Faisal Abbas

Public health sector expenditures, health status and their role in development of Pakistan

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Faisal Abbas

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Referent:	Prof. Dr. Ulrich Hiemenz
Korreferent:	Prof. Dr. Thomas Heckelei
Vorsitzender:	Prof. Dr. Joachim von Braun
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Dedication

This effort of mine is humbly dedicated to two personalities shaped most of my past and present and will remain a source of inspiration and encouragement for the rest of my life INSHAHALLAH; my *mother* (late) who enabled me to reach to the highest aims in my life and my *wife* whose cheering attitude and loving behavior made a real difference and will remain a source of motivation and encouragement for the rest of my life.

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Abbreviations and Acronyms

ADF	Augmented Dickey Fuller
BHU	Basic Health Unit
BoD	Burden of Diseases
CMR	Child Mortality Ratio
DHQ	District Headquarter Hospital
DHS	Demographic and Health Survey
EPI	Extended Program of Immunization
ECM	Error Correction Mechanism
FBS	Federal Bureau of Statistics
FIML	Full information Maximum Likelihood
GOP	Government of Pakistan
GDP	Gross Domestic Product
HCE	Health Care Expenditures
IMR	Infant Mortality Rate
LE	Life Expectancy
MoH	Ministry of Health
MTDF	Medium Term Development Framework
OECD	Organization for Economic Cooperation and Development
	PHC Primary Health Care
PSDP	Public Sector Development Program
RHC	Rural Health Centers
SHC	Secondary Health Care
SAP	Social Action Program
SPDC	Social Policy and Development Centre
THQ	Tehsil Headquarter Hospitals
TFR	Total Fertility Rate
VARM	Vector Auto Regressive Model
WHO	World Health Organization

Acknowledgment

I set my unfeigned and meek thanks before ALLAH Almighty, Who created the universe and bestowed the mankind with knowledge and wisdom to search for its secrets, favored and invigorated me with the fortitude and capability to aptly complete my research work, and contribute to the existing knowledge.

The journey to accomplish my PhD starts from a town known as Nawab Shah, in the province of Sindh where I was born and grew up. This was the time when Pakistan was under the Martial Law rule, Afghan-Russia war was underway and religious education was under increased emphasis. I started my schooling at the age of five years and when I was in grade six I first time became acquainted with English language learning. I studied in government institutions in my entire educational career.

I entered into the university with the ambition of getting into Pakistan's bureaucracy by passing the exam. These were the days when I was very much interested to know about how different statistical numbers related to health, education, poverty, etc. are estimated in Pakistan and across globe. After two years of university studies at University of Agriculture Faisalabad (UAF), I myself realized to decide to further my skills in economics and I chose applied (agricultural) economics as my field of study. This was my first appropriate introduction to the dismal science. After completing my Masters, I first time came to know about the Center for Development Research through internet surfing. I applied in a PhD program at Center for Development Research (ZEF) and fortunately I got admission as well as selected for German Academic Exchange Service (DAAD) scholarship. Here I would like to extend my heartiest thanks to DAAD for their supporting my PhD studies. This is how I came to start with my PhD in health economic issues related to Pakistan.

I would also like to say a few words about Dr. Khalid Mushtaq who actually introduced me to the field of macro-econometric and especially with time series analysis and techniques. He was the one who encouraged me to write something relevant to time series issues of Pakistan. Not only this, he also helped me to learn this technique and teach me some basic lessons of time series analysis using Microfit. In 2006 summer when I started collecting data in Pakistan, Dr. Abdul Saboor helped me to tackle with a number of official issues for getting primary and secondary data from ministries in Islamabad, Pakistan. Also, I would like to say big thanks to Mr. Naeem Sarwar and Mr. Masood Sadiq for their valuable contribution during my field research for collecting and understanding the data.

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Abstract

Health is one of the basic capabilities that generate economic freedom. Better health status is described as an indicator of economic success and failure of the nations. The availability of health care services and the physical, biological, epidemiological and socio economic environment in which a person live, broadly determines disease pattern, health status and therefore the quality of life. Despite of economic improvement, social and demographic indicators in Pakistan presents a dismal picture. Pakistan still has one of the highest infant mortality rates and low (female) life expectancy compared with the other developing countries of comparable income level. Keeping in view the likely role that health can play, this dissertation aims at empirically estimating the health related variables and their impact on economic development of Pakistan. This dissertation aims at empirically estimating the role of different macroeconomic and policy relevant factors affecting public health spending and health status in Pakistan over time. An attempt has been made to see the likely impact of health related variables like health status and per capita calorie availability on economic development using mainly health demand function and health production function. Time series data of Pakistan from 1972 to 2008 is used employing Johansen cointegration methodology, long run income elasticity of health expenditures in Pakistan is estimated. Contrary to the estimates for most of the industrialized countries, income elasticity of public health expenditures in Pakistan is less than unity while the short run elasticity is even negative.

Unemployment and urbanization has a strong negative impact on health expenditures in the long run but urbanization is not significant in short run. Furthermore, using cointegration and Granger bivariate causality analysis for health status of the population it is estimates that per capita health expenditures are negatively related with infant mortality rate and positively related with female life expectancy. An interesting result is reinforcing relationship between fertility and mortality rate in Pakistan verifying the modern economic theory of population. The curative measure of health care system that is doctor population ratio is important factor affecting positively to the female life expectancy and negatively to infant mortality. Another modeling strategy efficiency wage hypothesis is tested using production function framework. The results of nutrition availability are compared with that of life expectancy, fertility, health expenditures and mortality. It is estimated that the magnitude of calorie availability is stronger on per capita income relative to life expectancy, infant mortality, public health expenditures and fertility. One way causality is running from per capita calorie availability to per capita income.

It is concluded based on these results that health sector is interlinked with socio-economic development therefore; health policy must not see the health services in isolation but in an integrated manner to achieve the broader goals of pove rty reduction, human capital format ion and economic development. The results support the hypothesis of inc reasing public investments in health. The role of nutrition in agrarian economy like Pakistan is robust. Government has to ensure the smooth supply of food and nutrition to the population for increasing their living standard and productivity. Policies that promote social inclusion by increasing employment will help in improving health status of the population.

Zusammenfassung

Die Gesundheit ist einer der grundlegenden Faktoren für die wirtschaftliche Freiheit eines Volkes. Der Gesundheitszustand eines Volkes kann als Indikator für wirtschaftlichen Erfolg oder als Misserfolg eines Staates angesehen werden. Die Verfügbarkeit von Dienstleistungen im Bereich der Gesundheitsfürsorge und das somatische, biologische, epidemiologische und sozioökonomische Umfeld, in dem Menschen leben, bestimmt weitgehend ihr Krankheitsbild, ihren Gesundheitszustand und somit ihre Lebensqualität. Trotz einer verbesserten wirtschaftlichen Situation in Pakistan zeichnen soziale und demografische Indikatoren ein düsteres Bild. Im Vergleich zu anderen Entwicklungsländern mit vergleichbarem Einkommensniveau gibt es in Pakistan heute noch immer eine der höchsten Säuglings- und Kindersterblichkeitsraten und eine geringe Lebenserwartung, vor allem unter den Frauen. Aufgrund der Wichtigkeit des Faktors Gesundheit zielt diese Dissertation darauf ab, die mit der Gesundheit im Zusammenhang stehenden Variablen und ihre Auswirkungen auf die wirtschaftliche Entwicklung Pakistans empirisch zu beurteilen. Weiterhin wird in dieser Dissertation auf die empirische Evaluierung makroökonomischer und politisch relevanter Faktoren eingegangen, die staatliche Ausgaben im Gesundheitswesen beeinflussen und zur Verbesserung des Gesundheitszustands in Pakistan führen können. Es wurde ferner der Versuch unternommen, die möglichen Auswirkungen der gesundheitsrelevanten Variablen, wie z. B. der Gesundheitszustand oder die Pro-Kopf-Verfügbarkeit von Kalorien, auf die wirtschaftliche Entwicklung des Landes zu überprüfen. Hierbei wurden in erster Linie die Formeln zur Ermittlung der Gesundheitsnachfrage und zur Herstellung/Produktion von Gesundheit als Bearbeitungsansatz gewählt. In dieser Dissertation werden empirische Daten von Pakistan aus den Jahren 1972 bis 2008 verwendet. Unter Anwendung des Kointegrationsansatzes nach Johansen wird eine langfristige Einkommenselastizität im Bereich der Gesundheitsausgaben in Pakistan erwartet. Im Gegensatz zu Schätzungen für die meisten Industrieländer liegt die Einkommenselastizität der staatlichen Gesundheitsausgaben in Pakistan unter Eins, die kurzfristige Elastizität ist sogar negativ. Vor allem Arbeitslosigkeit und Urbanisierung wirken sich auf lange Sicht negativ auf Gesundheitsausgaben aus, wobei die Urbanisierung auf kurze Sicht gesehen keinen signifikanten Einfluss hat. Anhand der Kointegrationsanalyse und des bivariaten Kausalitätstests nach Granger wird bezüglich des Gesundheitszustandes eines Volkes außerdem angenommen, dass die Pro-Kopf-Ausgaben für Gesundheitsleistungen in einem negativen Zusammenhang mit der Kindersterblichkeitsrate und wiederum in einem positiven Zusammenhang mit der Lebenserwartung von Frauen stehen. Die Prüfung der modernen ökonomischen

Bevölkerungstheorie führt zu einem interessanten Ergebnis, das die Beziehung zwischen Fruchtbarkeits- und Sterblichkeitsrate in Pakistan noch verstärkt. Das Arzt-pro-Einwohner-Verhältnis ist ein wichtiger Faktor, der sich bei einer Erhöhung positiv auf die Lebenserwartung von Frauen und negativ auf die Kindersterblichkeit auswirkt. Im Rahmen der Anwendung der Produktionsgleichung wird eine weitere Modellstrategie, die Effizienz-Einkommens-Hypothese, untersucht. Es wird ein Vergleich zwischen den Ergebnissen der Nahrungsverfügbarkeit und den Zahlen zu Lebenserwartung, Fruchtbarkeit, Gesundheitsausgaben und Sterblichkeit angestellt. Mit Bezug auf diese Ergebnisse (Lebenserwartung, Kindersterblichkeit, staatliche Gesundheitsausgaben und Fruchtbarkeit) wird angenommen, dass die Pro-Kopf-Verfügbarkeit von Kalorien einen größeren Einfluss auf das Pro-Kopf-Einkommen hat. Die Kausalität gilt in eine Richtung, von der Pro-Kopf-Verfügbarkeit von Kalorien zum Pro-Kopf-Einkommen. Auf Grundlage dieser wichtigen Ergebnisse wird geschlossen, dass zwischen dem Gesundheitssektor und der sozio-ökonomischen Entwicklung eine (enge) Verbindung besteht. Aufgrund dessen sollten Gesundheitsdienstleistungen in der Gesundheitspolitik nicht isoliert betrachtet werden, sondern als Gefüge, um so größere Erfolge in der Armutsbekämpfung, der Schaffung von Humankapital und der wirtschaftlichen Entwicklung erreichen zu können. Die Ergebnisse stützen die Hypothese, dass sich steigende staatliche Gesundheitsinvestitionen positiv auf die Gesamtentwicklung eines Landes auswirken. In landwirtschaftlich geprägten Volkswirtschaften wie Pakistan spielt die Nahrungsversorgung eine besonders wichtige Rolle. Es ist Aufgabe der Regierung, die Versorgung der Bevölkerung mit Nahrungsmitteln sicherzustellen und damit wesentlich zur Hebung des Lebensstandards und Steigerung der Produktivität ihrer Landsleute beizutragen. Eine Politik, die sich für die Geschlechtergleichbehandlung einsetzt und die soziale Eingliederung durch eine höhere Beschäftigungsrate fördert, kann wesentlich zur Verbesserung des Gesundheitszustandes der Bevölkerung beitragen.

Chapter 1   General Introduction

1.1   Background

Since Robert Solow (1956) investment especially for physical capital formation, was regarded as basis for economic growth which trickle down by its own over time. New growth theories, on the contrary, emphasize human potential to achieve sustainable growth by investing in human capital formation. Health and education is regarded as basis to invest in people for their betterment and to make economic growth more broad based and sustainable.

The failure of convergence between developed and developing countries necessitates the emergence of endogenous growth theories pioneered by Romer (1986, 1990) and Lucas (1988). In their model, the positive externalities expected from investing in people prevent decreasing marginal capital productivity. Hence, this theory created an increasing interest of researchers and policy makers in investigating the role of human capital formation (especially health) for the growth process. Emphasis for achieving better results of investing in human lies on the ground of attaining basic services like health, education and nutrition for ensuring better quality of life to majority (Behrman and Schneider, 1993). Cross country evidence suggested that growth of income and provision of basic services (health, education and water and sanitation) can help reduce poverty more than expanding the industrial output (Bourguignon and Morrison, 1998).

Analyzing social sector spending has attained a prominent place in the development literature. Especially, macroeconomic aspects of social spending and its impact on human and economic development are investigated empirically. Developing human capital through better educational opportunities and improving the health status will boost the productive potential not only of the individual but also the society through positive externalities. The example of East Asian countries in this context is quite helpful as these countries were able to lower the disparities in human capital formation and hence achieve pro poor growth (Deininger and Squire, 1998 and Klasen, 2002). Investing in people is essential to achieve development goals like economic growth, structural change and poverty reduction.

Human development has remained a corner stone in development policy debate across the globe, while approaches to achieve this goal remained inconclusive. World Bank and related research perched around the notion that growth in the economy entails to build human capital while UNDP standpoint explains that human welfare is central to any development process. In former approach development is

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seen as a goal while latter focused on human welfare as an end of development process. Development policy followed by United Nations Development Program (UNDP, 1990) has emphasized more toward investing in human capital formation as opposed to that of World Bank.

Health (like education) is among the basic capabilities that gives freedom to human life (Sen, 1998 and 1999). Health is claimed to be a basic human right, an important aspect of life and is widely recognized that improved health not only lowers mortality, morbidity and level of fertility, but also contributes to increased productivity (Bloom and Canning, 2001).

The income-health, two way relationship, is described in empirical and theoretical literature. While which way to focus, for economic growth and hence sustainable development or vice versa is a debatable issue. One strand of literature agrees on investing in economy to produce more income which enables people to purchase things of value for them and hence achieve better living (Filmer and Pritchett, 1997 and Ravallion, 1997). While other relates better health status with increasing income by its effect on productivity and better functioning and reduced disease burden (see for example; Hanmer et.al, 2003 and Ramirez et.al, 2000). Nevertheless, public health expenditures are determined not only by income but also by host of other social, economic, demographic, environmental, cultural and political factors.

Better health can be regarded as a major determinant of welfare level and therefore, affects poverty directly. The strong association between health and economic indicators suggests that health is also a determinant of economic welfare of the nations. In recent years impact of human capital formation (especially health status) is realized to be an important predictor of economic growth not only in individual countries but across countries and over time (Alderman, et al, 2003; Bhargava, 2001; Webber, 2002 and Zon and Muysken, 2003). Therefore, health and its likely impact on individual's wellbeing and on economic development received immense importance at various levels (Frank and Mustard, 1994).

Although, health is associated with development but what is not yet confirmed is the path of causation as empirical evidence argues both ways (see for example; Ramirez, Ranis and Stewart, 1997 and Gallup, Sachs and Mellinger, 1998). It is doubtless to say human welfare and wellbeing is an end in itself, while understanding in a refined way, this complex relation between health and economic growth is an important policy issue for priority settings.

Evidence from post World War-II literature suggested an unprecedented increase in life expectancy and reduction in infant and child mortality. Although, the distribution is skewed across region and within

the country rural and urban areas have different outcomes. While this process of decline in mortality and increasing life expectancy had different path to reach at some better level in today's world. It took two to three centuries in Europe to reduce its infant and child mortality and increase life expectancy while in South-East Asia it took only few decades which is described by a study of Asian Development Bank (ADB, 1997) as "demographic gift". This demographic change has contributed 0.5 to 1.3 percent in annual growth since mid 1960 to early 1990 or 15 to 40 percent of the region's overall economic improvement. The effect of health and demographic variables are also analyzed for Africa, by Bloom and Sachs (1998) and concluded that half of the difference between growth of Africa and rest of the world can be explained by demographic factors and health improvements over the same period. Reduced mortality by 2 per 1000 live births accounts for 1 percent increase in growth rate in subsequent quarter century in 25 African countries. Because of the fact that mortality have direct bearing on fertility which directly affects growth process, as fertility reduces by 2 child growth increases by 1 percent. Cyclical nature of health development relationship makes it important to take care of both sides (Hamoudi and Sachs, 1999).

Income is explaining much of the difference between health of the poor at regional and/or at country level as well as across the countries. Nevertheless, factors other than income also have substantial role to play in determining decent living standards and achieving better health status. Much of the literature focused on growth determinants focus on income that is 'mean' to achieve an 'end', while few of the studies (Sen, 1985 and 1987) used poverty, health status and worst living conditions as deprivation of ends which is called capabilities and functioning of utmost importance. Survival is basic capability worthy of analyzing in its own right (Sen, 1995 and 1998). A determinant of economic welfare, as determined by GDP per capita is distinct from that of economic welfare as measured by infant mortality. While former measure explaining material welfare and has an indirect affect on human wellbeing and latter has a direct bearing on human welfare level (Sen, 1999 and Younger, 2001).

Recently, country level studies to empirically estimate the effect of health on economic growth are gaining importance. Dominating studies in this line of inquiry are cross country and panel data studies. These studies has a geographical focus on developed world, and/ or mix of developing and developed world, some of them focusing on least developing countries but virtually non is using single country data from developing country hence lacking evidence from the developing world.

Three issues are arising from the debate on the income and health relationship at macro-economic level. First, is that the exploration of the possible contribution of income and non income factors that

affect the public health expenditures. Secondly, affect of public health expenditures on aggregate population health by considering variables like; life expectancy and mortality. Finally, the role of different health related variables like; resource allocation for health sector, nutrition availability per capita, and health status (e.g., life expectancy, fertility, and mortality) on economic growth of the country. This dissertation is exploring the above issue and an addition to the ongoing debate of health-development nexus in a developing country context using annual time series data from Pakistan.

Social sector development, especially health, in Pakistan over the years remains a core policy agenda while still the health indicators are far from satisfactory. High total fertility rate at country level remained a challenge for every government with addition to increasing poverty and unemployment, high inflation and low level of health status. The continuous rise in fertility adds to increasing population growth which remained well above 2 percent in the decade of 1990 (Hussain et. al, 2003). Comparing Pakistan's social sector indicators with its South Asian neighbors gives very bleak picture of human development in the country. For instance, on average basis total fertility rate (children born by a women of age 15-49) was five in year 2002 which is very high compare to Sri Lanka having fertility rates of two even India (the most populous country after china) has three while Nepal has four (ADB, 2005). Comparing to Sri Lanka and India's population growth rate of about one percent annually, Pakistan is growing with a population growth rate of almost two percent (ADB, 2005). Pakistan has highest infant mortality rates of 74 per thousand live births comparing to 13 in Sri Lanka and 63 and 46 respectively for India and Bangladesh. Life expectancy in Sri Lanka is 74 years compared to Pakistan's 64 years, while in India and Bangladesh are not significantly different from that of Pakistan at 63 and 62 years respectively (ADB, 2005). Pakistan fall well behind in terms of developing its human resources, on human development index Pakistan's rank is 135th out of 177 countries even far behind then that of neighboring India at 127th and Sri Lanka at 93rd (UNDP, 2005).

In terms of allocation of monetary resources to health sector and access to far flung (remote) areas as well as coverage in terms of hospitals, hospital beds, skilled paramedic staff and doctors is lacking far behind (Khan, 2003a). The resource allocation (public spending) in last fifteen years squeezed in social sector.

 Pakistan's retrospective scenario is obvious from comparison with countries of its region, social disparity is deepened and the growth over time did not produce the results for the betterment of the people that is poverty and inequality increased (Easterly, 2001 and World Bank, 2002). Without social sector development high growth rate can't be helpful in reducing the gaps among social strata as well

as uplifting living standards of the people. As described by the Pakistan National Human Development Report (2002) that improving the conditions of health care, hygiene and prevention trims down the frequency of disease occurrence, reduces the cost for treatment and hence not only help in escalating the productivity but the income of the poor thus prevent the inhuman conditions.

Figure 1.1: Trend analysis of per capita income and per capita health expenditures
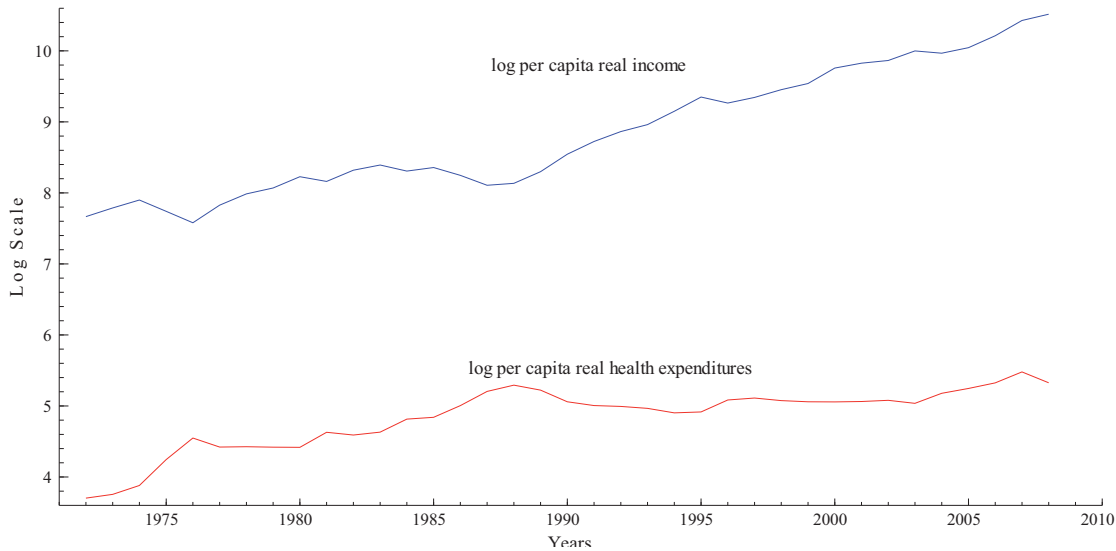
Low government health expenditures as percentage of GDP, growth oriented policies (industrial bias), lack of governance, mismanagement and lack of utilization of allocated resources during plan period are among the various factors adding to deteriorating health facilities and infrastructure in Pakistan. Two types of major issues faced by public health indicators; first is the higher average health inequality and second is inequality in provision of health care services.

The average indicators of health both on input and output (supply or demand side factors) are not performing well, due to reasons explained above and aggregate health status is improving but gradually comparing to increase in income level. If we compare the regions in Pakistan the inequality in terms of access to health services by income groups, gender and at regional level (rural and urban level) pose a further threat to the existing public health situation.

1.2   Objectives

Keeping in view the important role that health can play in improving living conditions of the population this dissertation aims at empirically estimating the role of health variables in economic development of Pakistan. Specifically, estimating the role of macroeconomic and policy relevant factors affecting public health spending and health status improvements in Pakistan over time. Beside

this, another objective of this dissertation is to provide a brief and comprehensive over view of the public health sector in Pakistan. Also, an attempt has been made to see the likely impact of health related variables like health status and per capita nutrition availability on economic development of Pakistan. The dissertation beside an overall objective of looking at health development nexus is focusing on the following;

A). the role of various income and non income variables that affect public health expenditures also the role that public health expenditure and other related factors can play in improving health status of the population. Long run and short run relationship of income and non income variables with health expenditures in Pakistan (an economy characterized by low public health spending) is explored using health demand function approach.

