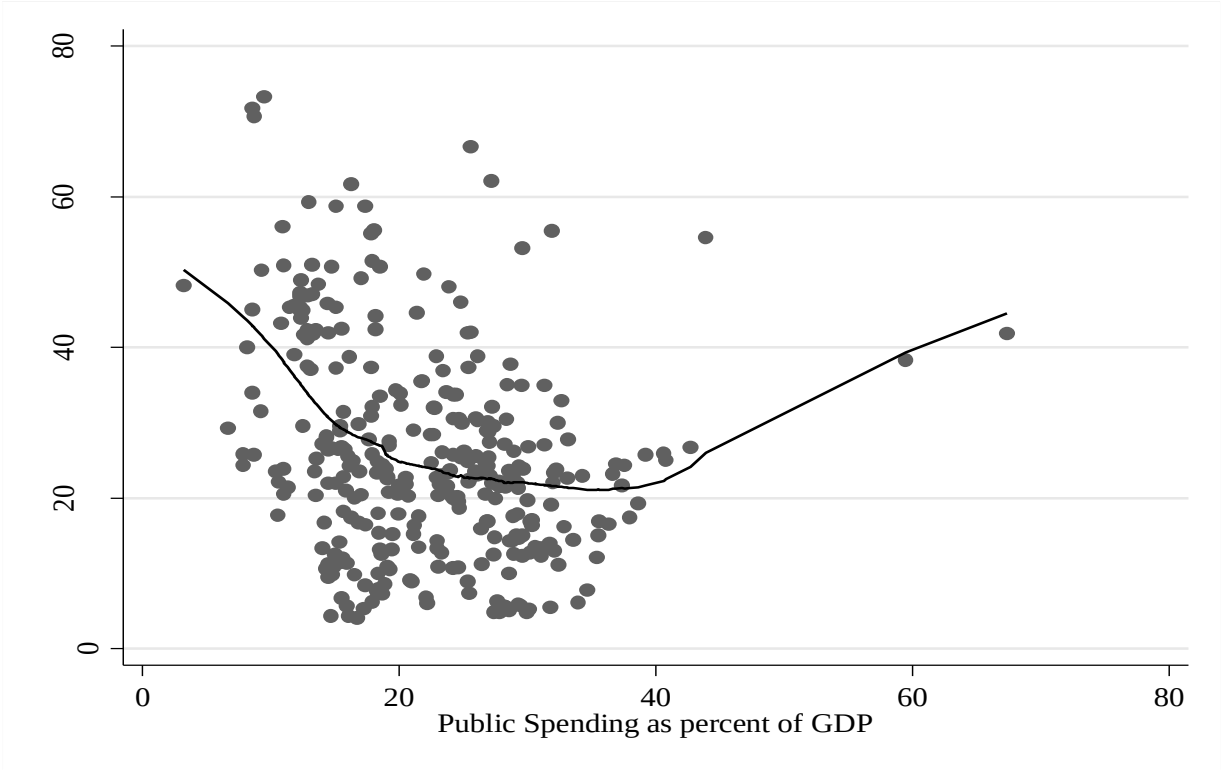

As health expenditures rise, poverty declines which suggests that when social infrastructure i.e. health expenditures improve, it plays its crucial role to reduce poverty in the panel countries. The more literate the people are; the less chances of being poor in these countries because physically and mentally healthy people can have better job opportunities. With better job opportunities, they can earn more income and can have more consumption on basic necessities of life and hence the chances of poverty could be reduced.

Figure 5.3 represents correlation between independent variables of this study i.e. public spending and dependent variable i.e. poverty for a panel of 52 developing countries. Public spending is

represented on horizontal axis while poverty is shown on vertical axis. This figure reveals a negative correlation between public spending and poverty.

**Figure 5.3**

**Correlation between Public Spending and Poverty**




Initially, when public spending is low, the poverty level is high and with an increase in public spending causes a decline in poverty which suggests that more public spending reduces the chances of poverty in the panel countries. Public spending targets poverty alleviation through health expenditures is top priority of all these countries. Public spending affects poverty directly through transfer payments to the poor segment of country in the form of poverty alleviation programs and enabling them to fulfill their basic needs and taking them out of the vicious circle of the poverty. Public spending can also affect poverty indirectly through social and physical infrastructure like more spending by the public sector on education, health, energy and roads etc. Education and

health facilities can make people more productive and enable them to have better job and earning capacity, while energy and infrastructure create more employment opportunities to these people and hence reducing the chances of poverty.

## 5.2 Empirical Results of Model 2; The Impact of Government Spending on Poverty through Mediating effect of Social Infrastructure i.e. Health Expenditures, for Developing Countries

This section shows empirical results of Mediation Model 2 for a panel of 52 developing countries to find the impact of public spending on poverty (Head Count Ratio as poverty level) through the channel of social infrastructure; i.e. health expenditures and the indirect effects of government spending on poverty. This section is divided into two subsections; Section 5.2.1 shows Model 2 for a panel of 52 developing countries to find the impact of public spending on poverty (Head Count Ratio as poverty level) through the channel of social infrastructure; i.e. health expenditures while number of countries is subjected to availability of data. Subsection 5.2.2 elaborates the indirect effects of government spending on poverty through the mediator i.e. health expenditures.

### 5.2.1 Empirical Results of Model 2: The Impact of Government Spending on Poverty through the Mediator i.e. Health Expenditures for Developing Countries

This section comprises of empirical outcomes of mediation analysis of model 2 where the impact of government spending on poverty is found through the mediator i.e. health expenditures for 52 developing countries

Table 5.1 shows empirical results of Mediation Model 2 for a panel of 52 developing countries to find the impact of public spending on poverty (Head Count Ratio as poverty level) through the channel of social infrastructure; i.e. health expenditures. This model is obtained from equations 3.7 and 3.8 of chapter 3. Equation 3.7 shows the impact of government spending on social infrastructure i.e. health expenditures and equation 3.8 explains the impact of public spending and social infrastructure; i.e. health expenditures on poverty. Estimation technique used for this model is Seemingly Unrelated Regression (SUR) suggested by Biorn (2004; and Hayes (2013) for unbalanced panel data to find the mediating effect government spending on poverty through social infrastructure; i.e. health expenditures as the channel for an unbalanced panel data set of 52 developing countries.

One the basis of obtained results, we reject the null hypothesis which states that Public spending has no statistically significant impact on poverty in the developing countries and conclude that public spending reduces poverty directly in a significant way in the selected developing countries.

From Table 5.1, public spending has an inverse (-1.034) and significant impact on poverty through social infrastructure; i.e. health expenditures in the panel countries. This outcome suggests that when public spending is increased by 1%, it reduces poverty by more than 1% i.e. (1.03%). It

means that when public spending is increased, it improves the availability of publically provided health facilities and people avail these facilities on their door step. Physically and mentally healthy people are more productive and have better chances of getting jobs. With jobs in hand, people earn more income enabling them to consume more money on basic necessities which leads to reduce chances of poverty. This outcome supports study conducted by (O'Donnell et al. 2007), where he examined the link between public spending and poverty and evidence on public healthcare spending incidence was tried to find. Empirical estimates revealed that public spending may help reducing poverty if these distributions are corrected and directed and pro-poor then the incidence of public spending can surely make the difference and can reduce poverty in a tremendous way.

Drèze and Sen, (2013), also concluded that human capabilities enhancement through educational and health facilities by the public sector can lead to achieve the goal of poverty reduction. Public spending can also be used as source of public welfare and poverty reduction as stated by Greeley (1994).

Thorat & Fan, (2007) empirically proved that anti-poverty programs along with different other public investments initiatives like health and education were also responsible for poverty reduction. Similar conclusions were also drawn by Zaman et al. (2011) and Hong and Ahmed (2009). Similarly, equation 3.7 from chapter 3 of this study shows the impact of government spending on social infrastructure; i.e. health expenditures. From Table 5.1, this relation is positive (0.786) and significant suggesting that as public spending goes up by 1%, it leads to improve social infrastructure; i.e. health expenditures by (0.78%) which in the second phase will reduce poverty level. In the same way, social infrastructure; i.e. health expenditures have an inverse (-0.274) and significant impact on poverty level. If health conditions get better by 1%, it leads to reduce poverty by (0.27%). Healthy people are more productive and have better chances of getting jobs. With

better jobs, people earn more income and consume more money on basic necessities which leads to reduce chances of poverty.

Some prior studies also support this outcome like Glick and Menon (2009) undergone a time series analysis based research study to examine the recent variation in poverty level in general and particularly to investigate the crucial role that public spending plays to improve social infrastructure (i.e. health and education) plays in poverty reduction.

Public investment in social infrastructure leads to equip people with good health education which means they get more chances of securing opportunities for higher income. Lanjouw et al. (2002) and Lu et al. (2010) also concluded that social infrastructure can play its vital role in poverty reduction.

This study further incorporates some control variables in general model to capture their impact on poverty. Control variables are incorporated in each model and this study estimates final model by omitting the insignificant variables through Thiel's criteria backward elimination method.

Omitted variables did not show their statistical insignificance in the analysis and therefore they are excluded from analysis.

From the obtained results, unemployment has a positive (0.09) and significant impact on poverty which means that with a rise of 1% in unemployment level, poverty in these panel economies goes up by (0.09%). It means that with the rise in unemployment, people lose their jobs and their income fall.

## Table 5.1

## The Impact of Public Spending on Poverty through the channel of Social Infrastructure; i.e. Health Expenditures

| Variables | Model | |
|---|---|---|
| | Health Expenditures | Poverty (HCR) |
| Public Spending | 0.786*** | -1.034*** |
| | (0.000) | (0.000) |
| Health Expenditures | | -0.274*** |
| | | (0.000) |
| Unemployment | | 0.090*** |
| | | (0.000) |
| Trade Openness | | -0.550*** |
| | | (0.000) |
| Population Growth | | 0.602*** |
| | | (0.000) |
| GDP growth | | -0.041*** |
| | | (0.000) |
| Inflation | | 0.056** |
| | | (0.030) |
| No. of Observations | 277 | 277 |
| No. of Countries | 52 | 52 |

Note: P-value of each coefficient is given in the parentheses. ***, ** and * represents the significance at 1%, 5% and 10% levels respectively.

When income of the people fall they cannot fulfill their basic necessities and they fall under the poverty line. Therefore, unemployment is one the reasons of poverty in these panel economies. Ali and Pernia (2003) suggested that reforms in public policies and diverting resources towards

physical infrastructure like transport and communication that can create employment opportunities for labors, improving their living standards and reduce poverty in developing countries.

Similarly, trade openness has an inverse (-0.550) and significant impact on poverty which means that if countries included in the study allow more international trade and open borders for regional trade by making less restrictions and tariffs on trade, poverty can be reduced in these economies. A 1% increase in trade openness leads to reduce poverty by (0.55%) in these panel economies. Trade openness and trade liberalization means that countries are either involved in free trade or they have minimum trade restrictions in the form of tariffs and quotas. With free or liberalized regional and international trade, on one hand more goods are produced and exported earning more foreign reserves, creating more employment opportunities for people in the economy enhancing earning possibilities for them. On the other hand it ensures the availability of cheaper goods and people of the trading countries can purchase them which leads to reduce chances of poverty. World Bank reported in (2009) that in the list of countries trading across boarder made through an indicator, many countries of the Sub Saharan region fall in the bottom 40% due to lack of proper transport and communication networks. Therefore, these regional countries need a modern transport and communication networks to enhance regional and international trade, obtain economic growth and reduce poverty (Jerome, 2011).

From Table 5.1, population growth is also found to have positive impact (0.602) and significant impact on poverty. If population grows by 1%, it causes poverty level to rise by (0.6%). Family planning and population control is slogan of the day because resources are scarce and more population means more mouths to feed, more resources needed for social infrastructure i.e. health facilities, more resources needed for physical infrastructure i.e. roads, highways, sewerage and clean water provision etc, more energy needed for domestic and commercial use and at the end of

the day more poverty. Geda et al. (2001) suggested that public policies should be diversified towards social infrastructure like health sector, population control and planning and also rural agriculture sector should be focused while designing policies so employment opportunities can be created, population can be controlled and chances of poverty can be reduced and that is the ultimate goal of nations.

GDP growth rate also shows and inverse and significant impact (-0.041) on poverty in the panel countries. A 1% increase in national income leads to reduce poverty by (0.04%) in these developing countries. Chemingui, (2007) came with same results after establishing the link between economic growth and public policy targeting poverty. Results revealed that the impact of prioritized allocation of funds by public sector towards poverty reduction and economic growth was tremendous than solely spending funds on other sectors like agriculture. Empirical outcomes also suggest that inflation has a positive (0.056) and significant impact on poverty in the panel developing countries. It means that if inflation in these economies rises by 1%, it leads to increase poverty by (0.05%) because in these developing countries people cannot afford expensive goods due to low level on incomes and if there is price hike it leads more people to drop below the poverty line. Therefore, poverty reduction in developing countries is possible if there less inflation in the economy and people can afford cheaper goods enabling them to bring themselves out of the vicious circle of poverty and that is the ultimate goal.

### 5.2.2 Empirical Results of Indirect effects of Model 2: The Impact of Public Spending on Poverty through Mediator i.e. Health Expenditures for Developing Countries

This section comprises of empirical outcomes of indirect effects of model 2 where the impact of government spending on poverty is found through social infrastructure i.e. health expenditures as the channel, for 52 developing countries. Table 5.2 represents the indirect effect of public spending on poverty and this indirect effect of public spending on poverty through social infrastructure is calculated using equations 3.10 from chapter 3.

**Table 5.2**

**The Indirect Effect of Government Spending on Poverty through social Infrastructure; i.e. health expenditures**

| Independent Variable | Channel | Dependent Variable | Indirect Effects | 95% Confidence Interval | |
|---|---|---|---|---|---|
| Public Spending | Social infrastructure (Health expenditures) | Poverty | -0.215*** (0.000) | -0. 300 | -0. 129 |

Note: P-value of each coefficient is given in the parentheses. ***, ** and * represents the significance at 1%, 5% and 10% levels respectively.

Results further show that we reject the null hypothesis which states that Public spending has no statistically significant impact on poverty through the channel of health in the developing countries and conclude that public spending significantly reduce poverty through the channel of health in the selected panel countries.

Table 5.2 shows that the impact of public spending on poverty is negative (-0.215) and significant. It means that when public spending increases it raises health expenditures and hence health facilities and when health conditions improve it leads to reduce poverty. This result are estimated through seemingly unrelated regression (SUR) technique for unbalanced panel data suggested by Biorn (2004) where equation 3.7 is differentiated partially with respect to public spending and equation 3.8 is differentiated partially with respect to social infrastructure i.e. health expenditures to get equation 3.10 from chapter 3.

These equations seem to be unrelated but they are actually related and can be calculated in a simultaneous way as suggested by Biorn (2004); and Hayes (2013). But as the figure 5.1 shows that initially, public spending improves health expenditures and hence health facilities but to a certain extent and beyond that level, public spending do not bring any further improvement in publically provided health facilities. Therefore, public spending cannot reduces poverty through social infrastructure i.e. health expenditures as the channel, beyond a certain point if there is not improved health conditions in the country. Theoretically this result suggests that the indirect effect is more profound as compared to direct effect. In other words it could be stated that when the level of public spending is raised, it leads to reduce poverty in the panel economies but with a prior condition of improving level of social infrastructure i.e. health expenditures that leads to reduce poverty.

This outcome of indirect effects is quite reasonable in case of developing countries because these countries do not allocate enough resources towards social infrastructure, i.e. health expenditures and as public spending is raised it also leads to allocate more resources towards publically provided health facilities. With further increase in health expenditures, the poverty level declines and this

process continues for a long time until and unless that country gets to the highest level of health sector and the lowest level of poverty.

## 5.3 Empirical Results of Model 2; The Impact of Government Spending on Poverty through Moderating effect of Social Infrastructure i.e. Heath Expenditures, for Developing Countries

This section shows empirical results of Moderation Model 2 for a panel of 48 developing countries to find the impact of public spending on poverty (Head Count Ratio as poverty level) through the moderation effect of social infrastructure; i.e. health expenditures. This section is subdivided into two sections. Section 5.3.1 represents model 2 for 48 developing countries to find the impact of public spending on poverty through moderator i.e. health expenditures. This section also shows result of Hausman specification test where it is specified that whether Fixed effects model is appropriate or Random effects model is appropriate. If Fixed effects model is selected for current panel data, it means that although the intercept in the model is may differ across countries but it does not vary over time i.e. it is time invariant while selecting Random effects model suggests that intercept of the model is time variant i.e. it may change over time. Section 5.3.2 explains the conditional effects of government spending on poverty.

### 5.3.1 Empirical Results of Model 2: The Impact of Government Spending on Poverty through the Moderator i.e. Health Expenditures for developing countries

This section comprises of empirical outcomes of moderation analysis of model 2 where the impact of government spending on poverty is found through the moderator i.e. health expenditures for 48 developing countries.

Table 5.3 shows empirical results of the general and final Model 2 for a panel of 48 developing countries to find the impact of public spending on poverty (Head Count Ratio as poverty level) through the moderation effect of social infrastructure; i.e. health expenditures. Fixed and random effects models are estimated to find the impact of public spending on poverty using social infrastructure i.e. health as moderator in this analysis. Number of countries declined from 52 to 48 due to the feature of Fixed and Random effects technique that they estimate for balanced panel data and data set contains only 48 cross sections with balanced time series. Table 5.3 also shows result of Hausman specification test where it is specified that whether Fixed effects model is appropriate or the Random effects model is more suitable for the data set. For Hausman specification test the null hypothesis that Random effects model is appropriate for the data set with alternative hypothesis that Fixed effects model is appropriate one. From Table 5.3 result of Hausman test suggests that Fixed effects model is more appropriate because P-value is (0.012) which means that null hypothesis is rejected and it is concluded that Fixed effects model is to be selected for the given data set.

It means that although the intercept in the model is may differ across countries but it does not vary over time i.e. it is time invariant.

## Table 5.3

## The Impact of Government Spending on Poverty through Moderation of Social Infrastructure; i.e. health expenditures

| Variables | Models (Poverty HCR is dependent variable ) | |
|---|---|---|
| | **Fixed Effects** | **Random Effects** |
| **Constant** | 2.922*** | 3.674*** |
| | (0.000) | (0.000) |
| **Public Spending (PS)** | -0.443*** | -0.456*** |
| | (0.002) | (0.000) |
| **Health Expenditures** | -0.444* | -0.378*** |
| | (0.097) | (0.12) |
| **PS*Health Expenditures** | -0.241*** | -0.214*** |
| | (0.007) | (0.009) |
| **Remittances** | -0.002*** | -0.0029*** |
| | (0.000) | (0.000) |
| **Unemployment** | 0.076*** | 0.065*** |
| | (0.000) | (0.000) |
| **Trade openness** | -0.299** | -0.170 |
| | (0.013) | (0.114) |
| **No. of Observations** | 297 | 297 |
| **No. of Countries** | 48 | 48 |
| **R-squared** | 0.11 | 0.14 |
| **Wald Chi$^2$** | | 45.21 |
| | | (0.000) |
| **F-statistic** | 20.00 | |
| | (0.000) | |
| **Hausman Test** | 14.510 | |
| **Chi$^2$ Statistic** | (0.012) | |

Note: P-value of each coefficient is given in the parentheses. ***, ** and * represents the significance at 1%, 5% and 10% levels respectively.

Table 5.3 contains results from estimation of equation 3.11 of chapter 4 of this study. From the obtained results in the Table 5.3, the intercept is positive (2.992) and significant which means that that expected mean value of the dependent variable i.e. poverty is positive if all the independent variables are zero or they are omitted from the model. Table 5.3 further shows that public spending has an inverse (-0.443) and significant impact on poverty. It means that if public spending increases by 1%, it will lead poverty to decline by (0.44%). This outcome suggests that when public spending expands it leads to allocate more financial resources towards poverty alleviation programs that directly reduce poverty in the panel countries. Increase in public spending also helps to invest more in public goods like social infrastructure i.e. health expenditures and literacy, and physical infrastructure i.e. energy sector and roads, highways, irrigation and sanitation increasing the availability of publically provided social and physical infrastructure on one hand and creating more employment opportunities for labors on the other hand. Better job opportunity means higher income and high consumption on necessities and lesser chances of poverty which is the ultimate goal of public policy. The relation between social infrastructure i.e. health expenditures and poverty is inverse (-0.444) and significant. It means if health expenditures rise by 1%, it will reduce poverty by (0.44%) in the panel countries. Physically and mentally healthy labors are more productive and have greater opportunities of better jobs and high income leading to high level of consumption reducing the chances of poverty. Greeley (1994) concluded that public spending can be used as a tool for public welfare and poverty reduction. Public welfare can enhanced by providing public goods to people like, health and educational services, provision of energy and other infrastructure facilities such as roads, irrigation and sanitation etc. Similar conclusions were also drawn by Zaman et al. (2011); and Hong and Ahmed (2009).

The moderation or conditional effect is captured in this model via interaction term for public spending and social infrastructure, i.e. health expenditures (PS*Health Expenditures). This interaction term (PS*Health Expenditures) indicating the conditional effect although negative (-0.241) and significant. It means that if public spending and health expenditures are raised by 1%, it will lead to reduce poverty in these panel countries by (0.24) percent but it would be more meaningful if it is discussed with total derivative which means that conditional effect is taken in the presence of low, median and higher level of health expenditure. That is why conditional effect of public spending on poverty is represented in next table. In other its can be stated that the inverse impact of public spending on poverty gets weaker in countries where level of social infrastructure, i.e. health sector gets higher. Haughton and Khandker (2009) also concluded that public spending can be helpful in poverty reduction conditional to the improved social infrastructure, i.e. health expenditures.

This study further incorporates some control variables in general model to capture their impact on poverty. Control variables are incorporated in each model and this study estimates final model by omitting the insignificant variables through Thiel's criteria backward elimination method. Omitted variables did not show their statistical insignificance in the analysis and therefore they are excluded from analysis.

In the final model, foreign remittances has inverse (-0.002) and significant impact on poverty in the panel developing countries. It means that if there is a 1% increase in the inflow of foreign remittances, it leads to reduce poverty by (0.002%). Although this impact is too weak but still there will be some reduction in poverty. As households receive foreign remittances, they have more money to spend on goods and less probability of being poor. Remittances flow is more towards developing economies due to their major export of human resource. People who receive foreign

remittances have more money to spend on basic necessities of life like food, clothing, shelter, basic health and education. When people have enough money from abroad and they can fulfill their basic needs, there are less chances of poverty. Similarly, unemployment rate is found to have positive (0.076) and significant impact on poverty in the panel economies. It means that if unemployment rate rises by 1%, it will increase poverty level by (0.076%). Unemployment has been one of the major causes of poverty in most of the developing countries. When people are jobless, their income and consumption levels fall and as a result they fall below poverty line. Chemingui (2007) also came with the same results and concluded that unemployment needs to be addressed coping with poverty. In the same way trade openness also affects poverty inversely (-0.299) in the panel developing countries. A 1% liberalization of international trade leads to decline poverty in these economies by (0.3%), because as countries involve in international trade with free trade agreements or minimum restrictions in the form of tariffs and quotas, on one hand availability of cheaper and variety goods is ensured in the form of large scale domestic production and on the other hand creating more jobs for labors enabling them to have better opportunities and less chances of poverty.

### 5.3.2 Empirical Results of Conditional Effects of Model 2: The Impact of Government Spending on Poverty through the Moderator i.e. Health Expenditures for Developing Countries

This section comprises of empirical outcomes of conditional effects of model 2 where the impact of government spending on poverty is found through social infrastructure i.e. health expenditures as the channel, for 48 developing countries

Table 5.4 represents the conditional effects of public spending on poverty and these effects of government spending on poverty through social infrastructure are calculated by evaluating equation 3.12 from chapter 3.

Table 5.4 represents conditional effects of government spending on poverty through social infrastructure, i.e. health expenditures for Model 2 with moderation effect. To express these conditional effects, three categories of these effects are made i.e. low level, average level and high of social infrastructure, i.e. health expenditures. Coefficients, P-Values and values for 95% confidence interval are presented in respective columns.

Logic behind these categories is that whatever the level of public spending is, if it does not have improved social infrastructure i.e. health expenditures as prior condition, it will not reduce poverty. These results are estimated through seemingly unrelated regression (SUR) technique for unbalanced panel suggested by Biorn (2004) where equation 3.11 is differentiated with respect to public spending to get equation 3.12 of chapter 3. The conditional effects of government spending on poverty through social infrastructure, i.e. health expenditures at the low level of health expenditures is (-1.376), at middle level

## Table 5.4

## The Conditional Effects of Government Spending on Poverty through Social Infrastructure, i.e. Health Expenditures

| Independent Variable | Channel | Levels of Health Expenditures | Conditional Effects | 95% Confidence Interval | |
|---|---|---|---|---|---|
| PS | Social infrastructure (Health Exp) | Low level of Health Exp | -1.376*** (0.000) | -2.123 | -0.629 |
| | | Average level of Health Exp | -1.420*** (0.001) | -2.198 | -0.642 |
| | | High level of Health Exp | -1.434*** (0.000) | -2.222 | -0.646 |

Note: P-value of each coefficient is given in the parentheses. ***, ** and * represents the significance at 1%, 5% and 10% levels respectively. Low means 25$^{th}$ percentile, average level is 50$^{th}$ percentile and high level shows 75$^{th}$ percentile levels of Public Spending respectively.

of health expenditures is (-1.420) and at high level of health expenditures is (-1.434). These conditional effects suggest that whatever level of public spending is, if it improves social infrastructure i.e. health expenditures in the first place, these high levels of health expenditures will reduce poverty in the next phase. In other words, it suggests that the impact of government spending on poverty reduction gets weaker if the level of social infrastructure, i.e. health sector improves with a rise in the level of public spending and these conditional effects are significant in this study. So it is concluded that the inverse impact of public spending on poverty is not only profound but also significant in countries with high level of social infrastructure, i.e. health expenditures. These outcomes are consistent with prior literature like (Wang et al. 2016) believe

that being poor or lacking of well-being comprises of both monetary as well as non-monetary aspects of individuals. As the Nobel Laureate Amartya Sen (1992) strongly believes poverty is not just the non fulfillment of basic needs due to lack of income, but poverty actually exists human beings are deprived of their basic capabilities like being unhealthy and unable to work and uneducated or illiterate.

Glick and Menon, (2009) also examined the recent variation in poverty level in general and particularly to investigate the crucial role that government spending plays to improve social infrastructure (i.e. health and education) plays in poverty reduction. Public investment in social infrastructure leads people to be healthy and educated which means they get more chances of securing opportunities for higher income. As suggested by Contreras and Larranaga (2001) that poverty is the lack of sufficient income to support minimum needs but poor might be lacking assets for income generation or they might be earning low return on their assets. Health and education are considered main sources for enhancing productive capabilities and knowledge of humans and converting this human resource into human capital. This human capital is so vital for poor households because it is the only asset for them associated with their earning. Therefore, investment in social infrastructure i.e. health and education by the public sector plays very crucial role in the process of transforming human resource into human capital. This role of public spending has been acknowledged so far for poverty reduction in developed and developing nations, where better health and educational facilities have enhanced the earning potential of individuals and enabled them to bring themselves out of the vicious circle of poverty. In another study where Helwege (1995) explore the relation between government spending and poverty and he advocates that public social investments help engaging economies into a virtuous cycle leading towards

social equality and further stimulating economic growth which in both cases result in poverty reduction.

This study further extends its empirical analysis for the whole world and therefore the panel data set is expanded to 77 countries. This panel data set includes both developed as well as developing countries subjected to data availability. The purpose of expanding data set to 77 countries is to explore the impact of government spending on poverty through the channels of social infrastructure and to compare these results with the developing countries. The objective behind this comparison is to investigate the role of public spending to alleviate poverty through the mediating and moderating effect of social infrastructure. Empirical results for 77 countries have been estimated for social infrastructure i.e. health expenditures. Estimation results comprise of graphical analysis for panel data set of 77 countries; empirical outcomes for the mediation and moderation analysis as well the indirect as well as the conditional effects of public spending on poverty through social infrastructure i.e. health expenditures. All these graphical analysis and estimation results are reported in the appendix named appendix of chapter 5.

From mediation analysis, this study finds that government spending has an inverse and significant impact on poverty through social infrastructure; i.e. health expenditures in the panel countries. This outcome suggests that when public spending is raised, it reduces poverty in these economies. It means that when public spending is increased, it improves the availability of publically provided health facilities and people avail these facilities on their door step. Physically and mentally healthy people are more productive and have better chances of getting jobs. With jobs in hand, people earn more income enabling them to consume more money on basic necessities which leads to reduce chances of poverty. Similarly, this study shows the impact of public spending on social infrastructure; i.e. health expenditures where this relation is positive and significant suggesting

that as public spending goes up, it leads to improve social infrastructure; i.e. health expenditures which in the second phase will reduce poverty in the panel countries. In the same way, social infrastructure; i.e. health expenditures has an inverse and significant impact on poverty level in these economies. If health conditions get better, it leads to reduce poverty because healthy people are more productive and have better chances of getting jobs, earning more income and less chances of being poor.

This section of the study further incorporates some control variables and the final model is obtained where results show that unemployment has a positive and significant impact on poverty which means that with a rise in unemployment level, poverty in these panel economies goes up. Similarly, trade openness has an inverse and significant impact on poverty which means that if countries included in the study allow more international trade and open borders for regional trade by making less restrictions and tariffs on trade, poverty can be reduced in these economies. In the same way, population growth is also found to have positive impact and significant impact on poverty. If population grows high, it causes poverty level to rise in the panel economies.

Indirect effect of government spending on poverty through social infrastructure i.e. health expenditures in the extended panel of developed and developing countries also confirms that this indirect link between poverty and public spending is more profound and if public spending is focused towards, it can reduce poverty in these economies.

From the obtained results conducted for moderation analysis for the extended panel data set, it is found that the intercept is positive and significant which means that that expected mean value of the dependent variable i.e. poverty is positive if all the independent variables are zero or they are omitted from the model. Results further reveal that government spending has an inverse and

significant impact on poverty. It means that if public spending increases, it will lead poverty to decline in the panel countries. This outcome suggests that when public spending expands it leads to allocate more financial resources towards poverty alleviation programs that directly reduce poverty in the panel countries. Increase in public spending also helps to invest more in public goods like social infrastructure i.e. health and education, and physical infrastructure i.e. energy sector and roads, highways, irrigation and sanitation increasing the availability of publically provided social and physical infrastructure on one hand and creating more employment opportunities for labors on the other hand. Better job opportunity means higher income and high consumption on necessities and lesser chances of poverty which is the ultimate goal of public policy. The relation between social infrastructure i.e. health expenditures and poverty is also inverse and significant. It means if health expenditures rise, it will reduce poverty in the panel countries.

The moderation or conditional effect is captured in this model via interaction term for public spending and social infrastructure, i.e. health (PS*Health Expenditures). This interaction term is indicating that the moderation effect has although negative but significant value and this effect needs to be explained along with the total derivative. Interaction term suggests that the impact of public spending on poverty reduction gets stronger with the prior condition of improved social infrastructure, i.e. health expenditures.

This section of the study also incorporates some control variables in general model to capture their impact on poverty and the final model is obtained. In the final model, only unemployment rate is found to have positive and significant impact on poverty in the panel economies. It means that if unemployment rate rises, it will increase poverty in the panel economies. Unemployment has been

one of the major causes of poverty in most of the developing countries. When people are jobless, their income and consumption levels fall and as a result they fall below poverty line.

In the same way the conditional effects of health expenditures as a moderator also confirms that public spending leads to reduce poverty in the presence of high level of health expenditures as prior condition in these panel countries. All of these results are consistent with the analysis conducted for developing countries and presented in this chapter.

Summarizing that the impact of government spending on poverty for developing countries through the channels of social infrastructure i.e. health expenditures, graphical analysis as well mediating and moderating analysis along with indirect effects, empirical results support that government spending reduces poverty directly and indirectly in the panel of developing countries. Health expenditures play its role as mediator when public spending is used to reduce poverty and this link is also confirmed by the indirect impact of government spending on poverty where health expenditure is used as channel for poverty reduction. As far as the moderation analysis is concerned, it is also clear from the result outcomes that health expenditures also play its role as moderator to reduce poverty in the developing countries and conditional effect of public spending on poverty also supports this link. All these above analysis are also carried out for the extended panel data set of 77 countries around the world and estimation results confirm that social infrastructure i.e. health expenditures play its crucial role as mediator as well moderator to reduce poverty in the panel countries and these outcomes are consistent with the analysis made for developing countries as well.

# Chapter VI

## Empirical Results of Model 3; The Impact of Public Spending on Poverty in Developing Countries.

This chapter comprises of empirical estimation and their economic interpretations of Model 3; the impact of government spending on poverty through physical infrastructure i.e. energy (access to electricity is taken as energy) as the channel. This chapter is subdivided into three sections. Section 6.1 comprises of graphical analysis; section 6.2 represents empirical outcomes of mediation analysis and indirect impact of government spending on poverty; and section 6.3 shows empirical results of moderation analysis as well as the indirect effects of public spending on poverty. Subsection 6.3 also shows result of Hausman specification test where it is specified that whether Fixed effects model is appropriate or Random effects model is appropriate for the current panel data analysis. If Fixed effects (FE) model is selected for current panel data, that means that although the intercept in the model is may differ across countries but it does not vary over time i.e. it is time invariant while selecting Random effects model suggests that intercept of the model is time variant i.e. it may change over time. At the end of each section, discussion has been made regarding empirical outcomes.

This study also incorporates some control variables that affect poverty in a positive or in a negative way. This study used six control variables in analysis which can affect poverty in a positive or in a negative way. These control variables are as follows: foreign remittances; which can help to reduce poverty as inflow of remittances rises it leads to reduce poverty, unemployment which has a positive relation with poverty as if unemployment rises it leads to

increase poverty, trade openness; which can help to reduce poverty, population growth; which leads to more poverty, GDP growth; that can reduce poverty and finally inflation; an increase in inflation further increases poverty. All of the above control variables are incorporated in each model and this study estimates final model by omitting the insignificant variables through Thiel's criteria backward elimination method. Omitted variables did not show their statistical insignificance in the analysis and therefore they are excluded from analysis.

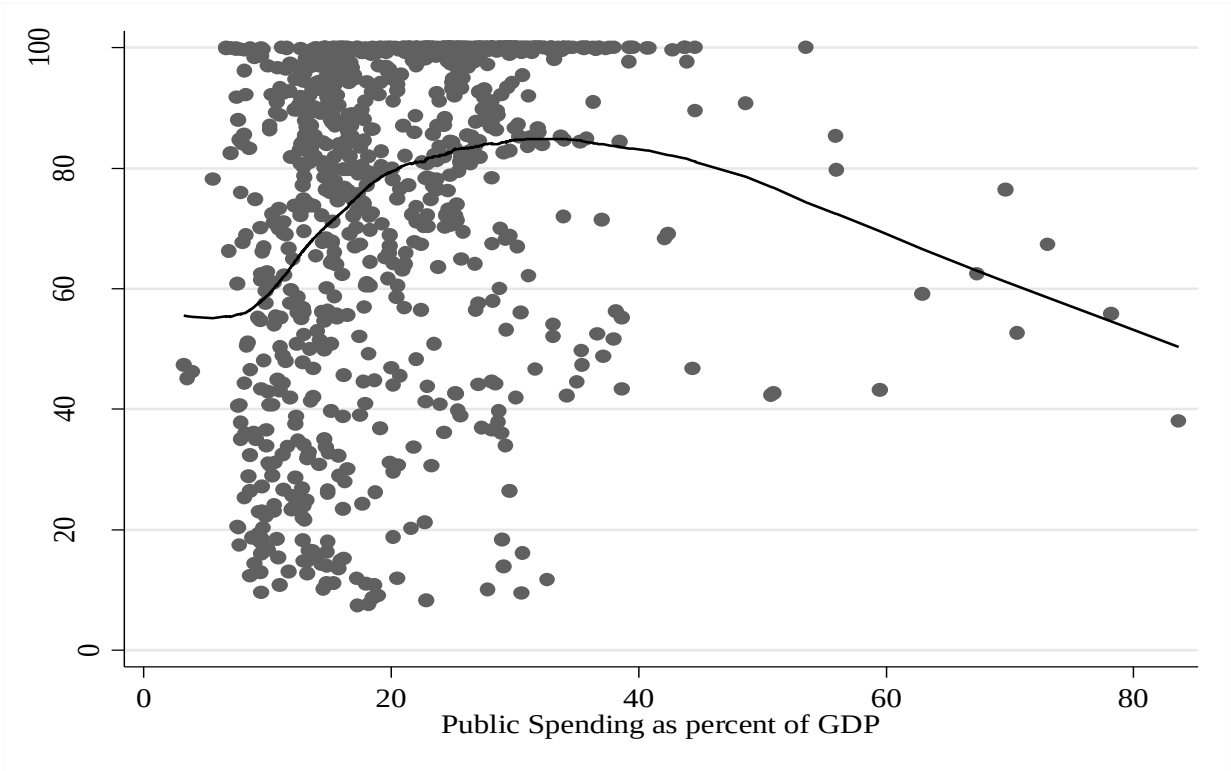
## 6.1 Graphical Analysis of Correlation

This section describes the graphical analysis of correlation for model 3; impact of public spending on poverty through the mediator i.e. energy (access to electricity). This section comprises of three graphs describing the correlation between energy i.e. access to electricity and public spending; correlation between poverty and energy i.e. access to electricity; and correlation between poverty and public spending for 52 developing countries.

Figure 6.1 represents correlation between physical infrastructure i.e. energy (access to electricity) and public spending for a panel of 52 developing countries. Independent variable i.e. public spending is represented on horizontal axis while physical infrastructure i.e. energy (access to electricity) is shown on vertical axis. This figure reveals a positive correlation between public spending and energy i.e. access to electricity. Initially, when public spending rises, energy sector i.e. access to electricity also rises suggesting that a rise in public spending leads to improve physical infrastructure i.e. energy (access to electricity) in the panel countries. When there is an increase in public spending on physical infrastructure i.e. energy sector (access to electricity), there is more availability of and accessibility to electricity of common masses.

**Figure 6.1**

**Correlation between Public Spending and Access to Electricity**

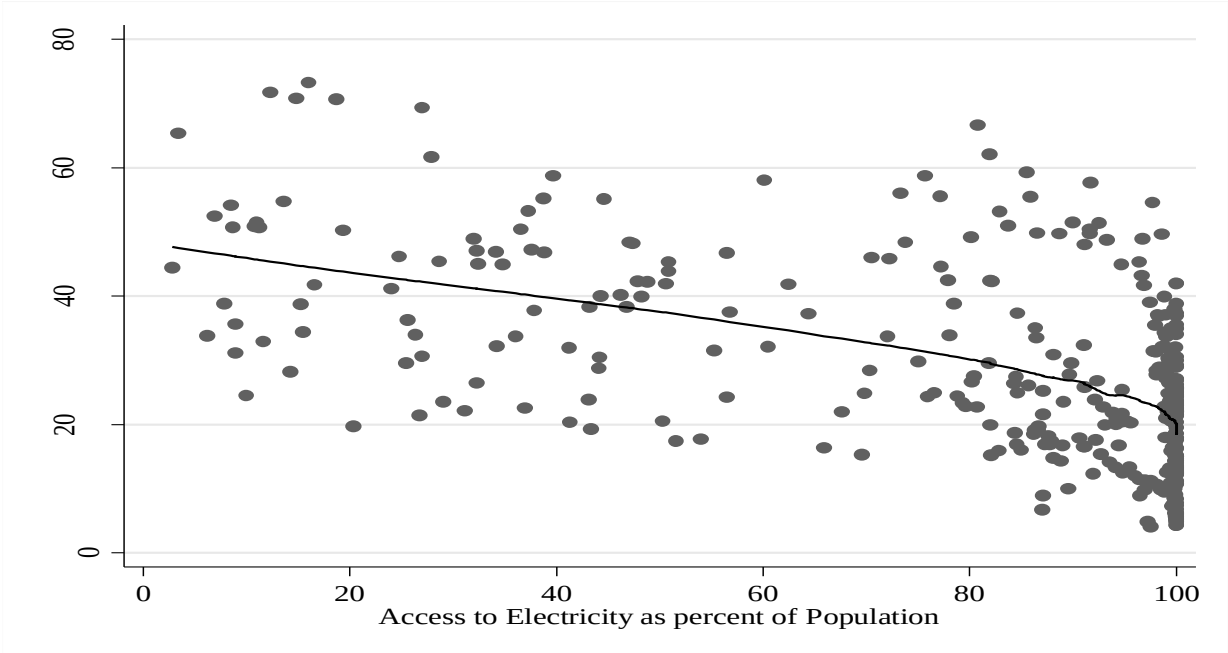



This figure also shows that the positive correlation between public spending and in panel countries.

Figure 6.2 represents correlation between energy i.e. access to electricity and poverty for a panel of 52 developing countries. Physical infrastructure i.e. energy (access to electricity) is represented on horizontal axis while poverty is shown on vertical axis. This figure reveals a negative correlation between physical infrastructure i.e. energy (access to electricity) and poverty.

**Figure 6.2**

**Correlation between Access to Electricity and Poverty**

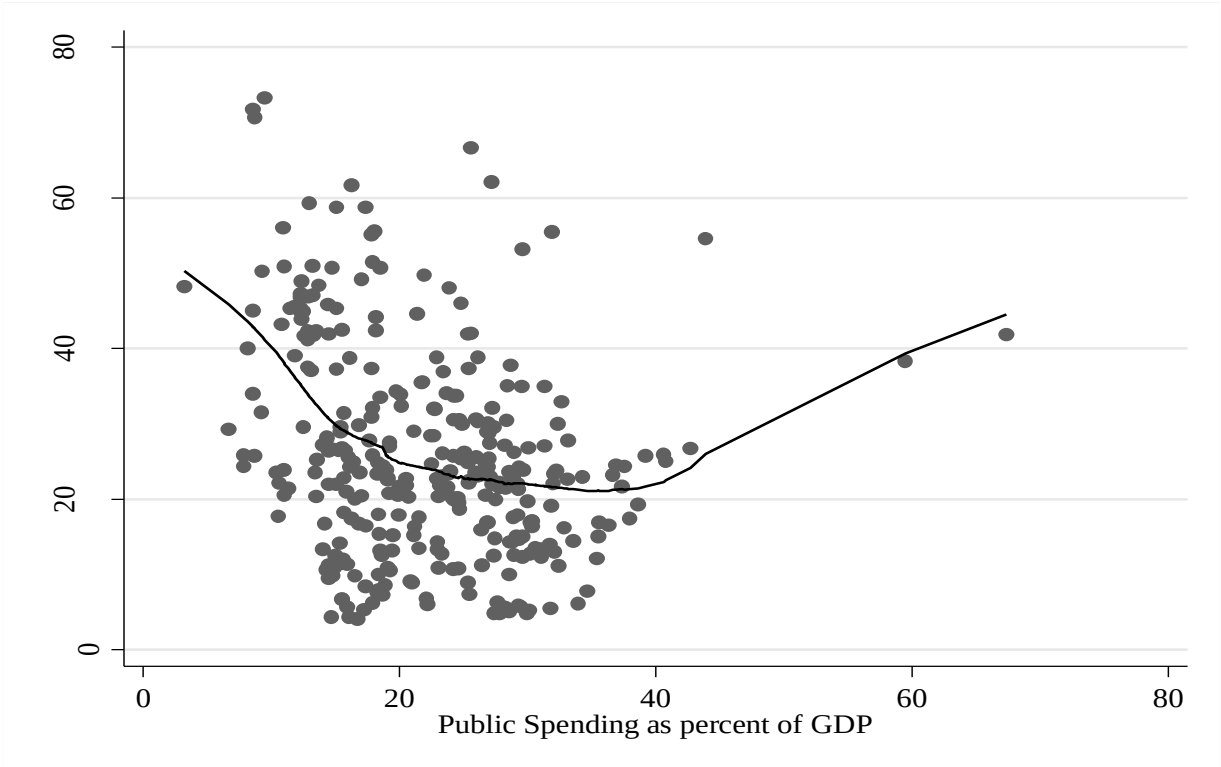



As access to electricity rises, poverty declines which suggests that when physical infrastructure i.e. access to electricity improves, it plays its important role to reduce of poverty in the panel countries.

The more accessible electricity for people is; the less chances of being poor in these countries because electricity is one of the basic needs and people should have access to it. Energy i.e. access to electricity on one hand is responsible for higher out level of goods and services in the economy and on the other hand it creates more jobs for people. With more and better job opportunities, people can earn more income and can have more consumption on basic necessities of life and hence the chances of poverty could be reduced.

## Figure 6.3

## Correlation between Public Spending and Poverty




Public spending can also affect poverty indirectly through social and physical infrastructure like more spending by the public sector on education, health, energy and roads etc. Education and health facilities can make people more productive and enable them to have better job and earning capacity, while energy and infrastructure create more employment opportunities to these people and hence reducing the chances of poverty.

Figure 6.3 represents correlation between poverty and public spending for the panel of 52 developing countries. Public spending is represented on horizontal axis while poverty is shown on vertical axis. This figure reveals a negative correlation between public spending and poverty. Initially, when public spending is low, the poverty level is high and with a rise in public spending causes a decline in poverty which suggests that more public spending reduces poverty in the panel of developing countries. Public spending affects poverty directly through transfer payments to the

poor segment of country in the form poverty alleviation programs enabling them to fulfill their basic needs and taking them out of the vicious circle of poverty.

## 6.2 Empirical Results of Model 3; The Impact of Government Spending on Poverty through Mediating effect of Physical Infrastructure i.e. Energy, for Developing Countries

This section shows empirical results of Mediation Model 3 for a panel of 52 developing countries to find the impact of public spending on poverty (Head Count Ratio as poverty level) through the channel of physical infrastructure; i.e. energy (access to electricity) and the indirect effects of public spending on poverty. This section is divided into two subsections; Section 6.2.1 shows Model 3 for a panel of 52 developing countries to find the impact of public spending on poverty (Head Count Ratio as poverty level) through the channel of physical infrastructure; i.e. energy (access to electricity) while number of countries is subjected to availability of data. Subsection 6.2.2 elaborates the indirect effects of government spending on poverty through the mediator i.e. energy (access to electricity).

### 6.2.1 Empirical Results of Model 3: The Impact of Public Spending on Poverty through the Mediator i.e. Energy (access to electricity) for Developing Countries.