B). it is an empirically established fact that health spending has an impact on health status, therefore using time series data it is empirically tested whether health output (e.g., life expectancy or IMR) is income sensitive and/or related to non economic factors or not. Also, the direction of relationship is estimated using Granger bivariate causality tests.

C). to quantify the impact of nutrition availability per capita on population adjusted income in Pakistan and comparing it with other health related factors like; infant mortality rate , public health care expenditures and total fertility rate.

1.3   Organization of the thesis

The dissertation includes, beside this first introductory chapter, seven other chapters. The outline of these chapters and their organization is described as follows;

First chapter briefly introduces the subject of this dissertation including overall and specific objectives. Second chapter presents an overview of the existing literature on; i) macroeconomic factors that affect public health expenditures ii) social, economic, political and demographic variables that impact aggregate health status iii) nutrition and its possible relationship with development (per capita income). The second chapter basically aims at presenting an overview of the state of the art and the gaps that exist in the literature. Also, this chapter identifies some questions and hypotheses to test, keeping in view the objectives of the dissertation. Finally, this chapter describes the contributions that are made by this dissertation. Third chapter briefly explains the health sector of Pakistan. It describes how health care services provision evolved in Pakistan. Also, it explains changes in the health care expenditures over time, health status of the population and accompanying health policy goals. This chapter further evaluates the health policies presented in different regimes. Lastly, the chapter elaborates and looks

into the health personnel and their role in health services provision. Fourth chapter explains the theoretical framework which forms the basis of this dissertation. Also, it explains the methodology used in this dissertation to dig out the various objectives.

Fifth chapter tries to answer the following question; what macroeconomic factors determine the expenditures on public health? Applying demand function approach this chapter empirically estimates the factors affecting public resource allocation to health care services in time series framework to get a better know how and policy guideline for resource allocation. This chapter aims at looking the determinants of public health sector expenditures in Pakistan, broadly speaking.

Chapter six tries to empirically estimate the social, demographic and economic factors that affect health status in Pakistan. The main objective of this chapter is to see whether increased spending in health sector helps in reducing (IMR) and also bringing some betterment in (female) life expectancy using production function approach. Health status is measured as Infant mortality rate (IMR) and female life expectancy at birth. This chapter also empirically estimates the causal link between health status, health care spending and other policy relevant variables. The result will help in formulating some policy guidelines for achieving better health status.

Chapter seven investigates how per capita availability of calories affects income at national level? This chapter models the impact of per capita calorie availability and other social and macroeconomic factors on GDP per capita, and tries to find out the long run relationship using growth theoretical framework. Granger bivariate causality between the variables of interest and the GDP per capita is also estimated. Final chapter summarize the main results of the dissertation and concludes with some policy guidelines and future areas of research.

Chapter 2   Review of Literature

2.1   Introduction

This chapter aims at looking the state of the art literature available on the issues; i) related to the factors that have influence on public health expenditures at macro-economic and/or aggregate national level, ii) studies related to social, economic and demographic factors that have influence on health status of population and iii) empirical literature which focused on the relationship between health human capital and the economic development.

The literature survey is not limited to only developing country studies but it includes; developed countries and countries in transition. Also, survey includes studies which used data from various countries (cross country studies), panel data studies, studies that used developed and developing country data, studies that applied single country micro level data as well studies that used time series data for one or more than one countries.

The main objective of this exercise is to bring in the gaps that exist in the literature. Also, an attempt has been made to answer empirically the questions that arise during literature survey. The literature review is divided into three parts each described separately below.

2.2   Factors affecting public health expenditures

Since the pioneering work of Joseph Newhouse (1977)[1] on possible relationship between public health spending and national income, this area of economics is getting much attention. His cross sectional study explained more than 90 percent of the variation in health expenditure when regressed with gross domestic product per capita and pin down the idea of relying only on national income as a sole determinant of heath care spending. Newhouse concluded that at margin health care is luxury good which means it is caring intensive. Contrary to Newhouse (1977) some micro studies that of Grossman (1972), Murinnen (1982) and Wagstaff (1986) observes slight correlation between income and health care utilization. Macro studies like that of Leu (1986), Gerdtham and Jönsson 1991a, b) and Hitiris and Posnett (1992) also tried to empirically estimate the strength of this relationship.

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[1] Using per capita medical care expenditure and share of medical expenditure in GDP and per capita GDP, Joseph New House (1977) estimated that elasticity varies from 1.13 to 1.31. New House run a simple OLS regression model and robustness check of the model is carried out using linear and non linear regression of medical care expenditures and GDP in per capita terms. It is concluded that income explains more than 90 percent of the variation in health expenditures thus the very simple approach of examining the health income relationship may be sufficient. This is criticized by many see among others (Hitiris and Posnett, 1992; Hansen and King, 1996 and Okunade and Karakus, 2001).

Hitiris and Posnett (1992) for example, examined the relationship the one explored by Newhouse and also included some non income variables influencing health spending like; proportion of population above 65, mortality rates, and public finance share of health spending. Although, the effect of these variables appears to be small but the model suggested the importance of non income variables.

As studies for example; Newhouse, (1977), Cullis and west, (1979) and Parkin et.al., (1987) are cross sectional in nature hence posed a limitation by assuming that health care is homogenous across countries, which is usually not the case. Sample size is also an issue of relevance with these cross sectional studies (Hansen and King, 1996). Although, per capita estimates are the conventional way to deal with these issues of comparing different population sizes across countries but this approach is not distribution sensitive.

Exchange rate conversions in this regard can also pose problems to convert data into common base. Hence, do not necessarily measure the purchasing power across countries (Parkin et.al, 1989). As with the conversion of exchange rate into PPP changes results dramatically hence, it is concluded by Parkin et.al, (1989) that not only income per capita but also other factors are important like relative prices of health care and the real income in cross country setting. Relative prices of health care is also an important determinant of the demand for health care and the omission can lead to downward bias and understate the role of non income indicators (Hitiris and Posnett, 1992).

Time Series studies, as against cross section regression estimates, used unit root approach to test stationarity problem, as if this condition is not met produces spurious results for the estimated parameters. Therefore, to avoid this problem some studies for example; Okundae and Karakus (2001) did the well established Augmented Dickey Fuller (ADF) and Phillip Perron (PP) unit root test. Using data on income and non income variables as possible explanatory variables that explain the health care spending some time series studies estimated income elasticity of health care and concluded whether health care is a luxury or necessity based on empirical analyses (see for example; Cutler, 1995).

Cross sectional model estimated the income elasticity of health spending near one saying health to be necessity (see Gerdtham and Jönsson, 2000); on the other hand, most of the time series studies (see Hitiris and Posnett, 1992) estimated health care elasticity to be more then unity emphasizing health as a luxury. It is also an interesting argument that elasticity of health spending depends on the level of development of a country and it is argued that a more developed country has greater than unity elasticity of health care spending while for a less developed country it is less than one (Scheffler,

2004). Therefore, health is a luxury and/or necessity good is unclear and it is essential to know as this has strong implications for health policy formulation.

Parkin (1987) described that although national income per capita and health care spending at national level has strong relationship but it is not all that matters, institutional factors according to him, in this regard plays an important role. Parkin (1987) regressed health care spending on GDP per capita for OECD countries after exchange rate conversion into US dollars and also analyzed the data both in terms of exchange rates and Purchasing Power Parity (PPP). The estimates revealed health care to be necessity and hence rejected the results of Newhouse (1977). The author explained that although Newhouse (1977) used macroeconomic data but borrowed interpretation from microeconomic theory and included only one explanatory variable which in micro and/or macroeconomic analysis is an under specified model.[2]

Hansen and king (1996) examined the issue of stationarity using macroeconomic time series data of demand for health care model for 20 OECD countries covering period of 1960 to 1987. Using Engle-Granger (EG) cointegration test for 17 OECD countries found no cointegration, while for remaining the hypothesis of no cointegration could not be rejected at the 5 % level of significance. Possible reasons can be inclusion of irrelevant explanatory variables in cointegration equation, as this increases the magnitude of the critical test values and/or the variables are not cointegrated even though some of them may have been (Engle and Granger, 1991). The findings suggest for most of the OECD countries that there is no long run relationship exists between health care expenditures (HCE), gross domestic product (GDP) and a selection of non income variables and/or between HCE and GDP alone, thus, negates the results obtained by Culyer (1990) and Hitiris and Posnett (1992). The principal outcome of their study was non stationarity of variables collectively. This finding did not disprove the importance of income and other non income variables in determining the level of health care spending. As the small sample size may fairly lower the power of ADF test, thus, interpretation of ADF and EG test must be treated with caution (Muscalleti and Hurn, 1992).

Okunade and Karakus (2001) applied ADF, Phillip Perron and IPS Heterogeneous panel unit root tests for their pooled data, across countries and time, for OECD countries. Engle-Granger and Johansson multivariate tests were applied for health care expenditure model. The cointegration test between health

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[2] The single regressor approach is justified by council of Europe (1980) report, saying that changes in GNP do not imply changes in health spending. Instead economic factors which can be summarized under GNP/capita can explain the largest part of differences in per capita health spending. But the argument is valid only if, the analysis is taken as summary of macroeconomic relationship and no further inference are made from it (Parkin, McGuire and Yule, 1987).

care spending and GDP per person for some of the OECD countries was cointegrated in Hansen and Okunade (2001) study while other lacks cointegration or showed dynamic instability. It is concluded by them that unit root test results are sensitive to data length i.e.; increasing the time length of data series does changes the order of integration and it is not clear whether the order is increasing or decreasing.

Parkin, McGuire and Yule (1987) criticized the use of aggregate data in cross country context to estimate the elasticity. It is also concluded, contrary to Newhouse (1977), that medical care is necessity rather than luxury. The paper criticizes the conventional or prevailing wisdom on health income relationship, suggesting some ground breaking steps to avoid spurious results of the estimates but lacks in providing concrete inferences regarding the use of non income variables. Also, paper is lacking in explaining the causality link and which functional form to use.

By applying cointegration technique, Blomqvist and Carter (1997) reexamined the view that whether health care is a luxury and/or necessity good. Data from 1960 to 1991 for 24 OECD countries on health care spending per capita in PPP terms, GDP per capita in PPP terms, the percentage of population aged 65 years and above and the implicit price deflator for US GDP for base year 1985 is used. Their study postulated a log linear model and explored that pooling restrictions are very doubtful after allowing for different intercepts for each country, and this finding had implications for the use of international cross sectional data for determining health care spending. As well as elasticity of health care above unity is doubtful, the possible reason is advancement in technology. As, according to them, the demand for health care services is derived demand, the commodity being valued by the consumer is good health and not the health services.

2.3   Social, demographic and economic determinants of health Status

At social, political and economic front determining factors affecting health status of population remain an interesting and challenging task. Although, economic development (income per capita) is well recognized a factor having large effect on health status (Preston, 1975 and World Bank, 1993) but controversies remained towards causal linkages. It is common finding in the literature that economic development (increase in per capita national income) is associated with reduction in infant mortality rates (IMR) and it is neither surprising nor new (see for example; Preston, 1975; Rodgers, 1979; Caldwell, 1986 and World Bank, 1993).

As mentioned by Preston (1975) and Rodgers (1979) that there exists a non linear relationship between income and health status, therefore, it is better to see this relation by adding a measure of income inequality. Rodger (1979) explained, for example, the variance in IMR through income and inequality.

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Waldmann (1992) in a cross country regression of 55 countries argued that after controlling for the level of GDP per capita, an increase in inequality increases IMR.

The sole use of income and inequality is criticized by Flegg (1982) on the grounds because such an estimation may sufficiently describes the general decline in the IMR as country develops while without proposing solutions to speeding up the decline. It is also suspected that study excludes more relevant variables like education (especially mothers' education) and immunization as a determinant of IMR implies that inequality estimate may overestimate. Using data from 46 developing countries, both income and Gini explaining the variation in IMR while addition of female illiteracy adds to the power of model significantly where as reducing elasticity of both income and Gini coefficient. Beside this addition of nurses and physician per 10,000 population also increases explanatory power of the estimated model. In a final regression model when all variables are added and excluding income do not diminished the explanatory power of the model which explained that income is rather indirectly affecting health status.

For the reason that income per capita is a summary measure of goods and services produced in a country, therefore, it may not influencing the IMR directly rather it affects through increased nutrition, better health services access, housing conditions, food etc. Cross country evidence suggested that there exists a correlation between income and IMR but there are some other factors beside income. As is evidence from the different level of health status achieved in developed countries which are having almost same level of development but very different health outcomes in terms of mortality and life expectancy. For example; USA invests higher on its health sector than many developed countries (e.g., France or Germany) but underperforms in terms of the health status of population (Bishai, 1995). From developing world, Pakistan is another example if compared with the countries of its income level, its performance lagged behind in terms of reducing child mortality and the level of average life expectancy. Thus, if it is income that explains everything related to health status than what role other factors like social, political, demographic and health care services can have in explaining the variation in health status is an important policy relevance question.

Cross country studies dominating the area of empirical investigation because of the easily available country/regional level data of demographic and health survey (DHS) and other household level surveys. Mturi and Curtis (1995) analyzed the socio-economic determinants of IMR and Child mortality using 1991/92 demographic and Health survey (DHS) data from Tanzania by applying hazard model. Demographic and biological factors affect infant and child mortality in Tanzania much as

expected and after controlling for other factors neither mother's education nor father's education play a significant role in IMR and CMR.[3] Gbesemete and Jönsson (1993) analyzed social, economic, demographic, environmental and political factors, using data of 28 low and middle income African countries. The negative sign reported for female literacy, health spending and urbanization with IMR. Urbanization variable implies that a more urban country has less chances of infant mortality (IMR). In studies on Pakistan, Sathar (1985), Afzal et.al (1988) and Zahid (1996) concluded that immunization has negative effect on infant mortality level. Using Pakistan demographic and health survey data (PDHS) data for the year 1990-91 Shehzad, (2006) estimated the effect of household income and hospital beds is positive and significant.

Filmer and Pritchett (1999) used cross national data to examine the impact of public health spending and other factors in determining child and infant mortality. Multivariate regression model is used with double log specification. Because of nonlinear relation of income with health status therefore, transformation of income into logarithmic form serves as to properly capture the non-linearity. While income is used as a control variable because of its universally acknowledged impact on health which work rather indirectly through better living conditions, hygienic food, better housing facilities etc. Health spending does affect child mortality rate (CMR) but it appears insignificant at conventional level of significance. Musgrove (1996) also reported similar results for health spending. While some other studies (see for example; Bidani and Ravallion, 1997 and Jamison et.al. 1996) found statistically significant results for health care spending. As, health spending accounting varies from country to country therefore, choice of countries can also have influence on outcomes as well as the functional form used. Of note is the argument of inefficiency of public spending and services provision to the population especially in developing countries. Issa and Ouattara (2005) used data from 160 countries, to analyze the effect of health expenditure on IMR. Health spending data disaggregated into public and private expenditures. It is argued that at low level of development public expenditure is more effective in reducing IMR while private expenditures are effective as country develops. Schell et.al, (2007) used linear regression model by dividing countries according to their level of economic development and found that at any level of development public health spending remained non-significant contributor in reducing IMR.

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[3] On the other hand, most studies consider that Mother's education is an important indicator and a negative relation exists with mortality (Paris and Lillard, 1994 and Wagstaff et.al. 2004). Female schooling specially post primary has positive effects on reducing mortality (Hill and King, 1992 and Subbarao and Raney, 1995).

Based on data from 117 countries, Zakir and Wunnava (1999) estimated that coefficient of health spending appeared significant. As hypothesized, fertility and IMR are positively related. While paper refuting the two way causality, proposed by Repetto (1978) and Chowdhury (1988), between IMR and fertility. This infant mortality-fertility hypothesis is also tested by Flegg (1982) using two stage least square (TSLS) with and without income variables but fertility does not appear to affect IMR in any case and concluded that Repetto's hypothesis is safely rejected suggesting that IMR is not determined by fertility level. Beenstock and Sturdy (1990) applied factor analysis, across Indian states. It is worth mentioning that poor nutrition in their model get an unexpected sign.

The studies by Brenner (1973), and Catalano and Serxner (1992) used time series data but do not take account of whether the variables are stationary or non stationary, hence their results may be misleading. It is due to Granger and Newbold (1974) that the variance of non stationary series is infinite therefore, to avoid normality assumption we cannot use traditional tests of significance. Bishai (1995) used data of Sweden, United Kingdom and USA. It is found that IMR is non-stationary i.e. I (1). The cointegration hypothesis is rejected for 19th century UK for (IMR) and GNP/capita while it was accepted for 19th century Sweden with expected sign. Cointegration using multivariate analysis supported for US and UK and not for Sweden. It is found that, in the long run, in UK and US infant survival and GNP/ capita are positively related. While a negative sign comes for infant survival and unemployment and for CBR and infant survival. Also, a negative relation is found between the unemployment and CBR and positive between CBR and income per capita. Bishai, Opuni and Poon (2007) used panel data from 21 countries from Europe and Latin America spanning 1870 to 1988 and find IMR to be non stationary.

Younger (2001) concluded that not a single variable[4] which explains GDP growth is significantly determining mortality. The results for the number of doctors, nurses and hospital beds per 1000 inhabitants showed that none of health care coverage variable significant. The primary school enrollment significantly increases IMR declining rate while secondary enrollment do not affect at all, this is opposite result compared to growth literature. Inequality variable is another determinant of mortality, while results interpret that increased inequality has declining effect on the rate of reduction in mortality which is opposing Waldmann thesis. Only primary school enrollment and DPT vaccination as policy variables showed any consistent correlation with declining mortality. As for income it does

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[4] The variables used were; the black market premium for foreign exchange; the ration of M2 money supply to GDP, as a measure of financial depth; inflation rate, the measure of inefficient taxation; the real exchange rate, as measure of competitiveness and the share of children of secondary school age attending school.

not appear as determinant of child's health status. Younger (2001) has got some counterintuitive results, as health care variables appear to be non significant with and without country fixed effects (FE). The paper concludes that factors affecting the progress of a country, determine by economic growth, are distinct from that affecting infant mortality. Because of less number of observations available it is not clear whether results are robust.

Using panel data approach with fixed and random effect (RE) models for 25 OECD countries, the study by Ramesh and Sam (2007) aimed at looking the economic, institutional and social determinants of health outcomes. Parameter estimates of health employment variable are strongly significant for life expectancy and IMR with FE and RE. This indicates that increasing spending on health employment and personnel will definitely increase access to health care and helps in improving life expectancy and reducing mortality. The most important factor affecting IMR includes physician supply, followed by immunization.

Macinko, Frederico and Desouza (2006) study using state level data from Brazil for the period 1990-2002 concluded that physician and nurses' supply is not significantly associated with IMR but hospital beds per 1000 population appear to be significant. Higher fertility and per capita income had a modest positive association with IMR. The positive association of income with IMR is surprising; one possible reason can be increasing inequality of income distribution which is highly positively correlates with IMR (Messias, 2003). The negative and significant association of hospital beds with IMR is consistent with that a large number of infant mortality is neonatal (i.e., mortality with in the first month of life) which is strongly influenced by the quality and availability of care during and after delivery which also covers prenatal care and coverage to low birth weight babies.

Banister and Zhang (2005) determined for China mortality levels that number of doctors per 10,000 populations is robust and significant. Consumption is significantly affecting mortality and life expectancy in rural areas, because rural areas are underserved while urban areas having insurance system and better health facilities. The study of Hanmer, Lensink and Howard (2003) used data for 115 countries using five years period from 1960-1997. It is estimated that income per capita and health expenditure is consistent and robust in explaining variations in IMR and CMR. Therefore, most of the empirical work which finds that health interventions significantly affect IMR and CMR is supported while the view of Filmer and Pritchett (1997) who argued a weak effect of health spending on health status is rejected. It is recognized that growth in income is necessary to sustain health expenditures.

2.4   Health and its role in economic development

Health is argued to be an engine of economic growth and productive asset a human possess (Barro, 1996). Therefore, health can be a critical factor for human capital formation. Health is an asset that nature has endowed to human being. Health has a significant economic value because of its role in the individual's welfare and for economic development (WHO, 1999). Although, studies are contrary in estimating the relationship of health with development nevertheless, a cyclical relation is assumed to exist between health and level of income[5]. Sorkin (1977) explained that mortality reduction has important impact on economic growth during the early 20th century, while magnitude of this effect depends on level of development. Developed country has relatively less impact on its growth by improvements in health while improved health has a strong positive relation with economic development in case of low income countries. Grossman (1972) and Bloom and Canning (2000) explained that healthy individuals are more efficient and therefore highly productive because they are better able to seek knowledge and skills. Bloom and Canning (2000 and 2001) in cross country analysis, used life expectancy as a variable of health capital. Their objective, using production function framework, is to estimate the effect of health on labor productivity. This approach, it is argued, ensures the robust estimation of the growth determinants rather than over estimating the contribution of one component. The impact of increase in health expenditures on improving health might be justified through its impact on labor productivity (Bloom, Canning and Sevilla, 2001). It is also concluded by Lee, Mason and Miller (2000) and Ainsworth and Over (1994) that life expectancy may influence life cycle savings and capital accumulation. Therefore, improvements in health not only increase productivity but also capital accumulation. Life expectancy appears to be a consistent and a strong predictor of economic growth than any other variable related to health human capital (WHO, 1999) and helps poverty ridden disease prone countries to come out of trap and can offer better quality of life to the majority of its population examples are: East Asia, Ireland and other wealthy developed countries (see for example; Steckle and Floud, 1977 and Bloom and Canning, 2001).

The study of Rivera and Currais (2003) aimed at estimating the effect of health investment on labor productivity as an important variable of human capital formation. The direction of relationship between health and income is also explored in this study for OECD countries using augmented Solow model.

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[5] There is a strand of literature focusing on income- health nexus (see for example; Barro and Lee, 1994; Prichett and Summers, 1993 and Marmot, 2002 and Deaton, 2002) while there also exists studies on health-income relationship (see for example; Smith, 1999; Finlay, 2007). This later issue is not yet extensively explored, especially in case of developing countries. Therefore, the focus is on health-income relationship in this dissertation's chapter 7.

Studies like Wheeler (1980); Currias and Rivera (1999); Behrman (1990) and Bloom et.al, (2000) concluded that health status improvements affects labor productivity significantly and positively. Fogel (1994) in this regard argued that better health status increases living standard directly and is consistent with increases in income. But Cullis and West (1979) and Easterly and Rebello (1993) find negative effect of health investment on income per capita. While Cullis and West (1979) suggested that health expenditures should not be considered investment in developed countries. Because, the benefits of health investments are noticeable only in long run and simple correlation may bias the results about the relation of health investment and productivity. Nevertheless, the role of health status with respect to productivity is positive.

Life expectancy is a commonly used variable to illustrate health status of the population (see for example, Grossman 1972; Mankiw et.al, 1992 and Barro, 1996). Bhargava et.al, (2001) and Evans et.al, (1994) criticizes that life expectancy does not show the labor productivity accurately and do not reflect the innovation needs of the labor force.