This section comprises of empirical outcomes of mediation analysis of model 3 where the impact of government spending on poverty is found through mediator i.e. energy (access to electricity)

for 52 developing countries. Table 6.1 shows empirical results of Mediation Model 3 for a panel of 52 developing countries to find the impact of public spending on poverty (Head Count Ratio as

poverty level) through the channel of physical infrastructure; i.e. energy (access to electricity). This model is obtained from equations 3.13 and 3.14 of chapter 3. Equation 3.13 shows the impact of public spending on physical infrastructure i.e. energy (access to electricity) and equation 3.14 explains the impact of public spending and physical infrastructure; i.e. energy (access to electricity) on poverty. Estimation technique for this model is Seemingly Unrelated Regression (SUR) suggested by Biorn (2004); and Hayes (2013) for unbalanced panel data to find the mediating effect government spending on poverty through physical infrastructure; i.e. energy (access to electricity) as the channel, for an unbalanced panel data set of 52 developing countries.

One the basis of obtained results, we reject the null hypothesis which states that Public spending has no statistically significant impact on poverty in the developing countries and conclude that public spending reduces poverty directly in a significant way in the selected developing countries.

From Table 6.1, the public spending has an inverse (-0.186) and significant impact on poverty through physical infrastructure; i.e. energy (access to electricity) in the panel countries. This outcome suggests that when public spending rises by 1%, it reduces poverty by (0.18%). It means that when public spending is increased, it improves access to electricity. Public spending can also affect poverty indirectly through social and physical infrastructure like more spending by the public sector on education, health, energy and roads etc.

Education and health facilities can make people more productive and enable them to have better job and earning capacity, while energy sector and infrastructure create more employment opportunities for people. With more and better jobs, people earn more income and consume more money on basic necessities which leads to reduce poverty in developing countries. This outcome is consistent with the study by Drèze and Sen (2013), where they talk about human capabilities

enhancement through educational and health facilities by the public sector. Sangco, (2002); Herrin, (1979); and Barnes, (1988) came with same conclusions that provision of adequate and reliable electricity and other energy sources is the basic responsibility of state and therefore, appropriate energy policy, planning and investing in energy sector by the public sector can make it possible that all the citizens of a country can access and use electricity as basic need. Similarly, access to proper electricity and other energy services for domestic use on one hand improves lives of poor households while on the other hand provision of adequate energy sources raises business activities, improves production of small and cottage industries and creates employment opportunities for poor increasing their incomes that further leads to reduce poverty in any economy.

Similarly, equation 3.13 from chapter 3 of this study shows the impact of public spending on physical infrastructure; i.e. energy (access to electricity). From Table 6.1, this relation is positive (0.366) and significant suggesting that as public spending goes up by 1%, it enhances physical infrastructure; i.e. access to electricity by (0.36%) which in the second phase will reduce poverty level. In the same way, physical infrastructure; i.e. energy (access to electricity) has an inverse (-0.184) and significant impact on poverty level. If electricity accessibility improves by 1%, it leads to reduce poverty by (0.18%) because access to electricity is basic need for people on one hand and on the other hand output level increases creating better chances of getting jobs.

With more and better jobs, people earn more income and consume more money on basic necessities which leads to reduce poverty in the panel of developing countries. Hussein and Filho, (2012) also concluded that electricity availability and better living standards reduce poverty. They came with outcomes that modern energy sources are necessary for better standard of living which is possible by creation of job opportunities with productivity boost.

## Table 6.1

## The Impact of Government Spending on Poverty through the channel of Physical Infrastructure; i.e. Energy (access to electricity)

| Variables | Model | |
|---|---|---|
| | Energy (access to electricity) | Poverty (HCR) |
| Public Spending | 0.366*** | -0.186* |
| | (0.000) | (0.057) |
| Energy (access to electricity) | | -0.184*** |
| | | (0.000) |
| Remittances | | -0.040*** |
| | | (0.000) |
| Unemployment | | 0.095*** |
| | | (0.000) |
| Trade openness | | -0.016*** |
| | | (0.000) |
| GDP growth | | -0.048*** |
| | | (0.000) |
| No. of Observations | 321 | 321 |
| No. of Countries | 52 | 52 |

Note: P-value of each coefficient is given in the parentheses. ***, ** and * represents the significance at 1%, 5% and 10% levels respectively.

More electricity production for domestic consumption as well as exporting it (electricity producers and oil exporters) can earn revenues leading to sustainable development and reducing poverty.

This study further incorporates some control variables in general model to capture their impact on poverty. Control variables are incorporated in each model and this study estimates final model by omitting the insignificant variables through Thiel's criteria backward elimination method. Omitted

variables did not show their statistical insignificance in the analysis and therefore they are excluded from analysis.

From the obtained results, foreign remittances is found to have inverse (-0.040) impact on poverty. It means that when there is a 1% increase in the inflow of foreign remittances, households receive more money and they spend more on basic needs and hence poverty level goes down by (0.04%). In the same way, unemployment has a positive (0.095) and significant impact on poverty level which means that with a rise of 1% in unemployment level, poverty in these panel countries goes up by (0.09%). It means that with the rise in unemployment, people lose their jobs and their income fall. When income of the people fall they cannot fulfill their basic necessities and they fall under the poverty line. Therefore, unemployment is one the reasons of poverty in these panel economies. Ali and Pernia (2003) suggested that reforms in public policies and diverting resources towards physical infrastructure like electricity generation, transport and communication that can create employment opportunities for labors, improving their living standards and reduce poverty in developing countries.

Similarly, trade openness has an inverse (-0.016) and significant impact on poverty which means that if countries included in the study allow more international trade and open borders for regional trade by making less restrictions and tariffs on trade, poverty can be reduced in these economies. If trade openness improves by 1%, it leads to reduce poverty by (0.016%) in the panel economies. Trade openness and trade liberalization means that countries are either involved in free trade or they have minimum trade restrictions in the form of tariffs and quotas. With free or liberalized regional and international trade, on one hand more goods are produced and exported creating more employment opportunities for people in the economy enhancing earning possibilities for them. On the other hand it ensures the availability of cheaper goods and people of the trading countries can

purchase them which leads to reduce chances of poverty. World Bank reported in (2009) that in the list of countries trading across boarder made through an indicator, many countries of the Sub Saharan region fall in the bottom 40% due to lack of proper transport and communication networks. Therefore, these regional countries need a modern transport and communication networks to enhance regional and international trade, obtain economic growth and reduce poverty, Jerome (2011).

Furthermore, result outcomes also show that GDP growth has a negative (-0.048) and significant impact on poverty. When GDP of the countries in the panel grows by 1%, poverty in these countries declines by (0.048%). If there is economic growth and GDP of these panel economies grows, on one hand it helps the governments of these countries to have more resources for public goods like social and physical infrastructure and more resources to allocate for poverty alleviation programs. On the other hand more economic activities mean more employment opportunities for labors leading to improve income levels of people. With more income and more consumption on basic necessities of life ensures lesser chances of poverty in the country. This result is also supported by the study conducted by Wilhelm and Fiestas (2005) in which they concluded that in the process of high economic growth, public spending can be helpful in poverty reduction. In a similar study by Helwege (1995), he also verified the link between public spending and poverty where his analysis revealed that social investments by the public sector engage economies into a virtuous cycle that results social equality and further stimulating economic growth. Both social equality and economic growth lead to achieve the ultimate goal of reducing poverty.

### 6.2.2 Empirical Results of indirect effects of Model 3: The Impact of Government Spending on Poverty through the Mediator i.e. Access to Electricity for Developing Countries

This section comprises of empirical outcomes of indirect effects of model 3 where the impact of government spending on poverty is found through the physical infrastructure i.e. energy (access to electricity) as the channel, for 52 developing countries.

**Table 6.2**

**The Indirect Effect of Government Spending on Poverty through Physical Infrastructure; i.e. Energy (access to electricity)**

| Independent Variable | Channel | Dependent Variable | Indirect Effects | 95% Confidence Interval | |
|---|---|---|---|---|---|
| Public Spending | Physical Infrastructure (Energy; access to electricity) | Poverty | -0.067*** (0.002) | -0.109 | -0.025 |

Note: P-value of each coefficient is given in the parentheses. ***, ** and * represents the significance at 1%, 5% and 10% levels respectively.

Table 6.2 represents the indirect effects of government spending on poverty and these indirect effects of public spending on poverty through physical infrastructure are calculated using equation 3.16 from chapter 3.

Result in Table 6.2 is estimated through seemingly unrelated regression (SUR) technique for unbalanced panel data suggested by Biorn (2004) where equation 3.13 and 3.14. Equation 3.13 is

differentiated with respect to public spending and equation 3.14 is partially differentiated to get equation 3.16 from chapter 3.

These equations seem to be unrelated but they are actually related and can be calculated in a simultaneous way as suggested by Biorn (2004); and Hayes (2013).

Results further show that we reject the null hypothesis which states that Public spending has no statistically significant impact on poverty through the channel of energy in the developing countries and conclude that public spending significantly reduce poverty through the channel of energy in the selected panel countries.

Table 6.2 shows that the conditional effect of public spending on poverty is negative (-0.067) and significant. It means that when public spending rises it improves physical infrastructure i.e. access to electricity and it reduces poverty in the next phase. In other words it means that indirect effect is more profound as compared to direct effect. But as the figure 6.1 shows that initially, public spending improves energy sector (access to electricity) but to a certain extent and beyond that level, public spending do not bring any further improvement in energy sector. Therefore, government spending leads to reduce poverty using energy i.e. access to electricity as a channel, to a certain extent and beyond that point if public spending further goes up, it will not reduce poverty anymore. Theoretically this result suggests that as the level of public spending goes up its impact on poverty reduction diminishes. In other words it could be stated that whatever the level of public spending is, it reduces poverty in the panel countries but with a prior condition of improved level of physical infrastructure i.e. energy (access to electricity) that leads to reduce poverty but the effects gets weaker as the physical infrastructure i.e. access to electricity improves.

## 6.3 Empirical Results of Model 3; The Impact of Government Spending on Poverty through Moderating effect of Physical Infrastructure i.e. energy (access to electricity), for Developing Countries.

This section shows empirical results of Moderation Model 3 for a panel of 48 developing

developing countries to find the impact of public spending on poverty (Head Count Ratio as poverty level) through the moderation effect of physical infrastructure; i.e. energy (access to electricity). This section is subdivided into two sections. Section 6.3.1 represents model 3 for 48 developing countries to find the impact of public spending on poverty through moderator i.e. energy (access to electricity). This section also shows result of Hausman specification test where it is specified that whether Fixed effects model is appropriate or Random effects model is appropriate. If Fixed effects model is selected for current panel data, it means that although the intercept in the model is may differ across countries but it does not vary over time i.e. it is time invariant while selecting Random effects model suggests that intercept of the model is time variant i.e. it may change over time. Section 6.3.2 explains the conditional effects of government spending on poverty.

### 6.3.1 Empirical Results of Model 3: The Impact of Government Spending on Poverty through the Moderator i.e. Energy (access to Electricity) for Developing Countries

This section comprises of empirical outcomes of moderation analysis of model 3 where the impact of government spending on poverty is found through the moderator i.e. energy (access to electricity) for 48 developing countries.

Table 6.3 shows empirical results of the general and final Model 3 for a panel of 48 developing countries to find the impact of public spending on poverty (Head Count Ratio as poverty level) through the moderation effect of physical infrastructure; i.e. energy (access to electricity). Fixed and random effects models are estimated to find the impact of public spending on poverty using physical infrastructure i.e. energy (access to electricity) as moderator in this analysis. Number of countries declined from 52 to 48 due to the feature of Fixed and Random effects technique that they estimate for balanced panel data and data set contains only 48 cross sections with balanced time series.

This Table 6.3 also shows result of Hausman specification test where it is specified that whether fixed effects (FE) model is appropriate or random effects (RE) model is suitable for the data set. Hausman specification test has the null hypothesis that Random effects model is appropriate for the data set with alternative hypothesis that Fixed effects model is appropriate one.

From Table 6.3 result of Hausman test suggests that Fixed effects model is more appropriate because P-value is (0.000) which means that null hypothesis is rejected and it is concluded that fixed effects model is to be selected for the given data set. It means that although the intercept in the model is may differ across countries but it does not vary over time i.e. it is time invariant.

## Table 6.3

## The Impact of Government Spending on Poverty through Moderation of Physical Infrastructure; i.e. Energy (access to electricity)

| **Variables** | **Models (Poverty HCR is dependent variable )** | |
|---|---|---|
| | **Fixed Effects** | **Random Effects** |
| **Constant** | 158.047*** | 154.44*** |
| | (0.000) | (0.000) |

| | | |
|---|---|---|
| **Public Spending (PS)** | -1.218*** | -1.074*** |
| | (0.000) | (0.000) |
| **Energy** | -0.466*** | -0.431*** |
| **(access to electricity)** | (0.048) | (0.000) |
| **PS*Energy/** | 0.008*** | .0088*** |
| **(access to electricity)** | (0.000) | (0.001) |
| **Remittances** | -4.063*** | -4.047*** |
| | (0.000) | (0.000) |
| **Unemployment** | 0.538*** | 0.490*** |
| | (0.000) | (0.001) |
| **Population Growth** | 5.482*** | 3.631*** |
| | (0.000) | (0.003) |
| **Inflation** | 0.120*** | 0.124*** |
| | (0.000) | (0.000) |
| **No. of Observations** | 319 | 319 |
| **No. of Countries** | 48 | 48 |
| **R-squared** | 0.221 | 0.276 |
| **Wald Chi$^2$** | | 363.32 (0.000) |
| **F-statistic** | 29.40 (0.000) | |
| **Hausman Test Chi$^2$ Statistic** | 36.70 (0.000) | |

Note: P-value of each coefficient is given in the parentheses. ***, ** and * represents the significance at 1%, 5% and 10% levels respectively.

Table 6.3 contains results from estimation of equation 3.17 of chapter 4 of this study. From the obtained results in the Table 6.3, the intercept is positive (158.047) and significant which means that that expected mean value of the dependent variable i.e. poverty is positive if all the independent variables are zero or they are omitted from the model. Table 6.3 also shows that public spending has an inverse (-1.218) and significant impact on poverty. It means that if public spending is raised by 1%, poverty declines by (1.2%) in the panel countries. This outcome suggests that

when public spending expands it leads to allocate more financial resources towards poverty alleviation programs that directly reduce poverty in the panel countries. Increase in public spending also helps to invest more in public goods like social infrastructure (education and health), and physical infrastructure (energy sector and roads, highways, irrigation and sanitation etc), creating more employment opportunities for labors. Better job opportunity means higher income and high consumption on necessities and lesser chances of poverty which is the ultimate goal of public policy.

This result is in line with the study conducted by Drèze and Sen (2013), where they talk about human capabilities enhancement through educational and health facilities by the public sector. Sangco, (2002); Herrin, (1979) and Barnes, (1988) came with same conclusions that provision of adequate and reliable electricity and other energy sources is the basic responsibility of state and therefore, appropriate energy policy, planning and investing in energy sector by the public sector can make it possible that all the citizens of a country can access and use electricity as basic need. Similarly, access to proper electricity and other energy services for domestic use on one hand improves lives of poor households while on the other hand provision of adequate energy sources raises business activities, improves production of small and cottage industries and creates employment opportunities for poor increasing their incomes that further leads to reduce the chances of poverty in any economy. Similarly, from Table 6.3, the impact of physical infrastructure i.e. energy (access to electricity) is negative (-0.466) and significant suggesting that if electricity accessibility improves by 1%, it leads to reduce poverty by (0.46%) because access to electricity is basic need for people on one hand and on the other hand output level increases creating better chances of getting jobs for people. With more and better jobs, people earn more income and consume more money on basic necessities which leads to reduce chances of poverty.

Hussein and Filho, (2012) also concluded that electricity availability and better living standards reduce poverty. They came with outcomes that modern energy sources are necessary for better standard of living which is possible by creation of job opportunities with productivity boost. More energy production for domestic consumption as well as exporting it can earn revenues leading to sustainable development and reducing poverty.

The moderation effect is captured in this model via interaction term for public spending and physical infrastructure, i.e. energy (PS*Energy). This interaction term (PS*Energy) indicating the moderation effect has a significant and positive value. As government spending and poverty are inversely related so positive (0.008) interaction term suggests that inverse the link between government spending and poverty gets weaker with the prior condition of improved physical infrastructure, i.e. energy (access to electricity). But this outcome could be more easily understood by looking at the country specific effects also known as conditional effect of public spending on poverty. In other words it can be stated that the inverse impact of public spending on poverty is not only more profound but also significant in countries with high level of physical infrastructure, i.e. energy (access to electricity). Haughton and Khandker, (2009) also concluded that public spending can be helpful in poverty reduction conditional to the improved physical infrastructure, i.e. energy (access to electricity). Although this conditional effect is positive but it would be more meaningful if we discuss it with total derivative. Where conditional effect is separated and is estimated with low median and high level of physical infrastructure i.e. energy.

This study further incorporates some control variables in general model to capture their impact on poverty. Control variables are incorporated in each model and this study estimates final model by omitting the insignificant variables through Thiel's criteria backward elimination method. Omitted

variables did not show their statistical insignificance in the analysis and therefore they are excluded from analysis.

In the final model, foreign remittances is found to have an inverse (-4.063) and significant impact on poverty in the panel countries. It means that as the inflow of foreign remittances rises by 1% it reduces poverty by more than 1% i.e. (4.06%) in the selected panel countries. A rise in foreign remittances inflow means households receive more money for consumption and when they spend more money on basic needs it will lead to reduce the probability of being poor. Remittances flow is more towards developing economies due to their major export of human resource. People who receive foreign remittances have more money to spend on basic necessities of life like food, clothing, shelter, basic health and education. When people have enough money from abroad and they can fulfill their basic needs, there are less chances of poverty.

Similarly, unemployment is also found to have positive (0.538) and significant impact on poverty in the panel economies. It means that if unemployment rate rises by 1%, it will increase poverty level by (0.54%). Unemployment has been one of the major causes of poverty in most of the developing countries. When people are jobless, their income and consumption levels fall and as a result they fall below poverty line. Chemingui (2007) also came with the same results and concluded that unemployment needs to be addressed to reduce poverty in the panel developing countries.

Further, population growth and inflation are also having positive and significant impact on poverty in the panel developing countries. Population growth rate has a positive value of (5.482) and inflation has positive value of (0.120) respectively. It means that when population grows by 1% in these developing countries, it will lead to raise poverty by more than 1% i.e. (5.5%). This is quite

alarming situation for populous countries where they have to feed too many mouths and there are chances of poverty in these countries because there is limitation of physical and financial resources in these economies. Similarly, a 1% increase in inflation will cause a rise in poverty of (0.12%) in the sampled developing countries. Inflation is also one of the major problems of developing nations where common masses buy goods at higher prices and they do not have enough income to fulfill their basic needs, and that is why developing countries have more chances of having high rates of poverty. As a policy measure these countries should focus on their population growth control and should take steps for lowering price level and as a result the probability of poverty will decline which is the ultimate goal of public policy.

### 6.3.2 Empirical Results of Conditional Effects of Model 3: The Impact of Government Spending on Poverty through the Moderator i.e. Energy (access to electricity) for Developing Countries

This section comprises of empirical outcomes of conditional effects of model 3 where the impact

of government spending on poverty is found through physical infrastructure i.e. energy (access to electricity) as the channel, for 48 developing countries.

Table 6.4 represents the conditional effects of public spending on poverty through physical infrastructure which are calculated using equation 3.18 from chapter 3. This Table 6.4 elaborates conditional effects of public spending on poverty through physical infrastructure, i.e. energy (access to electricity) for Model 3 with moderation effect. To express these conditional effects, three categories of these effects are made i.e. low level, average level and high of physical infrastructure, i.e. energy (access to electricity). Coefficients, P-Values and values for 95% confidence interval are presented in respective columns. Logic behind these categories is that

whatever the level of public spending is, if it does not have improved physical infrastructure i.e. energy (access to electricity) as prior condition, it will not reduce poverty. These results are estimated through seemingly unrelated regression (SUR) technique for unbalanced panel data suggested by Biorn (2004) where equation 3.17 is differentiated with respect to public spending to get equation 3.18 from chapter 3.

The conditional effect of government spending on poverty through physical infrastructure, i.e. energy at the low level of energy is (-1.041), at middle level of energy is (-1.035) and at high level of energy is (-1.034).

These conditional effects suggest that whatever level of public spending is, if it improves physical infrastructure i.e. energy (access to electricity) in the first place, these high levels of access to electricity will reduce poverty in the next phase. In other words, it suggests that the impact of government spending to reduce poverty gets stronger if the level of physical infrastructure, i.e. energy (access to electricity) improves with a rise in the level of public spending and these conditional effects are significant in this study.

**Table 6.4**

**The Conditionals Effects of Government Spending on Poverty through Physical infrastructure, i.e. Energy (access to electricity)**

| Independent Variable | Channel | Levels of access to Electricity | Conditional Effects | 95% Confidence Interval |
|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| Public Spending | Physical Infrastructure (Energy/access to electricity) | Low level of access to electricity | -1.041*** (0.000) | -1.44 | -0.636 |
| | | Average level access to electricity | -1.035*** (0.000) | -1.437 | -0.633 |
| | | High level of access to electricity | -1.034*** (0.000) | -1.435 | -0.632 |

Note: P-value of each coefficient is given in the parentheses. ***, ** and * represents the significance at 1%, 5% and 10% levels respectively. Low means 25$^{th}$ percentile, average level is 50$^{th}$ percentile and high level shows 75$^{th}$ percentile levels of Public Spending respectively.

So it is concluded that the inverse impact of government spending on poverty is not only more profound but also significant in countries with high level of physical infrastructure, i.e. improved access to electricity.

This study further extends its empirical analysis for the whole world and therefore the panel data set is expanded to 77 countries. This panel data set includes both developed as well as developing countries subjected to data availability. The purpose of expanding data set to 77 countries is to find the impact of government spending on poverty channelizing through the physical infrastructure and to compare these results with the developing countries. The objective behind this comparison is to investigate the role of public spending to alleviate poverty through the mediating and moderating effect of physical infrastructure. Empirical results for 77 countries have been estimated for physical infrastructure i.e. access to electricity. Estimation results comprise of graphical

analysis for panel data set of 77 countries; empirical outcomes for the mediation and moderation analysis as well the indirect and conditional effects of government spending on poverty through physical infrastructure i.e. access to electricity. All these graphical analysis and estimation results are reported in the appendix named appendix of chapter 6.

From the mediation analysis conducted for extended panel data set including 77 developed and developing, results show that government spending has an inverse and significant impact on poverty through physical infrastructure; i.e. energy (access to electricity) in the panel countries. This outcome suggests that when public spending is raised, it reduces poverty in these economies. It means that when public spending is increased, it improves access to energy. Public spending can also affect poverty indirectly through social and physical infrastructure like more spending by the public sector on education, health, energy and roads etc. Sangco, (2002); Herrin, (1979) and Barnes, (1988) came with same conclusions that provision of adequate and reliable electricity and other energy sources is the basic responsibility of state and therefore, appropriate energy policy, planning and investing in energy sector by the public sector can make it possible that all the citizens of a country can access and use electricity as basic need. Similarly, access to proper electricity and other energy services for domestic use on one hand improves lives of poor households while on the other hand provision of adequate energy sources raises business activities, improves production of small and cottage industries and creates employment opportunities for poor increasing their incomes that further leads to reduce the chances of poverty in any economy. Similarly, results of this study shows the impact of public spending on physical infrastructure; i.e. energy (access to electricity) is positive and significant suggesting that as public spending goes up, it increases physical infrastructure; i.e. access to energy which in the second phase will reduce poverty level in these economies. In the same way, physical infrastructure; i.e. energy (access to electricity) has

an inverse and significant impact on poverty level. If energy accessibility improves, it leads to reduce poverty because access to energy is basic need for people on one hand and on the other hand output level increases creating better chances of getting jobs. With more and better jobs, people earn more income and consume more money on basic necessities which leads to reduce chances of poverty. Hussein and Filho, (2012) also concluded that energy availability and better living standards reduce poverty. They came with outcomes that modern energy sources are necessary for better standard of living which is possible by creation of job opportunities with productivity boost. More energy production for domestic consumption as well as exporting it (electricity producers in general and oil exporters in specific) can earn revenues leading to sustainable development and reducing poverty.