The study by Rico et.al., (2005) used model based on Bloom, Canning and Sevilla (2001) and tried to improve the specification by including ordinal health index variable, rather than life expectancy, that is a cumulative index of; health services, socioeconomic conditions, life style and environment using panel data from 1970, 1980 and 1990. It is concluded that aggregate health index performed better than life expectancy. It is therefore important to include investment in health as a macroeconomic policy measure to keep countries out of poverty trap (WHO, 1999). Using annual time series data from 1960 to 2003 from Pakistan, the study by Abbas and Peck (2007) estimated that during 1990s 18 percent of the growth in Pakistan economy is attributed to human capital which is more than physical capital growth. It is also estimated that human capital contribution to productivity increased from 17 percent in 1960 to 40 percent in 1990s. Therefore, human capital formation through investing in health care is essential for growth in the economy. Granger causality test is applied by Mayer (2001) on annual time series data from 18 Latin America countries to estimate the causality between health and income. It is concluded that there exists a conditional Granger causality from health to income. Instead of using common measure of health status i.e. life expectancy this study used a measure of health status which is probability of survival. Brinkley (2001) used data from USA for GNP, life expectancy (LE), Infant mortality rates (IMR) and investment in medical research and concluded that impact of health on income is important in framing public policies for better health status. It is suggested that increasing health expenditures will definitely increases productivity and therefore increases income and wealth.

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Bhargava et.al, (2001) tries to investigate the effects of health indicators like adult survival rates (ASR) on GDP growth rates at 5 years interval in panel of countries. The relation of life expectancy to income is integrated with economic growth model of Barro and Sala-i- Martin (1995).

It is estimated that the total fertility rate is negatively associated with GDP growth rates.

Investment GDP ratio positively and significantly related with economic growth rates but coefficient is small. Lagged ASR and interaction term ASR with GDP (ASR*GDP) is significant determinant of economic growth rates with positive sign. The empirical results show no specific changes when ASR is replaced by life expectancy variable.

Robert Fogel (1997) worked on historical data from Britain and concluded that 30 percent of the economic growth for the year 1780 to 1979 was due to improvement in nutritional status which contributed to longevity, which assured people to invest more on human capital for economic growth. Nevertheless, the issue of nutritious diet is considered an important as nutrition plays an important role in maintaining the better health and increases productive potential (Scheffler, 2004). Poor nutrition is said to be a prime cause of low productivity in developing countries (Bhargava, 1997). The strategies to promote better health status need to emphasize on local country conditions like economic and social development, nutritional status and health services availability. Bhargava (2001) summarizes the existing evidence at macro and micro level, to better understand the theoretical link between health, nutrition and economic development.

2.5   Research gaps and contribution

By reviewing literature on three interlinked areas of health in this chapter few observations have been made and are given below; First, single country time series studies on health and development relationship are few (e.g., by Murthy and Okunade, 2000) and are using, in most cases, data from developed countries[6]. Second, price changes effect health expenditures therefore, it is important to compare real rather than nominal values. Hence, it is concluded that macroeconomic theory, may guide well to develop better econometric framework to understand the size and determinants of health spending (McGuire, et.al., 1993).

Third, brief overview of the literature on the possible determinants of health expenditures revealed that almost all the studies reviewed are using data from developed or OECD countries in cross country or panel data settings, or from single but developed country (for example; USA and Canada). Only a few

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[6]The estimated income elasticity of health spending is more than unity in almost all of the developed country studies.

studies used time series data from single country and analyzed the existing evidence on health care expenditures, income and other variables of interests. Virtually none of the studies reviewed belong to single country analysis or panel estimates from developing countries.[7] As health care services are not homogenous across countries, even within country there is lack of access to services and inequality in provision; therefore, there is an urgent need to draw attention towards analyzing the time series data at a country level. Fourth, a large number of studies are using data from cross section of countries while it is difficult to interpret the results in aggregate production function, and hence it seems that the results of the existing empirical evidence is mostly misinterpreted. Time series analyses implies an aggregate production function, therefore, it has an advantage in that it is more likely than cross section analyses, to be looking at consistent production function, easy to interpret and more robust. Although time series data may have structural breaks (McGuire et.al., 1993).

Fifth, as theories provide a loose justification for empirical specification of health sector behavior, therefore, empirical model employed in the studies of health spending and its determinants for allocating optimal resources to health sector are ad hoc. Sixth, in most of the macroeconomic studies the evidence has been found for a double logarithm or log-linear form (Gerdtham et, al. 1992). Seventh, the results of cross country regression analysis and/or panel data estimation may be biased because of sample size used; nature of data used and methodological issues also exert a significant effect on coefficients and their sign (Hanmer, Lensink and Howard, 2003).

Eighth, there exists a wide array of empirical evidence on IMR and life expectancy as health status variables and the factors affecting them, both in developing and/or developed country context. Studies in these lines of inquiry used; cross country regression approach taking one year data and explaining a snap shot view of the existing evidence, making use of the regional data from a single country and applied panel data approaches, while time series studies are rare in analyzing the predictors of mortality and life expectancy. Because getting such a long time series data on health related variables is difficult and there is hardly any attempt by researchers to use developing country data. Hence, there exists a wide gap in terms of applying cointegration methodology in developing country settings to explore macroeconomic predictors of health expenditures and health status.

Ninth, there is a contentious debate on the issue of health income relationship and reverse causality. Number of studies tried to model the impact of health on growth as well as on development. No single

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[7]Only one studies cited above is from cross country analysis of 30 African countries in a linear OLS settings.

study tries to use, in time series framework and at single country level, the role that nutrition (as a health status indicator) can play in economic development.

Keeping in view, the gaps that exists in the literature on health expenditures, health status and different health related factors affecting economic development an attempt has been made in this study to fill the following gaps; i) the study uses unemployment (as a measure of social exclusion) and urbanization (as environmental factor) affecting public health care expenditures in a single country setting using annual time series data from Pakistan, ii) cointegration and causality analysis is extensively employed to analyze the robust determinants of health expenditures, health status and their role in development of Pakistan. In previous studies only long run relationship is empirically estimated using cointegration techniques but in this study first time we have estimated the short run dynamic relationship. Weak exogeneity test also carried out which gives robust result about the endogenous and exogenous variables in the vector autoregressive modeling (VARM) approach and gives significance of dependant and independent variables by imposing zero restriction and iii) an important factor of human health is nutrition. An attempt has also been made to see the impact of nutrition on development while it is also compared with the traditional indicators of health (like; fertility, mortality and health expenditures) that has been widely applied in this type of empirical research but not compared with nutrition and its importance in determining its impact on economic development.

2.6   Research Questions

It is important to know the contribution of health in economic development of less developed countries like Pakistan. Health is suppose to play a vital role in improving living standard of the population and helps to reduce poverty. Therefore, this dissertation tries to answer this following main research question;

What role public health expenditures and health status (measures like; life expectancy, infant mortality, fertility, per capita health spending and nutrition) play in the economic development of Pakistan?

There are number of sub research questions that are addressed in this dissertation. These sub questions help to address the main research question. These are given as follows;

A).   what income and non income factors at macro-level explain the health expenditures at national level in Pakistan? Which factors are responsible in determining health expenditures in the short and in the long run?

B).   empirically estimating whether the short run and long run income elasticity of health expenditures is less than or equal to unity?

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C).   what role unemployment (as a measure of social determinant of health) and urbanization can play in public health expenditure estimation?

These objectives are addressed in chapter five of this dissertation which empirically examines the link between various income and non income factors that affect public health expenditures in Pakistan using data from 1972 to 2006. This chapter employs the Johansen cointegration methods and error correction mechanism in exploring long run and short run dynamic relationship.

D).   what is the role of various social, economic, political, and health services related variables in determining the health status of the population at national level in Pakistan?

E).   whether infant mortality and female life expectancy are causally related with public health spending, health personnel and national income?

The above objectives D and E are addressed in chapter six of this dissertation using annual data spanning from 1972 to 2006 and applying Johansen cointegration framework and Granger bivariate causality analysis.

F).   what role nutrition intake have in development of a country?

G).   what impact other factors fertility, mortality and health expenditure have on development compared to nutrition at aggregate level?

H).   Are these factors (per capita income vs. nutrition, health expenditures and infant mortality) are causally related in Pakistan?

The above sub research questions F, G and H are empirically examined using annual time series data from Pakistan from 1972 to 2008 and form the basis of chapter seven of this dissertation.

Chapter 3   Health sector of Pakistan: A brief overview

3.1   Introduction

Pakistan, since independence, has progressed reasonably well in economic terms but human resource development remained at a standstill. Economic growth rate was above five percent on annual average basis during the last five decades. Subsequently income per capita tripled in nominal terms during the same period (GoP, 2006 and Uddin and Swati, 2006). Over the years, the share of health spending in the total government budget declined from 0.7 percent in 1990 to 0.6 percent in the year 2003 (Lashari, 2004). Human resources remained underdeveloped in terms of skills, better health and education attainment, while ill health, illiteracy, poverty, inequality and social exclusion enlarged (Easterly, 2001 and World Bank, 2002). Underdeveloped as well as underinvested social sector especially education and health is playing a vital role in vicious cycle of deprivation (Abu-Ghaida and Klasen, 2004).

In view of the potential role that better health can play in improving the living conditions in the country, this chapter traces the different aspects of health sector in Pakistan including public health spending, public health infrastructure, health status improvements in terms of outcome, access to public health care as well as human resource for health.

This thesis is dealing explicitly with the public health expenditures in Pakistan which mainly are coming from tax revenues and other government sources but not including the out of pocket expenditures, philanthropic or any other kind of private expenditures on health. This is done because of the data limitations and non availability of private health expenditures time series at national level.

Political economy of health sector and the development planning in health is also discussed. To this end, this chapter aims at assessing the health sector of Pakistan (public health services provision) from 1972 to 2006. Also, looks into the major reasons for low health status in the country, trend analyses of health workforce availability and public spending on health.

The organization of the chapter is as follows; in section two health system of Pakistan is explained. Section three describes public health sector expenditures (recurrent and development expenditures) overtime. Section four briefly explains health infrastructure availability in the country; Health personnel and paramedical staff are also dealt in this section. A snapshot of health status is explored in the fifth section. Finally, the chapter summarizes and concludes.

3.2   Health system[8] in Pakistan

After partition, in 1947, Pakistan inherited a totally inadequate health care system comprising only of one medical college, a few doctors, with heavy burden of infectious diseases, Tuberculosis (TB), lack of adequate infrastructure, high infant and maternal mortality rate and population having low life expectancy. The system is divided into public and private having traditional medicine systems like Ayurvedi, and Unani (Greek) (Zaidi, 1988, and Hassan and Mehmud, 2006).

With annual population growth rate of over 2 percent since mid 1990s, Pakistan is 7th most populated country in the world (GOP, 2006). Two third or almost 70 percent of the population lives in nucleated villages (compact group of people having private residence) while one third of the population lives in urban areas and hence divided into lower, growing middle and upper income classes (GOP, 2004; Illiyas et al., 1997 and Khan and Bhutta, 2001). Pakistan becomes heir to a health care model, followed by British colonial rule and/or western oriented, which is highly centralized, curative in nature and inefficient in providing health care to all specially to rural poor (Zaidi, 1988; Khan, 2006). Health care provision in Pakistan has three distinct biases: class bias against poor (especially rural population); regional bias in favor of urban areas (Zaidi, 1988); gender bias that is male having more access and privilege to use health services compared to female. In the year 2001, government of Pakistan opted devolution plan to decentralize the responsibilities to districts through provincial administration and hence to Tehsil (sub district), although planning and finance is the shared responsibility of federal and provincial government. In the devolution plan, health remained a provincial subject as it is declared in the constitution of 1973 (Uddin and Swati, 2006). Three tier health care systems that exist in Pakistan (see figure 3.1) is facing diverse problems like inequality in services provision, inefficient and not well trained human resources, corruption and mismanagement among others (Nishtar, 2007 and Sheikh and Rabbani, 2004). Health in most of the developing countries is provided by the public sector and lacks public spending e.g., Pakistan is spending only 0.8 percent of its GDP for health sector services (GOP, 2006).

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[8]The organizations, institutions and resources whose primary purpose is to improve health is known as health system. A health system needs staff, funds, information, supplies, transport, communications and overall guidance and direction (WHO, 2000).

Figure 3.1: Description of three tiers Health System of Pakistan

Tier	Facility	Description
1st tier	Basic Health Units (BHUs)	i). 5000-10000 population coverage without bed facility. Staff of a doctor and 2-3 paramedics/ technicians, includes dispensaries and maternity and child health centers (MCH). iii). Offers preventive health Programmes like; child care, midwifery, immunization, malaria control, diahorreal diseases, child spacing and school health services.
	Rural Health Centre (RHC)	i). 5-10 basic health units (BHU), having 3 doctors including one female, a dentist and also multipurpose paramedical staff also called rural community hospitals. ii). 10-25 beds and for diagnosing simple diseases, offers Preventive care, maternity and child and emergency handling.
2nd tier	Tehsil headquarter Hospital (THQ)	i). Referral care hospital for minor surgery with 60 beds, includes junior specialists, senior doctors and nurses. ii). One doctor for 15 beds now a days it is 30. One doctor per 50 outpatients, one for emergencies and medico-legal work at district headquarter hospital.
3rd tier	District Headquarter Hospital (DHO)	i). It is referral for serious cases having equipped with almost all medical facilities and include 6-10 specialists and senior doctors. Also consists of blood bank. ii). Diagnosis, and treatment surgery by specialists and senior doctors, also arrange training Program for nurses and paramedical staff.
	Teaching Hospital(TH)	i). Referral for complicated hospitals, consists of more than 300 beds. Also includes all major specialties and sub specialties required for training and consists of a blood bank. ii). Diagnosis treatment by specialists, field surgery and intensive care. Conduct training of graduate/postgraduate students, medical staff and for nurses in sub specialties.

Source: Author's own conception from different sources.

3.3   Development planning and health Sector

In Pakistan, the effort of making policies and plans was primarily aims to improve the living standard of the people by reducing social inequities like illiteracy and by providing decent living through health services provision. Hence, health planning remained an integral part of all the five year plans. In 1955-60 the first five year development plan was implemented.

Health personnel shortage was one of the key concerns to achieve better health status in the first plan period. It was pointed out in the plan document that health services should be expanded modestly due to lack of required number of health personnel. Lack of curative services and less finance was the major obstacles in achieving the necessary health coverage for all. Health sector expansion, during fifth plan period, had got momentum but population growth rate was still high in Pakistan, high infant mortality rate, inadequate number of doctors and paramedical staff, imbalances between special programs and general health services. Funds for preventive care remained less available, hence provide impediment in health sector improvement.

Instead of extending and strengthening general health services more emphasis remained on crash programs like malaria eradication, Tuberculosis (TB), expanded program of immunization (EPI). In this context, foreign aid for health also meant mainly for these crash programs. This results in high burden of communicable diseases, while some success has been achieved to eradicate major epidemic diseases like smallpox and malaria.

Shortage of recurrent finance also retarded full utilization of medical infrastructure, doctors and paramedics and consequently achieving targets for health. Mother and child health received not much attention and hence extended to small portion of population which consequently increased maternal mortality ratio (MMR), infant mortality ratio (IMR) and child mortality ratio (CMR). Paramedical staff is in short supply (like nurses and pharmacists etc.) and the reason for this shortage was socio cultural barriers that are playing dominant role and limited capacity of training school with inadequate residential facilities, inefficient staff, equipment and laboratories.

Health for comprehensive national coverage was the slogan of the sixth national plan. Low allocation to health sector is described as the fundamental hurdle in achieving the targets and hence improving the health status. While recurrent expenditures are facing difficulty as allocation is insufficient. After almost three decades of planning it is realized in seventh plan that health is necessarily provided to all in order to achieve and improve the quality of life. Due to lack of finance and/or less utilization capacity (Hassan and Mehmud, 2006 and Lashari, 2004), for example 50 percent of the allocated

budget for 5th plan is actually utilized (Hakim, 2001 and Lashari, 2004), achieving the targets of integrated health care system at national and provincial level seems bleak. During 8th plan period (1993-98), inadequate primary health care (PHC) and health manpower imbalances are among the other health sector needs. As, almost 60 percent of the recurrent (Non development) expenditures go to salaries, there is little space to invest in health infrastructure development. In medium term development framework (MTDF) 2005-2010 emphasis is on PHC and on Communicable diseases which accounts for major burden of diseases (BOD) around 40 percent.

3.4 National health policies

The national health policies of 1990 and 1997 stated that huge death toll in Pakistan is due to diseases that can easily be prevented if due emphasis is given to nutrition, water and sanitation and birth control (MoH, 1990, 1997). Health policy of 1997 aimed at increasing the training opportunities for paramedical staff at local and national/international levels, while development of integrated health programs and promoting Primary health care initiatives. For controlling and preventing communicable diseases, it emphasized on Expanded Program of Immunization (EPI) to be broaden to all areas (MoH, 1997). High priority was given to upgrading health care system in the national health policy of 1990. Provision of universal coverage in accordance with the initiative of 'health for all in 2000', with the objective of making health services more effective, equitable, efficient and accessible. Efforts were also made in the policy document to enhance community participation and also to include preventive, curative and promotive services (MoH, 1990). Human resources development was the utmost part of both the policies in order to have better access and utilization of existing facilities.

National Health Policy 2001 addresses health problems and improvement in living conditions. Key measures include; improvements and upgrading Tehsil and district level hospitals, establishment of referral system between primary and secondary as well as tertiary health care facilities (MoH, 2001). The aim is to protect people against hazardous diseases; promoting public health and upgrading of curative facilities.

As child survival rates in Pakistan is low thus in Health policy of 2001, a provision is made for focused reproductive health care services provision for married women of child bearing age. This enhances and ensures the safe motherhood initiative and hence increases mother and child survival rates. In this regard, primary health care access is made available to the majority of women through lady health worker's Program at door step (GHWA, 2008). Health sector reforms 2004 prioritize to save people

against deadly diseases; to promote public health and upgrade curative facilities. Priority was given to primary health care (PHC) and secondary health care (SHC).

3.5 Political economy of health sector

Health care is sold in market on competitive basis like other commodities. So, only those who are able can buy this service. In Pakistan majority of those living in poverty are unable to purchase health care. This situation created a type of health sector which is pro rich in its access and thus less efficient. Because the facilities are enjoyed by few, hence regional inequality in access and utilization of health services is increasing among different economic classes. Zaidi (1988, 2005) agreed about urban and class bias in health sector and concluded that not only spatial inequality at regional level but also social class determines access and ability to afford health services. Not only regional or class bias but also the gender bias is persistent. This can be captured well by looking into the maternal mortality, life expectancy of female, pregnancy related deaths of mothers, infant and child mortality. One of the reasons explained by Zaidi (1988) for urban bias in health sector is that; the most powerful and influential groups like politicians, feudal (absentee landlords) and businessman are living in cities and hence exert pressure on government policies in their own favor while neglecting or leaving little for rural counterparts. As urban health sector is receiving six times the resources rural areas receive (Zaidi, 2005) while almost three fourth of our population is rural. The health status of an individual and community is determining factor for the economic and social path a country can take by utilizing its human capital. Therefore, provision of health care to all regardless of their location and economic status must be given high priority if government wants to achieve the goals like poverty reduction, economic and social aspect of human development and hence endorse social progress and equity.

Allocation of funds to the high priority areas and their utilization remained always a problem. As an example, only in structural adjustment program phase one (SAP-I), more than 96 percent of the allocated budget were utilized while in some five year plan periods the utilization rate remained lower than 60 percent, that created hurdles to achieve policy targets (Khattak, 2001). At the same time the ratio of utilization of recurrent budget remained high compared to development budget. Like in SAP-I&II funds utilization showed that for recurrent (non development) spending it remained almost 99 percent where as for development budget it is as low as 34 percent (that is out of Pak. Rupees.18.5 million only Pak. Rupees. 6.27 million were utilized). This shows inefficient governance and incongruity of resources available for health sector. One reason for this backdrop is the weak design of projects and politically motivated implementation.

3.6 Public health spending

Health is provincial subject in Pakistan and provinces get about 5-6 percent of the total federal government resources hence less is available for health sector (Hakim, 2001 and Hassan and Mahmud, 2006). Low level of public health expenditures are among the contributing factors to the deteriorating health conditions in Pakistan (GoP, 2006; Hassan and Mehmud, 2006; Lashari, 2004 and Uddin and Swati, 2006). As is evident from the figure 3.2 since early 1970s, spending on health remained less than 1 percent of GDP until recently.

Private health spending constitutes almost 80 percent of the total health spending and makes the health expenditure up to 3.5 percent of GDP. Private sector is actively involved in health sector, allocating resources and expanding at a higher pace. For example, private health spending increased from 75 percent in 1995 to 80.4 percent in 2004 (WHO, 2004 and 2007). Development health spending, during the early 70s, remained lower than recurrent expenditures. Although, non-development spending is higher compare to development spending as ratio of total health spending it still needs to be more in terms of utilization, because utilization rate also remained low over the years. It can be observed that with the beginning of 1990s the gap between development and recurrent spending is widening, largely because of policy shift and due to increased expenditure on renovation and upgrading the existing health facilities (see figure 3.2).

Figure 3.2: Pakistan total, development and non development health expenditures
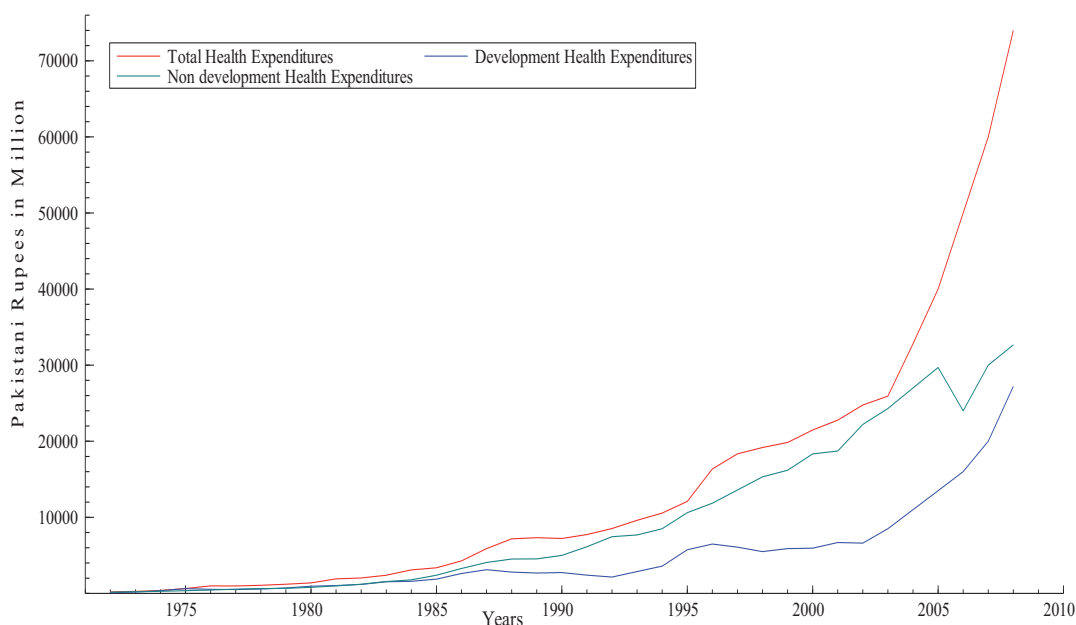
With the start of the Social Action Program (SAP) in the mid of the 1990, health sector spending got momentum and increased rapidly. With the start of 21st century declining trend in health spending started again, mainly due to foreign funding stopped. After 2002, the development health spending is on increase as present government is allocating more on social sector especially on health and education through increased Public Sector Development Program (PSDP). Total Health spending as percentage of GDP remained very low (less than one percent throughout the history of Pakistan with few exceptional years) as the share of health sector was merely about 0.44 percent in the year 1972 which goes up to 0.51 percent in the year 2005.