This section of the study further incorporates some control variables in general model to capture their impact on poverty the final model is obtained. Results show that foreign remittances have been found to have inverse and significant impact on poverty. It means that when there is an increase in the inflow of foreign remittances, households receive more money and they spend more on basic needs and hence poverty level goes down. In the same way, unemployment has a positive and significant impact on poverty level which means that with a rise unemployment level, poverty in these panel economies goes up. It means that with the rise in unemployment, people lose their jobs and their income fall. When income of the people fall they cannot fulfill their basic necessities and they fall under the poverty line. Similarly, trade openness has an inverse and significant impact on poverty which means that if countries included in the study allow more international trade and open borders for regional trade by making less restrictions and tariffs on trade, poverty can be reduced in these economies. An increase in trade openness leads to reduce poverty in these panel economies. Trade openness and trade liberalization means that countries are either involved in free

trade or they have minimum trade restrictions in the form of tariffs and quotas. With free or liberalized regional and international trade, on one hand more goods are produced and exported creating more employment opportunities for people in the economy enhancing earning possibilities for them. On the other hand it ensures the availability of cheaper goods and people of the trading countries can purchase them which leads to reduce chances of poverty.

Indirect effects of mediation analysis also exhibits that when public spending goes up, it improves access to electricity in the first stage and then high level of accessibility to electricity reduces poverty in the second stage in the selected panel countries and this impact gets stronger with time.

Empirical results of moderation analysis show that, the intercept is positive and significant which means that that expected mean value of the dependent variable i.e. poverty is positive if all the independent variables are zero or they are omitted from the model. It is further shown that government spending has an inverse and significant impact on poverty. It means that if public spending is raised, it will lead poverty to decline in the panel economies. This outcome suggests that when public spending expands it leads to allocate more financial resources towards poverty alleviation programs that directly reduce poverty in the panel countries. Similarly, from the obtained results, the impact of physical infrastructure i.e. energy (access to electricity) is negative and significant suggesting that if energy accessibility improves, it leads to reduce poverty because access to energy is basic need for people on one hand and on the other hand output level increases creating better chances of getting jobs. With more and better jobs, people earn more income and consume more money on basic necessities which leads to reduce chances of poverty. Hussein and Filho, (2012) also concluded that energy availability and better living standards reduce poverty. They came with outcomes that modern energy sources are necessary for better standard of living which is possible by creation of job opportunities with productivity boost. More energy production

for domestic consumption as well as exporting it (electricity producers in general and oil exporters in specific) can earn revenues leading to sustainable development and reducing poverty.

From the moderation analysis of this section, the conditional effect is captured in this model via interaction term for public spending and physical infrastructure, i.e. energy (PS*Energy). This interaction term (PS*Energy) indicating the moderation effect has a positive and significant value. As public spending and poverty are inversely related so positive interaction term suggests that the impact of public spending on poverty reduction gets stronger with the prior condition of improved physical infrastructure, i.e. energy. In other words it can be stated that the inverse impact of public spending on poverty is not only more profound but also significant in countries with high level of physical infrastructure, i.e. energy. Haughton and Khandker, (2009) also concluded that public spending can be helpful in poverty reduction conditional to the improved physical infrastructure, i.e. energy sector. Although this value is positive but it could be more meaningful if explained in terms of total derivative as given in the following paragraph.

This section of the study also incorporates some control variables in general model to capture their impact on poverty and the final model is obtained. In the final model, foreign remittances are found to have an inverse and significant impact on poverty in the panel countries. It means that as the inflow of foreign remittances rises, it reduces poverty in the selected panel countries. A rise in foreign remittances inflow means households receive more money for consumption and when they spend more money on basic needs it will lead to reduce the probability of being poor. Similarly, inflation rate is also found to have positive and significant impact on poverty in the panel economies. It means that if unemployment rate rises, it will increase poverty level in the panel countries. Unemployment has been one of the major causes of poverty in most of the developing countries. When people are jobless, their income and consumption levels fall and as a result they

fall below poverty line. Chemingui (2007) also came with the same results and concluded that unemployment needs to be addressed in order to cope with poverty.

In the same way the conditional effects of access to electricity as a moderator also confirms that public spending leads to reduce poverty in the presence of high level of access to electricity as prior condition in these panel countries and this level of accessibility to electricity gets high in developing countries and presented in this chapter.

Summarizing that the impact of government spending on poverty for developing countries through the channels of physical infrastructure i.e. access to electricity, graphical analysis as well mediating and moderating analysis along with indirect effects, empirical results support that government spending can reduce poverty directly and indirectly in the panel of selected developing countries. Physical infrastructure i.e. access to electricity plays its role as mediator when public spending is used to reduce poverty and this link is also confirmed by the indirect impact of government spending on poverty and here access to electricity is used as channel for poverty reduction. As far as the moderation analysis is concerned, it is also clear from the result outcomes that access to electricity also plays its role as moderator to reduce poverty in the developing countries and conditional effects of public spending on poverty also supports this link. All these above analysis are also carried out for the extended panel data set of 77 countries around the world and estimation results confirm that physical infrastructure i.e. access to electricity plays its crucial role as mediator as well moderator to reduce poverty in the panel countries and these outcomes are consistent with the analysis made for developing countries as well.

# Chapter VII

## Empirical Results of Model 4; The Impact of Public Spending on Poverty in Developing Countries.

This chapter comprises of empirical estimation and their economic interpretations of Model 4; the impact of government spending on poverty using the channel of physical infrastructure i.e. rail line. This chapter is subdivided into three sections. Section 7.1 explains graphical analysis; section 7.2 represents empirical outcomes of mediation analysis and indirect impact of government spending on poverty; and section 7.3 shows empirical results of moderation analysis along with the indirect effects of public spending on poverty. Subsection 7.3 also shows result of Hausman specification test where it is specified that whether Fixed effects model is appropriate or Random effects model is appropriate for the current panel data analysis. If fixed effects (FE) model is selected for current panel data, it means that although the intercept in the model is may differ across countries but it does not vary over time i.e. it is time invariant while selecting Random effects model suggests that intercept of the model is time variant i.e. it may change over time. At the end of each section, discussion has been made regarding empirical outcomes.

This study also incorporates some control variables that affect poverty in a positive or in a negative way. This study used six control variables in analysis which can affect poverty in a positive or in a negative way. These control variables are as follows: foreign remittances; which can help to reduce poverty as inflow of remittances rises it leads to reduce poverty, unemployment which has a positive relation with poverty as if unemployment rises it leads to increase poverty, trade openness; which can help to reduce poverty, population growth; which leads to more poverty, GDP

growth; that can reduce poverty and finally inflation; an increase in inflation further increases poverty. All of the above control variables are incorporated in each model and this study estimates final model by omitting the insignificant variables through Thiel's criteria backward elimination method. Omitted variables did not show their statistical insignificance in the analysis and therefore they are excluded from analysis.

## 7.1 Graphical Analysis of Correlation

This section describes the graphical analysis of correlation for model 4; impact of government spending on poverty through rail line in kilometers as transportation as the mediator. This section presents three graphs describing the correlation between transportation i.e. rail line in kilometers and public spending; correlation between poverty and transportation i.e. rail line in kilometers; and correlation between poverty and public spending for 52 developing countries.

Figure 7.1 represents correlation between the main independent variable of this study i.e. public spending and physical infrastructure i.e. transportation (rail line) used as mediating variable for a panel of 52 developing countries. Independent variable i.e. public spending is represented on horizontal axis while physical infrastructure i.e. transportation (rail line) is shown on vertical axis. This figure reveals a positive correlation between public spending and transportation i.e. rail line. Initially, as public spending increases, transportation facilities like rail line and other facilities also improve. It suggest that when public spending is raised, it leads to improve physical infrastructure i.e. transportation in the form of rail line in the panel countries.

When there is an increase in public spending on physical infrastructure i.e. transportation like rail line, there is more availability and accessibility of common masses to public transportation

services i.e. rail transportation. This figure also shows that the positive correlation between public spending and rail transportation in the panel countries.

## Figure 7.1

## Correlation between Public Spending and Transportation

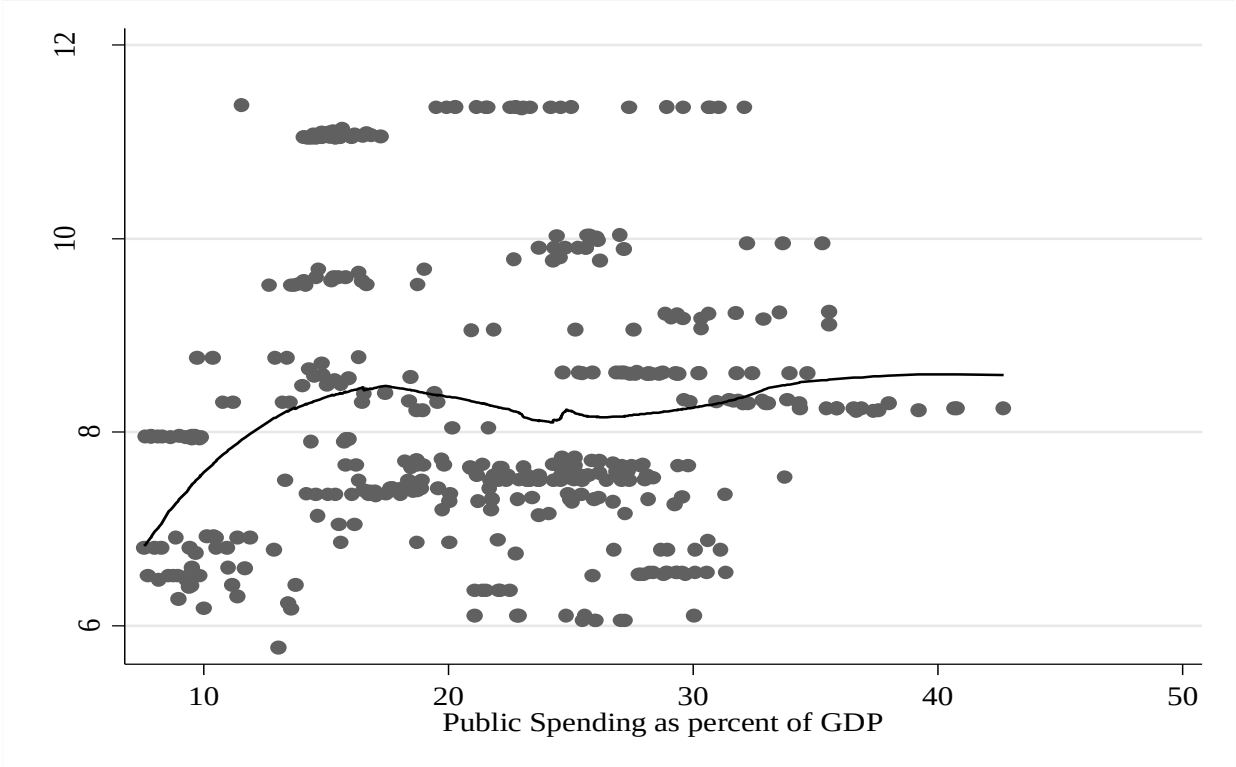
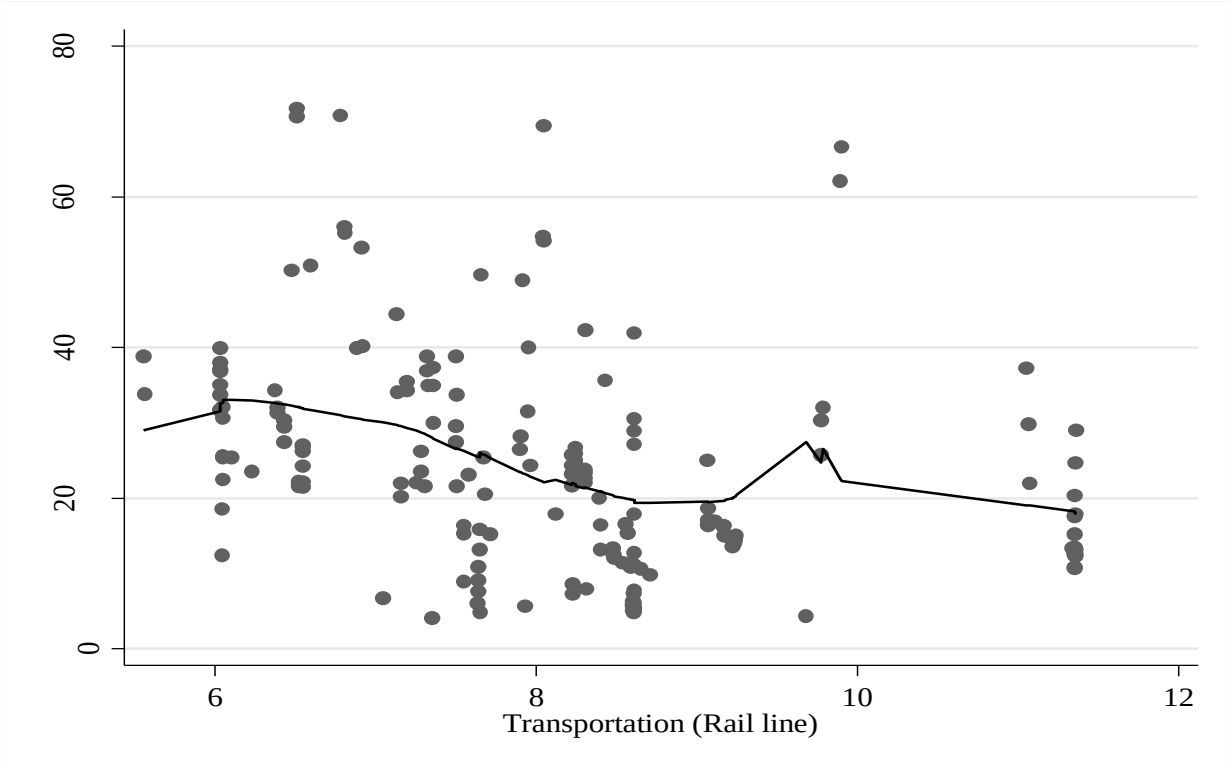



Figure 7.2 represents correlation between physical infrastructure i.e. rail line in kilometers as transportation used as the mediating variable in this study for a panel of 52 developing countries and the main dependent variable of this study i.e. poverty. Physical infrastructure i.e. rail line transportation is represented on horizontal axis while poverty is shown on vertical axis. This figure reveals a negative correlation between physical infrastructure i.e. rail line transportation and poverty.

## Figure 7.2

## Correlation between Transportation and Poverty

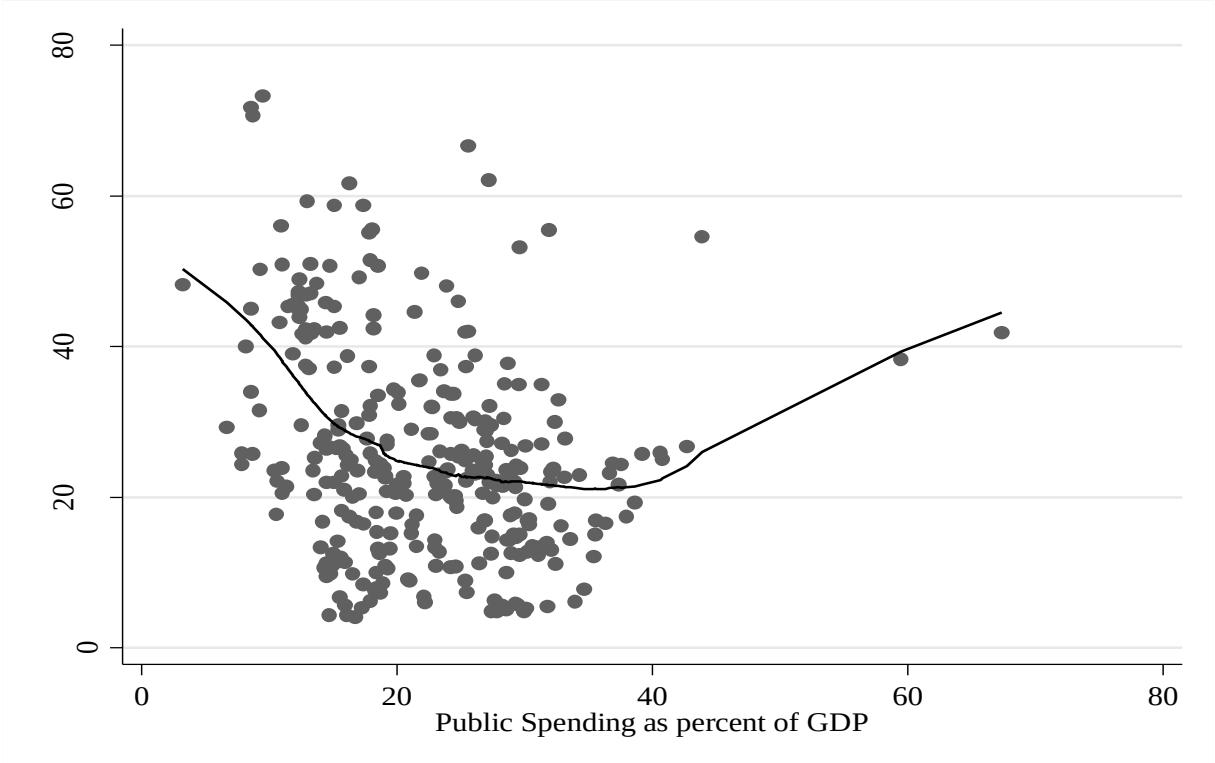



As transportation i.e. rail line improves, poverty declines which suggests that better physical infrastructure i.e. transportation (rail line) its crucial role to play in the poverty reduction in the panel countries. To improve physical infrastructure in the form of rail lines transportation, more public spending is needed which create more jobs. More jobs mean people earn more and with high income they can spend more on goods and services that further reduces the chances of poverty.

Figure 7.3 represents correlation between poverty and public spending for a panel of 52 developing countries. Public spending is represented on horizontal axis while poverty is shown on vertical axis.

## Figure 7.3

## Correlation between Public Spending and Poverty




This figure reveals a negative correlation between public spending and poverty. Initially, when public spending is low, the poverty level is high and with an increase in public spending causes a decline in poverty which suggests that more public spending reduces poverty in the panel countries.

Public spending affects poverty directly through transfer payments to the poor segment of country in the form poverty alleviation programs enabling them to fulfill their basic needs and taking them out of the vicious circle of poverty. Public spending can also affect poverty indirectly through social and physical infrastructure like more spending by the public sector on education, health, energy and roads etc. Education and health facilities can make people more productive and enable

them to have better job and earning capacity, while energy and infrastructure create more employment opportunities to these people and hence reducing the chances of poverty.

## 7.2 Empirical Results of Model 4; The Impact of Government Spending on Poverty through Mediating effect of Physical Infrastructure i.e. transportation (rail line), for Developing Countries

This section explains empirical results of Mediation Model 4 for a panel of 52 developing countries to find the impact of public spending on poverty (Head Count Ratio as poverty level) through the channel of physical infrastructure; i.e. transportation (rail line) and the indirect impact of government spending on poverty. This section is subdivided into two sections; Section 7.2.1 shows Model 4 for a panel of 52 developing countries to find the impact of public spending on poverty (Head Count Ratio as poverty level) through the channel of physical infrastructure; i.e. rail line as transportation and the number of countries is subjected to availability of data. Subsection 7.2.2 elaborates the indirect effect of government spending on poverty through the mediator i.e. rail line as transportation.

### 7.2.1 Empirical Results of Model 4: The Impact of Public Spending on Poverty through the Mediator i.e. Rail line as transportation for Developing Countries

This section comprises of empirical outcomes of mediation analysis of model 4 where the impact of government spending on poverty is found through the mediator i.e. transportation (rail line in kilometers) for 51 developing countries.

Table 7.1 shows empirical results of Mediation Model 4 for a panel of 51 developing countries to find the impact of public spending on poverty (Head Count Ratio as poverty level) through the

channel of physical infrastructure; i.e. rail line as transportation. This model is obtained from equation 3.19 and 3.20 of chapter 3. Equation 3.19 shows the impact of public spending on physical infrastructure i.e. rail line as transportation and equation 3.20 explains the impact of public spending and physical infrastructure; i.e. rail line as transportation on poverty. Estimation technique for this model is Seemingly Unrelated Regression (SUR) suggested by Biorn (2004); and Hayes (2013) for unbalanced panel data to find the mediating effect government spending on poverty by channelizing the physical infrastructure; i.e. rail line transportation, for an unbalanced panel data set of 51 developing countries.

One the basis of obtained results, we reject the null hypothesis which states that Public spending has no statistically significant impact on poverty in the developing countries and conclude that public spending reduces poverty directly in a significant way in the selected developing countries.

From Table 7.1, the public spending has an inverse (-1.377) and significant impact on poverty through physical infrastructure; i.e. rail line as transportation in the selected panel countries. This outcome suggests that when public spending is raised by 1%, it reduces poverty by more than 1% i.e. (1.37%). It means that when public spending increases, it improves rail infrastructure and transportation facilities and people in the country. On one hand to invest in rail transportation, public spending is diversified towards these projects creating more jobs in the country enabling people to earn more income. On the other hand rail line infrastructure and latest rail transportation improves labor mobility in the country further improving the chances of better and more job s for people.

## Table 7.1

## The Impact of Government Spending on Poverty through the channel of Physical Infrastructure; i.e. Rail line as Transportation

| Variables | Model | |
|---|---|---|
| | Transportation (rail line in km) | Poverty (HCR) |
| Public Spending | 0.461*** | -1.377*** |
| | (0.000) | (0.000) |
| Transportation | | -0.0008*** |
| (rail line in km) | | (0.000) |
| Trade Openness | | -0.244*** |
| | | (0.003) |
| No. of Observations | 350 | 350 |
| No. of Countries | 51 | 51 |

Note: P-value of each coefficient is given in the parentheses. ***, ** and * represents the significance at 1%, 5% and 10% levels respectively.

With more and better jobs, people earn more income and consume more money on basic necessities which leads to reduce of poverty in the panel countries.

According to reports of Asian development Bank (2001); and Department for International Development, (2002), about 70% of investments in physical infrastructure i.e. transportation in the developing world are state financed, only 3% are from international aid and rest is from the private sectors of the concerned countries. Ali and Pernia, (2003) also stated that in modern world, the crucial role of physical infrastructure for poverty reduction has been widely recognized and it is accepted that strengthened institutions and good governance can play their role to transfer the benefits of public investments in physical infrastructure like transport and communication to the poor segments of country in the form of better and more employment opportunities. Reforms in public policies and diverting resources towards physical infrastructure like transport and communication that can improve living standards and reduce poverty in developing countries. There have been considerable evidences where efforts were made to evaluate theoretically as well

as empirically the contribution that physical infrastructure has made to economic growth and development. Ariyo and Jerome, (2004); and Calderon (2008) also came with same outcomes that with more public spending on road infrastructure and transportation reduces poverty. Some studies like Ogun (2010) and Estache and Wodon (2010) recognize that in modern world, attention from the impact of infrastructure on growth has shifted towards income inequality and poverty reduction.

Similarly, equation 3.19 from chapter 3 of this study shows the impact of public spending on physical infrastructure; i.e. rail transportation. From Table 7.1, this relation is positive (0.46) and significant suggesting that as public spending goes up by 1%, it increases physical infrastructure in the form of rail transportation by (0.46%) which in the second phase will reduce poverty level in the selected panel countries. In the same way, physical infrastructure; i.e. rail line as transportation has an inverse (-0.0008) and significant impact on poverty level. If rail transportation improves by 1%, it reduces poverty by (0.0008%). This relationship is quite weak but still with better rail transportation, poverty declines in the selected panel countries. Wu, et al., (2022) and Fan, et al., (2022) used rail line as physical infrastructure and as a determinant of poverty in Chinese region and concluded that improved physical infrastructure reduces poverty. According to World Bank reported (2009) that in the list of countries trading across boarder made through an indicator, many countries of the Sub Saharan region fall in the bottom 40% due to lack of proper transport and communication networks while (Jerome, 2011) concluded that, countries need a modern rail transportation as well as communication networks to enhance regional and international trade, to obtain economic growth and reduce poverty.

This study further incorporates some control variables in general model to capture their impact on poverty. Control variables are incorporated in each model and this study estimates final model by

omitting the insignificant variables through Thiel's criteria backward elimination method. Omitted variables did not show their statistical insignificance in the analysis and therefore they are excluded from analysis. From the obtained results, trade openness has an inverse (-0.244) and significant impact on poverty which means that if countries included in the study allow more international trade and open borders for regional trade by making less restrictions and tariffs on trade, poverty can be reduced in these economies. A 1% rise in trade openness leads to reduce poverty by (0.24%) in these panel countries. Trade openness and trade liberalization means that countries are either involved in free trade or they have minimum trade restrictions in the form of tariffs and quotas. With free or liberalized regional and international trade, on one hand more goods are produced and exported creating more employment opportunities for people in the economy enhancing earning possibilities for them. On the other hand it ensures the availability of cheaper goods and people of the trading countries can purchase them which leads to reduce chances of poverty.

### 7.2.2 Empirical Results of Indirect Effects of Model 4: The Impact of Government Spending on Poverty through the Mediator i.e. Rail line as Transportation for Developing Countries

This section comprises of empirical outcomes of indirect effects of model 4 where the impact of

government spending on poverty is found by channelizing it through physical infrastructure i.e. rail line as transportation for 52 developing countries.

Table 7.2 represents the indirect effect of public spending on poverty and this indirect effect of public spending on poverty channelizing through physical infrastructure is calculated using equation 3.22 from chapter 3.

## Table 7.2

## The Indirect Effects of Government Spending on Poverty through Physical Infrastructure; i.e. Rail line as Transportation

| Independent Variable | Channel | Dependent Variable | Indirect Effects | 95% Confidence Interval | |
|---|---|---|---|---|---|
| Public Spending | Physical infrastructure (Transportation/Rail line in km) | Poverty | -0.00037*** (0.000) | -0.00070 | -0.00023 |

Note: P-value of each coefficient is given in the parentheses. ***, ** and * represents the significance at 1%, 5% and 10% levels respectively.

Results show that we reject the null hypothesis which states that Public spending has no statistically significant impact on poverty through the channel of transportation in the developing countries and conclude that public spending significantly reduce poverty through the channel of transportation in the selected panel countries.

Table 7.2 shows that public spending affects poverty inversely (0.00037) and significantly. It means that when public spending increases, it improves rail line infrastructure transportation and as a result poverty declines. Although this impact is quite weak but still an improvement in rail transportation reduces poverty in the panel developed and developing countries. It further states that indirect effect of public spending on poverty through physical infrastructure i.e. rail line is more profound as compared to direct effect.

These results are estimated through seemingly unrelated regression (SUR) model for unbalanced panel data suggested by Biorn (2004) where equation 3.19 is differentiated partially with respect

to public spending and equation 3.20 is also differentiated partially with respect to transportation i.e. rail line to get equation 3.22 from chapter 3. These equations seem to be unrelated but they are actually related and can be calculated in a simultaneous way as suggested by Biorn (2004); and Hayes (2013). Figure 7.1 also confirms that public spending improves rail transportation but to a certain extent and beyond that level, public spending does not bring any further improvement in physical infrastructure i.e. rail transportation. Therefore, government spending reduces poverty if it is channelized through physical infrastructure i.e. rail transportation to a certain extent and beyond that point if public spending further goes up, it will not reduce poverty anymore. Theoretically this result suggests that initially, as the level of public spending goes up its impact on poverty reduction rises. In other words it could be stated that whatever the level of public spending is, it reduces poverty in the panel countries but with a prior condition of improving level of physical infrastructure i.e. rail line transportation that leads to reduce poverty but the effects gets stronger till the highest level of rail transportation. Wu et al. (2022) and Fan et al. (2022) used rail line as physical infrastructure and as a determinant of poverty in Chinese region and concluded that improved physical infrastructure reduces poverty.

## 7.3 Empirical Results for Model 4; The Impact of Government Spending on Poverty through Moderating effect of Physical Infrastructure i.e. Rail line as Transportation, for Developing Countries.

This section shows empirical results of Moderation Model 4 for a panel of 27 developing countries to find the impact of public spending on poverty (Head Count Ratio as poverty level) through the moderation effect of physical infrastructure; i.e. rail line as transportation. This section is subdivided into two sections. Section 7.3.1 represents model 4 for 27 developing countries to find the impact of government spending on poverty via the moderator i.e. rail line as transportation.

This section also shows result of Hausman specification test where it is specified that whether Fixed effects model is appropriate or Random effects model is appropriate. If Fixed effects model is selected for current panel data, it means that although the intercept in the model is may differ across countries but it does not vary over time i.e. it is time invariant while selecting Random effects model suggests that intercept of the model is time variant i.e. it may change over time. Section 7.3.2 explains the conditional effects of public spending on poverty for the selected panel countries.

### 7.3.1 Empirical Results of Model 4: The Impact of Government Spending on Poverty through the Moderator i.e. Rail line as Transportation for Developing Countries

This section comprises of empirical outcomes of moderation analysis of model 4 where the impact of government spending on poverty is found through the moderator i.e. rail line as transportation for 27 developing countries

Table 7.3 shows empirical results of the general and final Model 4 for a panel of 27 developing countries to find the impact of public spending on poverty (Head Count Ratio as poverty level) through the moderation effect of physical infrastructure; i.e. rail line as transportation. Fixed and random effects models are estimated to find the impact of public spending on poverty using physical infrastructure i.e. transportation (rail line) as moderator in this analysis. Number of countries declined from 52 to 27 due to the feature of Fixed and Random effects technique that they estimate for balanced panel data and data set contains only 27 cross sections with balanced time series. This Table 7.3 also shows result of Hausman specification test where it is specified that whether fixed effects (FE) model is appropriate or random effects (RE) model is suitable for the given data set. Using Hausman specification test having the null hypothesis that Random effects model is appropriate for the data set with alternative hypothesis that Fixed effects model is appropriate one. From Table 7.3 result of Hausman test suggests that Fixed effects model is more appropriate because P-value is (0.049) which means that null hypothesis is rejected and it is concluded that fixed effects model is to be selected for the given data set. It means that although the intercept in the model is may differ across countries but it does not vary over time i.e. it is time invariant.

Table 7.3 contains results from estimation of equation 3.23 of chapter 3 of this study. From the obtained results in the Table 7.3, the intercept is positive (14.856) and significant which means that that expected mean value of the dependent variable i.e. poverty is positive if all the independent variables are zero or they are omitted from the model. Table 7.3 also shows that public spending has an inverse (-0.855) and significant impact on poverty. It means that if public spending is raised by 1%, poverty decline by (0.85%) in the panel developing countries.

This outcome suggests that when public spending expands it leads to allocate more financial resources towards poverty alleviation programs that directly reduce poverty in these panel countries. Increase in public spending also helps to invest more in public goods like social infrastructure i.e. literacy and health sector, and physical infrastructure i.e. power generation and rail lines improvement, highways, irrigation and sanitation creating more employment opportunities for labors.

More and better job opportunities lead to higher income and high consumption on necessities and therefore, lesser chances of poverty which is the ultimate goal of public policy.

The relation between physical infrastructure i.e. rail line as transportation and poverty is although inverse (-0.24) but insignificant in the selected panel countries. It means when rail transportation improves by 1%, it reduces poverty by (0.24%) but this relationship is not significant in the panel countries. Reason behind this insignificance is that in developing countries, public spending are mostly diversified towards physical infrastructure like roads and transportation in the urban areas while rural areas are either ignored or very little attention is given while investing in rural infrastructure projects.

## Table 7.3

## The Impact of Government Spending on Poverty through Moderation of Physical Infrastructure; i.e. Rail line as Transportation

| Variables | Models (Poverty HCR is dependent variable ) | |
|---|---|---|
| | **Fixed Effects** | **Random Effects** |
| **Constant** | 14.856*** | 13.457*** |
| | (0.000) | (0.000) |
| **Public Spending (PS)** | -0.855*** | -0.898*** |
| | (0.001) | (0.000) |
| **Rail line as Transportation** | -0.244 | -0.111 |
| | (0.500) | (0.270) |
| **PS*Rail line/ Transportation** | 0.00006*** | 0.00007*** |
| | (0.000) | (0.000) |
| **Remittances** | -0.389*** | -0.360*** |
| | (0.000) | (0.000) |
| **Unemployment** | 0.040*** | 0.042*** |
| | (0.000) | (0.000) |
| **Trade Openness** | -0.0050** | -0.0033* |
| | (0.031) | (0.10) |
| **Inflation** | 0.0040*** | 0.0044*** |
| | (0.004) | (0.001) |
| **No. of Observations** | 147 | 147 |
| **No. of Countries** | 27 | 27 |
| **R-squared** | 0.200 | 0.210 |
| **Wald Chi$^2$** | | 367.97 |
| | | (0.000) |
| **F-statistic** | 39.06 | |
| | (0.000) | |
| **Hausman Test** | 12.62 | |
| **Chi$^2$ Statistic** | (0.049) | |

Note: P-value of each coefficient is given in the parentheses. ***, ** and * represents the significance at 1%, 5% and 10% levels respectively.

As a result rural areas in the developing countries lack physical infrastructure like rail lines and other transportation. Although governments spend on rail transportation but it does not affect poverty level in a significant way. Therefore, in the sampled panel countries, governments should

focus on the physical infrastructure like rail transportation in the urban as well as in the rural areas in order achieve the ultimate goal of poverty alleviation in these countries. Anyanwu and Erhijakpor, (2009) suggested that rail and other transportation affects poverty inversely and they suggested that physical infrastructure can be made further pro-poor by proper policy design and regulating as well as institutional reforms can help strengthening this impact and the ultimate goal of less poverty in the country can be achieved. Ogun, (2010) also suggested that while designing public policies regarding investing in public projects, attention should be given to social and physical infrastructure like, healthcare and education, energy and especially the rural and urban transport and communication networks because all of them have strong negative impact on poverty in the developing countries.

The moderation effect is captured in this model via interaction term for public spending and physical infrastructure, i.e. rail line as transportation (PS*Transportation). This interaction term (PS*Transportation) indicating the moderation effect having positive as well as significant value. As government spending and poverty are related inversely, so positive (0.00006) interaction term suggests that the impact of government spending on poverty reduction becomes weaker if the prior condition of improved physical infrastructure, i.e. rail line as transportation is fulfilled. But this outcome could be more clear with country specific effects where it is seen that countries with different levels of access to transportation, the effect of public spending on poverty would be different. This is also known as conditional effect of public spending on poverty. In other its can be stated that the inverse impact of public spending on poverty is not only more profound but also significant in countries with high level of physical infrastructure, i.e. rail transportation. This outcome is consistent with literature like Seetanah et al. (2009) confirmed that improved infrastructure i.e. rail line and rural roads and transportation reduced poverty although this link

was not much strong in case of urban transportation. It was suggested that subsidies on transport and communications are used widely to help the poor out but these subsidies cannot be limited to poor due to the dispersion of poor in urban areas which further makes it quite difficult for them to accomplish their needs regarding transportation. Therefore, some alternate schemes and programs be identified and implemented in urban areas to target urban poor. Having said that this conditional or moderation effect is positive but still it can be seen with the total derivative and therefore this conditional effect is presented in the next Table 7.4.

This study further incorporates some control variables in general model to capture their impact on poverty. Control variables are incorporated in each model and this study estimates final model by omitting the insignificant variables through Thiel's criteria backward elimination method. Omitted variables did not show their statistical insignificance in the analysis and therefore they are excluded from analysis.

In the final model, foreign remittances have significant impact on poverty in the panel countries. Foreign remittances although have an inverse (-0.389) and significant impact in the panel developing countries. It means that when there is a 1% increase in the inflow of foreign remittances, it will reduce poverty by (0.38%) in these panel countries. Remittances flow is more towards developing economies due to their major export of human resource. People who receive foreign remittances have more money to spend on basic necessities of life like food, clothing, shelter, basic health and education. When people have enough money from abroad and they can fulfill their basic needs and there are less chances of poverty. Similarly, unemployment is also found to have positive (0.040) and significant impact on poverty in the panel economies. It means that if unemployment rate rises by 1%, it will increase poverty level by (0.04%). Unemployment has been one of the major causes of poverty in most of the developing countries. When people are

jobless, their income and consumption levels fall and as a result they fall below poverty line. Chemingui, (2007) also came with the same results and concluded that unemployment needs to be addressed while coping with poverty in the developing countries.

In the same way, trade openness has an inverse (-0.005) and significant impact on poverty which means that if countries included in the study allow more international trade and open borders for regional trade by making less restrictions and tariffs on trade, poverty can be reduced in these economies. A 1% improvement in trade liberalization and openness leads to lower poverty by (0.005%) in these panel economies. Trade openness and trade liberalization means that countries are either involved in free trade or they have minimum trade restrictions in the form of tariffs and quotas. With free or liberalized regional and international trade, on one hand more goods are produced and exported creating more employment opportunities for people in the economy enhancing earning possibilities for them. On the other hand it ensures the availability of cheaper goods and people of the trading countries can purchase them which leads to reduce chances of poverty. Jerome, (2011), concluded that regional and international trade can help to reduce poverty in the developing countries. World Bank reported in (2009) that in the list of countries trading across boarder made through an indicator, many countries of the Sub Saharan region fall in the bottom 40% due to lack of proper transport and communication networks. Therefore, these regional countries need a modern transport and communication networks to enhance regional and international trade, obtain economic growth and reduce poverty. Inflation rate is also found to have positive (0.004) and significant impact on poverty in the panel economies. It means that if unemployment rate rises by 1%, it will increase poverty level by (0.004%) in the panel countries.

### 7.3.2 Empirical Results of Conditional Effects of Model 4: The Impact of Government Spending on Poverty through the Moderator i.e. Rail line as Transportation for developing countries

This section comprises of empirical outcomes of conditional effects of model 4 where the impact of government spending on poverty is found by channelizing this link through physical infrastructure i.e. rail line as transportation for 27 developing countries. Table 7.4 represents the conditional effects of public spending on poverty and these conditional effects of public spending on poverty through physical infrastructure are calculated by evaluating equation 3.24 from chapter 3.

**Table 7.4**

**The Conditional Effects of Government Spending on Poverty through Physical infrastructure, i.e. Rail line as Transportation**

| Independent Variable | Channel | Levels of Rail line (Transportation) | Conditional Effects | 95% Confidence Interval | |
|---|---|---|---|---|---|
| Public Spending | Physical infrastructure (Transportation) | Low level of Transportation | -0.890*** (0.000) | -1.302 | -0.494 |
| | | Average level of Transportation | -0.870*** (0.000) | -1.302 | -0.496 |
| | | High level of Transportation | -0.860*** (0.000) | -1.302 | -0.497 |

Note: P-value of each coefficient is given in the parentheses. ***, ** and * represents the significance at 1%, 5% and 10% levels respectively. Low means 25$^{th}$ percentile, average level is 50$^{th}$ percentile and high level shows 75$^{th}$ percentile levels of Public Spending respectively.

Table 7.4 represents conditional effects of government spending on poverty through physical infrastructure, i.e. rail line as transportation for Model 4 with moderation effect. To express the conditional effects, three categories of these effects are made i.e. low level, average level and high of physical infrastructure, i.e. transportation (rail line). Coefficients, P-Values and values for 95% confidence interval are presented in respective columns.

Logic behind these categories is that whatever the level of public spending is, if it does not have improved physical infrastructure i.e. transportation (rail line) as prior condition, it will not reduce poverty. These results are estimated through seemingly unrelated regression (SUR) technique for unbalanced panel data suggested by Biorn (2004) where equation 3.23 is differentiated with respect to public spending to get equation 3.24 from chapter 3.

The conditional effects of government spending on poverty through physical infrastructure, i.e. rail line as transportation at the low level is (-0.890), at middle level is (-0.870) and at high level is (-0.860). These conditional effects suggest that whatever level of public spending is, if it improves physical infrastructure i.e. rail transportation level in the first place, it will reduce poverty in the next phase. In other words, it suggests that the impact of government spending on poverty reduction gets stronger if the level of physical infrastructure, i.e. rail transportation improves with a rise in the level of public spending and these conditional effects are significant in this study. So it is concluded that the inverse impact of government spending on poverty is not only more profound but also significant in countries with high level of physical infrastructure, i.e. rail line as transportation.

This study further extends its empirical analysis for the whole world and therefore the panel data set is expanded to 76 countries. This panel data set includes both developed as well as developing

countries subjected to data availability. The purpose of expanding data set to 76 countries is to find the impact of government spending on poverty via the channels of physical infrastructure and to compare these results with the developing countries. The objective behind this comparison is to investigate the role of public spending to alleviate poverty through the mediating and moderating effect of physical infrastructure. Empirical results for 76 countries have been estimated for physical infrastructure i.e. rail line as transportation. Estimation results comprise of graphical analysis for panel data set of 76 countries; empirical outcomes for the mediation and moderation analysis as well the indirect and conditional effects of government spending on poverty through physical infrastructure i.e. rail line as transportation. All these graphical analysis and estimation results are reported in the appendix named appendix of chapter 7.

From mediation analysis of the extended panel data set for the whole world, results reveal that government spending has an inverse and significant impact on poverty through physical infrastructure; i.e. transportation in the panel countries. This outcome suggests that when public spending is increased, it reduces poverty in these countries. It means that when public spending increases, it improves road infrastructure and transportation facilities and people in the country. On one hand to invest in transportation and road infrastructure, public spending is diversified towards these projects creating more jobs in the country enabling people to earn more income. On the other hand road infrastructure and better transportation improves labor mobility in the country further improving the chances of better and more job s for people. With more and better jobs, people earn more income and consume more money on basic necessities which leads to reduce of poverty in the panel countries. According to reports of Asian development Bank (2001); and Department for International Development (2002), about 70% of investments in physical infrastructure i.e. roads and transportation in the developing world are state financed, only 3% are

from international aid and rest is from the private sectors of the concerned countries. Ali and Pernia, (2003) also stated that in modern world, the crucial role of physical infrastructure for poverty reduction has been widely recognized and it is accepted that strengthened institutions and good governance can play their role to transfer the benefits of public investments in physical infrastructure like transport and communication to the poor segments of country in the form of better and more employment opportunities. Reforms in public policies and diverting resources towards physical infrastructure like transport and communication that can improve living standards and reduce poverty in developing countries. There have been considerable evidences where efforts were made to evaluate theoretically as well as empirically the contribution that physical infrastructure has made to economic growth and development. Ariyo and Jerome, (2004); and Calderon (2008) also came with same outcomes that with more public spending on road infrastructure and transportation reduces poverty. Some studies like Ogun (2010) and Estache and Wodon (2010) recognize that in modern world, attention from the impact of infrastructure on growth has shifted towards income inequality and poverty reduction.

Similarly, this section of the study also shows the impact of public spending on physical infrastructure; i.e. transportation is positive and significant suggesting that as public spending goes, it increases physical infrastructure in the form of transportation which in the second phase will reduce poverty level in the panel countries. In the same way, physical infrastructure; i.e. transportation has an inverse and significant impact on poverty level. If transportation improves, it reduces poverty and this relationship is although quite weak but still positive and with better roads and transportation, poverty declines in the selected panel countries.

This section of the study further incorporates some control variables in general model to capture their impact on poverty and the final model is obtained by omitting the insignificant variables.

From the obtained results, unemployment has a positive and significant impact on poverty which means that with a rise in unemployment level, poverty in these panel economies goes up. It means that with the rise in unemployment, people lose their jobs and their income fall. When income of the people fall they cannot fulfill their basic necessities and they fall under the poverty line. Therefore, unemployment is one the reasons of poverty in these panel economies. Ali and Pernia (2003) suggested that reforms in public policies and diverting resources towards physical infrastructure like transport and communication that can create employment opportunities for labors, improving their living standards and reduce poverty in developing countries.

Indirect effects of mediation analysis also exhibit that when public spending goes up, it improves transportation (rail line) in the first stage and then improved level of transportation reduces poverty in the second stage in the selected panel countries. Moderation analysis reveals that public spending and transportation (rail line) both reduce poverty directly while as a moderator, transportation also plays its vital role in poverty reduction in the panel countries.

In the same way the conditional effects of transportation (rail line) as a moderator also confirms that public spending leads to reduce poverty in the presence of high level of transportation as prior condition in these panel countries. This outcome is also confirmed for developing countries and presented in this chapter.

Summarizing that the impact of government spending on poverty for developing countries through the channels of physical infrastructure i.e. rail line as transportation, graphical analysis as well mediating and moderating analysis along with indirect and conditional effects, empirical results support that government spending can reduce poverty in a direct as well as indirect way in the panel of developing countries. Physical infrastructure i.e. rail line as transportation plays its role

as mediator when public spending is used to reduce poverty and this link is also confirmed by the indirect effect of government spending on poverty where transportation is used as channel for poverty reduction. As far as the moderation analysis is concerned, it is observed from the result outcomes that transportation (rail line) does not play its role as moderator to reduce poverty in the developing countries but conditional effects of public spending on poverty shows a significant relation of public spending and poverty with transportation as prior condition. All these above analysis are also carried out for the extended panel data set of 76 countries around the world and estimation results confirm that physical infrastructure i.e. rail line as transportation plays its crucial role as mediator as well moderator to reduce poverty in the panel countries and these outcomes are consistent with the analysis made for developing countries as well.

# Chapter VIII

# Conclusion and Policy Implications

This chapter elaborates the conclusions and policy implications of this study. This chapter is subdivided into two sections. Section 8.1, represents conclusions of the study while section 8.2 explains the policy implications presented on the basis of this study.

## 8.1 Conclusions

This section concludes about the impact of public spending on poverty through the channels of social as well as physical infrastructure for developing countries. Social infrastructures comprise of two variables i.e. literacy rate and health expenditures. Similarly, the physical infrastructure also represents two variables i.e. access to electricity as energy and rail line in kilometers as transportation.