3.7 Health human resources

Human resource development in health sector remained a major obstacle to access and better provision of health care. Endowed with less infrastructure and unskilled manpower, Pakistan trained skillful manpower in every sector of economy including health. High population growth rate of around 3.1 percent in the early years of 1970s and almost 2.6 percent in the end of 1980 has over taken the increased production of doctor. Hence the doctor patient ratio remained high. Progress in this regard is slow and disparity in allocating doctors to regional basis is showing huge inequalities. In the early 1970, at most 4100 people were served by a doctor and 12000 by a nurse. In the mid 80s although the rate of increase of medical colleges and training centers were high so was the production of doctors and paramedical staff. Over the years, doctors and nurses ratio per population declined gradually. Although nurse population ratio is now 3000 while doctor population ratio is around 1300. One reason is the migration of doctors and nurses to western and to Middle East countries in search of better economic opportunities. Socio-cultural practices in this regard also play a major role like; marriages of female doctors and reluctance to work away from home (in rural areas). This attitude is creating socio economic problem in provision and access to better health care especially in rural areas. Problem of unemployment of doctors in urban areas and shortage of doctors in rural areas is a leading factor for not having better access and provision of equitable health services.

3.8 Health status

During the past three and half decades Pakistan has done well in terms of health services provision to majority but still conditions are far from satisfactory. Over all, life expectancy went up from 50 years in 1972-73 to almost 68 years in the years 2005-06; still Pakistan is low compared to the countries of its region.

Though, female life expectancy in Pakistan is higher than males (as is globally measured), the difference is not too big. Secondly, micro studies on this issue also show that women live longer but less healthy life than males. The situation is seemingly worst in rural areas because of lack of necessary infrastructure, increasing poverty and inequality, cultural hindrances and less funding to rural areas compare to urban areas (Zaidi, 1988 and 2005). Infant Mortality Rate (IMR) is decreasing but still very high at above 70 deaths per 1000 live births (see the Figure 3.3). During the early 1970's, IMR declined while in the beginning of 1980 it rose up to 130 infant deaths per 1000 live births, highest in the history of Pakistan.

Figure 3.3: Infant mortality rate and female life expectancy in Pakistan
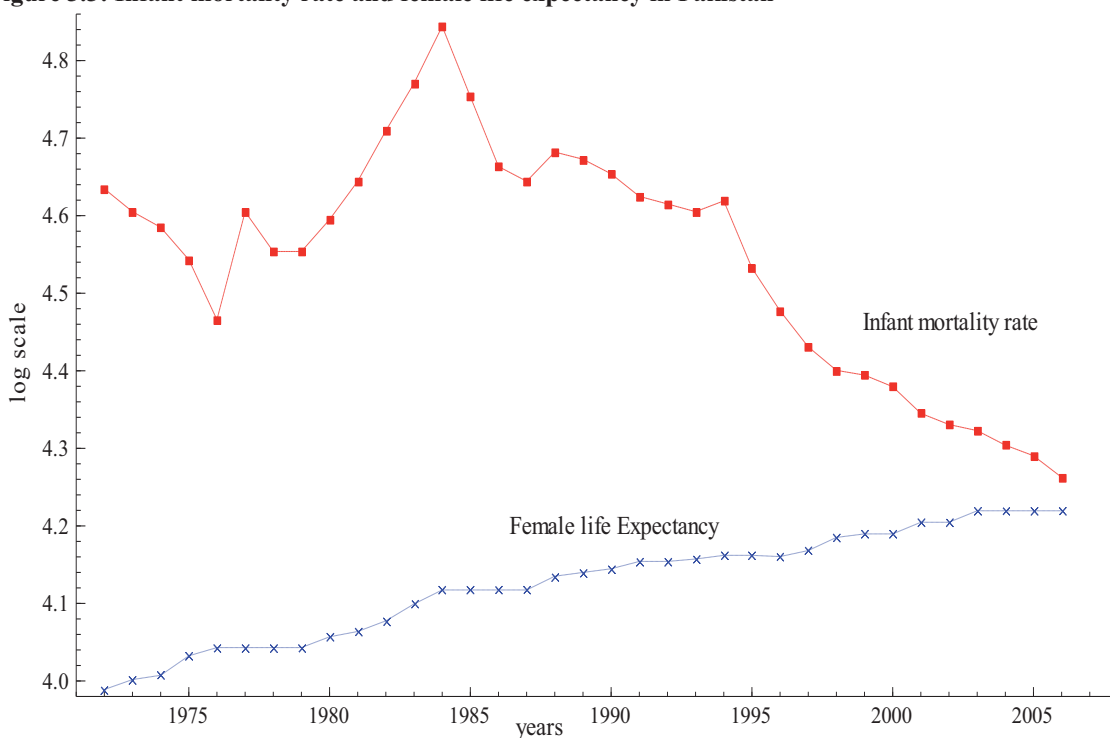
Thereafter, it remained declining gradually. Spread of infectious diseases, lack of maternity and child health care centre, improper immunization to children in the early years, socio economic deprivation, and urban bias in health care provision and access to health care services explains part of the story.

3.9   Summary

As health is considered to be a basic human right it is necessary to adopt an integrated approach to public health provision that includes preventive, promotive and curative aspects of health care. Pakistan has to take care of its human resources through better health services provision. Better health of population cannot be achieved in isolation and therefore authorities must interlink the process of

formulating health policies with other sector of economy. One issue is lack of funding for health sector while it is coupled with lack of utilization of available funds. The attitude of centralized policymaking process makes it difficult to adopt policies and plans and their implementation, due to little or no involvement of provincial governments. Government can provide a viable policy and guidance to provincial and district governments to take concrete measures to increase access to health care facilities of all the community by employing more doctors in rural health facilities. This will serve two purposes; one is to reduce unemployment among doctors and secondly increase access to basic health services.

Chapter 4 Conceptual and theoretical framework and methodology

4.1 Conceptual framework

It is recognized globally that human capital formation plays pivotal role in economic growth in the long run. In this context, health is a critical component of the living standards (socio-economic) of a society. Health is broadly visualized as an input into and outcome of development process, integrated socio economic uplift based (linking health improvements with other sectors like water and sanitation and nutrition) on health status improvements depicts a reflection and cause of ongoing development efforts towards human welfare. It is an established fact that improvements in health of population as a whole definitely have a positive impact by generating social returns to individuals and communities. This explains on one hand, improved human capital is better capable of participating in economic activities, improved productivity at individual level and consequently better living standards. On the other hand, better health status will result in lesser absence from work and reduces disease burden (Basta, Karyadi and Scrimshaw, 1979) which translates into low economic cost in terms of providing health services and hence better coverage and better management of the available resources.

As health related illness in most of the African and Asian economies, costing economic loss and retarding human development. The improvement in health would translate towards low population growth, higher income, and higher economic growth. Health provides basis for productivity increase and efficient learning (WHO, 2001).

Inability of growth rate convergence of developing countries necessitates the emergence of new growth theories. Along with physical capital, new growth theories, emphasized on human capital formation and its importance for economic growth. Health is a prominent part of human capital along with education.

Lichtenberg (2004) argued that more public health services could enhance level of life expectancy. An increase in government spending not only leads towards longer life and hence faster economic growth as reinforced by that long life implies a larger work force, which can also drive faster growth (Aisa Pueyo, 2004). For broad based economic growth, developing countries, has to draw attention towards human capital formation by investing in health and education, as higher spending is worthwhile (see for example; Webber, 2002).

Studies revealed that a healthy person not only works efficiently but also able to devote more time to economic activities that increase productivity. It is estimated that health improvements accounts for one third increase in GDP growth (Bloom and Sevilla, 2004). An increase of health spending by one

percent causes 0.5 percent increase in GDP per capita per annum. Hence, improved health causes economic growth. The impact of improved health status augments country's human capital. Direct contribution of health in economy is through increased labor productivity; hence, there is growing evidence on investing in health not only for economic growth and for improving human capital but to prevent slippage into poverty by avoiding income or consumption shocks for example, in Colombia, the public and private investments in health are related to future earnings of individual as one more day of disability decreased male (rural) earnings by 33% and 13% for female (Ribero and Nunez, 1999). Ill health may mean that people who are able to work have reduced productivity, shortened working lives, and increased numbers of days lost to illness. Therefore, imposes a higher level of risk on the poor than on people with more assets. Reduced cost due to better health (less illness) mean increase in welfare.

Improved health can contribute substantially to economic growth, predominantly by way of reducing production losses caused by worker illness and raising labor productivity. Most obvious sources of gain are fewer working days lost to illness, greater opportunities to obtain better-paying jobs, and longer working lives (World Bank, 1993).

However, a related reason why better health may not automatically boost efficiency is that rapid population growth and an increasing labor force in many developing countries result in a labor surplus and, consequently, in higher unemployment or a sharp drop in the marginal productivity of workers (Sorkin, 1984). Economic growth can sometimes be explained partly by the control of endemic diseases, especially if new regions are opened up for settlement and development. In Brazil, for example, improvements in transportation and the control of malaria in various regions triggered a rapid increase in economic growth (Sorkin, 1984). Spending that reduces the incidence of disease can produce big savings in treatment costs. As research in nine developing countries and seven developed countries has shown, preventing a case of AIDS saves, on average, about twice GNP per capita in discounted lifetime costs of medical care (World Bank, 1993).

There are direct and indirect channels that contribute to lower health status in Pakistan which includes; lack of education (especially the mother's education), poverty, high fertility, urban bias in health services provision, lack of planning and poor management and unnecessary delay in implementation, lack of evaluation process and low utilization of funds and corruption, lack of adequate health facilities, paramedical staff, low level of public spending (development spending is less than non development spending), lower doctor patient ratio, prevalence of infectious diseases etc. All these points are of relevance to Pakistan as much as for any other developing country. Number of these issues needs

political commitment; some of them are relevant to demographic policy, others with social and economic order in the country. Keeping in view the role that health can play in the economic development of Pakistan, following is a conceptual model (see figure 4.1) to better understand the link between political, social, economic and demographic factors at aggregate level and their interaction with public health expenditures, health status of the population and ultimately with the development of the economy. The two way arrow means that there is a possibility of reverse causality and in some cases this hypothesis is also empirically tested for example; the relation of health spending and health status, the relation of infant mortality, fertility and income, relationship of life expectancy, income and health expenditures etc.

Figure 4.1: Diagrammatic relationship among health, health status and Economic Development
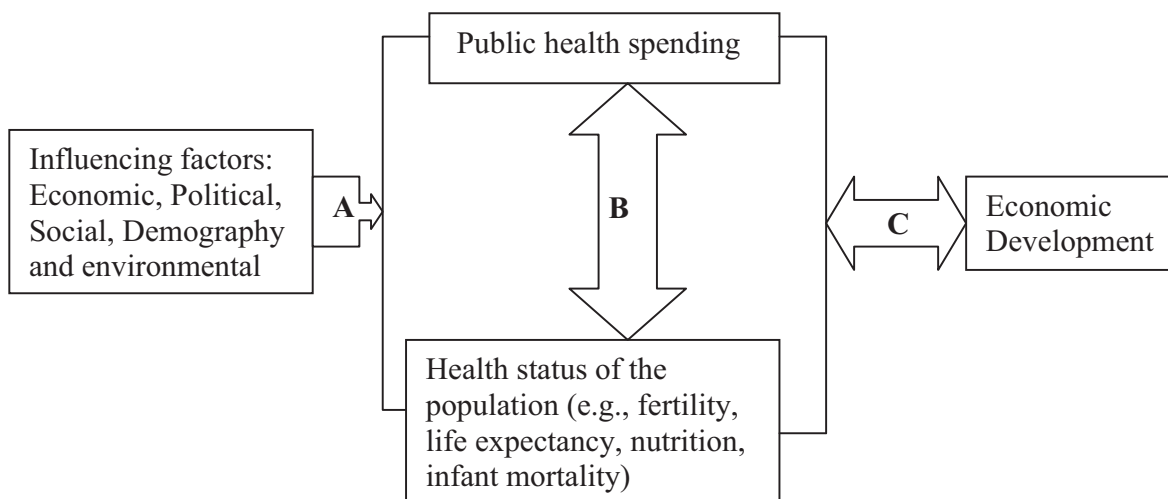
Source: Author's own illustration.

It is however; clear that health is an important aspect of human development and is affected by political, social, economic, demographic and environmental consequences. Therefore, at macroeconomic level a conceptual model is developed to analyze the channels that affect health expenditures, health status and hence economic development of a country. In this hypothetical model (panel A) shows that factors that affect public health expenditures at national level (see for example; Gerdtham, et.al. 1992; Hansen and King, 1996; Blomqvist and Carter, 1997; Newhouse, 1977).

Panel B of the figure 4.1 shows reinforcing relation between health status and public health expenditures as well as other factors that are equally affecting health expenditures. It is assumed that the more improved the health status a society enjoys, it is more conscious of its health and hence

positively affecting health expenditures (see for example; World Bank, 1993; okunade and Karakus, 2000 and Hamuodi and Sachs, 1999).

In many studies it is explained that health in not only an input to development process but an end of this process to accomplish as well. Therefore, a reverse relationship is hypothesized in this model between health status and economic development of a country (see for example; Finlay, 2007 and Suhrcke et.al, 2005).

4.2 Theoretical framework

4.2.1 Demand for health care

McGuire et.el, (1993) described the analysis of health care 'notorious' because it is lacking a theoretical basis[9]. Grossman (1972) tried to provide a theoretical model for health but due to imperfect health care markets it still needs to be adopted for better specifications of health care models[10]. Like for example McGuire et.al, (1993) explained that without any theoretical basis an additive functional form is estimated by virtually all studies (see for example; Hitiris and Posnett, 1992; Newhouse, 1977 and Wolfe, 1986) while it may be linear or nonlinear, which is yet to be known. For example; some studies have found that income after a certain level has a declining affect on infant mortality (Rodgers, 1979 and Younger, 2001). Linear models imply that inputs of the models are independent and giving constant marginal products when an additional unit of an input is used. On the other hand log form models show declining marginal products (McGuire et.al., 1993)

The law of diminishing returns as applied to population health suggests that with an additional input the marginal increment to health improvements reduces. It is rationale because societies take more cost effective decisions keeping other things constant (Bishai, Opuni and Poon, 2007). It also proves that with the increase in income its effect on reducing mortality declines provided the distribution of income is egalitarian. Most of the studies on the determinants of health expenditures used demand function approach to specify the models, specifically, real health care expenditures (HCE) is hypothesized to be a function of real GDP and a selection of economic and non income variables. It is explained in many empirical studies on health and health care demand that the determination of health expenditures includes political and economic actors. While, usually, it is assumed that government is the sole decision maker (Mc Guire et. al, 1993). For a consumer, health care expenditures are the

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[9] As, most of the modeling in health economics is adhoc therefore, number of studies followed empirical approach to find coefficients of interest without much reliance on theory.

[10] For detail discussion of health care markets and their imperfect behavior see among others; Jack, 1999, Mills and Gilson, 1988 and Schultz, 2004.

product of the quantity consumed and the price paid. But analyzing health spending and its determinants, previous studies lack the demand and price issue and only focus on supply side and on income effects. In reality, it is market and not the individuals making decisions about the size of expenditures (Mc Guire et. al, 1993). Due to lack of health care price index or any other measure that capture the price of health care in Pakistan it is difficult to capture the price effect directly. Therefore, the GDP deflator is used as proxy to capture the price effect of the health care markets. Instead of using nominal values of per capita income and health expenditures real values based on 2000-01 GDP deflator is used in this dissertation. Changes in income affects demand for health care and hence the coefficient of income with respect to any health care measure (e.g., health expenditures) is termed as elasticity and based on its magnitude health care can be described as inferior, normal and superior good (McGuire, et.al, 1993). While, there is also concerns about the status of this income elasticity which is in most of the cases above unity for Developed countries while it is less than unity in case of developing countries but the issue of whether health care is luxury or necessity is less settled yet (see for details for example; Grossman 1972; Hansen and King, 1996; Karatsaz, 2000; Okunade and Karakus, 2001 and Parkin, McGuire and Yule, 1987).

4.2.2 Production function approach

Grossman (1972) stated that the demand for health care is derived which is produced through a process defined by a production function. His model is widely used in empirical studies of health and health care. Grossman (1972) developed a theoretical model of health care which is commonly applied for analyzing the factors affecting health status and its relationship with economic and non economic factors. The model can be specified as;

$$H= f (A) \tag{4.1}$$

Where *H* is any measure of health status like Life expectancy, infant mortality and (*A*) is a vector of other economic (income per capita), social (education), environmental (urbanization), demographic (population below or above certain age group) and health service variables (like population doctor ratio, population hospital ratio etc) variables affecting health status[11]. Although, Grossman (1972) presented a model at micro level but number of studies tried to employ his specification at

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[11] Although, Grossman (1972) production function specification talk about initial health endowments (at individual level) as decreasing over the life cycle provided the due investment has been made but in this study it is not possible to include any specific measure for this variable. Rather, an attempt has been made in this dissertation to hypothesize that the lagged value (or first difference) of a variable in time series model can best proxy this kind of initial health stock at national level (see for details Schultz, 2004, p. 638).

macroeconomic level (see for example; Fayissa and Gutema, 2005 and Thorton, 2002). While to make the analysis more closely to what Grossman specified it is better to represent the variables in their per capita form. This is done because; first it avoids any sort of inequality that can distort the results of the analysis and create bias results. Second, it can be helpful to see the results in a more homogenous way. A country is a big unit of analysis and region may differ widely but per capita estimation can be a possible source to avoid these regional biases to some extent. We can rewrite equation 4.1 in per capita extended form as follows;

h= f (e, d, p, s, n)   (4.2)

e is economic factors in per capita terms affecting health status *h* and *d* is demographic factors, *p* political factors, *s* is social factors and *n* environmental factors. classifying input and output for the production function is necessary, Feldstein (1967) suggested some output definitions one of them is improvements in health (i.e., increase in life expectancy or reduce mortality).

4.3   Methodology

Time series data at a single country is advantageous because it is looking at a consistent aggregate national level production function. Time series approach in not free from problems though. One of them is stationarity issue. The assumption of stationarity in time series analysis is important because of the reason that correlation between unrelated non stationary series can be positive and/or negative unity as the length of time series in question increases (Yule, 1926). Therefore, it is possible that the studies Like Hitiris and Posnett (1992) may end up with a relation which is because of non stationarity and hence spurious. The spurious relationship gives an impression of a worthy link between two or more variables that is invalid when objectively examined.

Spurious regression is also an issue to take into account while dealing with time series data, as it mostly exhibits trend, if it is not taken care of gives absurd results. Simple technique of differencing will increase the problem of spurious autocorrelation. Cointegration approach in this type of situations offers a solution by examining closely the variable properties through short and long run relationships by developing dynamic models. Variables my drift apart, in the short run, but not so far away in the long run that undermine the long run relationship.

The basic idea underlying cointegration analysis is that if two or more variables are integrated of the same order (i.e., integrated of order one) than long rune relationship using cointegration approach can be establish if the error term obtained is stationary or integrated of order lower than that of variables entering in the cointegration model. It means that variable can depart in the short run but move again to

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average in the long run therefore, the resulting empirical estimation is not spurious and we can apply simple ordinary least square estimation techniques to estimate the parameters.

There are number of ways one can apply cointegration methodology but in this dissertation we have adopted vector autoregressive (VAR)[12] and vector error correction methodology (VECM). The basic idea underlying VAR methodology is that all variables of the model are treated symmetrically by estimating separate equation for each variable including its lag and lags of the remaining variables (Sims, 1980). Also, VAR are a suitable model for describing data generating process (DGP) of a small (moderate) set of time series variables (Luetkepohl and Kraetzig, 2004). In VAR modeling, all variables are being treated as exogenous and less reliance on uncertain theoretical considerations, whereas, zero restrictions are usually imposed using statistical procedures to test for weak exogeneity. Hence, this methodology provides an allowance for rich dynamics.

A VAR model of order p can be represented in a following equation;

$$X_t = A_1 X_{t-1} + \ldots\ldots + A_p X_{t-p} + \varepsilon_t \tag{4.3}$$

Where A_i is *(KxK)* coefficient matrix and ε_t is *(Kx1)* vector of unobservable error term, which his usually time invariant and with zero mean and a positive definite covariance matrix i.e. $E\left(\varepsilon_t \varepsilon_t'\right) = \Sigma \varepsilon$.

Above equation (4.3) is unable to accommodate trended variables generally. In this case a vector error correction form of model is more appropriate of the following form;

$$\Delta X_t = \Pi X_{t-1} + \Gamma_1 \Delta X_{t-1} + \ldots\ldots + \Gamma_{p-1} \Delta X_{t-p+1} + \varphi_t \tag{4.4}$$

Here $\Pi = -\left(I_k - A_1 - \ldots\ldots - A_p\right)$ and $\Gamma_i = -\left(A_{i+1} + \ldots\ldots + A_p\right)$ for $i = 1, \ldots\ldots\ldots, p\text{-}1$.

If the aim is to estimate the cointegration relationship among variable of interest than it is better to apply VECM as it captures both the long run and short dynamic relationship. In above equation (4.4) the term for short run dynamics is Γ_i and for long run it is ΠX_{t-1}, which is also called the rank of the cointegration vector. The distinction of VECM from that of VAR is that former is in difference form while later is in level form. Once the long run relationship among the variable is estimated using VECM it is easy to find the causality between variables using standard bivariate granger causality tests.

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[12] It is common in economic analysis to have simultaneity problem as variables that are supposed to be endogenous can also be modeled as exogenous and hence criticized by many (see Sims, 1980). It is advocated by Sims (1980) that if there is no pre distinction of exogenous and endogenous variables, it is better to treat them in the same way. This means each equation has same number of regressors and this is the basic idea underlying VAR methodology. VAR does not identify the underlying variable as exogenous or endogenous rather estimate all possible equations for each variable (Sims, 1980 and Asteriou, 2006).

For estimating cointegration among variables the standard steps include testing for unit root, vector auto regression (VAR) or vector error correction mechanism (VECM) estimation, weak exogeneity test and causality test. While not each chapter of this dissertation used all the steps because in each chapter the objective is different and hence the estimation steps differs. Chapter five for example; estimates unit root, cointegration alpha and beta restrictions on variables (i.e. weak exogeneity test) and then VECM for short run dynamics. Chapter six estimates the order of integration of the variables followed by cointegration and beta restriction test for significance of long run parameters. It also estimates bivariate granger causality. Chapter seven follows the steps of sixth chapter but it did not estimated the zero restriction for alpha and beta coefficients.

The detail of each step that is unit root analysis, Johansen cointegration methodology, Vector autoregressive and error correction mechanism and Granger bivariate causality test is described in the following sections of this chapter.

4.4   Unit root analysis (order of integration)

Since the pioneering work of Dickey and Fuller (1981) testing for unit roots become a norm in time series analysis. Non stationary time series data are generated by a process which does not remain the same over time (Hamilton, 1994). Before proceeding with estimation of time series data, it is necessary to check whether the underlying series is stationary[13] or non stationary as this has important implications for the t-value, Durban Watson (DW) statistics and R^2 measure and use of usual test statistics become invalid (Philips, 1986 and Seddighi, Lawler and Katos, 2000). Therefore, if the stationarity is not achieved the empirical estimation produces spurious[14] regression results (Granger and Newbold, 1974 and Sims, 1980). A series is non stationary (stationary) if its mean and variance are independent of time or in other words remain changes (constant) over time and the value of covariance between times period depends only on the lag between time periods. A stationary series has a tendency constantly to return to its mean value and to fluctuate around it in a more or less constant range, while a non-stationary series has a changing mean at different points in time and its variance varies with the sampling size.