On the basis of empirical analysis carried out to find the impact of public spending on poverty for the panel of developing countries through the channel of social infrastructure i.e. literacy rate, this study concludes that public spending reduces poverty directly as well as indirectly. This study further concludes that the mediating and moderating role of social infrastructure i.e. literacy rate is also significant in case of developing countries.

This study further concludes on the basis of empirical analysis carried out to find the impact of public spending on poverty for the panel of developing countries through the channel of social infrastructure i.e. health expenditures, that public spending reduces poverty directly as well as indirectly. As far as the mediating and moderating role of social infrastructure i.e. health

expenditures is concerned, it is concluded that in case of developing countries, health expenditures reduce poverty by playing its role as mediator as well as moderator.

From the obtained mediation results, this study concludes that in social infrastructure, education is relatively more effective to eradicate poverty in the developing countries as compared to health expenditures, which means that the mediating role of education is found to be more profound in the selected countries as compared to health.

In case of extended panel data set of 77 countries around the world, it is also concluded that social infrastructure i.e. literacy rate plays its vital role to reduce poverty. It is further concluded that social infrastructure i.e. literacy rate also plays its crucial role as mediator as well moderator in the poverty reduction in the selected panel of developed and developing countries.

Similarly, for extended panel data set of 77 for the whole world, this study concludes that public spending reduces poverty in a direct and indirect way. It is further concluded that social infrastructure i.e. health expenditures also plays its crucial role as mediator as well moderator in the poverty reduction in the selected panel of developed and developing countries around the world.

Similarly, talking about the empirical analysis carried out to find the impact of public spending on poverty for the panel of developing countries through the channel of physical infrastructure i.e. energy (access to electricity), this study concludes that public spending reduces poverty directly as well as indirectly. In case of mediating and moderating role of physical infrastructure i.e. energy, it is further concluded that this channel is also significant in case of panel developing countries and access to electricity as moderator further strengthens this channel.

In the same way, after empirically analyzing the impact of government spending on poverty for developing countries through the channels of physical infrastructure i.e. rail line as transportation, this study concludes that government spending can lead to reduce poverty in a direct as well as indirect way in the panel of developing countries. It is further concluded that physical infrastructure i.e. transportation plays its role as mediator when public spending is used to reduce poverty and this link is also confirmed by the indirect effect of government spending on poverty where transportation is used as channel for poverty reduction. As far as the moderation analysis is concerned, it is observed from the result outcomes that transportation (rail line) does not play its direct role to reduce poverty in the developing countries but conditional effects of public spending on poverty shows an inverse relation between the two. On the basis of this analysis it is concluded that although the indirect effect of government spending on poverty is significant in the case of developing countries but as moderator, it strengthens the relation between government spending and poverty.

Similarly, on the basis of mediation results of physical infrastructure this study further concludes that access to energy is more effective in reducing poverty in the panel developing countries as compared to transportation. It means that the mediating role of access to energy is found to be more profound as compared to transportation in these countries.

In the same way, on the basis of obtained outcomes for moderating variables i.e. social and physical infrastructure, this study concludes that although the country specific effects of both social and physical infrastructure are found effective in the selected panel countries. But the role of health is more profound in these countries among all the moderating variables i.e. education, health, energy and transportation.

When same analysis was carried out for the extended panel data set of 77 developed as well as developing countries selected from around the world, it is also concluded that public spending affects poverty inversely in a direct and indirect way. This study further concludes that physical infrastructure i.e. access to electricity also plays its important role as mediator to reduce poverty in the panel developed and developing countries. In the same way, access to electricity also improves the impact of public spending on poverty by playing its role as moderator.

After carrying out the direct and indirect analysis for the extended panel data set of 76 countries around the world, on the basis of estimation results this study concludes that physical infrastructure i.e. transportation plays its important role as mediator as well moderator to reduce poverty in the panel countries and these outcomes are consistent with the analysis made for developing countries as well.

This study further concludes that some control variables like foreign remittances, unemployment, trade openness, population growth, GDP growth rate and inflation rate also affect poverty in the developed as well as in the developing countries. From the results of this study, it is concluded that foreign remittances, trade openness and GDP growth reduces poverty in developed and developing countries. On the basis of results, it is also concluded that unemployment, population growth and inflation are responsible for high level of poverty in the panel countries.

Comparing the direct as well as indirect effectiveness of public spending on poverty through the channels of social and physical infrastructure, this study concludes that in case of education; the indirect effect is strong than direct effect of public spending; in case of health, the direct effect is strong than indirect; in case of energy as well as transportation, the direct effects are stronger than indirect effects.

All the direct as well as indirect effects are highly significant i.e. at 1% level of significance except the direct effect of public spending on poverty in case of physical infrastructure, i.e. energy which is significant at 5% level of significance. Similarly, all the mediators as well as moderators are highly significant i.e. at 1% level of significance except education where as moderator, education variables is significant at 5% level of significance.

## 8.2 Policy Implications

This section presents the policy implications of this study. These policy implications are suggested on the basis of conclusions drawn about the role of government spending plays to reduce poverty through the channels of social and physical infrastructure. Policy implications of this study are as follows;

i. Developing countries should implement government budgeted social safety nets programs like in Pakistan Benazir Income Support Program (BISP), Pakistan Bait-ul-Mal (PBM), Employees Old Age Benefit Institution (EOBI) and Workers Welfare Fund (WWF), to eradicate poverty alleviation programs in the developed as well as developing countries. Some other programs like; universal cash transfer, conditional and unconditional etc could also be used for poverty reduction in developing countries. These Social Safety Net programs could be used as channels for poverty reduction in developing countries.

ii. Similarly, public sector should initiate programs like free education or health services, or fee waivers Exemption from payment for essential services so the poor can obtain free health care and education even where fees are charged in the developing countries.

Like in case of Pakistan, foundation schools, schools supported by NGOs and Danish schools in Punjab. For free health, Sehat Sahulat program, charity hospitals etc.

iii. In the same way public sector in the developing countries should also initiate programs with the public private partnership to encourage electrification in rural areas making electricity more accessible for individuals for domestic as well as commercial use. Governments should also encourage NGOs to provide solar system to individuals and rural areas making electricity more accessible to individuals for domestic and commercial use so people can bring themselves out of poverty.

iv. Likewise, governments in the developing countries should initiate public private partnership programs for transportation making is more accessible for people to enhance mobility of labors, reducing transportation costs of goods and services and increasing overall production in the country and on the other hand it can also generate employment opportunities for people further improving their earnings and declining poverty in the developed as well as developing countries.

v. It is also commended that governments in the developing countries should make policies increasing foreign remittances inflow, enhancing trade openness and further to increase GDP growth so it will also help reducing poverty. It is further recommended that public policies can also be used as tool to generate employment, slow down population growth and control inflation in the developed and developing countries because these factors are also found responsible for high level of poverty.

## 8.3 Directions for Future Study

This study uses social infrastructure i.e. education and health and physical infrastructure i.e. energy and transportation as mediators and moderators to find the impact of public spending on poverty in developing countries.

As directions for future, some comprehensive studies can be conducted filling the gap using other social infrastructure like; public housing schemes, drinking water and sanitation as channels to reduce poverty in the developing countries.

In the same way, studies can also be conducted using some other physical infrastructure like road infrastructure, projects of mass transit, irrigation, telecommunication which can be used as channels to cope with poverty in the developing countries.

Public private partnership could be an effective tool in the developing countries where these social and physical infrastructure and use them as channels to eradicate poverty.

## 8.4 Limitations of the study

There are some limitations of this study like;

I. This study was conducted for the selected developing countries and the number of countries was subject to the availability of data for all the variables used in the study.
II. Due to lack of time, this study used only four channels two from social and two from physical infrastructure. Some other channels can also be explored as given in the future study directions.

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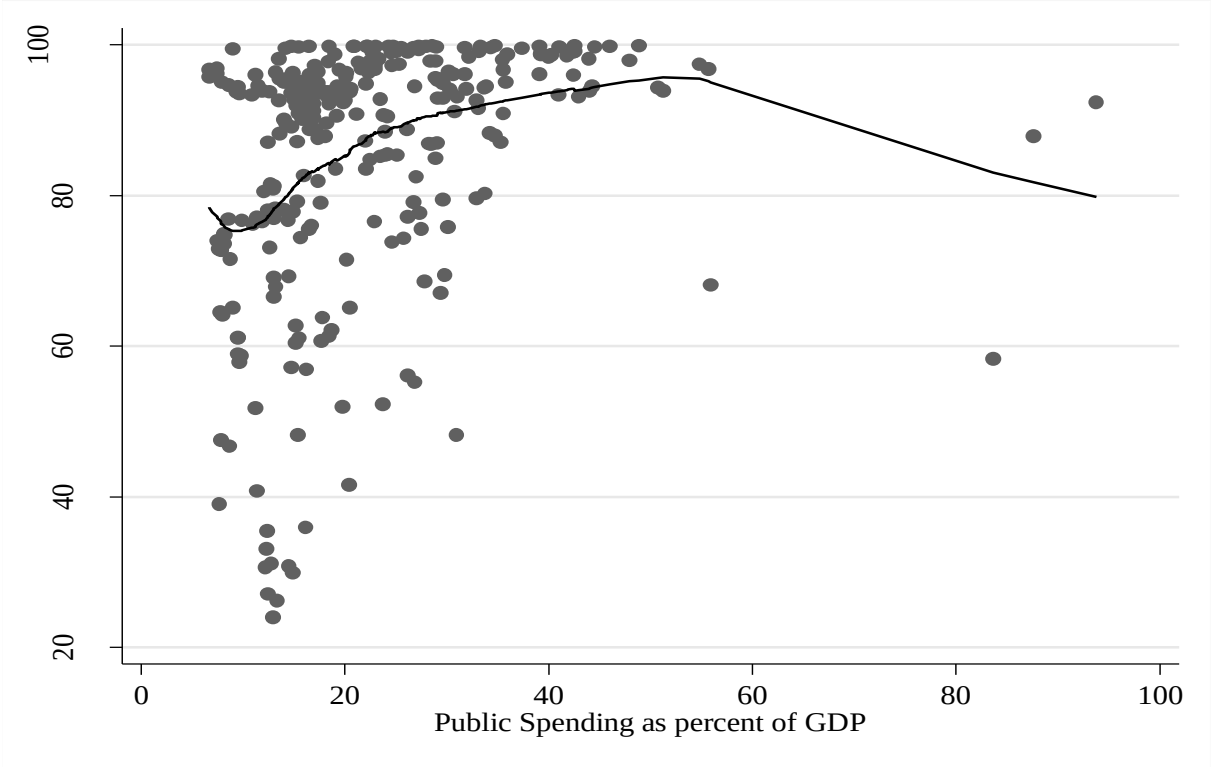
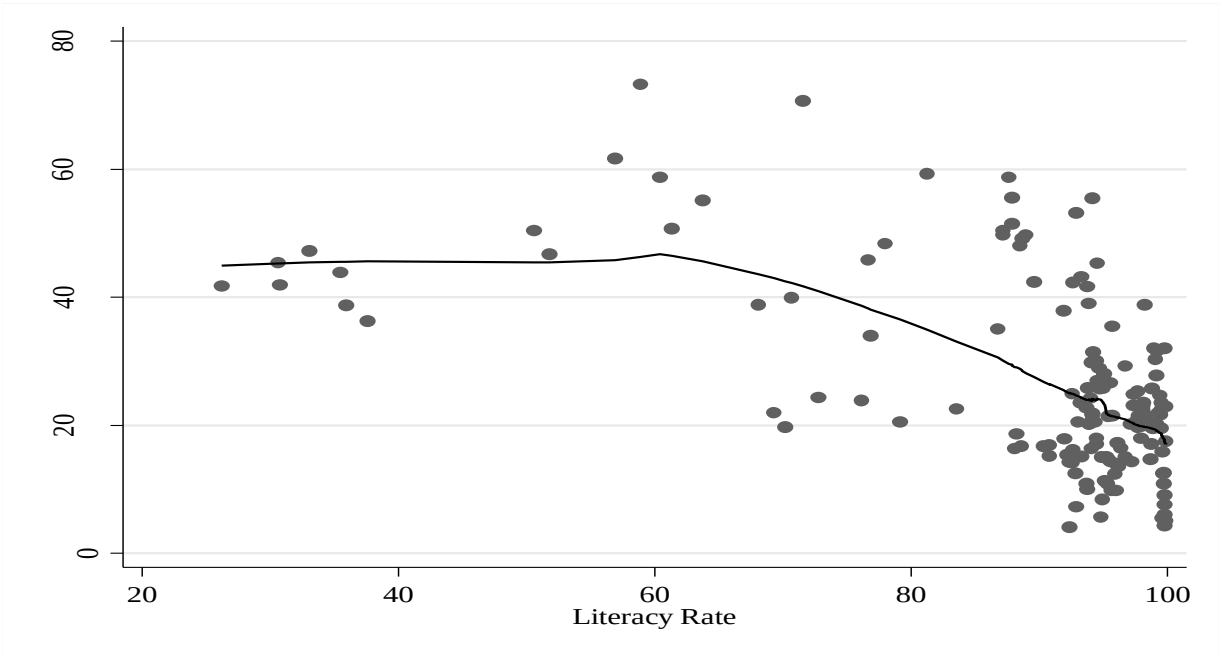
## Appendices for Chapter 4

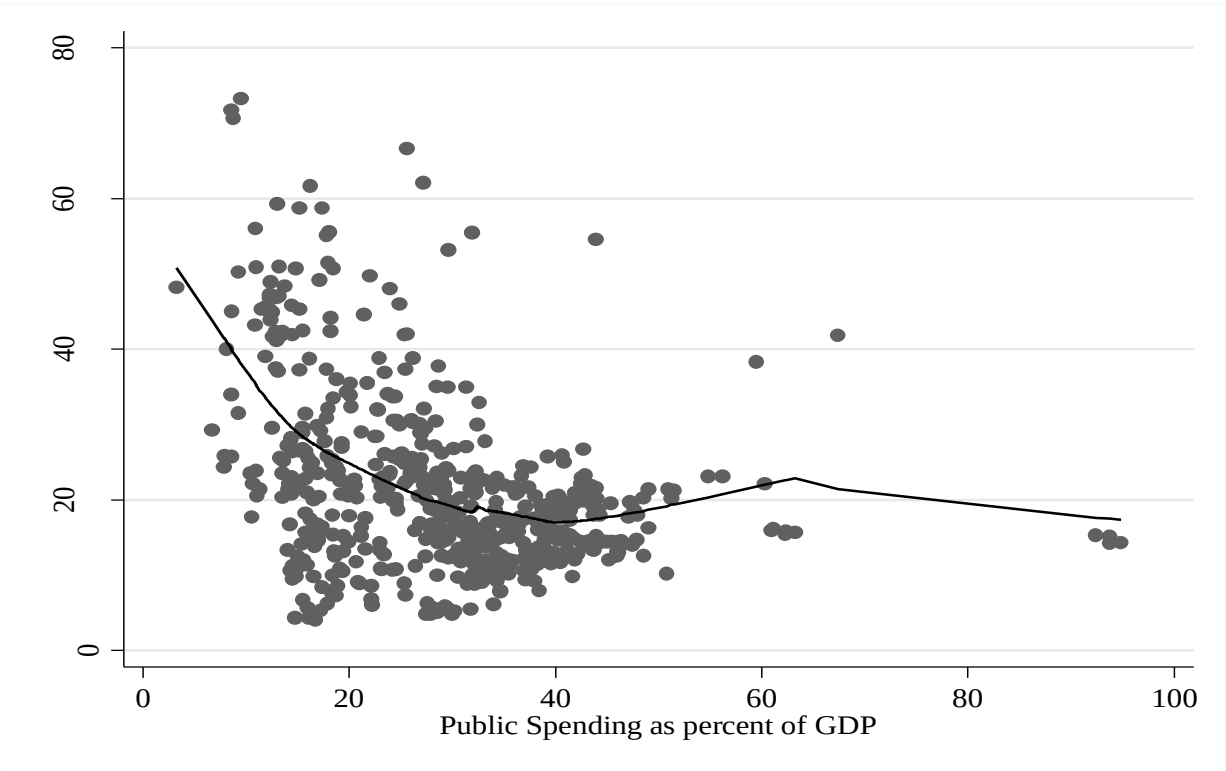
Appendix 4.1 Figure: Correlation between Public Spending and Literacy Rate for 77 Developed and Developing Countries




Appendix 4.2 Figure: Correlation between Literacy rate and Poverty for 77 Developed and Developing Countries




Appendix 4.3 Figure: Correlation between Public Spending and Poverty for 77 Developed and Developing Countries



Appendix 4.4 Table: Impact of Public Spending on Poverty through the channel of Social Infrastructure; i.e. Literacy rate for 77 Developed and Developing Countries

| Variables | Model | |
|---|---|---|
| | Literacy rate | Poverty (HCR) |
| Public Spending | 0.643*** | -0.095*** |
| | (0.000) | (0.000) |
| Literacy rate | | -0.015*** |
| | | (0.000) |
| Unemployment | | 0.107*** |
| | | (0.000) |
| Trade openness | | -0.108*** |
| | | (0.000) |
| Population growth | | 0.171*** |
| | | (0.000) |
| GDP growth | | -0.046*** |
| | | (0.000) |
| Inflation | | 0.088*** |
| | | (0.000) |
| No. of Observations | 410 | 410 |
| No. of Countries | 77 | 77 |

Note: P-value of each coefficient is given in the parentheses. ***, ** and * represents the significance at 1%, 5% and 10% levels respectively.

Appendix 4.5 Table: Indirect Effects of Public Spending on Poverty through social Infrastructure; i.e. Literacy rate for 77 Developed and Developing Countries

| Independent Variable | Channel | Dependent Variable | Indirect Effects | 95% Confidence Interval | |
|---|---|---|---|---|---|
| Public Spending | Social infrastructure (Literacy rate) | Poverty | -0.00977*** (0.000) | -.0120746 | -.0074821 |

Note: P-value of each coefficient is given in the parentheses. ***, ** and * represents the significance at 1%, 5% and 10% levels respectively.

Appendix 4.6 Table: Impact of Public Spending on Poverty through Moderation of Social Infrastructure; i.e. Literacy rate for 77 Developed and Developing Countries

| Variables | Models (Poverty HCR is dependent variable ) | |
|---|---|---|
| | Fixed Effects | Random Effects |
| Constant | 13.912*** | 10.575*** |
| | (0.000) | (0.000) |
| Public Spending (PS) | -6.131*** | -6.110*** |
| | (0.001) | (0.002) |
| Literacy rate | -0.097*** | -0.075*** |
| | (0.007) | (0.001) |
| PS*Literacy rate | 1.184*** | 1.280*** |
| | (0.004) | (0.004) |

| | | |
|---|---|---|
| Unemployment | 0.043***<br>(0.008) | 0.040***<br>(0.001) |
| No. of Observations | 268 | 268 |
| No. of Countries | 48 | 48 |
| R-squared | 0.342 | 0.355 |
| Wald $Chi^2$ | | 51.72<br>(0.000) |
| F-statistic | | 9.86<br>(0.000) |
| Hausman Test<br>$Chi^2$ Statistic | 15.20 (0.004) | |

Note: P-value of each coefficient is given in the parentheses. ***, ** and * represents the significance at 1%, 5% and 10% levels respectively.

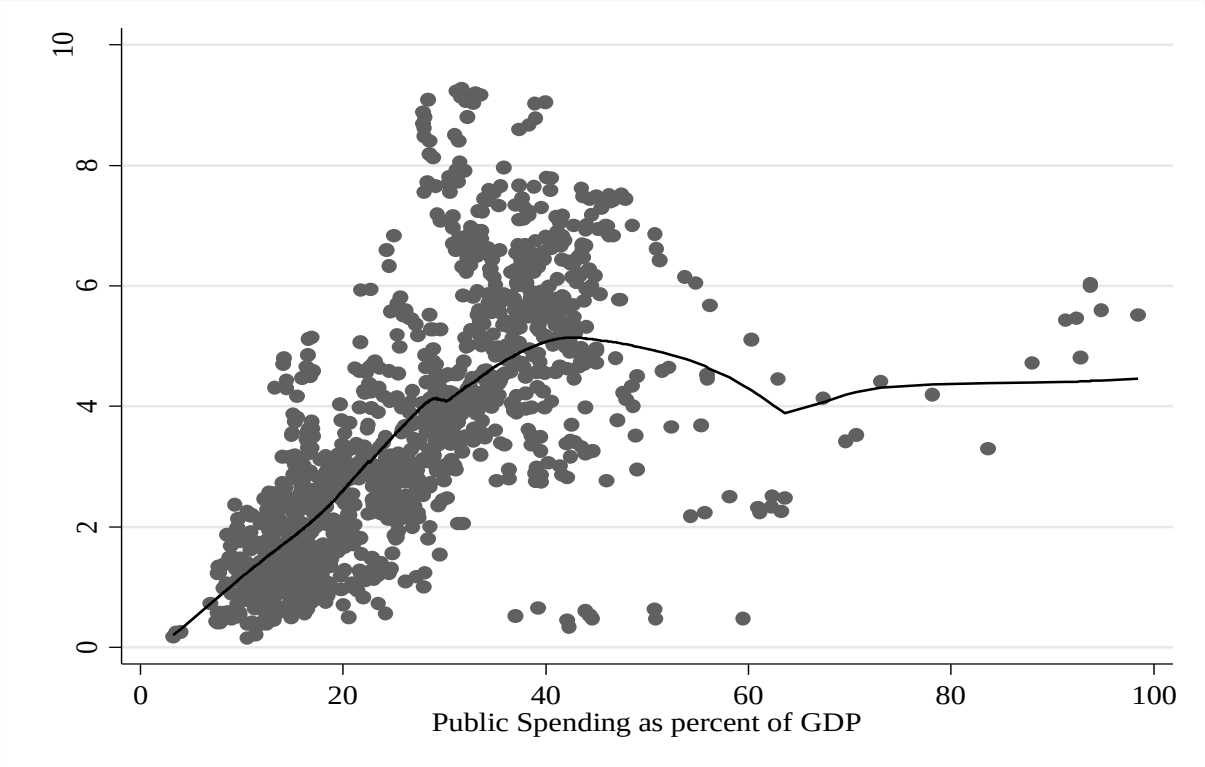
Appendix 4.7 Table: Conditional Effects of Public Spending on Poverty through social infrastructure, i.e. Literacy rate for 77 Developed and Developing Countries

| Independent Variable | Channel | Levels of Literacy | Indirect Effects | 95% Confidence Interval | |
|---|---|---|---|---|---|
| PS | Social infrastructure (Literacy rate) | Low level of Literacy | -2.521***<br>(0.001) | -3.971 | -1.071 |
| | | Average level of Literacy | -1.931***<br>(0.000) | -3.001 | -0.861 |
| | | High level of Literacy | -1.524***<br>(0.000) | -2.342 | -0.705 |

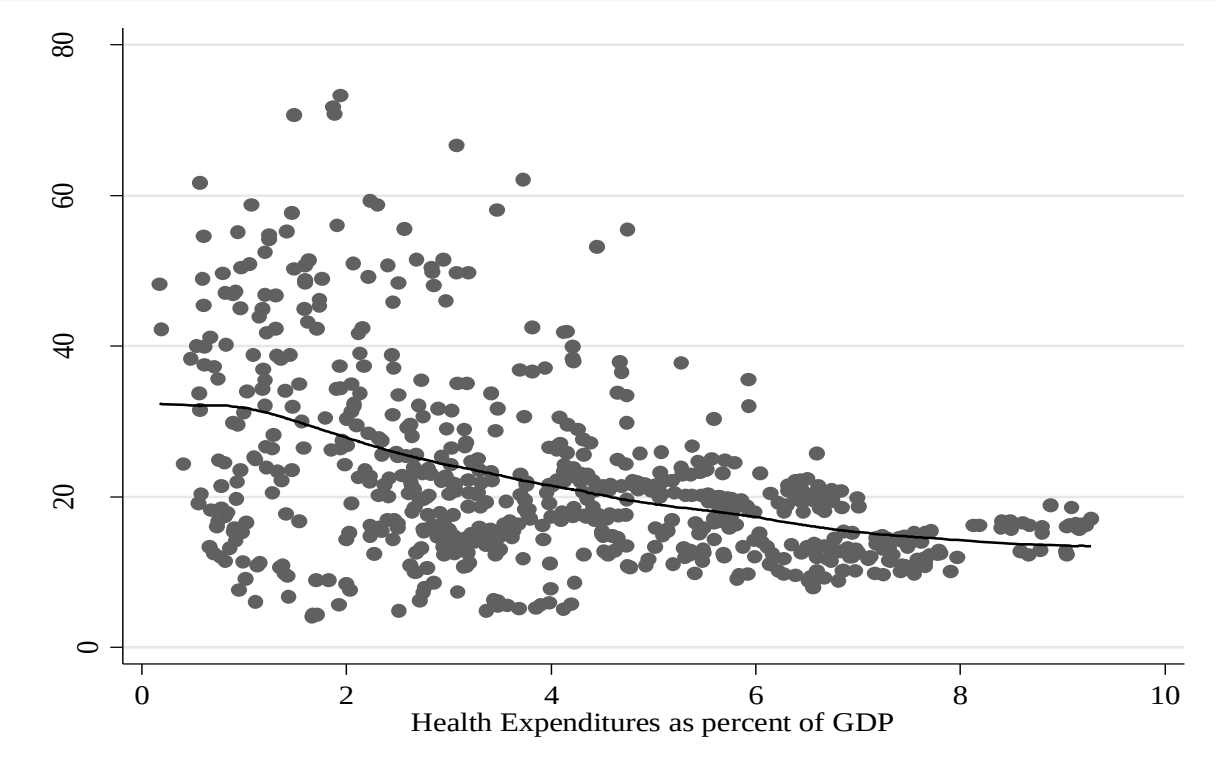
Note: P-value of each coefficient is given in the parentheses. ***, ** and * represents the significance at 1%, 5% and 10% levels respectively. Low means $25^{th}$ percentile, average level is $50^{th}$ percentile and high level shows $75^{th}$ percentile levels of Public Spending respectively.

# Appendices for Chapter 5

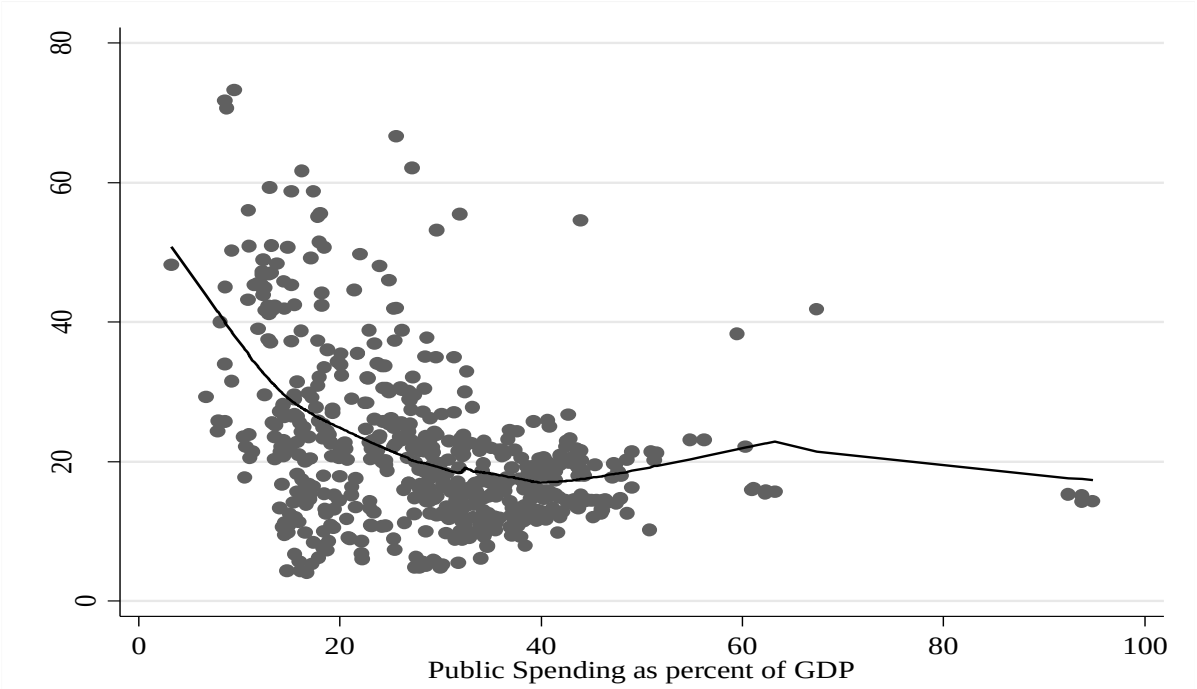
Appendix 5.1 Figure: Correlation between Public Spending and Health Expenditures for 77 Developed and Developing Countries



Appendix 5.2 Figure: Correlation between Health Expenditures and Poverty for 77 Developed and Developing Countries




Appendix 5.3 Figure: Correlation between Public Spending and Poverty for 77 Developed and Developing Countries



Appendix 5.4 Table: Impact of Public Spending on Poverty through the channel of Social Infrastructure; i.e. Health Expenditures for 77 Developed and Developing Countries

| Variables | Model | |
|---|---|---|
| | Health | Poverty (HCR) |
| Public Spending | 1.285*** | -0.949*** |
| | (0.000) | (0.000) |
| Health Expenditures | | -0.177* |
| | | (0.092) |
| Unemployment | | 0.112*** |
| | | (0.000) |
| Trade openness | | -0.584*** |
| | | (0.000) |
| Population growth | | 0.161*** |
| | | (0.000) |
| No. of Observations | 599 | 599 |
| No. of Countries | 77 | 77 |

Note: P-value of each coefficient is given in the parentheses. ***, ** and * represents the significance at 1%, 5% and 10% levels respectively.

Appendix 5.5 Table: Indirect Effects of Public Spending on Poverty through social Infrastructure; i.e. Health Expenditures for 77 Developed and Developing Countries

| Independent Variable | Channel | Dependent Variable | Indirect Effects | 95% Confidence Interval | |
|---|---|---|---|---|---|
| Public Spending | Social infrastructure (Health Expenditures) | Poverty | -0.228* (0.093) | -0.493 | 0.038 |

Note: P-value of each coefficient is given in the parentheses. ***, ** and * represents the significance at 1%, 5% and 10% levels respectively.

Appendix 5.6 Table: Impact of Public Spending on Poverty through Moderation of Social Infrastructure; i.e. Health Expenditures for 77 Developed and Developing Countries

| Variables | Models (Poverty HCR is dependent variable ) | |
|---|---|---|
| | Fixed Effects | Random Effects |
| Constant | 3.856*** | 3.908*** |
| | (0.000) | (0.000) |
| Public Spending (PS) | -0.339*** | -0.246*** |
| | (0.008) | (0.002) |
| Health Expenditures | -0.219* | -0.201* |
| | (0.0850) | (0.092) |
| PS*Health Exp | -0.021* | -0.013* |
| | (0.090) | (0.094) |
| Unemployment | 0.022*** | 0.023*** |
| | (0.000) | (0.000) |
| No. of Observations | 599 | 599 |
| No. of Countries | 73 | 73 |
| R-squared | 0.231 | 0.239 |
| Wald $Chi^2$ | | 85.60 (0.000) |
| F-statistic | 22.39 (0.000) | |
| Hausman Test $Chi^2$ Statistic | 1.42 (0.840) | |

Note: P-value of each coefficient is given in the parentheses. ***, ** and * represents the significance at 1%, 5% and 10% levels respectively.

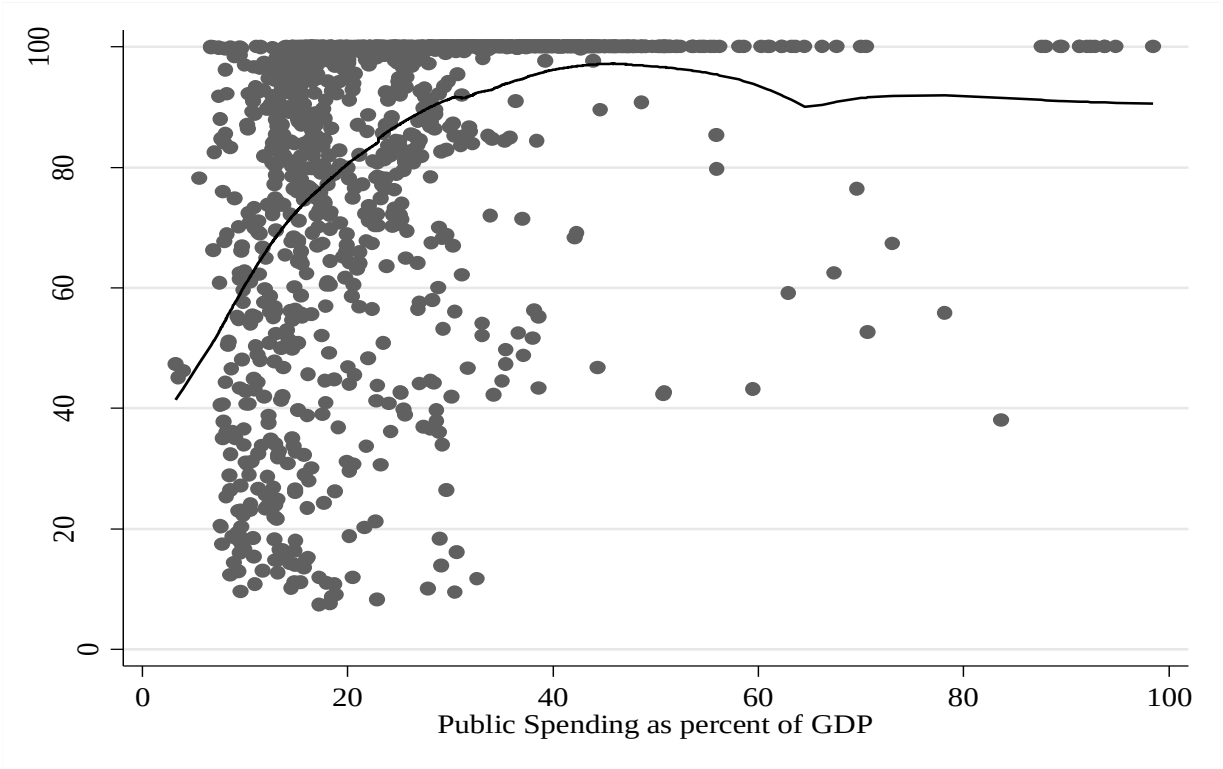
Appendix 5.7 Table: Conditional Effects of Public Spending on Poverty through social infrastructure, i.e. Health Expenditures for 77 Developed and Developing Countries

| Independent Variable | Channel | Levels of Health Exp | Indirect Effects | 95% Confidence Interval | |
|---|---|---|---|---|---|
| Public Spending | Social infrastructure (Health) | Low level of Health Exp | -0.283** (0.022) | -0.524 | -0.041 |
| | | Average level of Health Exp | -0.288** (0.041) | -0.565 | -0.012 |
| | | High level of Health Exp | -0.293** (0.057) | -0.595 | -0.009 |

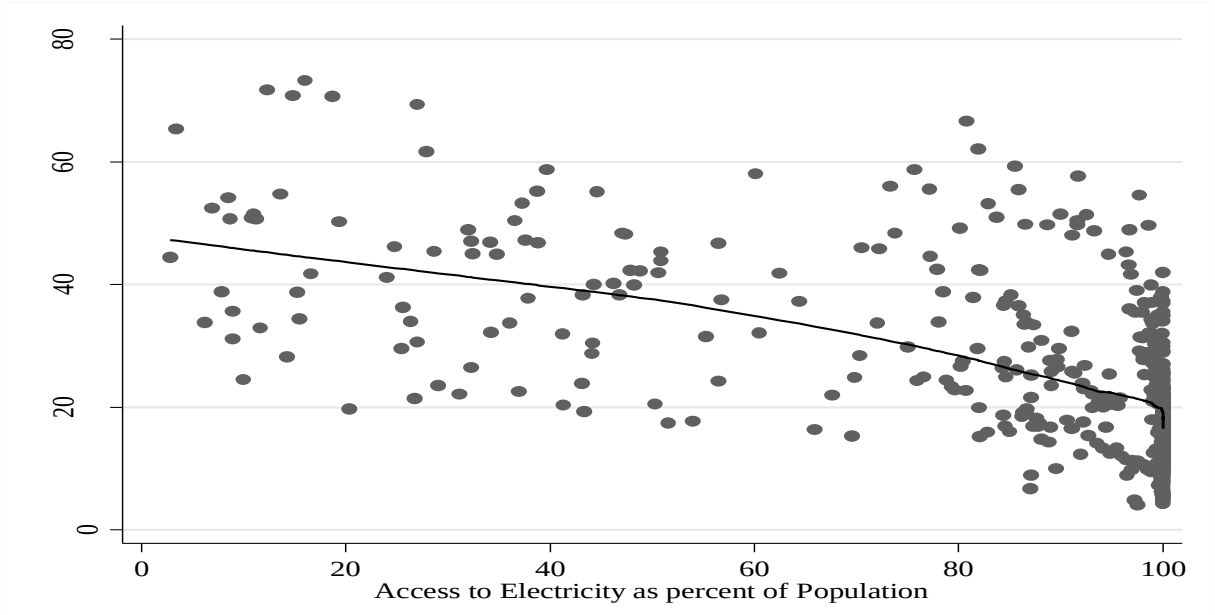
Note: P-value of each coefficient is given in the parentheses. ***, ** and * represents the significance at 1%, 5% and 10% levels respectively. Low means $25^{th}$ percentile, average level is $50^{th}$ percentile and high level shows $75^{th}$ percentile levels of Public Spending respectively.

# Appendices for Chapter 6

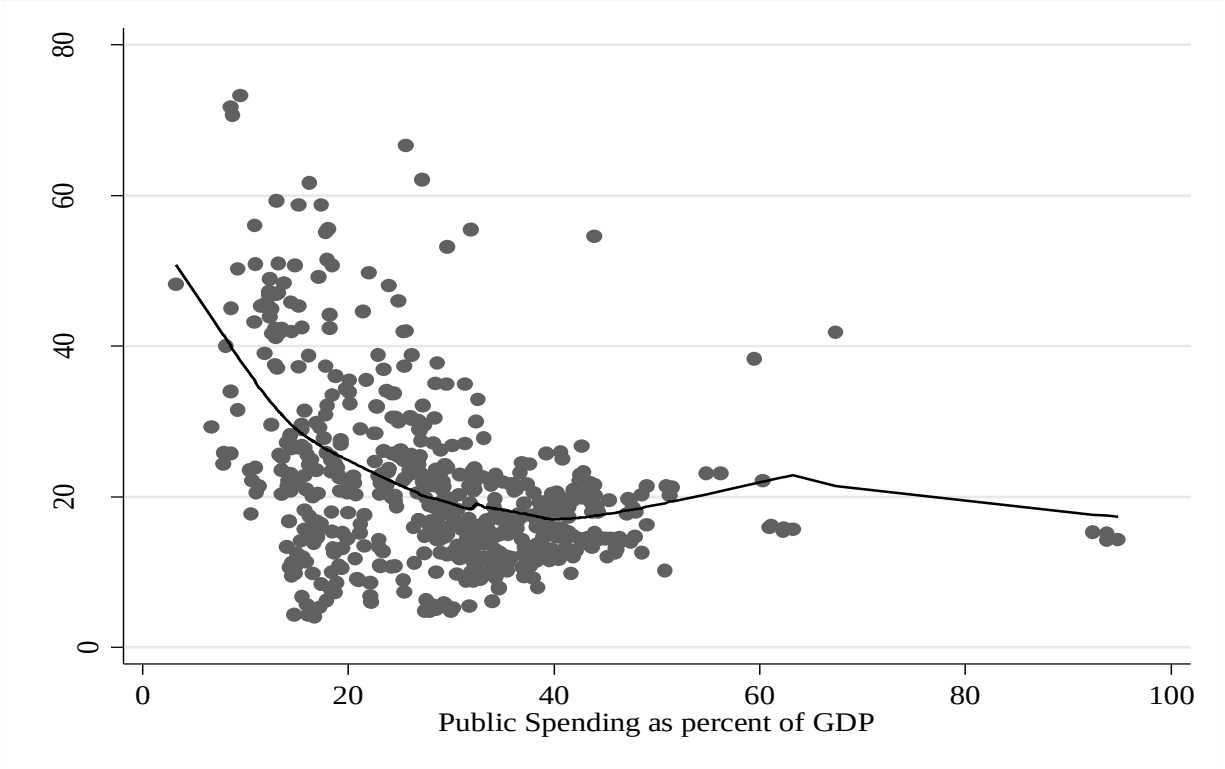
Appendix 6.1 Figure: Correlation between Public Spending and Access to Electricity for 77 Developed and Developing Countries




Appendix 6.2 Figure: Correlation between Access to Electricity and Poverty for 77 Developed and Developing Countries



Appendix 6.3 Figure: Correlation between Public Spending and Poverty for 77 Developed and Developing Countries




Appendix 6.4 Table: Impact of Public Spending on Poverty through the channel of Physical Infrastructure; i.e. Access to Electricity for 77 Developed and Developing Countries

| Variables | Model | |
|---|---|---|
| | Access to Electricity | Poverty (HCR) |
| Public Spending | 1.652** | -0.837*** |
| | (0.032) | (0.008) |
| Access to Electricity | | -0.371*** |
| | | (0.000) |
| Remittances | | -0.421*** |
| | | (0.000) |
| Unemployment | | 0.018*** |
| | | (0.000) |
| Trade openness | | -0.700*** |
| | | (0.000) |
| No. of Observations | 458 | 458 |
| No. of Countries | 76 | 76 |

Note: P-value of each coefficient is given in the parentheses. ***, ** and * represents the significance at 1%, 5% and 10% levels respectively.

Appendix 6.5 Table: Indirect Effects of Public Spending on Poverty through Physical Infrastructure; i.e. Access to Electricity for 77 Developed and Developing Countries

| Independent Variable | Channel | Dependent Variable | Indirect Effects | 95% Confidence Interval | |
|---|---|---|---|---|---|
| Public Spending | Physical Infrastructure (Access to Electricity) | Poverty | 0.612** (0.032) | 0.052 | 1.172 |

Note: P-value of each coefficient is given in the parentheses. ***, ** and * represents the significance at 1%, 5% and 10% levels respectively.

Appendix 6.6 Table: Impact of Public Spending on Poverty through Moderation of physical Infrastructure; i.e. Access to Electricity for 77 Developed and Developing Countries

| Variables | Models (Poverty HCR is dependent variable ) | |
|---|---|---|
| | Fixed Effects | Random Effects |
| Constant | 145.92*** (0.000) | 138.122*** (0.000) |
| Public Spending (PS) | -1.316*** (0.000) | -1.102*** (0.000) |
| Access to Electricity | -0.558*** (0.000) | -0.483*** (0.000) |
| PS*Access to Electricity | 0.013*** (0.000) | 0.010*** (0.000) |
| Remittances | -3.397*** (0.000) | -3.310*** (0.000) |
| Inflation | 0.162*** (0.000) | 0.164*** (0.000) |
| No. of Observations | 620 | 620 |
| No. of Countries | 73 | 73 |
| R-squared | 0.348 | 0.340 |
| Wald $Chi^2$ | | 518.68 (0.000) |
| F-statistic | 38.33 (0.000) | |
| Hausman Test $Chi^2$ Statistic | 20.20 (0.001) | |

Note: P-value of each coefficient is given in the parentheses. ***, ** and * represents the significance at 1%, 5% and 10% levels respectively.