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[13] The stationary series has the following properties; the mean $E(Y_t)=\mu$ is constant for all t, the variance var $(Y_t)=E(Y_t-\mu)^2$ $=\sigma^2$ is constant for all t and the covariance $cov\ (Y_t,\ Y_{t+m})=E[(Y_t-\mu)(Y_{t+m}-\mu)]=\gamma_k$ is constant for t and $k\neq0$.

[14] Spurious results means that the means and variances of regression results are time variant thus, the use of these means and variances fail to converge the results of computed statistics as the sample size increases. Therefore making hypothesis testing a seriously biased towards falsely rejecting the null hypothesis of no relationship between regressor and regresand, when the null is true. Philips (1986) showed that the DW statistics converges to zero. This has an important implication because low DW statistics means the variable are non stationary in regression model. While the rule of thumb also suggests that if DW statistics is greater than R^2 it means results are spurious (Rao, 1994).

To illustrate the conditions for stationarity, consider the following first order autoregressive AR (1) model:

$$Y_t = \Phi Y_{t-1} + \mu_t \qquad\qquad t = 1, \ldots\ldots, T \qquad\qquad\qquad (4.5)$$

Where μ_t assumed to be an identically and independently distributed (IID) with zero means and constant variance $(0, \sigma^2)$. If $\Phi < 1$, the series Y_t is stationary and if $\Phi = 1$, the series is non-stationary and is also known as a random walk. Y_t can be made stationary after differencing. The order of differencing needed to achieve stationarity depends on the number of unit roots it contains. If a series becomes stationary after differencing d times, then it contains d unit roots and is said to be integrated of order d, which is written as $I(d)$ in equation (4.5) if $\Phi = 1$, Y_t has a unit root and thus $Y_t \tilde{\ } I(1)$ i.e., Y_t is integrated of order one. The initial solution to the analysis of integrated series in derived from the work of Box and Jenkins (1970, 1976), who formulate regressions in which the variables are expressed in first differences. However, this process of differencing results in the loss of valuable long-run information among the series (Davidson, *et al.,* 1978). In general, the Box-Jenkins approach assumes that non-stationary data can be repeatedly differenced until stationarity is achieved. Granger and Newbold (1974) suggested that with high R^2 and low DW-statistics regression should be run on the first differences of the variables. However, if there is more than one unit root, the standard testing procedure is to test first for a unit root in the levels of the series Y_t. If the hypothesis of the presence of a unit root is not rejected, we test the first difference (i.e. ΔY_t) for the presence of a second unit root and so on. This testing procedure thus, from lower to higher order of integration continues until the null of a unit root is rejected.

4.4.1 *Dickey Fuller (DF) and Augmented Dickey Fuller (ADF) unit root test*

There are number of approaches to test the unit root hypothesis but the Dickey-Fuller (DF) test (Dickey and Fuller, 1981) is most commonly used. The DF/ADF-tests are based on the assumption that there is only one unit root in the process (Dickey, et al., 1986). The DF-test requires, estimating the following model by ordinary least square (OLS):

$$\Delta Y_t = \alpha_0 + \alpha_1 t + \alpha_2 Y_{t-1} + \mu_t$$

$$\Delta Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \mu_t \qquad\qquad\qquad (4.6)$$

$$\Delta Y_t = \alpha_1 Y_{t-1} + \mu_t$$

Equation (4.6) indicates that the series Y_t now has both stochastic and deterministic trends and can be used as DF- equation for testing the unit root hypothesis. The test statistic used the unit root hypothesis is the τ t-statistic and the critical values are in Fuller (1976).While the other equations estimate the same unit root hypothesis by including drift term or without drift and linear trend. If the calculated value is greater than the critical value, then Y_t is non-stationary and therefore null of unit root is accept.

From equation (4.6) we can also test the joint hypothesis of unit root and no trend against the alternative hypothesis of trend stationary. If the calculated value is less than the critical value, the null hypothesis is accepted and Y_t is non-stationary with insignificant trend; conversely, if the null hypothesis is rejected, Y_t is stationary with significant trend and is a trend stationary series.

In equation (4.6) if α_0 and α_1 is set equal to zero while α_2 is equal to unity i.e., ($\alpha_0 = \alpha_1 = 0$ and $\alpha_2 = 1$) then it looks like equation (4.5) which is purely random walk model and is non stationary. Thus needs differencing to make stationary and is said to be difference stationary (DS). The trend is called stochastic trend (Nelson and Plosser, 1982). If α_0 is not equal to zero while α_1 and α_2 is equal to zero and one respectively i.e., ($\alpha_0 \neq 0; \alpha_1 = 0$ and $\alpha_2 = 1$), then the equation (4.6) looks like random walk with drift and is non stationary and needs differencing to become stationary. In this situation Y_t can exhibit a positive or negative trends depending upon α_0 is negative or positive. In third case if α_0 and α_1 both are non zero and α_2 is equal to zero i.e., ($\alpha_0 \neq \alpha_1 \neq 0; \alpha_2 = 0$), we get a trend stationary series. The mean of Y_t is time variant in this case and not constant *(i.e., $\alpha_0 + \alpha_1 t$)* while its variance is constant over time. To get stationarity in this case we have to subtract the mean of Y_t from Y_{t-1}, the resulting series will be stationary and is called trend stationary (TS). The procedure of removing the trend is commonly called detrending (Gujarati, 2005).

If the series has a stable long-run trend and tends to revert to the trend line following a disturbance, it may be possible to stationarize it by detrending, perhaps in conjunction with logging or deflating. However, sometimes even detrending is not sufficient to make the series stationary, in which case it may be necessary to transform it by taking differences. If the mean, variance, and autocorrelations of the original series are not constant in time, even after detrending, the statistics of the changes in the series between periods will be constant. Sometimes it can be hard to tell the difference between a series that is trend-stationary and the difference-stationary, thus, unit root test may be used to get a more definitive answer.

The DF-statistic is based on assumption that μ_t is white noise[15], but it is unlikely that the error term is white noise; there is autocorrelation in the residuals of the OLS regressions in the above equation (4.6). Two approaches have been put forward to overcome this problem. First, we can generalize the testing of equation (4.6), or second, we can adjust the DF-statistics by applying Augmented Dickey Fuller (ADF) test. It is common to follow the Augmented Dickey Fuller (ADF) test. Because the ADF test uses a regression of the first difference of the series against the series lagged once; it may include a constant and/or time trend. The key insight of the ADF test is that testing for non stationarity is equivalent to testing for the existence for the unit roots data contains thus it is preferred and more in use. Therefore, to make μ_t white noise, lagged values of the dependent variable are included on the right hand side of the DF-equations which is written as:

$$\Delta Y_t = \alpha_0 + \beta_{1t} + \left(\Phi_1 - 1\right)Y_{t-1} + \Sigma\theta_t\Delta Y_{t-1} + \mu_t \qquad\qquad (4.7)$$

Generally, we do not know how many lagged values of the dependent variable to include on the right hand side of (4.7). There are several approaches but we used the Lagrange multiplier (LM) test (Holden and Perman, 1994). LM test is statistically more powerful not only in large samples but also in finite or small samples and therefore preferable (Maddala, 1992) and it is widely used because it is easy to apply. As the regressor in the LM model containing lagged values of regressand may appear as explanatory variables while other tests like Durbin Watson (DW) test does not use lagged values (Gujarati, 2005). In LM test principally, it is only the null hypothesis according to which the model is tested and this is convenient where the alternative hypothesis is complex and/or difficult to estimate. Although, estimation of alternative hypothesis is done if null hypothesis is rejected; using LM test it will be simple and economical when null hypothesis is not rejected (Patterson, 2000). In testing for the presence of unit roots in the individual time series using the augmented Dickey-Fuller (ADF) test (Dickey and Fuller, 1981, and Said and Dickey, 1984), both with and without a deterministic trend, we follow the sequential procedure of Dickey and Pantula (1987), the null of the largest plausible number of unit roots, assumed to be three, is tested and, if rejected, that of two unit roots is tested and so on until the null is not rejected anymore[16]. The number of lags in the ADF-equation is chosen to ensure that serial correlation is absent using the Breusch-Godfrey statistic (Greene, 2000). The ADF-statistic

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[15] A white noise error term has zero mean, constant variance and is independent of their past value which is also written as; $\mu_t \sim IID\ (0,\ \sigma^2)$ therefore it is stationary by definition.

[16] The results of up to two lags are presented for all the variables used for analysis for all the three equations that is with constant, with constant and trend and without these two terms.

has the same asymptotic distribution as the DF-statistic, so the same critical values can be used as previously (Dickey and Fuller, 1981).

4.4.2 *Philip and Peron (PP) unit root test*

Basically *DF* test assumes that the disturbance term is *IID*, while Philip and Peron (1988) used non parametric adjustment to DF test and proposed *Z* statistics where they relaxed the assumption of IID. The test regression for Philip Peron test is the AR (1) process which is as follows;

$$\Delta Y_{t-1} = \alpha_0 + \alpha_1 Y_{t-1} + \varepsilon_t \tag{4.8}$$

To account for the serial correlation in ε_t, PP test makes a correction to t statistics. The asymptotic distribution of the Philip Peron t statistics is the same as ADF t statistics hence MacKinnon (1991) critical values are valid for this test as well (Asteriou, 2006).

The Phillips and Peron (1988) statistic can be computed using the same equation specifications as in Dickey and Fuller (1981), and the null hypothesis of the PP test is also that a unit root exists, as against the alternative of stationarity. The estimated coefficients from the regressions are modified to obtain *Z* statistics, and these statistics are compared to the Dickey– Fuller critical values. The intention of the PP test is to improve the finite sample properties of the ADF test.

4.5   Testing for Cointegration (long run relationship)

The basic idea of cointegration is to identify the equilibrium or a long-run relationship between the two or more variable, if a long-run relationship exists, then divergence from the long-run equilibrium path is bounded, and the variables are said to be cointegrated. In other words, the variables may, in the short run, drift apart from each other but have the tendency to move towards long run equilibrium. In this case, two conditions must be satisfied. First, the series for at least two of the individual variables are integrated of the same order and second, a linear combination of the variables exist which is integrated to an order lower than the individual variables. For example, if the variables become stationary after differencing once, i.e. *I(1)*, then the error term from the cointegration regression is stationary, i.e. *I(0)* (Hansen and Juselius, 1995), Consider the cointegration regression of the following form:

$$Y_t = \alpha + \beta X_t + \mu_t \tag{4.8}$$

If the series Y_t and X_t are both *I(1)* and the error term μ_t is I(0), then the series are cointegrated of order *I(1,0)*. In (4.8), β measures the equilibrium relationship between the series Y_t and X_t, and μ_t is the deviation from the long-run (mean) equilibrium path.

The economic interpretation for cointegration is that if in the long-run two or more series i.e., Y_t and X_t are linked together to form an equilibrium relationship, then even though Y_t and X_t themselves are trended (i.e. non-stationary), they nevertheless move together closely over time and the difference between them is constant (stationary). Therefore, the concept of cointegration implies the presence of long-run equilibrium to which an economic system moves overtime, and μ_t may thus be interpreted as the disequilibrium error that is the extent to which the relationship deviates from equilibrium (Harris and Sollis, 2003). In other words, from a statistical point of view, a long-term relationship means that the variables move together over time so that short-term disturbances from the long-term trend will be corrected (Manning and Andrianacos, 1993; Hall and Henry, 1989). A lack of cointegration suggests that such variables have no long-run relationship and they can diverge arbitrarily away from each other (Dickey et. al., 1991).

4.5.1 Johansen Cointegration procedure

Johansen's Full Information Maximum Likelihood (FIML) approach (Johansen, 1988; Johansen and Juselius, 1990) is used in this study to test for cointegration[17]. The reason is that Johansen cointegration method has some advantage over Engle-Granger (1987)[18] two step procedure which is another way to measure long run relationship between cointegrated variables, in an easy to comprehend and simple way (Asteriou, 2006).

The issue with Engle Granger approach is that if there are more than two variables in the equation there may be more than one cointegrating relationship exists but the Engle Granger procedure is unable to identify this possibility or we can say that with this approach it is not possible to predict the number of cointegrating vectors. As it is two steps procedure and first step is to generate error term and the second is to see whether the error term is stationary or not using OLS. Thus, the error introduced in the first step is carried out in the second and gives misleading results. While Johansen maximum likelihood method is preferred because of two reasons; one is that even there is only one cointegrating relationship rather more than one; it is possible only with Johansen approach that we can calculate the speed of

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[17] This approach is also called multivariate as one can use more than one variable in the model to test for possible cointegration. Therefore, there are chances that more than one cointegrating vector can appear in the model forming several long run equilibrium. While in general form it can be said that for *n* variables possible number of cointegrating vector can be *n-1*. If *n* is greater than two and assumption is that the model has only one cointegrating vector has serious consequences and it is one of the criticism on the *EG* approach which is unable to counter this issue and therefore Johansen multiple equation approach is useful (Asteriou, 2006).

[18] Granger (1981) introduced a noteworthy link between *I (1)* processes and the concept of cointegration i.e., long run equilibrium, while Engle and Granger in (1987) in their seminal work further formalized this concept.

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adjustment coefficients. Secondly, it is also possible to obtain estimates for both cointegrating vectors, while with the Engle Granger simple equation we have only a linear combination of two long run relationships (Asteriou, 2006). The Johansen method allows the estimation of all possible cointegrating relationships and offers a set of statistical tests for hypothesis testing as how many cointegrating vectors exist. Knowledge of the number of cointegrating vectors is important as under or over estimation has potentially serious consequences for estimation and inferences. Under-estimation implies the omission of empirically relevant error-correction terms and over-estimation implies that the distribution of statistics is non-standard. The Johansen maximum likelihood approach based on the following multivariate vector autoregressive (VAR) model is chosen:

$$Z_t = A_1 Z_{t-1} + ... + A_k Z_{t-k} + \mu_t \qquad Where\ \mu_t \sim IID(0, \sigma^2) \qquad (4.9)$$

In the above equation (4.9) the variable Z_t is a $(n \times 1)$ vector of $I\ (1)$ variables which contain both endogenous and exogenous variables included in the vector autoregressive model (VAR) like; $[pche, pci, pophosp, unemply, hegdp, pop14, urban]$, A_i is a $(n \times n)$ matrix of parameters and μ_t is $(n \times 1)$ vector of white noise error term. This type of modeling strategy is advocated among other by Sims (1980) to estimate dynamic relationship of the variables which are jointly endogenous. Equation (4.9) can be estimated in an efficient way by using least square (OLS) methodology because each variable in Z_t is regressed on the lagged values of its own and on some other variables included in the system.

Two likelihood ratio (LR) tests are used for detecting the presence of a single cointegrating vector. The first is the trace test, which tests the null hypothesis of at most r cointegrating vectors against the alternative that it is less than r.

The likelihood ratio test (LR-test) constructed for detecting the presence of a single cointegrating vector is trace test statistic. The equation for this trace test is given as;

$$\lambda_{trace}(r) = -T \sum_{i=1+r}^{p} \ln\left(1 - \hat{\lambda}_{r+1}\right) \qquad (4.10)$$

Under this test we check the null hypothesis of at most r cointegrating vectors against the alternative that it is greater than r. The critical value for this test has been derived by Monte Carlo simulations and tabulation by Johansen (1988) and Osterwald-Lenum (1992).

The second is the maximal Eigen value test, which tests the null hypothesis of r cointegrating vectors against the alternative that it is $r + 1$.

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$$\lambda_{max}\left(r, r+1\right) = -T \ln\left(1 - \overset{\wedge}{\lambda}_{r+1}\right)$$ (4.11)

Where;

$\lambda_i =$ Estimated values of the characteristic roots obtained from Π matrix

$r =$ Number of cointegrated vectors

$T =$ Total number of observations

The critical values for these tests have been derived from (Johansen 1988; Johansen and Juselius, 1990 and Osterwald-Lenum, 1992). The trace test shows more robustness to skewness than maximal Eigen value test. We presented the results of both the tests.

4.5.2 *Error correction specification (short run dynamics)*

Once the long run relationship i.e., cointegration is established, then the error correction specification can be used to test the short run dynamic relationship of the variables. Since, variables can deviate from their mean value or equilibrium path in the short run, therefore, it is interesting to estimate the dynamic behavior of variables using vector error correction model (VECM). It is written in the vector form and makes use of the lagged values of the dependant variables in the right hand side thus, it not only regress the other variables of the system but also the differenced lagged values of the dependant variable at the same time. This model also includes adjustment coefficient that explains short run deviation from the mean equilibrium path hence the error term is included and the past or lagged value of error term is used to capture the effect of past event on the present values.

If the series *pche* (real per capita health expenditure), *pci* (per capita income) and some other variables of interests are *I (1)* and are cointegrated, then the Error Correction Model (ECM) is represented by the following equation, the general form of the model is looking like as follows;

$$\Delta Z_t = \Gamma_1 \Delta Z_{t-1} + \ldots\ldots + \Gamma_{k-1} \Delta Z_{t-k+1} + \Pi Z_{t-k} + \upsilon_t$$ (4.11)

Where Δ is the difference operator can be written as $\Delta Z_t = Z_t - Z_{t-1}$, υ_t is the white noise error term which is independently and identically distributed (IID) with zero mean and constant variance and $Z_t = \left[pche, pci, pophosp, unemply, hegdp, pop14, urban\right]$, whereas Γ_i and Π are $(n \times n)$ matrices of the parameters with $\Gamma_i = -\left(I - A_1 - A_2 \ldots\ldots - A_i\right)$ where $(i = 1, \ldots, k-1)$, and

$\Pi = -(I - A_1 - A_2 \ldots - A_k)$. The estimated values of $\overset{\wedge}{\Gamma}_i$ and $\overset{\wedge}{\Pi}$ gives the short run and long run

information of changes in Z_t. As the term $\Pi = \alpha\beta'$, where α represents the speed of adjustment to disequilibrium and the matrix term β gives long run coefficients in a way that the term $\beta'Z_{t-k}$ set in the above equation (4.11) represents up to $(n-1)$ cointegration relationships in the model, to make sure that the Z_t converge with their long run steady state solutions (Harris and Sollis, 2003). Here, the term Π is the error correction term and measures the speed of adjustment in Z_t and it is the feedback effect or the adjustment coefficient which shows how much of the disequilibrium is being corrected i.e.; it captures the extent to which any disequilibrium in the previous period effects adjustments in the present period. That is why its lagged value is used in the equation. While the optimal lag length of the variables included in the model are determined by using the general-to-specific modeling procedure of Hendry (1980).

There are three cases when the requirement of ΠZ_{t-k} that is the error correction term, is stationary that it is *I (0)* can be met; i) when all variables included in the Z_t are stationary that is integrated of order zero which can be estimated by using VAR in level using simple OLS techniques, ii) when variables are not cointegrated meaning that no relationship of the variables present in Z_t is *I (0)* therefore, the term Π is an $(n \times n)$ matrix of zeros. In this case it is appropriate to use VAR in first difference form involving no long run information and iii) finally for ΠZ_{t-k} to be stationary when there is up to $(n-1)$ cointegration relationships between variables in Z_t that is $\beta'Z_{t-k} \sim I(0)$. In this case $r \leq (n-1)$ exists in β together with $(n-r)$ non stationary vectors.

Error Correction Model (ECM) is formulated in the first difference terms and hence eliminates trends from the variables involved, thus resolve the problem of spurious regressions. As disequilibrium error term is a stationary variable *I (0)* by definition of cointegration hence this has implications that the two variables are cointegrated, implies that there is some adjustment process that prevents the errors in the long run relationship becoming larger and larger. One advantage of using ECM is that it reintroduces, in a statistically acceptable way, lagged error correction term which captures the long run information which is lost through differencing.

4.5.3 Weak exogeneity test

Determining the number of vectors in Johansson cointegration analysis is one step in establishing a long run relation while a step further is to estimate that whether the variables included in the VAR model are endogenous or exogenous by restricting alpha and beta coefficients of the cointegration equation. This test gives us an idea to better model the variables and helps in determining the relationship between variable for policy analysis. Weak exogeneity test is carried out by applying zero restriction to alpha and beta coefficients of the model and using likelihood ratio (LR) test with chi square distribution to see whether they are significantly different from zero or not. This test also helps to see, when there is disequilibrium which variables adjust (Johansen and Juselius, 1990). The beauty of this analysis is to make better understanding of which variable is endogenous and exogenous and therefore, its affect on the model estimation (Hendry, 2004).

4.6 Granger causality test

Once the cointegration is established between variables the next step is to test for causality. The concept of causality has fascinated philosophers for centuries and it is described as property of reality and not of a model (Hendry, 1995). Therefore, it is not easy to define causality and specifying what makes something a cause (Hendry, 2004). However, Granger (1969) proposed a definition of causal relation of variables using present and past information of the concern variables, it is causality in econometric or empirical sense that is either X_t causes or does not causes Y_t. Nevertheless, causality inferences and analysis are helpful policy formulation tools[19].

If two or more variables are in long run relation i.e., cointegrated, then Engle and Granger (1987) error correction specification is one method that can be used to test for Granger causality. Causality in Granger (1969) sense can be defined as; a variable Y_t is said to Granger cause X_t (denoted as $Y_t \Rightarrow X_t$), if X_t can be predicted with greater accuracy by using past values of the Y_t variable rather than not using such past values, keeping all other terms remaining unchanged. This relationship can be captured by using vector autoregressive (VAR) model and it can be possible to get unidirectional, bidirectional causality and/or

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[19] For details on causality analysis, its critique and underlying methodology see for example; Hoover, 2001; Cox 1992; Hendry 1995, Granger, 1980, 1988a,b among others.

both the variables are independent of each other, i.e. no long run relationship exists at all (Asteriou, 2006)[20]. In this chapter an attempt has been made to estimate the bivariate Granger causality.

In the Granger sense, if the series X_t and Y_t are I (1) and are in long run relationship i.e., they are cointegrated, then Engle and Granger (1987) error correction specification can be used to test for causality in Granger framework. The error correction model (ECM) to test for granger causality is represented by the following equations;

$$\Delta X = \alpha_1 + \sum_{i=1}^{n} \beta_i \Delta X_{t-i} + \sum_{i=1}^{n} \beta_j \Delta Y_{t-j} + \delta ECT_{t-1} + \varepsilon_{1t} \tag{4.12}$$

$$\Delta Y = \alpha_2 + \sum_{i=1}^{n} \sigma_i \Delta Y_{t-i} + \sum_{i=1}^{n} \sigma_j \Delta X_{t-j} + \lambda ECT_{t-1} + \varepsilon_{2t} \tag{4.13}$$

where Δ is difference operator, ε_{1t} and ε_{2t} are uncorrelated and the white noise error terms, ECT_{t-1} is the error correction term derived from the long-run cointegrating relationship, while n is the optimal lag length orders of the variables which are determined by using the general-to-specific modeling procedure (Hendry and Ericsson, 1991). Using equations (4.12 and 4.13) one can have the following different cases of causal relations; i) X_t causes Y_t only when the lagged values of X_t in equation (4.12) may be statistically different from zero while values of Y_t are not, ii) Y_t causes X_t only when the lagged values of Y_t in equation (4.13) may be statistically different from zero but values of X_t are not different from zero, iii) bidirectional causality occurs when both the lagged values of terms X_t and Y_t are significantly different from zero using equation 4.12 and 4.13 and iv) when both X_t and Y_t are significantly not different from zero and are independently moving on their paths in the long run without influencing each other. There is no causal relation between these two variables in this case (Asteriou, 2006).

The null hypotheses that Y will granger cause X if $\varepsilon_{1t} \neq 0$. Similarly, X will granger cause Y if $\varepsilon_{2t} \neq 0$. To implement the Granger-causality test, F-statistics are computed under the null hypothesis that in above equations all the coefficients of ε_{1t} and $\varepsilon_{2t} = 0$. For conducting bivariate causality test it is simply regressing Y_t on lagged values of Y_t and obtaining the residual sum of square for this restricted (RSS$_R$) model, now include the values of regressor X_t beside lagged values of Y_t and obtain the residual sum of

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[20] This simple definition can also be extended to allow for measuring instantaneous causality (denoted as $Y_t \rightarrow X_t$), which also includes not only the lagged (past) values of the variable Y_t, also by using present values of the Y_t variable (Charemza and Deadman, 1997). While this is not the focus of this chapter as we estimated only bivariate causality.

square of the unrestricted *(RSS_U)* model. Using the following F-test formula can give the F- test values and the test is as follows;

$$F = \frac{(RSS_R - RSS_U)/m}{RSS_U/(n-k)} \qquad (4.14)$$

This follows $F_{(m,\ n-k)}$ degrees of freedom. Where m is the number of restriction, k is the number of parameters and n is the number of observations.

Chapter 5   Determinants of public health expenditures in Pakistan

5.1   Introduction

Poverty, inequality, market failures and the negative externalities present, mostly in developing countries, necessitate government involvement in major public services provision like health (World Bank, 1993). The World Health Organization (WHO) in its recent report (2001) has recommended annually US$ 34 per capita as a required package for essential health services in developing countries like Pakistan (WHO, 2001). Health outlay and its control is not a mean (objective) in itself, but providing health care services to consumers for their better health by using scarce resources so that a unit increase in spending on health care has more worth than elsewhere (Culyer, 1990). Nevertheless, targeting a value for health care expenditures is more a political than an economic issue. It is not possible through cross country analysis that what is due to reforms and measures undertaken and what should be attributed to other factors like country specific characteristics (Buchanan, 1965 and Barros, 1998). As this process helps to understand in a broader context the factors that determine the resources devoted to health sector.

With the economic well-being of individuals and households, good health is a critical input into poverty reduction, economic growth, and long-term economic development (Abel and Leiserson, 1978 and WHO, 2001).

Due to low priority given to social sector development in Pakistan in the past, health expenditure remained below 1 % of Gross Domestic Product (GDP) this accounts for the poor local health conditions (Zaidi, 1999). In the start of 1990s the government of Pakistan had become more aware of the need to improve the overall health status of the population. In 1992, the government with the financial help of international partners has launch social action program (SAP). This program aimed at improving the provision of basic social services in four key sub sectors, one of which is (primary) health. As mentioned above over the years the government spending less than 1% of GDP on health care, which is lower than some neighboring countries such as Bangladesh 1.2 % and Sri Lanka 14 % and are enjoying better infant survival and longer life expectancy (ADB, 2005).

In Pakistan, only 3.07 % of the total annual budget is allocated for economic, social and community services (GOP, 2005). Public and private expenditure on health in Pakistan represents 3.45% of GDP, including less than 1 percent of GDP are public health expenditures, a low figure by the bench mark mentioned by world health organization (WHO) that about 4 percent of the GDP to be spend on health

sector. Despite advancement in the overall economy, half a century down the road from independence, social and demographic indicators in Pakistan presents a dismal picture.

The current effort of the government to decentralize the system of governance includes the health sector, and assigning responsibility for health to the newly created local governments brings not much change in itself. As it is over taken by the corrupt machinery at government level as well as lack of available infrastructure impedes in its way (Islam, 2002 a, b).

Keeping in view the despondent condition of the health sector in Pakistan and the likely role that health sector can play in the development process, this study aims at answering the following question; what factors determine the resource allocation to health sector? The study examines this possible long-run relationship by applying cointegration approach using real per capita health expenditure, real per capita income, and other variables of policy relevance from socio economic and demographic spheres. Further restriction tests on alpha and beta coefficient are applied to test the weak exogeneity of the variables. This is the deviation from traditional studies done on this issue, as no single study employs the weak exogeneity test. This paper empirically estimates the long run relationship that macroeconomic and other factors have with health expenditures. Also, long run elasticity is calculated to draw policy guidelines for health sector of Pakistan. Short run dynamics are estimated using vector error correction model (VECM) and applying general to specific modeling approach following David Hendry (1984).

The study is unique in the following respects; i) during literature survey, there is virtually non existence of this type of studies on developing countries, ii) most of the studies used panel data or cross country regression approach, while single country analysis rarely exists, iii) the study also tested some new hypothesis which are not yet tested e.g., unemployment variable is tested which measures the economic policies followed by the government in the medium to long run period. Because over the years unemployment remained a major issue in Pakistan and large family size with increasing dependency ratio (because of unemployment) exert pressure on the existing resources available to a household therefore, at macro-level it is government policies of generating employment which will bring social inclusion for the majority of the population and thus, helps in reducing inequity and investing in better living. This will help at macroeconomic level to formulate policies that promote public health and improve living standards.

The remainder of the chapter is organized as follows; Section 5.2 discusses model applied and data used for the analysis as well as the variable specification. While section 5.3 of this chapter presents the result of empirical analyses and last section summarizes and concludes the chapter.

5.2   Model, data and variables

5.2.1   Model

Health sector cannot be seen in isolation with other sectors of the economy and thus it has to be in conjunction with social, economic and demographic behaviors in the economy. Consequently, not only biological and economic but also social and demographic changes are affecting health and health care expenditures decisions at national level. A stochastic model is proposed in this study in which health spending per capita on annual basis is hypothesized to be determined by a host of macro level factors from economic, social and demographic spheres affecting. The functional form of model used is given as follows;

Health expenditures/capita = f (Economic, Social, health services and personnel and Demographic factors)   (5.1)

Transforming the illustrative form into mathematical model which is given in the equation below;

$$pche_t = \begin{pmatrix} \alpha + \beta_1 pci_t + \beta_2 pophosp_t + \beta_3 unemply_t + \\ \beta_4 hegdp_t + \beta_5 pop14_t + \beta_6 urban_t + \varepsilon_t \end{pmatrix} \qquad (5.2)$$

Where t is time period equals to *1972, 73, 74,………, 2006.*

$pche_t$ = Real Health care expenditures per capita on annual basis in Pakistani Rupees.

pci_t = Real income per capita at constant factor cost in Pakistani Rupees.

$pophosp_t$ = ratio of population per hospital which shows as a proxy for health care services quality and access. As more hospital will increase access to health care services. Because of less population burden on each hospital resources and therefore, enhancing efficiency by better quality of the services provision through hospital.

$unemply_t$ = this is the number of unemployed people as of total labor force in the economy in percentage terms to capture the social exclusion.

$hegdp_t$ = Total health expenditure as percentage of Gross domestic product (GDP). This is the variable for government attitude showing preference by allocating public resources on priority basis, to achieve better allocation to health sector. It is the ratio of total health spending to GDP in percentage.

$pop14_t$ = Population less than 14 years of age, used as child age population, as percentage of total population.

urban_t = Urbanization is showing the growth rate of the population living in urban areas as percentage of total population.

ε_t = White noise disturbance term.

Whereas β 's are coefficient representing elasticity of respective variable[21]. The sign of $\beta_1, \beta_2, \beta_4, \beta_5$ are expected to positively influence the health spending while β_3 is negatively related to health expenditures. The sign of urbanization variables β_6 is open for discussion. Urbanization can be positively related to health care spending, possible explanation can come from the view that over crowded cities has less infrastructure to support, huge influx of migrants and growing population. Urbanization is ill planned in developing countries and therefore, it lacks adequate facilities of sanitation and water supply. Industrialization is also experienced together with urbanization thus causing problem of Pollution (Gugler and Flanagan, 1978; Adegbola, 1987 and Gbesemete and Gerdtham, 1992). While in contrast to this it is also said that urbanites have access and more medical care facilities at their disposal (Siddiqui, et.al., 1995), also they have strong social networking as well as transportation facilities. Thus have negative correlation with health care expenditures. Health spending[22] seems to be the most significant indicator of health resources and/or policy hence it is used as dependant variable in this analysis. It is hypothesized that public health spending as percent of GDP is positively related with dependant variable. This variable is basically capturing the government attitude and helps to explain the commitment of the government in health care policy priority over the years. As income per capita is a summary measure of all the goods and services produced in a country in a given time period, it is frequently used in growth models for policy purposes as a leading economic development and living condition indicator. In some of the micro studies a weak link is founded between health expenditures and income (for example; Newhouse and Phelps, 1974; Wagstaff, 1986 and Murinnen, 1982). While explaining that the individuals are mostly subsidized or they don't have to pay the full price of using health resources but this is not true for a whole country. Income of a country is determines the level of development as well as the resources available for different uses. Therefore, per capita real income is hypothesis to be positively linked with health care spending as evident from many studies (Newhouse, 1977; Murthy and Okunade, 2000). Unemployment undermines the economic and social stability in the society. Economies which fail to provide productive and secure

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[21] Because all variables are in logarithm form therefore coefficient can be interpreted as elasticity.
[22] Public Health expenditures in Pakistan are mostly financed through tax revenues that government collects (Nishtar, 2007).

employment to their people invite political instability, social unrest in terms of poverty and inequality and therefore economic insecurity that ultimately leads to social exclusion. Secondly, an unemployed person is less likely to contribute to the national income and more rampant the unemployment is in the economy it will lead to a less growth or even negative growth in that economy. Therefore, it is hypothesized that as unemployed exists in Pakistan wide spread it reduces potential of the people to contribute positively to the income growth at national level and hence reduce national income means decrease in allocation of scarce resources and hence has a negative relation with public health expenditures. Health infrastructure is a necessary component of access to health and better health care services provision to population. While in terms of health facilities there is no doubt that Pakistan has achieved a gradual growth over a period of time. Nevertheless, this growth in facility provision to the majority has fallen short of promises made by different development plans of every government.

Although, all government hospitals are charging small user fee for all visitors but due to corruption and lack of proper funds management created this problem (Hakim, 2001). It is hypothesized that as number of health facilities e.g. hospitals increase, it will positively impact the health care expenditures at national level. Growing population, if remained unchecked for a longer period of time, has a pernicious effect on the quality of human capital formation and human development through deepening the burden on scarce public resources and infrastructure. Health seeking behavior changes with the age. Age structure of the population may be of prime importance in determining the level of health care expenditures because high population growth rate exerting pressure to all existing resources including health sector. As demand for health care fluctuates with age like children of less than 15 years of age (dependant age group) are more likely to use medical care (Gbesemete, and Jonsson, 1993). Secondly, communicable diseases are prominent in children than in young age group. As pointed out by Nkrumah (1973) that parent in developing countries have the habit of bringing their children of fewer than 15 years age to hospital when they are extremely ill, hence increases the cost of medical care. One argument is that the parents are poor and less able to afford the disease cost and secondly, the children who survive beyond five years have developed strong immunity to fight against diseases according to their (parent's) perception. Contrary to studies like that of Hitiris & Posnett (1992) and Barros (1998)[23], this study used variable of less than 15 years age population for Pakistan. Because infant and child mortality is higher in developing countries as is the case in Pakistan. Therefore, demand for medical

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[23] Studies that used OECD or other developed countries data mostly used population of age greater than 65 years as a demographic factor (see for example; Hitiris and Posnett, 1992; Hansen and King, 1996 and George and Karatzas, 2000)

care is growing with the increase in number of less than 15 years age population. Also, in case of Pakistan it makes sense to use less than 15 years of age population as more than two fifth of the population falls under this category and making it a bigger group demanding for health care and hence, a positive relation is hypothesized to exist between age structure of the population and health care spending.

In this study a double log model, guided by existing literature, is followed. This type of approach is preferred because; it is easy to apply in single country settings and it provides the coefficients as elasticity estimates which are relatively straightforward to interpret. Secondly, as most of the previous studies estimated the determinants of health spending preferred this approach to be providing best fit for the given variables.

All financial variables are transformed to real term by deflating with GDP deflator for 2000-01 as base year. All financial figures used here are in local currency units that is Pakistani Rupee (Rs.). Although, some studies make use of health care services price index for OECD countries but this is not possible for developing countries over a period of time, as time series data of this kind is rarely available. Secondly, it is difficult to calculate the price index for health care services in countries like Pakistan where health services price and medical care price data availability is impediment. Because of lack of time series data for relative health care price index, this study used GDP deflator to convert financial figures into their real values. This is done to take care of price issue as well as most of the studies used cross country data therefore it is necessary for the cross country analysis to take care of price differences by using separate variable while this is a single country study where change is prices almost affect every segment of the society with few exceptions.

5.2.2 Data

Annual time series data spanning from 1972 to 2006 for real per capita health care expenditure (RPCHE) and other social, economic, health personnel and services and demographic variables are used in this analysis. Gross domestic product per capita (RPCI) is used as a measure of living standard (see for example, King and Levine, 1993; Roubini and Sala-i-Martin, 1992). The variables and their graphical depiction is presented in appendix (see appendix A table).

Data sources for all the variables are 50 years of statistics in Pakistan published by the Federal Bureau of statistics (FBS) Pakistan, various issues of Economic survey of Pakistan and State bank's hand book of Statistics on Pakistan Economy 1947-2004. These are the authentic sources on publishing country wide macroeconomic data periodically and /or on yearly basis. While series like population less than

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fourteen years of age (pop14) and also urbanization (urban) variables are taken from World Bank, World Development Indicators (WDI) CD-ROM 2005 and 2006.

5.2.3 Variables

i) Public health expenditures

Low public health spending per capita can be described as single major contributing factor of low health status in Pakistan. Health expenditures continuously increasing over time, but this increase were relatively slower during the decade of 1970 until mid 1980. While it got momentum in the 1990s as it increases from Pak Rs. 75 to almost Pak Rs. 160 in the year 2003 and moved up again to Rs.180 in the years to follow. Growth rate of per capita health spending remained fluctuating although declining during the last three decades. It got a negative growth rate of 0.04 % in the year 1977 due to political instability (democracy is taken over by the military dictatorship) as well as changing priorities of the governments towards industrialization and agriculture (Hussain, 1999). In the year 1989-90 again a negative growth rate followed by a sharp increase in the year 1992-93 because of the launching of Social Action Program (SAP)[24].

ii) Public health expenditures as percent of GDP

Health spending as percentage of GDP remained lower than one percent through out in the last five decades with the exception of just three years during the latter half of 80s. It fluctuates as high as 1.19 percent in the year 1987 to as low as 0.44 percent in the year 1972. During the early years of development planning, the emphasis of the government health policy remains on curative care and from the sixth plan period preventive approach is followed (ADB, 1997). This can be seen from the government spending priority shift as spending went up from 0.72 in 1994 to around 0.85 percent in the next year and 0.81 in the year to follow. Firstly due to SAP program and secondly due to start of new prime minister Programme for family planning and health care during the mid 90s. Although expenditure growth were positive and it helps to achieve some reduction in infant mortality rate but this

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[24]Social Action Program (SAP phase I and II) was launched by the efforts of donors and government of Pakistan for the promotion of social sector specially education, health and water and sanitation. The critics of SAP described it a failure as unnecessary constraints were put on governments and these programmes largely remain ineffective (Abbasi, 1999). International donors like World Bank and IMF also admitted that first phase of SAP-I had a limited success as well as unable to raise the GDP share of health spending while it marginally increased in the second phase and remained ineffective in betterment of the deteriorating conditions. It was also criticized on missing the long run vision because of its focus on development spending while recurrent spending remained an unsettled issue from SAP programmes (Pasha, et.al. 1995). Political disturbances were also described as one possible factor responsible for SAP failure and distribution of benefits were exploits the Programme at the expense of community (SPDC, 2000).

no longer remain a constant phenomena and also health expenditures as percentage of GDP reduced to around 0.72 percent in the start of year 2000 and again this decreasing trend continue in the early years of the decade. The GDP share of health expenditures reduces to almost 0.51 percent in the year 2005 and rose to 0.57 percent in the following year.

iii) *National income*

Pakistan has performed reasonably well in economic terms over the past five decades. Income per capita increased over 2.3 percent in real terms and economy's overall growth remained around 4.8 percent per annum (Hussain, 1999 and Uddin and Swati, 2006). While the growth remained fluctuating with periods enjoyed very high growth rates as well as periods having low growth followed by some time negative growth spells as well. For example in sixties growth rate was 6.7 percent while in the decade of seventies it goes down to average 4.8 percent. The reasons explained by Swati and Uddin (2006) was flood in some parts of the countries while other faced severe drought, dismemberment of the country into east and west in 1971[25], increased oil prices in the global market and nationalization policies of Bhutto in that era also contributed to this sluggish growth trend. Growth pattern of sixties was revived again in the 1980s and growth went up to around 6.7 percentage point. Contributing factors were political stability, good performance of agriculture sector, high growth performance shown by manufacturing and services sector and increased privatization policies and deregulation. In these three decades high population growth rate dismantled the growth performance in terms of per capita increment. Per capita income increases more than two percent in the seventies which came down from almost 4.2 percent in the sixties. Due to better economic performance in the 1980s income per capita again touched a level of almost 2.4 percent.

The decade of 90s showed a dismal picture as economy remained slow-moving until the year 2000 its performance do not increased above 2 percent. Although, per capita income experienced a negative growth in the year 1996-97 it remained hovering around 1 percent till 1999-2000 while it also had a negative growth of around one percent in the subsequent year.

iv) *Unemployment rate*

Over the years unemployment followed a gradual increasing trends with few years observed a high growth of unemployment. During the early 1970s, lopsided government policies and due to international environment, economic activity witnessed a marked slowdown. Political disturbance and

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[25] East Pakistan became Bangladesh in 1971 after war of blood shed.

shattered confidence of investors also played an important role, thus reduces employment opportunities. Also, the reforms of 1972-77 hit the ongoing performance of the economy adversely. This has affected the agriculture and industrial sector particularly manufacturing sector, and severely worsened the unemployment conditions in the country. At that time agriculture and manufacturing was the largest provider of employment to the majority of the people in the country (Khan, 1997). Due to high outflow of migrants to oil rich Middle Eastern economies reduces the burden of unemployment in the late 1970s and early years of 1980 (Malik et. al, 1994 and Khan, 1997). Due to structural adjustment reforms employment situation hit adversely and with the increase in inequality and poverty unemployment also rose in the late 1980s (Kemal, 1994). Slow growth in employment opportunities can also be visible in the decade of 1980s, as population increased from almost 84 million to 109.71 million while employment increased from 24.7 million to 29.83 million that leaves huge population unemployed. The political instability, use of power for personal purpose and decreasing private investment as well as government investment created the economic slowdown of 1990 and thus unemployment increased in the early years of the decade sharply to around 5.9 percent in the year 1992 further it went up to above six percent in 1997. While the reduced labor productivity affected the real wages and hence coupled the problem of persistence unemployment in the economy (Hussain, 1999). In the start of new millennium the rising trend of unemployment remained high and it goes up from 7.82 percent in 2000 to around 7.92 percent in the year 2005-06.

v)   *Health facilities*

Population per hospital was more than 130,000 in the year 1972, which went up to around 141,000 during the early years of 1980. One possible reason is rapidly increasing population while lack of government spending in building more hospital facilities over the years also seems to add to this condition. This ratio is also increasing at an increasing rate and it reached to 146,905 till the 1990. Increasing population hospital ratio and deteriorating situation of the government health care facilities shows that the cost recovery is an issue and this has implications for building new government hospitals as well as to renew the already existing facilities.

vi)   *Age structure*

Pakistan's population growth rate remained above 3 percent since the early 1970s. During 1980s Pakistan experienced a population growth rate of above 2.3 percent. Due to this high growth rate Pakistan is ranked amongst the 7th most populous country in the world (Hussain, 1999 and GOP, 2007).

Increased fertility can be a sole responsible factor for this much high growth rate (Sathar, 1991). Until the early 1990s, the annual population growth rate was 3 percent and a noticeable decline in the growth rate started only in the mid-1990s, reaching 2.2 percent at the end of the decade. However, due to the persistently high birth rate in the recent past, the overall age structure of the population is heavily weighted towards the younger age group (below 15 years), which constitutes around 43 percent of the total population (GoP, 2006 and UNFPA, 2003). Almost 55 percent of Pakistan's population falls in the age category of 15-64, whereas it is observing an increasing trend as it was 53 percent in the years 1972-73. However, the rest of the population which is around 3.5-4 percent is 65 years of age and above.

vii)   Urbanization

In Pakistan, urbanization remained largely a phenomena which depend on three most prominent factors among others; i) Push and pull ii) rural areas developed characteristics of urban areas and get the status of urban settlements (Zaidi, 1999) and iii) reclassification of rural urban areas (Arif and Ibrahim, 1998). In the early 1970s when urban growth rate were 4.35 percent it was natural population increase in urban areas as well as rural urban migration which contributes to this high urbanization. While in the start of 80s it remained high because of push and pull factors like rural wage rate slow down, high growth of manufacturing sector in urban areas, increasing inequality in rural area. On the other hand with the growing population in areas near to cities, give them the status of urban areas and political influence also played a vital role in this regard. Pakistan's urban population growth remained as high as 4.8 percent when only 25 percent of our population was urbanized. It went to a slightly low growth rate of 4.4 percent in the year 1981 and to 3.5 percent in the year 1998 (Abbasi, 1987; Arif and Ibrahim, 1998 and GoP, 1998). Share of urban population also increased from merely 25 percent in 1972 to almost around 38 percent in the year 2005-06. This means the degree of urbanization increased in Pakistan but gradually because of decreased urban population growth rate (Arif and Ibrahim, 1998) and also because of illegal immigrants from Bangladesh, Afghanistan and Burma as well as deteriorating law and order situation which hamper the way of rural migrants also slow down the pace of urbanization (Abbasi, 1987 and Arif and Irfan, 1997). Nevertheless, the absolute increase as measured by population living in urban areas as percentage in total population is increasing.

5.3   Results and discussion

5.3.1   Unit root test results

Univariate properties of the variables of interest are estimated using the standard Dickey Fuller (DF), Augmented Dickey–Fuller (ADF) and the Phillips–Perron (Phillips and Perron, 1988) unit root tests. The tests allow for both the presence of a constant and a constant deterministic trend. Both the ADF and PP tests fail to reject the null hypothesis of unit root for all variables. However, the null hypothesis rejected overwhelmingly for all the series in first-difference. The results of DF test is presented in table 5.1a in level and in difference form while that of ADF and PP test are presented in table 5.1b. Three forms for testing unit root hypothesis were used including drift term, without drift and trend and with drift and trend.

Table 5.1a: Dickey Fuller (DF) unit root results in level and differenced form

Variables	DF Level Form			DF Differenced Form		
	No drift and trend	Drift	Drift and trend	No drift and trend	Drift	Drift and trend
pche	1.933	-3.13*	-3.20*	-4.65**	-4.81**	4.61**
pci	3.48	0.74	-2.22	-3.35**	-4.60**	4.57**
pop14	-2.62*	-1.34	-1.51	-3.20**	-3.53*	-3.54*
pophosp	2.52	0.19	-0.96	-5.43**	6.30**	-6.5**
hegdp	-0.73	-1.52	-1.95	-5.96**	-5.94**	-5.78**
unemply	1.234	-1.55	-2.5	-5.02**	-5.51**	-5.56**
urban	-2.29*	-2.20	0.37	-3.54**	-3.81**	-4.39**

* shows the significance level at 5% and ** at 1% level.