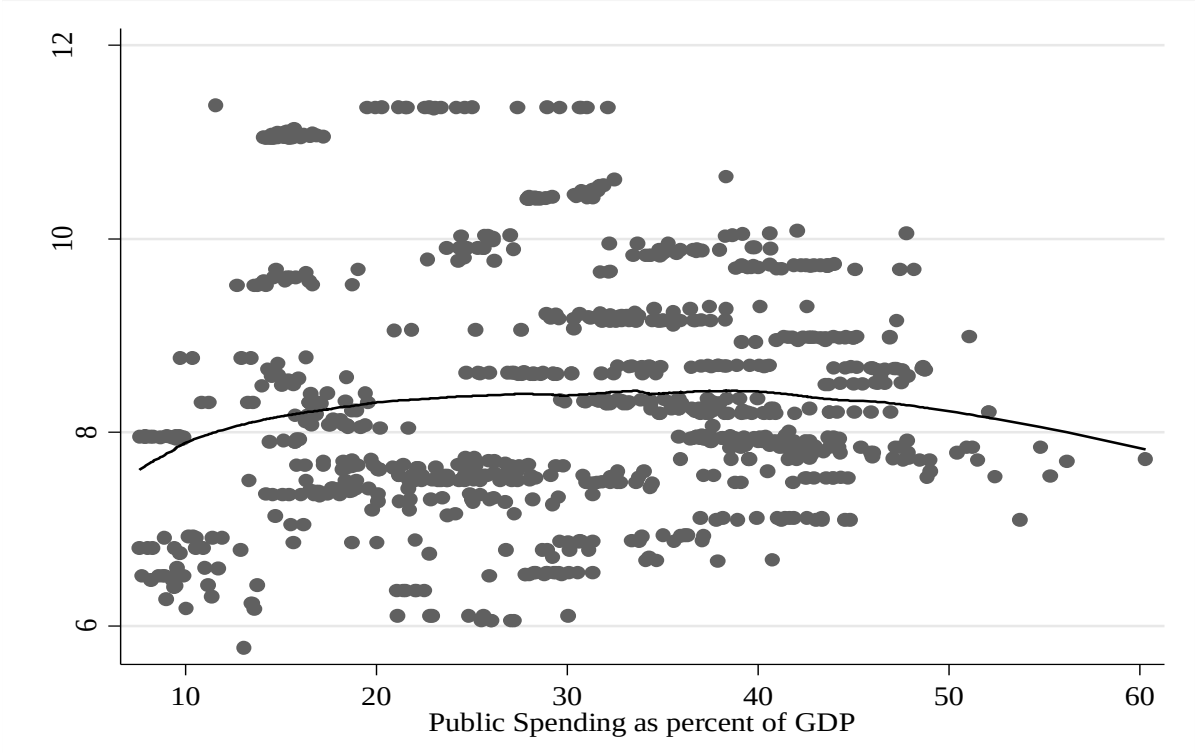
Appendix 6.7 Table: Conditional Effects of Public Spending on Poverty through Physical infrastructure, i.e. Access to Electricity for 77 Developed and Developing Countries

| Independent Variable | Channel | Levels of Energy (Access to electricity) | Indirect Effects | 95% Confidence Interval | |
|---|---|---|---|---|---|
| Public Spending | Physical infrastructure (Access to Electricity) | Low level of Energy | -1.060*** (0.000) | -1.381 | -0.735 |
| | | Average level of Energy | -1.054*** (0.000) | -1.376 | -0.732 |
| | | High level of Energy | -1.050*** (0.000) | -1.376 | -0.733 |

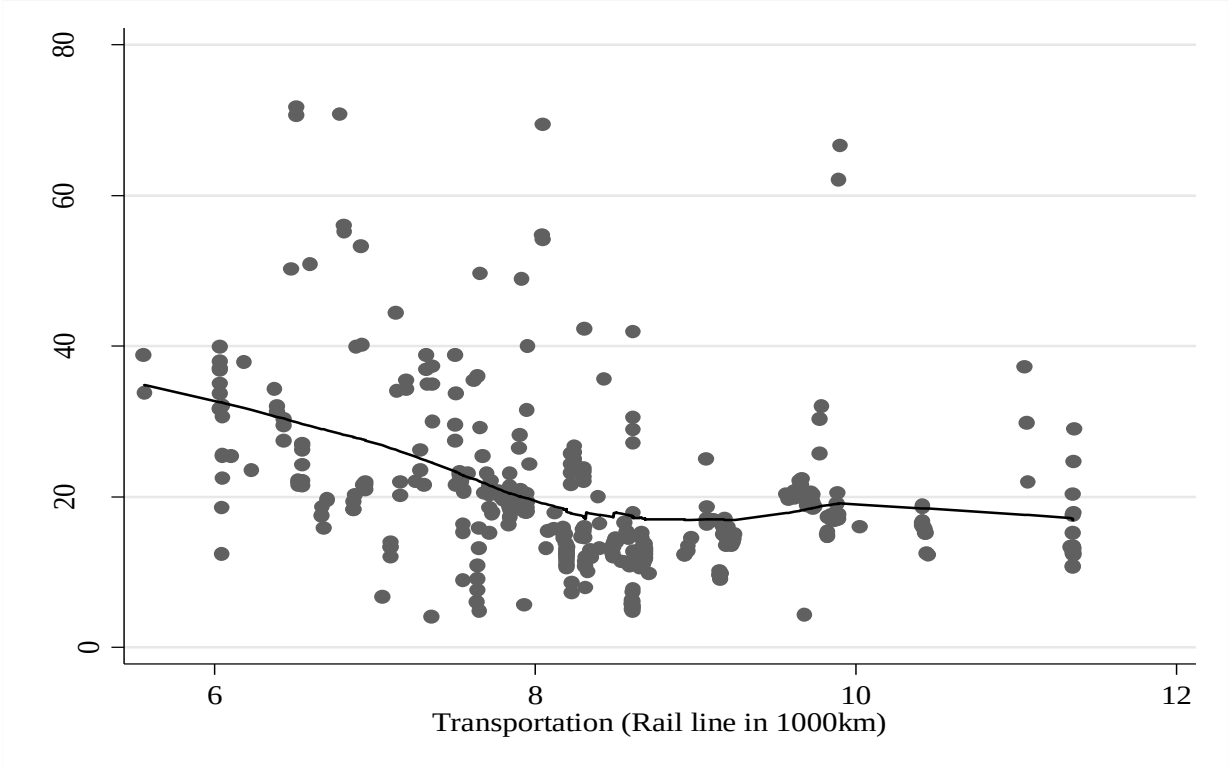
Note: P-value of each coefficient is given in the parentheses. ***, ** and * represents the significance at 1%, 5% and 10% levels respectively. Low means 25th percentile, average level is 50th percentile and high level shows 75th percentile levels of Public Spending respectively.

## Appendices for Chapter 7

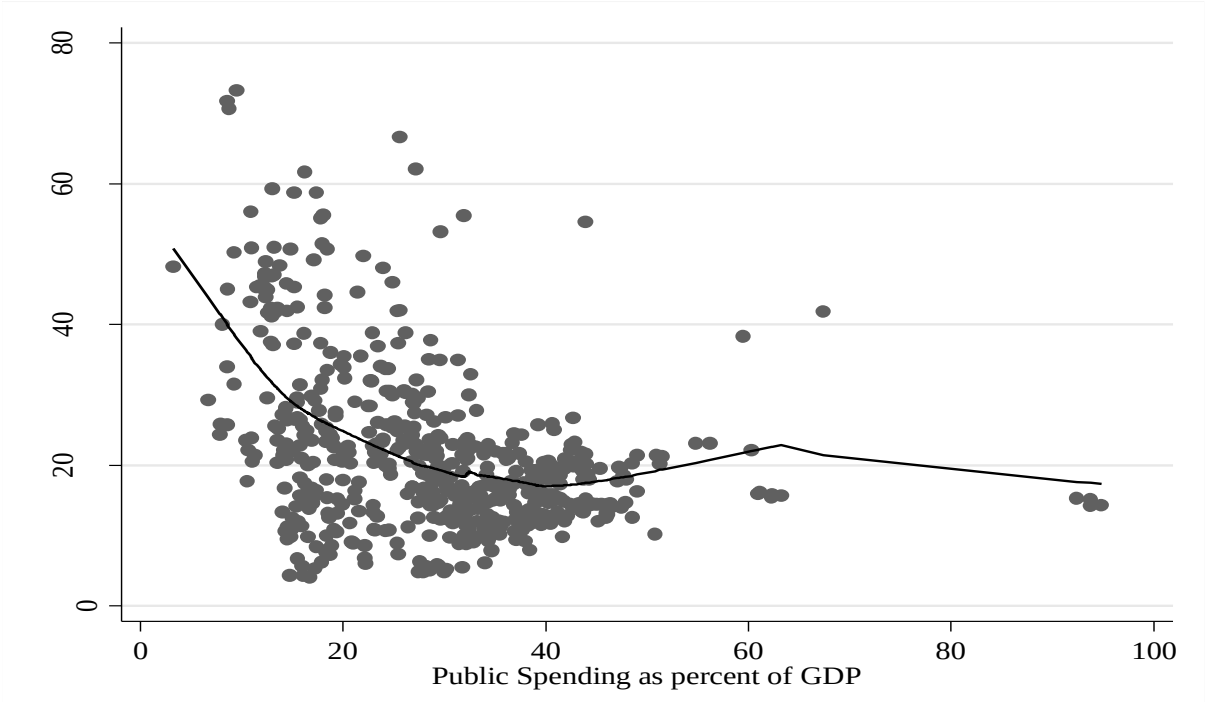
Appendix 7.1 Figure: Correlation between Public Spending and Transportation for 77 Developed and Developing Countries



Appendix 7.2 Figure: Correlation between Transportation and Poverty for 77 Developed and Developing Countries




Appendix 7.3 Figure: Correlation between Public Spending and Poverty for 77 Developed and Developing Countries



Appendix 7.4 Table: Impact of Public Spending on Poverty through the channel of Physical Infrastructure; i.e. Transportation for 77 Developed and Developing Countries

| Variables | Model | |
|---|---|---|
| | Transportation | Poverty (HCR) |
| Public Spending | 0.468*** | -1.271*** |
| | (0.000) | (0.000) |
| Transportation | | -0.0005*** |
| | | (0.000) |
| Unemployment | | 0.075* |
| | | (0.100) |
| No. of Observations | 583 | 583 |
| No. of Countries | 76 | 76 |

Note: P-value of each coefficient is given in the parentheses. ***, ** and * represents the significance at 1%, 5% and 10% levels respectively.

Appendix 7.5 Table: Indirect effects of Public Spending on Poverty through Physical Infrastructure; i.e. Transportation for 77 Developed and Developing Countries

| Independent Variable | Channel | Dependent Variable | Indirect Effects | 95% Confidence Interval | |
|---|---|---|---|---|---|
| Public Spending | Physical Infrastructure (Transportation) | Poverty | -0.000013*** (0.000) | -0.000015 | -0.000010 |

Note: P-value of each coefficient is given in the parentheses. ***, ** and * represents the significance at 1%, 5% and 10% levels respectively.

Appendix 7.6 Table: Impact of Public Spending on Poverty through Moderation of Physical Infrastructure; i.e. Transportation for 77 Developed and Developing Countries

| Variables | Models (Poverty HCR is dependent variable ) | |
|---|---|---|
| | Fixed Effects | Random Effects |
| Constant | 34.852*** | 39.592*** |
| | (0.000) | (0.000) |
| Public Spending (PS) | -0.485* | -0.582*** |
| | (0.082) | (0.004) |
| Transportation | -0.000097** | -0.000075*** |
| | (0.015) | (0.000) |
| PS*Transportation | 0.00037** | 0.00041*** |
| | (0.018) | (0.000) |
| Remittances | -0.000029** | -0.000040* |
| | (0.031) | (0.091) |
| No. of Observations | 468 | 468 |
| No. of Countries | 68 | 68 |
| R-squared | 0.21 | 0.18 |
| Wald $Chi^2$ | | 13.72 |
| | | (0.000) |
| F-statistic | | 8.76 |
| | | (0.000) |
| Hausman Test | 0.410 | |
| $Chi^2$ Statistic | (0.520) | |

Note: P-value of each coefficient is given in the parentheses. ***, ** and * represents the significance at 1%, 5% and 10% levels respectively.

Appendix 7.7 Table: Conditional effects of Public Spending on Poverty through Physical Infrastructure; i.e. Transportation for 77 Developed and Developing Countries

| Independent Variable | Channel | Levels of Transportation | Indirect Effects | 95% Confidence Interval | |
|---|---|---|---|---|---|
| Public Spending | Physical Infrastructure (Transportation) | Low level of Transportation | -0.582** (0.022) | -1.081 | -0.083 |
| | | Average level of Transportation | -0.580** (0.022) | -1.079 | -0.081 |
| | | High level of Transportation | -0.578** (0.022) | -1.077 | -0.078 |

Note: P-value of each coefficient is given in the parentheses. ***, ** and * represents the significance at 1%, 5% and 10% levels respectively. Low means $25^{th}$ percentile, average level is $50^{th}$ percentile and high level shows $75^{th}$ percentile levels of Public Spending respectively.

Appendix 8-A Table: Summary Statistics of 52 Developing Countries

| Variable | N | Mean | P50 | SD | Min | Max |
|---|---|---|---|---|---|---|
| Ln_PS | 1120 | 2.926 | 2.915 | 0.430 | 1.171 | 4.426 |
| Literacy rate | 334 | 81.522 | 89.304 | 19.071 | 19.044 | 99.874 |
| H_Exp | 1004 | 2.330 | 2.121 | 1.373 | 0.084 | 6.824 |
| Ln_Acc_Elec | 1368 | 4.064 | 4.403 | 0.776 | -0.627 | 4.605 |
| Ln_Railroads | 624 | 7.874 | 7.644 | 1.406 | 5.556 | 11.378 |
| Poverty_HCR | 399 | 27.779 | 24.800 | 14.857 | 4.100 | 73.200 |
| Ln_Rem | 1715 | 19.577 | 19.815 | 2.230 | 11.512 | 25.146 |
| Unemployment | 1560 | 8.405 | 5.997 | 6.774 | 0.140 | 38.8 |
| Ln_Tropen | 1849 | 3.902 | 3.900 | 0.537 | -1.591 | 6.355 |
| Pop_Growth | 2070 | 1.715 | 1.769 | 1.185 | -3.757 | 8.790 |
| GDP_Growth | 1924 | 3.648 | 4.333 | 5.543 | -44.9 | 34.5 |
| Ln_Inflation | 1602 | 1.9177 | 1.918 | 1.229 | -3.134 | 8.920 |

Appendix 8-B Table: Correlation Matrix of 52 Developing Countries

| Variable | Ln_PS | Literacy rate | H_Exp | Ln_Acc_ Elec | Ln_ Railroads | Poverty_ HCR | Ln_ Rem | Unemp | Ln_ Tropen | Pop_ Growth | GDP_ Growth | Ln_ Inflation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ln_PS | 1 | | | | | | | | | | | |
| Literacy rate | 0.512 | 1 | | | | | | | | | | |
| H_Exp | 0.836 | 0.277 | 1 | | | | | | | | | |
| Ln_Acc_Elec | 0.517 | 0.647 | 0.247 | 1 | | | | | | | | |
| Ln_Railroads | 0.262 | 0.009 | 0.289 | 0.238 | 1 | | | | | | | |
| Poverty_HCR | -0.281 | -0.479 | -0.002 | -0.801 | -0.270 | 1 | | | | | | |
| Ln_Rem | -0.361 | -0.266 | -0.364 | 0.151 | 0.124 | -0.505 | 1 | | | | | |
| Unemployment | 0.737 | 0.172 | 0.592 | 0.347 | 0.092 | 0.044 | -0.237 | 1 | | | | |
| Ln_Tropen | 0.240 | 0.308 | 0.240 | 0.150 | -0.310 | -0.038 | -0.380 | 0.009 | 1 | | | |
| Pop_Growth | -0.346 | -0.342 | -0.415 | -0.376 | -0.303 | 0.197 | -0.108 | -0.267 | -0.353 | 1 | | |
| GDP_Growth | -0.179 | -0.049 | -0.199 | 0.035 | 0.007 | -0.046 | 0.174 | -0.141 | -0.154 | 0.249 | 1 | |
| Ln_Inflation | 0.170 | -0.142 | 0.131 | -0.050 | 0.488 | 0.043 | -0.283 | 0.196 | -0.351 | 0.045 | -0.047 | 1 |

Appendix 8-C Table: Summary Statistics of 77 Developed and Developing Countries

| Variable | N | Mean | P50 | SD | Min | Max |
|---|---|---|---|---|---|---|
| Ln_PS | 1924 | 3.193 | 3.264 | 0.499 | 1.171 | 4.589 |
| Literacy rate | 409 | 84.232 | 92.629 | 18.223 | 19.044 | 99.895 |
| H_Exp | 1504 | 3.386 | 3.056 | 2.080 | 0.084 | 9.276 |
| Ln_Acc_Elec | 2143 | 4.256 | 4.600 | 0.671 | -0.627 | 4.605 |
| Ln_Railroads | 1121 | 8.134 | 7.952 | 1.268 | 5.556 | 11.378 |
| Poverty_HCR | 727 | 22.774 | 19.500 | 12.766 | 4.100 | 73.200 |
| Ln_Rem | 2586 | 19.733 | 20.043 | 2.150 | 10.449 | 25.146 |
| Unemployment | 2310 | 8.371 | 6.488 | 6.163 | 0.140 | 38.8 |
| Ln_Tropen | 2735 | 3.977 | 3.956 | 0.524 | 1.591 | 6.355 |
| Pop_Growth | 3069 | 1.291 | 1.256 | 1.236 | -3.847 | 8.790 |
| GDP_Growth | 2790 | 3.303 | 3.970 | 5.051 | -44.9 | 34.5 |
| Ln_Inflation | 2477 | 1.677 | 1.671 | 1.314 | -4.020 | 8.920 |

Appendix 8-D Table: Correlation Matrix of 77 Developed and Developing Countries

| Variable | Ln_PS | Literacy rate | H_Exp | Ln_ Acc_ Elec | Ln_ Railroads | Poverty_ HCR | Ln_ Rem | Unemp | Ln_ Tropen | Pop_ Growth | GDP_ Growth | Ln_ Inflation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ln_PS | 1 | | | | | | | | | | | |
| Literacy rate | 0.471 | 1 | | | | | | | | | | |
| H_Exp | 0.865 | 0.280 | 1 | | | | | | | | | |
| Ln_Acc_Elec | 0.473 | 0.646 | 0.253 | 1 | | | | | | | | |
| Ln_Railroads | 0.099 | 0.007 | 0.130 | 0.196 | 1 | | | | | | | |
| Poverty_HCR | -0.147 | -0.427 | -0.072 | -0.746 | -0.268 | 1 | | | | | | |
| Ln_Rem | -0.247 | -0.198 | -0.188 | 0.083 | 0.291 | -0.279 | 1 | | | | | |
| Unemployment | 0.717 | 0.216 | 0.596 | 0.331 | -0.015 | 0.028 | -0.282 | 1 | | | | |
| Ln_Tropen | 0.091 | 0.312 | 0.028 | 0.121 | -0.276 | -0.008 | -0.270 | -0.039 | 1 | | | |
| Pop_Growth | -0.586 | -0.381 | -0.614 | -0.376 | -0.129 | 0.098 | 0.008 | -0.410 | -0.292 | 1 | | |
| GDP_Growth | -0.460 | -0.081 | -0.520 | 0.045 | 0.051 | -0.048 | 0.154 | -0.382 | 0.129 | 0.389 | 1 | |
| Ln_Inflation | -0.161 | -0.187 | -0.249 | -0.101 | 0.399 | 0.089 | -0.075 | -0.082 | -0.185 | 0.263 | 0.181 | 1 |

Appendix 9-A List of 52 Developing Countries

| S No | Country Name | S No | Country Name | S No | Country Name | S No | Country Name |
|---|---|---|---|---|---|---|---|
| 1 | Afghanistan | 14 | Georgia | 27 | Macedonia, FYR | 40 | Russian Federation |
| 2 | Albania | 15 | Ghana | 28 | Mali | 41 | Senegal |
| 3 | Argentina | 16 | Guatemala | 29 | Myanmar | 42 | Serbia |
| 4 | Azerbaijan | 17 | Honduras | 30 | Mongolia | 43 | Togo |
| 5 | Bangladesh | 18 | Indonesia | 31 | Mozambique | 44 | Thailand |
| 6 | Bulgaria | 19 | India | 32 | Malawi | 45 | Tajikistan |
| 7 | Belarus | 20 | Jamaica | 33 | Malaysia | 46 | Timor-Leste |
| 8 | Botswana | 21 | Kazakhstan | 34 | Namibia | 47 | Tunisia |
| 9 | Cameroon | 22 | Kyrgyz Republic | 35 | Nicaragua | 48 | Turkey |
| 10 | Cabo Verde | 23 | Cambodia | 36 | Peru | 49 | Tanzania |
| 11 | Costa Rica | 24 | Sri Lanka | 37 | Philippines | 50 | Uganda |
| 12 | Dominican Republic | 25 | Morocco | 38 | Paraguay | 51 | South Africa |
| 13 | Ethiopia | 26 | Madagascar | 39 | West Bank and Gaza | 52 | Zimbabwe |

Appendix 9-B List of 77 Developed and Developing Countries

| S No | Country Name | S No | Country Name | S No | Country Name | S No | Country Name |
|---|---|---|---|---|---|---|---|
| 1 | Afghanistan | 21 | Ethiopia | 41 | Morocco | 61 | West Bank and Gaza |
| 2 | Albania | 22 | Finland | 42 | Madagascar | 62 | Russian Federation |
| 3 | Argentina | 23 | Georgia | 43 | Macedonia, FYR | 63 | Senegal |
| 4 | Austria | 24 | Ghana | 44 | Mali | 64 | Serbia |
| 5 | Azerbaijan | 25 | Greece | 45 | Malta | 65 | Slovak Republic |
| 6 | Bangladesh | 26 | Guatemala | 46 | Myanmar | 66 | Slovenia |
| 7 | Bulgaria | 27 | Honduras | 47 | Mongolia | 67 | Sweden |
| 8 | Belarus | 28 | Croatia | 48 | Mozambique | 68 | Togo |
| 9 | Botswana | 29 | Hungary | 49 | Malawi | 69 | Thailand |
| 10 | Switzerland | 30 | Indonesia | 50 | Malaysia | 70 | Tajikistan |
| 11 | Chile | 31 | India | 51 | Namibia | 71 | Timor-Leste |
| 12 | Cameroon | 32 | Iceland | 52 | Nicaragua | 72 | Tunisia |
| 13 | Cabo Verde | 33 | Italy | 53 | Netherlands | 73 | Turkey |
| 14 | Costa Rica | 34 | Jamaica | 54 | Norway | 74 | Tanzania |
| 15 | Cyprus | 35 | Kazakhstan | 55 | Panama | 75 | Uganda |
| 16 | Czech Republic | 36 | Kyrgyz Republic | 56 | Peru | 76 | South Africa |
| 17 | Germany | 37 | Cambodia | 57 | Philippines | 77 | Zimbabwe |
| 18 | Dominican Republic | 38 | Sri Lanka | 58 | Poland | | |
| 19 | Spain | 39 | Lithuania | 59 | Portugal | | |
| 20 | Estonia | 40 | Latvia | 60 | Paraguay | | |

Appendix 9-C Table for variables definitions

| S.No | Name of Variable | Definition | Source |
|---|---|---|---|
| **Dependent Variables** | | | |
| 1 | Poverty | National poverty headcount ratio is the percentage of the population living below the national poverty line(s). National estimates are based on population-weighted subgroup estimates from household surveys. For economies for which the data are from EU-SILC, the reported year is the income reference year, which is the year before the survey year. | World Development Indicators (WDI) |
| **Explanatory Variables** | | | |
| 2 | Public Spending | Expense is cash payments for operating activities of the government in providing goods and services. It includes compensation of employees (such as wages and salaries), interest and subsidies, grants, social benefits, and other expenses such as rent and dividends. | World Development Indicators (WDI) |
| 3 | Literacy Rate (Education) **(Used as Mediator and Moderator)** | Adult literacy rate is the percentage of people ages 15 and above who can both read and write with understanding a short simple statement about their everyday life. | World Development Indicators (WDI) |
| 4 | Health Expenditures **(Used as Mediator and Moderator)** | Public expenditure on health from domestic sources as a share of the economy as measured by GDP. | World Development Indicators (WDI) |
| 5 | Access to Electricity (Energy) **(Used as Mediator and Moderator)** | Access to electricity is the percentage of population with access to electricity. Electrification data are collected from industry, national surveys and international sources. | World Development Indicators (WDI) |
| 6 | Rail Line in km (Transportation) **(Used as Mediator and Moderator)** | Rail lines are the length of railway route available for train service, irrespective of the number of parallel tracks. | World Development Indicators (WDI) |
| **Control Variables** | | | |
| 7 | GDP Growth rate | Annual percentage growth rate of GDP at market prices based on constant local currency. Aggregates are based on constant 2015 prices, expressed in U.S. dollars. GDP is the sum of gross value added by all resident producers in the | World Development Indicators (WDI) |

| | | | |
|---|---|---|---|
| | | economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. | |
| 8 | Population Growth rate | Annual population growth rate for year t is the exponential rate of growth of midyear population from year t-1 to t, expressed as a percentage. Population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship. | World Development Indicators (WDI) |
| 9 | Trade Openness | Merchandise trade as a share of GDP is the sum of merchandise exports and imports divided by the value of GDP, all in current U.S. dollars. | World Development Indicators (WDI) |
| 10 | Foreign Remittances | Personal remittances comprise personal transfers and compensation of employees. Personal transfers consist of all current transfers in cash or in kind made or received by resident households to or from nonresident households. Personal transfers thus include all current transfers between resident and nonresident individuals. Compensation of employees refers to the income of border, seasonal, and other short-term workers who are employed in an economy where they are not resident and of residents employed by nonresident entities. Data are the sum of two items defined in the sixth edition of the IMF's Balance of Payments Manual: personal transfers and compensation of employees. Data are in current U.S. dollars. | World Development Indicators (WDI) |
| 11 | Unemployment | Unemployment refers to the share of the labor force that is without work but available for and seeking employment. | World Development Indicators (WDI) |
| 12 | Inflation | Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly. | World Development Indicators (WDI) |