Table 5.1a elaborates the results of the DF unit root tests and showed that on balance all the variables are I (1) that is they are non stationary while real per capita health expenditures (pche), at 5 and 1% level of significance is appeared to be stationary in DF test with drift and also when drift and trend is included in the model. When both the terms are excluded it becomes non stationary with a value of 1.93 where as in difference form it shows that using all three specifications of the model this variable appear to be significantly I (1) at 1 % level of significance. DF unit root test in levels for population of age less than 15 years of age (Pop14) variable showed that it is stationary in model without trend and constant in level form but it is non stationary in both the models i.e. with drift and with drift and trend. Almost, all remaining variables becomes stationary after first differencing hence are I(1) and are stationary at 1% level of significance., except the variable of urban population growth rate as percentage of total population *(urban)* which is significant at 5 % level of significance in ADF in difference form including linear trend with drift.

Table 5.1b: Augmented Dickey fuller (ADF) and Philip Peron (PP) unit root results

Variables	ADF in Level Form				ADF in Differenced Form				PP Test
	With D		With D and T		With D		With D and T		
	1	2	1	2	1	2	1	2	
pche	-2.80	-2.91	-3.42*	-3.12*	-4.52**	-3.43*	-4.34**	-3.15*	-2.75
pci	0.51	0.73	-2.54	-2.22	-4.10**	-2.90	-4.11**	-2.88	0.56
pop14	-1.44	-1.45	-2.38	-2.64	-2.78	-2.60	-2.79	-2.45	-1.27
pophosp	0.28	0.24	-0.86	-0.98	-3.86	-2.40	-4.03**	-2.54	0.16
hegdp	-2.02	-1.74	-2.18	-1.82	-5.58**	-4.31**	-5.52**	-4.2**	0.42
unemply	-1.54	-1.51	-2.73	-3.00*	-4.05**	-3.69**	-4.12**	-3.7**	-0.99
urban	-1.93	-1.92	-0.77	-0.95	-2.69	-2.36	-3.28*	-2.99*	-1.8

*show significance level at 5% and ** at 1% level. Figure in parenthesis are *p*-values.
D= drift term and T= Time trend, PP is Philip and Peron unit root test.

The values of PP test also confirms the results obtained using DF and ADF unit root test, all the variables including the population of less than 15 years of age (*pop14)* and per capita health expenditures (pche) are also showing their behavior as non stationary variable although the value of former variable is large than all other variables but non significant confirming that it contains unit root.

5.3.2   *Cointegration results*

After estimating possible unit root hypothesis in all variables, that tells us about the order of integration of the variables, the next step in Johansen methodology is to estimate the cointegration relation for all the variables in the model. The results of cointegration equation estimated are presented in the table 5.2.

Table 5.2: Eigen value and Trace statistics (test for number of cointegrating vectors)

Rank	Eigen value	Log likelihood	H_0 : rank <=	Trace test	P-value
0		423.63	0	161.35	0.000**
1	0.872	458.55	1	91.498	0.093
2	0.622	475.11	2	58.389	0.290
3	0.507	487.14	3	34.335	0.488
4	0.417	496.32	4	15.972	0.720
5	0.248	501.18	5	6.255	0.669
6	0.122	503.40	6	1.805	0.179
7	0.052	504.31			

** Shows the rejection at 1 % level of critical values.
Number of lags included in the analysis is one. Constant is unrestricted.

Trace test as well as Eigen value statistics are presented with the hypothesis tested. Trace statistics strongly rejects the null hypothesis that there is no cointegration present among the variables but do not reject the hypothesis that there is one cointegrating relationship (i.e. *r=1*). The null hypothesis of no cointegration relation is rejected by trace statistics at 1% level of significance and this is also validated by maximum Eigen value statistics. It can be concluded that there exists a one cointegrating vector, meaning there is long run relationship exist between per capita health spending and other economic, social and demographic variables included in the model.

Therefore, it is safely said that our model has one cointegrating vector that is a unique long-run equilibrium relationship exist and implies that the variables are bounded together by long-run relationship. The cointegration relation for the variable of health spending with income per capita and for other variables of interest is established at 1% level of significance.

According to the definition of cointegration which says that the error term obtained after cointegration must be lower in order than that of the variables of the model. The residual[26] term (μ_t) is analyzed using zero, one and two lags without trend and constant and it is concluded that it is stationary i.e., *I (0)* (Asteriou, 2006).

Table 5.3: Standardized alpha and beta Eigen vectors (cointegration results)

i). Standardized results for ß eigenvectors						
pche	pci	pophosp	unemply	hegdp	pop14	urbanize
1.0000	-0.2371	-3.9425	0.3235	-0.9302	-2.5438	1.2942
0.3211	1.0000	66.951	-15.267	-24.084	85.339	-51.533
-0.1574	-0.1383	1.0000	0.0883	-0.0288	0.5224	-0.7312
1.0043	0.3095	-7.9731	1.0000	-0.2616	10.269	5.1897
1.3297	0.6482	16.536	-1.3080	1.0000	45.647	-0.5357
-0.0029	0.0258	0.0192	0.0363	0.0245	1.0000	-0.0261
-0,1046	-0.0926	2.2814	0.1755	0.0771	-0.3787	1.0000
ii). Standardized results for α- eigenvectors						
pche	-0.734	-0.0016	-0.4453	0.0315	-0.0264	-0.6891	0.0477
pci	0.711	0.0093	0.2230	0.006	0.024	0.5367	-0.012

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[26] The test of stationarity for residual term regress its lagged value on its own without intercept or trend because it is an error term.

pophosp	0.0038	0.0003	-0.4232	0.0026	-0.0082	-0.015	-0.0054
unemply	0.0070	0.0055	-1.8567	-0.0004	0.0741	-0.663	-0.137
hegdp	0.177	0.0092	1.337	0.0766	-0.0393	-0.643	-0.085
pop14	0.0091	0.0002	-0.0016	-0.005	-0.0006	-0.0965	0.0062
urbanize	-0.058	0.0017	0.037	-0.023	0.0002	0.165	-0.0054

iii). Test Summary

Vector AR 1-2 test	F (98, 46) 1.2209 (0.2277)
Vector Hetero test	χ^2 (392) 408.51 (0.2725)
Vector Normality test	χ^2 (14) 44.45 (0.0001)**
Residual(μ_t)[1]	-2.96** (0)[2]
	-2.99** (1)
	-2.84** (2)

[1]shows error term that is obtained after cointegration and the tested unit root hypothesis showed it is I (0).   [2] Figure in parenthesis are lag length.

After determining the number of possible cointegration vector the logical step in Johansen framework is to restrict alpha and beta coefficient by hypothesizing them equal to zero, which is related to the first column of alpha matrix and first row of beta matrix. For the one cointegrating vector, the number of (α) rows and (β') columns are six as there are seven variables included in the model, it can be easy to write the seven equations for the variables involved in the estimation of restriction test. Although, the first row of the standardized beta eigenvectors is of relevance as we normalized the remaining variables on per capita health expenditures *(pche)* and the standardized results of all the equations estimated are given in the above table 5.3. Essential test results are also presented in the same table 5.3 under the test summary heading and all diagnostic tests provide the evidence that there is no statistical problem present in the data.

Table 5.4: Test for Zero Restrictions on long run parameters (coefficients)

Variables	pche	pci	pophosp	unemply	hegdp	pop14	urbanize
α-coefficient	-0.734	-0.002	-0.4453	0.0315	-0.027	-0.6891	0.0477
LR test: χ^2 ($\approx$ 1)	30.48	22.12	0.017	0.001	1.107	0.998	3.75
P-value	0.00**	0.00**	0.89	0.97	0.29	0.32	0.052

** and * show rejection at 1 and 5 percent level of significance respectively.

The procedure of testing zero restrictions on alpha and beta coefficients is carried out by using likelihood ratio test statistics with chi square distribution. The results of alpha (α) restriction showed that zero restriction tests for *pche* and *pci* are rejected   but it cannot be rejected for the other variables (see table 5.4). It is therefore, easy to normalize all the variables in the model using *pche*. This is essentially testing which variable is weakly exogenous i.e., test of weak exogeneity and if this condition holds it is possible to write $\Pi_i Z_{t-i}$ as follows;

$$\Pi_1 Z_{t-1} = \alpha_{11} \left[\beta_{11}\beta_{21}\beta_{31}\beta_{41}\beta_{51}\beta_{61}\beta_{71}\right] \begin{bmatrix} \ln pche_{t-1} \\ \ln pci_{t-1} \\ \ln pophosp_{t-1} \\ \ln unemply_{t-1} \\ \ln hegdp_{t-1} \\ \ln popu_{t-1} \\ \ln urban_{t-1} \end{bmatrix} \qquad (5.10)$$

The variable of health spending per capita is significant at 1 percent level of significance meaning that this can also be used as the dependant variable and it clears 73 percent of the long run disturbance in the economy if a shock occurs. While real income in alpha restriction shows that variables can also be model using income as endogenous (dependant) variable. None of the variables using alpha restrictions appear to be significantly different from zero meaning that other variables has to be treated as endogenous (independent variable) and we can normalize these variables using per capita health expenditures *(pche)*. Thus, the single equation model, which gives the long run elasticity of the parameters also called Johansen normalized estimates, for the determinants of health care spending which is estimated by normalizing all variables on the health expenditure variable can be written as follows;

$$pche = 0.237 * pci + 3.942 * pophosp - 0.323 * unemply + 0.930 * hegdp$$
$$+ 2.544 * popu - 1.290 * urban \qquad (5.11)$$

The long run estimates of the respective coefficients are also tested for significance to determine which variables are uniquely determining the cointegrating vector present in the long run model. This is done by imposing zero restrictions on (β) coefficients and the significance is checked using Likelihood ratio (LR) test with chi square distribution and the results are summarized in the table 5.5 below.

As the results indicate that the variable of *pche* is also significant meaning that it can also be modeled as independent variable, but in this case as our objective is to measure that impact of income on health

and not the other way round, that is why we rely on the result of alpha restriction that *pche* can also be modeled as dependant variable.

Table 5.5: Tests for zero restrictions on the long run parameters (ß-coefficients)

Variables	pche	pci	pophosp	unemply	hegdp	pop14	urbanize
ß-coefficient	1.0000	-0.237	-3.942	0.323	-0.930	-2.544	1.294
LR test: χ^2 (≈ 1)	35.17	9.93	20.30	11.70	27.16	5.73	7.93
P-value	0.00**	0.00**	0.00**	0.00**	0.00**	0.02*	0.00**

**show rejection at 1 percent level of significance and * at 5 percent level of significance.

Secondly, this result also confirms the two way causality between these two variables and as the literature suggested that the relation between income and health is spiral (Hamoudi and Sachs, 1999) therefore both can be modeled interchangeably but it all depends on the objective of the estimation.

The signs of all the variables are in accordance with the theory and promising with their magnitude. The negative sign for unemployment variable in equation (5.11) is expected because unemployment is affecting productivity potential there by reducing national income as well as affecting individual's own income, thus, one may expect a less income available for the food and other things than caring for health. Secondly, as in the developing countries no insurance protection is available for the individuals thus hampering the increasing burden on government to increase budget for basic necessities like food, housing and clothing provision rather than spending on health care which is a later priority in almost every developing country. Thirdly, government need more spending and programs for employment generation rather spending on health care of the majority therefore shifts the government emphasis from spending on health.

Urbanization is affecting health spending negatively in Pakistan. This result is in consensus with some previous studies like; Siddiqui et.al. (1995) and Toor and Butt (2005) which concludes that urbanization is significantly but negatively affecting health care expenditures. Cumper (1984) concluded that urbanization lead to greater availability to health services hence may offset the demand for health care expenditures. In case of Pakistan, one factor that can also be responsible for this negative relation is the availability of low cost private doctors which are not registered doctors but are in demand due to their easy availability and low price. Secondly, urban infrastructure is relatively more developed e.g., transportation system hence reduces the cost of health.

Population of less than 14 years of age is adding positively to health care spending. Because, it is one of the largest age group consisting of total population in Pakistan and due to the fact that the child age group has the largest needs for health care services, therefore, positively influencing health

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expenditures. As it is evident from the sign and magnitude of the variable of age structure that the child age (especially children) consumes more of the health resources and it is positively related meaning that one percent increase in ratio of population of less than 14 years of age increases health spending by around 2.5 percent, following the coefficient of population hospital ratio which is higher and a one percent increase in population hospital ratio increases the health spending increases health spending by almost 3.95 percent.

The value of more than unity shows that with an increase in population in this age group (0-14 years) will definitely bring more than double the increase in health spending. Because still the burden of disease (45-50 percent) in Pakistan is communicable diseases and this age group is relatively more prone to these diseases.

Positive sign of income variable shows the potential of level of development of a country and its affect on the public health expenditures and it is in agreement with other studies in this line of inquiry (see e.g., Okunade and Karakus, 2001 and Toor and Butt, 2005). However, the elasticity of less than one is pointing towards health care spending is a normal (necessity) good rather than luxury as is the case in most of OECD and/or developed countries. This result is contrary to the results of Newhouse (1977), Leu (1986) and in line with that of Parkin, McGuire and Yule (1987). While, this low income effect is pointing towards worsen income distribution and lack of government to prioritize health sector as one of the major sector.

Income elasticity of health care is around 0.23 can be interpreted as a unit increase in income will lead to less than proportionate increase in health spending. This result might be that in Pakistan the public health sector is not efficient and almost fails to deliver health care to a large share of population that give rise to private health facilities. Rural areas lacking hospitals and other necessary medical services (if present at distance places) while lack of transportation and infrastructure facilities in rural areas pose threat to their health and health care services utilization. That is why private sector is prevailing side by side with public health sector and that private sector mainly motivated for profit.

The sign and affect of health spending as percentage of GDP is positive and a priori. If population is increasing at a slower rate than increase in GDP and health spending as percentage of GDP remain the same then it implies that country has more resources available for each person. It clearly indicates that increase in health spending as percentage of GDP will affect the health spending per capita positively through reduced population growth rate channel.

The affect of health care services is positive as is hypothesized and its elasticity appeared to be more than unity directing that government has to invest more on building infrastructure to well equip the sector with facilities specially health care services like Basic health units (BHUs), primary health care centers (PHCs). This has a prominent affect on health spending.

5.3.3   *Results of vector error correction model (short run dynamics)*

Short run dynamic modeling is carried out by using general to specific modeling approach following David Hendry (1984) and Campos *et. al.,* (2005). The specific purpose of this exercise is to see which of the variables are important in the short run as a policy measure as well as the impact of different variables in the short run. Secondly, this can also help us to build on the lines that how some of the variables are behaving in both the periods. Keeping in view that one cointegration vector is estimated therefore, the only extension to Johansen procedure that is to estimate is short run dynamics using this vector form of the equation (5.9) which is given as follows;

$$
\begin{bmatrix}
\Delta \ln pche_t \\
\Delta \ln pci_t \\
\Delta \ln pophosp_t \\
\Delta \ln unempl_t \\
\Delta \ln hegdp_t \\
\Delta \ln popu_t \\
\Delta \ln urban_t
\end{bmatrix}
= \Gamma_i
\begin{bmatrix}
\Delta \ln pche_{t-i} \\
\Delta \ln pci_{t-i} \\
\Delta \ln pophosp_{t-i} \\
\Delta \ln unempl_{t-i} \\
\Delta \ln hegdp_{t-i} \\
\Delta \ln popu_{t-i} \\
\Delta \ln urban_{t-i}
\end{bmatrix}
+ \alpha\beta'
\begin{bmatrix}
\ln pche_t \\
\ln pci_t \\
\ln pophosp_t \\
\ln unempl_t \\
\ln hegdp_t \\
\ln popu_t \\
\ln urban_t
\end{bmatrix}
+ \upsilon_t
\qquad (5.12)
$$

The results of the short run dynamic model are presented in the table 5.6 below.

The negative sign with significant coefficient of income in the short run is surprising. It is not the income per se but the level of development a country is enjoying effects the health spending and also health of population. As described by Judge, et.al, (1998) that level of economic development has tremendous effect on health spending as with low income people are unable to buy food on the one hand (also problem of food poverty affecting their health) and because of less income disposable at their hand they are less likely to spend on health rather than on basic necessities (like food and housing). The other possible justification for income being negatively affecting health spending is the inequality affect of income which in the short run as well as in the long run has important implications for public resource allocation.

Table 5.6: Short run Vector Error Correction Model (VECM) Results

Variables	Coefficient	t-statistics	Probability value
pci	-0.583 [0.1238]	-4.71	0.000
pophosp	0.763 [0.3558]	2.14	0.042
Pop14	3.240 [1.177]	2.75	0.011
hegdp	0.176 [0.064]	2.74	0.011
$hegdp_{t-1}$	0.298 [0.1244]	2.40	0.024
unemply	-0.086 [0.0508]	-1.68	0.105
constant	0.088 [0.01346]	6.54	0.000
ECT_{t-1}	-0.377 [0.175]	-2.16	0.041
Diagnostic Test Results			
AR 1-2 test	$F_{(2, 22)}$	0.9156 (0.4150)	
Normality Test	$\chi^2(2)$	2.1640 (0.3389)	
Hetero Test	$F_{(16, 7)}$	0.3882 (0.9445)	
ARCH 1-1 Test	$F_{(1, 22)}$	0.2109 (0.6506)	
RESET Test	$F_{(1, 23)}$	0.1112 (0.7418)	
R^2	0.9179		
$F_{(8, 24)}$	33.55 [0.000]**		
DW	2.15		

* Rejection at 5 % level of significance and ** at 1 %. [ ] shows the Standard errors of the coefficients and ( ) shows probability level. ECT stands for error correction term.

Another possible candidate for this negative coefficient might be the low priority given to health sector in government development planning and therefore lack of utilization of available funds in health sectors may cause a negative income effect in the short run. As it is also evident that in the long run the income effect although positively affecting health spending nevertheless, has a significant but small coefficient. Finally, urban bias in health care spending can also pose a threat in the immediate period because majority, lives in rural areas, remains unable to get benefit from the public facilities and this is why public facilities remain inefficient.

The quality control variable for health services used in this analysis, population per hospital, is significant and positively affecting health care expenditures as in the long run. But short run elasticity

is smaller than the long run. It is because people in the short run are cautious about access and the quality criterion comes after wards. Because mainly, in Pakistan, the burden of communicable diseases is high and this does not need much of the hospital care rather than an immediate access to any facility, therefore, due to epidemiological transition[27] in the long run this variable is becoming more of policy relevance.

Urbanization variable is less important in case of Pakistan in the short run because migration is not a short run phenomenon. The sign of unemployment coefficient is according to a priori but unemployment appeared to be non significant. Obvious reason can be that the strong social bonding of Pakistani society making unemployment in short run a transitory phenomena and hence making it less significant in explaining health care expenditures, on the other hand in the long run as unemployment is persistent it causes threat to not only individual and society but the whole economy therefore it is significantly and negatively affecting the health care expenditures in the long run. Health spending as ratio of GDP is also affecting in the same period as well as its lagged value by one year affecting positive and significant. This means that increase in GDP share of health expenditures has lagged affect not only in the long run but also in the short run, emphasizes the importance of investing in health on priority basis.

The error term is significant and the value shows that the previous period disturbance in the variables is almost 38 percent adjusted in this year which is quite logical and reasonable. Almost 92 percent of the variation in the model is explained by the income as well as non income independent variables. Diagnostic test results show that no such statistical problems like autocorrelation, heteroscedasticity, functional form and normality exists in the model.

5.4   Summary

What determines health expenditures at national level is an important question. This chapter tries to seek answer to this question by empirically estimating the factors affecting health expenditures like economic, social, political, demographic and health services availability at national level. The study used annual data from Pakistan spanning from 1972 to 2006. The results of unit root tests confirmed on balance all variables are non-stationary and are I (1) therefore, cointegration analysis and vector error

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[27] The process of degenerative and man-made diseases displaces pandemics of infection as the primary causes of morbidity and mortality. Epidemiological Transition is used to be thought that—the shift from infectious and deficiency diseases to chronic non communicable diseases—was a unidirectional process, beginning when infectious diseases were predominant and ending when non communicable diseases dominated the causes of death.

correction modeling (VECM) is carried out to find possible long run relationship and short run dynamics between heath care expenditures per capita and other income and non income variables. Long run relationship is found among health expenditures and other income and non income variables. Long run elasticity of income is less than unity which is contrary to most of the OECD studies. In the short run, it is found that urbanization is not affecting the health expenditures. Although it's affect in the long run is pronounced because of it is a gradual process and takes time. Health infrastructure is another important variable that influences health expenditures both in long and in the short run.

Chapter 6 Economic, social, demographic and political factors affecting health status in Pakistan

6.1 Introduction

Public health issues are getting increased attention in policy discussions at country as well as at international level. The broader aim of public health intervention in an economy is to reduce poverty by eliminating disease burden through better health services provision. Therefore, MDGs place spot light on health because of its own right and to enhance development process in the poor economies (Sachs, 2004). MDGs in this regard, come up with the targets of reducing infant and child mortality by two third from its 1990 level by the year 2015. It is broadly conceived that health status improvement and mortality reduction has robust poverty reducing effects (Hanmer, Lensink and Howard, 2003).

At global level health status has improved over the years, but unequally. Each year nearly 3.3 million babies are stillborn, and over 4 million more die within 28 days of coming into the world. Deaths of babies during this neonatal period are as numerous as those in the following 11 months (WHO, 2005). Health status is a mirror image of the reflections of social, economic and demographic circumstances in which a person lives (Woodward and Kawachi, 2000). Therefore, to explore factors affecting infant mortality and life expectancy (as indicators of health status) help the national government in achieving their MDG targets. It reduces disease burden and makes potential use of available human capital. Also, assists in better allocation of scarce resources to make interventions cost effective and improving efficiency with equity (Banister and Zhang, 2005).

Economic policies of promoting growth as well as social development are necessary and sufficient conditions for increase in infant survival chances, but their magnitude differs. In this regard individual steps, government efforts, and global community have to play a significant role. There are some good achievements to celebrate like Pakistan virtually is malaria and small pox free; polio vaccine has played a significant role in achieving better health by reducing Poliomyelitis among early age children. Still there are areas which needs emphasize, one of them is reducing infant deaths and increasing chances of their survival in later life.

Despite of the efforts, different governments did to improve health status of children and new borne, a meager achievement is apprehended and Pakistan still is facing relatively high infant mortality[28]

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[28] Infant mortality rate (IMR) can be a cause of natural or biological disorder such as degenerative diseases (cancer, heart disease, diabetes etc.) and from causes related to early infancy such as birth injuries, congenital disorders, and premature births etc., while it may be due to environmental and/ or external reasons such as infections and accidents. This type of mortality, if properly taken care can be treated and is relatively preventable (Shryock et.al. 1976 and Suwal, 2001).

compared to the countries of its income level. Infant mortality decreased gradually but still high in Pakistan (see table 6.1).

Table 6.1: Cross country comparison of economic and health indicators

Countries	GDP/capita[1]	Health spending[2]	IMR[3]	Life Expectancy[4]	TFR[5]	Immunization[6]
Pakistan	*2225*	*0.7*	*80*	*63.4*	*4.3*	*67*
Bhutan	1969	2.6	67	63.4	4.4	87
Bangladesh	1870	1.1	56	63.3	3.2	77
India	3139	1.2	62	63.6	3.1	56
Philippine	4614	1.4	26	70.7	3.2	80
Indonesia	3609	1.1	30	70.8	2.4	72
Srilanka	4390	1.6	12	74.3	2.0	96
LDCs	4775	NA	57	65.2	2.9	74
South Asia	3072	NA	62	63.7	3.2	62

Source: UNDP Human Development Report 2006, see indicators tables number 1, 5, 6 and 10.

1. GDP per capita is in purchasing power parity (PPP) US dollars for the year 2004.

2. Public spending on health as % of GDP for the year 2003-04.

3. IMR is infant mortality rate per 1000 live births for the year 2004.

4. Life expectancy at birth in number of years for the year 2004.

5. Total fertility rates are number of births per women; it is based on five years average 2000-05.

6. Immunization coverage is for one year old against measles in percentage form for the year 2004.

Economic factors, broadly speaking income per capita and/or its distribution as well as epidemiological, social and cultural conditions in which people live affects survival chances. Countries falling in same income group have shown different tendency in declining the rate of Infant mortality (see table 6.1). This confirms a link between income and IMR while explaining that income is not the sole factor that explains all the variation in health status. Looking into comparative figures Pakistan lags behind in every respect of health status as for example, infant mortality for South Asia is 62 and for developing countries it is 57 per thousand live births but Pakistan lies well ahead at 80 per 1000 live births. Life expectancy lies below the average of South Asia and less developed countries (LDCs). Total fertility rate remained high and hovering around 4.3 births per women while the figure for South Asia is 3.2 and LDCs are even lower at 2.9 births per women of child bearing age.

Mortality reduction and better living standard can be attributed by growth mediated and support led processes (Dreze and Sen, 1989). Growth in income increase choices and indirectly expands individual functioning. Whereas non income indicators like better health and education services provision, and access measures directly the functioning of the household (Sen, 1998). Income growth remain inadequate in most of the developing countries because of anti poor nature of growth or it remained less participatory like provision of employment and basic social services like education, health and water and sanitation, as is the case of Hong Kong and Korea. The support led processes works through the priority given to social services through better managing and provision of basic health facilities and education as is the case of Kerala (India) and Srilanka (Sen, 1998).

The provision of health care services whether public or private and access to them also affects health. Effective delivery of health care services to majority of the population and increased budgetary allocation at government level has shown a positive and/ or reducing mortality impact on health status (Gbesemte and Jonsson, 1993; Zahid, 1996 and Schell, Reilly, Rosting, Peterson and Ekström, 2007). It is argued that because of less spending on health sector developing countries are trapped in the higher infant mortality cycle over the years (Issa and Ouattara, 2005). It is also argued that not only the health care spending but its efficiency matters in improving the health status (Filmer and Pritchett, 1999).

Pakistan's health profile indicates that the sector has expanded in physical infrastructure and its manpower and also contributed to some improvement in selected health status indicators over the years. Nevertheless, the public health care delivery system has been inadequate in meeting the needs of the growing population and in faltering down its benefits to the grass root level.

The goal of this chapter, broadly speaking, is empirically estimating the long run relationship between health status and various social, economic and demographic variables using cointegration and causality analysis.

This chapter makes use of time series data spanning from 1972 to 2006 and tries to analyze the following questions: What factors (economic, demographic, social and political) determines the health status in Pakistan? What role health spending and health care access can play in explaining mortality in the long run? Whether the infant mortality and female life expectancy has causal relation with public health care spending and income at national level? What is the likely effect of policy variables like development health spending and nutrition in improving health status?

Specifically, this chapter aims at empirically examining; i) the long run relationship between health status and various policy relevant economic and non economic factors, ii) estimating the number of

cointegrating vectors using Johansen full information maximum likelihood approach. In estimating cointegrating vectors, trace and Eigen value statistics are used. Beta coefficient is restricted equal to zero to see the significance of different variables iii) finally, Granger bivariate causality test is employed to see the direction of causality.

6.2   Model and Data

An important component of human capital formation is improvements in the health status of the population. Mortality statistics and their analysis remained the subject of demographer, but it is connected strongly with economic causes and thus provides a solid reason to test it as an indicator of economic success or failure (Sen, 1995)[29]. Poor household, communities and countries are more prone to diseases and thus facing high mortality. This evidence provides us conceptual reason to study infant mortality rate (IMR) and life expectancy (LE) as indicators of health status in a developing country, Pakistan.

It is difficult to model the whole array of macroeconomic factors affecting health status and therefore, it is a hasty decision for a researcher to model according to what is more relevant and important considering the economic conditions and pattern of variables over time in a particular country. Nevertheless, some country specific factors are important in a single country analysis. By reviewing literature and analyzing social, economic, political and demographic pattern, it is required that health status cannot be seen in isolation in Pakistan. Any attempt to reduce mortality for achieving better health of the population will definitely not bring any good in the long run unless necessary steps are taken to avoid disease burden as well as to provide necessary health care facilities. Therefore, it is good to foresee the health an integrated sector with other sectors of the economy. Social, economic and demographic factors are more relevant in case of health status improvements and reducing mortality.

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[29]Infant mortality rate explains social inequalities prevailing in a country. The reason for using mortality as an indicator of health status is widely accepted and explored due to the following reasons; although, Morbidity can also be a logical candidate for analyzing country level predictors of health status and thus, making national health goals achievable. But morbidity data is not easily available and if it is available it is self perception, which is heavily criticized by Sen (2002), and therefore it is convenient to use mortality as an indicator of well being (Sen, 2002). Reidpath and Allotey (2003) criticized the use of IMR and tried to correlate it with disability adjusted life expectancy (DALE) and concluded that both the measures are linearly related with a coefficient of 0.91, therefore, IMR is better and cost effective measure of population health. IMR indicates the way society weigh health status of the children, child care attitude and health care facility position provided publicly. Hence, it is a measure that can well reflect the government attitude towards building human capital.

Not only income but also non income indicators help in predicting living standard of the people as well as affecting their health status. Therefore, any modeling strategy to estimate the factors affecting health status must take account of both income as well as non income variables. Through literature survey, it is explored that non income indicators like the family size that is measured in this chapter by total fertility rate has a direct bearing on infant deaths. Because, mother is less able to take care of her kids if they are more in numbers and it also has a direct link with family income and resource distribution. More kids will deplete the resources a household possess and consequently become vulnerable to diseases and increases probability of infant death. In this context, access to hospital facilities as well as the efficiency of health services matter. Therefore, in this study we included variables related to health care services provision like doctor population ratio. To better capture the role that health services can play in providing better care to the population.

Double logarithmic form model is used for the analysis; because the relation between income and infant mortality is not linear, as income increases its affect on reducing infant mortality declines. The model for health status variables can be written as follows;

$$\begin{bmatrix} imr \\ lefem \end{bmatrix} = f\left(pci, dhe, hepc, tfr, popdoc, claories, unemply\right) \tag{6.1}$$

In mathematical notation it can be written as;

$$imr = \alpha_0 + \alpha_1 pci + \alpha_2 hepc + \alpha_2 tfr + \alpha_3 popdoc + \varepsilon_t \tag{6.2}$$

$$lefem = \beta_0 + \beta_1 pci + \beta_2 dhe + \beta_3 calories + \beta_4 unemply + \beta_5 popdoc + v_t \tag{6.3}$$

Here *imr* is Infant mortality rate per 1000 live births, *pci* is the real per capita income at national level in Pakistani rupee, *dhe* is the development health spending in Pak. Rupees in real terms, *lefem* is female life expectancy at birth, *popdoc* is the ratio of population per registered doctor, *calorie* is the availability of nutrition per capita and *unemply* is unemployment rate in the economy, *hepc* health expenditures per capita in Pakistani rupee and *tfr* total fertility rate i.e., children born by women of child bearing age (15-49 years).

Health status is one of the indicators that not only reflect the welfare level of individual and society but point out the effectiveness of government efforts towards improving health care outcomes through public spending on health sector and judicious policies. Pakistan still far behind in achieving a decent health standards and increased life expectancy for majority of population and specially the miseries faced by the women. Difficulty in access and provision of better health care facilities to majority of population is still not achievable despite of government meager efforts. Health status variables, as both

infant mortality and life expectancy are outcome variables, reflecting the situation of population health as well as public health sector efficiency in utilization of available resources, therefore, in this study infant mortality rate (IMR) and life expectancy for female (lefem) is used as dependant variable to capture the status of population health.

An ambiguous relationship is expected to exist between female life expectancy as health status measure and public health expenditures. Because higher per capita health spending may increases the access and provision of health facilities and will positively relate to health status. An adverse relation appears only if government imposes user fee or kind of taxes and if this is paid at the expense of the individual's preventive health care such as food, clothing and housing which may occur in subsistence or less developed societies like that of Pakistan (Hadley, 1982 and Fayissa and Gutema, 2005).

Although, the quality of health care services is a bit difficult task to measure specially in developing country context but in this study the variable that is closely related to the quality of health services includes; Population per doctor (*popdoc*) who are supplier of health care services. The doctor population ratio is high in Pakistan (meaning more population for a doctor) and therefore leads to development of malpractices on the part of doctors and lack of access to health services. Supply induced demand hypothesis in actual is tested here in case of Pakistan which explains that; as the doctors population ratio decreases, it helps in betterment of the health status of population due to increased access and reducing supply constraints. The inducement of supply of doctors will definitely have a positive health effects therefore, it is hypothesized to be negatively related to infant mortality rates and positively to life expectancy of females. As more doctors in competitive health services markets are producing more services and facilities which are accessible to majority therefore, reduces the health care cost to consumers and hence positive externality affects the health status of the population. It is hypothesized that the fertility (*tfr*) rate has a negative relation with life expectancy and a positive relation with infant mortality. An attempt has also been made to estimate the direction of causality between infant mortality and fertility at national level. It is obvious that increased fertility lowers the health of mothers and low space births harm the new born babies adversely.

Nutritional status of mothers affects the survival chances of new born as well as availability of food and nutritive value. Food consumption broadly determines the healthy life years spend. It is, therefore, indirectly affecting female life expectancy specially having impact during pregnancy years for a mother in high fertility societies. It also plays a vital role in making household free of food poverty which is alarmingly high in Pakistan. Calorie based (food poverty) incidence showed that about one-third of the

households are living below the food poverty line (consuming calories below the recommended level) and they are not meeting their nutritional requirements. The incidence of calories based poverty is higher in rural areas 35% than in urban areas 26% (UN, 2001).

In case of Pakistan, nutrition of pregnant mother in matters more than new borne as breast feeding is a common practice till the first two years of child's birth. But as the child grows it has to face many facets of diseases due to wide spread existence of communicable diseases as well as malnutrition in adulthood also affects one's individual capability and also productivity (Brown and Pollit, 1996). Nutritional aspect, in traditional societies like Pakistan, is more important in younger age rather than in early life years to improve productivity as well as healthy life years towards the later stage of life compared to infant age. Thus, it is hypothesized that per capita nutritional availability has a positive relation with life expectancy. Real per capita income and real per capita health expenditures are used for the base year 2000-01.

Data is used from official statistics and already published sources of government of Pakistan like; Federal Bureau of statistics (FBS) annual publications, State bank of Pakistan (SBP), World development indicators CD-ROM 2005-06 and economic survey of Pakistan publication of economic advisor wing, ministry of finance, Pakistan. Calories data (average per capita calorie intake per day) from 1972 to 2000-01 is obtained from FAO year book as well as online data set available from the food balance sheet (FAO, 2000) while remaining are from economic survey of Pakistan (GOP, 2007). Per capita income and development health expenditures are converted into real terms by using GDP deflator for the base year 2000-01 to keep price effect differentiated from income effect.

6.3   Variable description

i)   Health status

Although, gradually declined, the level of infant mortality is still very high in Pakistan. For example, during the 1988 Pakistan demographic survey (PDS) it was revealed that the infant deaths in rural areas are almost 116 per 1000 live births as compared to 87 in urban areas (Malik et.al., 1994). One reason can be that health spending goes to curative care rather than preventive care as about 80 percent of the total health expenditures is devoted to curative care, while remaining meager 20 percent is for preventive and mother and child care health services (GoP, 2006). Although the emphasis of the PRSP strategy is to shift the focus of public health resources towards later but still not much success has been achieved (PHCR, 2002).

The rate of infant deaths was high in early 1970s above 100 but it slightly goes down to 89 in the following years till the start of 1980s. It increased again in the 1983-84 and went a record high to more than 125 infant deaths per 1000 live births. By the late 1980s and early 1990s, infant mortality decline remained stagnated (Agha, 2000). One possible reason is governments changing priorities that put pressure on health sector resources and switched to some other sectors like industrialization.

The rate of infant deaths remains gradually declining during early 1990s; it went down to almost 92 deaths per 1000 live births, in subsequent years it decreases to less than 80 deaths per thousand live births. During the early years of new millennium it goes on decreasing from almost 80 deaths per 1000 live births to 72 infant deaths per 1000 live births. Over the years the declining trend remained consistent with few exceptional years but still the mortality rate is high.

Life expectancy overtime grew from 54 years in 1972 to 68 years in year 2006. Life expectancy differs across regions and between genders while it is also less compare to developing countries. Women on an average enjoying a relatively higher life expectancy than men in case of Pakistan but the difference in number of years is not significant compared to what exist in western societies (ADB, 1997). The reason for this discrimination against women is boy preferences in most of the households in Pakistan and because of less spaced births and high fertility. This adds more to gender inequality in health. Although, female life expectancy remained above over all life expectancy as well as better than the life expectancy of male, nevertheless, the healthy years of life for women are less due to lack of decision making power as well as access to health and other health related resources in customary society of Pakistan. During structural adjustment program (SAP), the life expectancy remains sluggish as it was in the late 1980s. One reason might be structural adjustment Program affects the income per capita and increased inequality and poverty therefore, adversely affecting the living standards of the population.

ii)   *Health services*

Skilled personnel in health sector remained a major obstacle to access and better provision of health care. Endowed with less infrastructure and unskilled manpower, Pakistan gained and trained skillful manpower in every sector of economy including health. Although, high population growth of around 3.1 percent in the early years of 70s and almost 2.9 percent in the end of 1980 over taken the increased production of health personnel and hence the doctor, nurse and dentist patient ratio remained low. Doctor population ratio is reducing as more doctors are produced than ever before and also a stopover to a rapid population growth rate which is now almost around 2 percent (still high compare to countries of the region). Progress in this regard is slow and disparity in allocating doctors to regional basis.

In the early 1970, at most 4100 people were served by a doctor and 12000 by a nurse. In the mid 80s although the rate of increase of medical colleges and training centers were high so was with the production of doctors and paramedical staff like nurses but the trend reversed in the 1990s. Over the years the ratio of doctors and nurses per population remained declining gradually. Nurse population ratio is now 3000 while doctor population ratio is around 1300. One reason of this high ratio is the migration issue of doctor and nurses to western and to Middle East in search of better economic opportunities. Socio cultural practices in this regard also play major role like marriage of female doctors, as well as female staff is reluctant to work at distant places especially in rural areas (Zaidi, 1988).

iii)   Total fertility rate (TFR)

High fertility rate over the year consistently adding pressure to the existing public health resources as well as it also reduces household welfare. Fertility rate was following a gradual declining trend over the course of three decades, as it was as high as 7.2 children per women of child bearing age in the year 1972 which went down to 7in the year 1985. Persistence of the high fertility rate over the years in Pakistan mainly responsible for the host of maladies like; despite of achieving high growth of economy for the last five decades inequality remained an integral part, social welfare loss at individual and at community level, difficulties in labor absorption as they are unskilled and ethnic tensions and therefore political instability remained in a vicious circle of high population growth rate due to high fertility rate.

iv)   Nutritional status

In Pakistan per capita calories intake has grown from 2239 (kilo) calories per day in 1972 to 2425 in 2006 with an average annual growth rate of 0.60 per cent (GOP, 2003). Due to high population growth rate during the late 1960s as well as high fertility rate in the early years of 1970s the calorie per head per day remained low in those years. Nutrition availability and access has a potential to bring a rapid change in the relation of food related disease burden. In spite of the increase in calorie intake per capita, food security remains an unfulfilled dream for currently about 42 million people (UN, 2001). The fact that about one third of the population does not have access to food needed for adequate nutrition is manifested by the incidence of malnutrition.

6.4   Results and Discussion

6.4.1   Unit root results

Summary statistics of the variables used in the analysis showed that infant mortality is down ward trended with gradual decline and the income per capita increase is sharp over the period of last four decades. Female life expectancy on an average increased from 54 years to 68 years from 1972 to 2006 (see table 6.2 for details).

Infant mortality rates *(imr)* appear to be non stationary both in DF[30] and ADF in its level form where as it integrated of order zero in difference form with drift, without drift using two lags in DF equation. Therefore, it is I (1) and contains a unit root. Life expectancy of female *(lefem)* also appeared to be I (1) and become stationary after differencing one time in DF and ADF specifications. It is significant at 1% level of significance in both tests. Development health spending *(dhe)* is also significant at 1 % level of significant with lags one and two in ADF equations including constant and with constant and trend showing it to be an I (1). Per capita income *(pci)* is non significant at two lags in ADF equation with constant but when trend is included it becomes significant at 1 % level of significance at one lag.

Table 6.2: Summary statistics of the Variables

Variables*	Mean	Maximum	Minimum	SD**
imr	95.291	127	71	13.983
pci	8662.2	27249.43	1957.534	7265.014
dhe	5892.2	10989.77	1198.871	2248.997
lefem	61.985	68	54	4.253
tfr	5.917	7.2	3.2	1.1566
Calories	2294.8	2493	2136	113.485
Popdoc	2487.0	4088.78	1298.74	980.795
unemply	4.625	8.27	1.65	2.11
hepc	131.83	205.37	40.53	45.19

*Source: own calculation from data. ** SD is standard deviation.*

*imr= Infant mortality rate per 1000 live births. lefem= Female life expectancy in years. pci= Per capita income in Pak Rupees adjusted to base year 2000-01.dhe= Development health expenditures in Pak Rupees. tfr= Total Fertility rate. calorie= nutrition availability per capita. popdoc= population doctor ratio. unemply= Rate of unemployment. hepc= Health expenditures per capita in Pakistani Rupees.

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[30] For detail description of empirical part of Dickey Fuller (DF) and Augmented Dickey Fuller (ADF) as well as Philip Perron (PP) test see methodology part of chapter four of this dissertation.

While excluding constant and trend it shows significance at 5 % level of significance at one lag. While in any equation of DF in level form it is non stationary. Total fertility rate *(tfr)* is significant at 5 % level of significance without constant and trend in level form in DF equations while in all other ADF and DF specifications it is non-significant meaning that it contains a unit root (see table 6.3).

But in DF equation with constant and with constant and trend, it is significant at 1% level of significance making it an I (1) variable. The null of unit root is also rejected for population per doctor *(popdoc)* in all the DF and ADF models in level form and it becomes stationary after taking first difference.

Table 6.3: Unit root results for the variables in level and difference form

variable	i) DF and ADF unit root results in level form								
	DF			ADF					
	With C	With C,T[1]	Without C, T	With C		With C,T		Without C, T	
				1	2	1	2	1	2
imr	-0.02	-1.36	-1.12	-0.24	-0.23	-1.50	-1.41	-1.47	-1.41
lefem	-1.97	-2.27	4.79	-1.86	-1.92	-2.50	-2.34	-2.50	-2.34
dhe	-1.55	-2.13	1.30	-1.72	-1.64	-2.91	-2.54	-2.91	-2.53
pci	0.74	-2.22	3.49	0.51	0.73	-2.54	-2.22	-2.54	-2.22
tfr	0.81	-1.35	-3.50**	0.36	-0.19	-1.48	-1.80	-1.48	-1.80
pop/doc	-0.66	-1.16	-6.68**	-0.77	-0.72	-2.10	-2.10	-2.09	-2.10
calories	-1.93	-3.86**	0.41	-1.10	-0.89	-2.63	-2.41	-2.63	-2.41
ii) DF and ADF unit root results in differenced form									
imr	-4.82**	-5.21**	-4.77**	-3.60*	-2.99*	-4.1**	-3.50*	-3.5**	-2.9**
lefem	-5.21**	-5.19**	-3.83**	-4.3**	-3.9**	-4.4**	-4.2**	-2.9**	-2.45*
dhe	-5.02**	-4.96**	-5.01**	-5.4**	-5.3**	-5.2**	-4.9**	-5.3**	-5.0**
pci	-4.60**	-4.57**	-3.35**	-4.1**	-2.90	-4.1**	-2.88	-2.63*	-1.66
tfr	-4.10**	-4.32**	-3.31**	-2.40	-2.40	-2.49	-2.58	-1.91	-1.83
pop/doc	-3.80**	-3.77**	-2.12*	-3.30*	-3.61*	-3.29*	-3.55*	-1.65	-1.56
calories	-9.12**	-8.95**	-9.11**	-5.3**	-3.9**	-5.2**	-3.9**	-5.3**	-3.9**

*and ** show significance at 5 and 1 percent level of significance respectively.[1] shows that c is equal to constant and T is time trend.*

Whereas when constant and trend is excluded from ADF equation this variable becomes non stationary in difference form at lag one and two. Therefore, on balance it can be safely said that all the variables are I (1) in both DF and ADF unit root tests.

6.4.2   Cointegration results

After empirically testing for order of integration for all the variables, a test for possible long run relationship (Cointegration) is conducted following Johansen (1988). Johansen cointegration procedure employed for the presence and number of cointegrating vectors among the variables in the model. The results are presented in Table 6.4, which imply that trace statistics strongly rejects the null hypothesis that there is no cointegration between variables *(i.e. r = 0)*, but do not reject the hypothesis that there is one cointegrating relationship *(i.e. r = 1)* at 5 % level of significance.

It is therefore concluded that our model has one cointegrating vector (i.e., a unique long-run equilibrium relationship exists). The maximal Eigen value test also rejects the null of no cointegration and hence in line with the results of the trace statistics. While the null of no cointegration for female life expectancy equation is rejected at 1 % level of significance and therefore it is concluded from the trace statistics that long run relationship exists between life expectancy of female and other economic and non economic macro-level factors (see panel B of table 6.4). The results of Eigen Value statistics confirm the trace test results and point towards the existence of one cointegrating vector. The results for the diagnostic tests are presented in the table as summary measures to see whether there is problem of any kind in both the models. All the results with their respective values seem non significant meaning that there is no such problem of misspecification, non normality and heteroscedasticity in the estimated models.

The long run elasticity of all the variables is estimated using Johansen procedure and the results are presented in table 6.5. Short run elasticity are not computed keeping in mind that both the variables that is infant mortality (IMR) and female life expectancy (LEFEM) are long run phenomenon and thus in short run it will not be appropriate to measure elasticity to make inferences. The signs of the coefficients are according to a priori accept income per capita. Income is negatively relating with the female life expectancy which is counterintuitive. Negative relation of income with female life expectancy can be attributed to the unpaid work performed by women in agriculture fields and house etc., which affect energy requirement of body and hence negatively impact their health.

Table 6.4: Eigen value and Trace statistics (Tests for no. of cointegrating vectors)

A). Infant mortality rates cointegration results (imr)					
Rank	Eigen value	Log likelihood	H_0 : rank <=	Trace test	P-value
0		264.615	0	74.98*	0.017
1	0.626	280.837	1	42.54	0.144
2	0.543	293.750	2	16.71	0.669
3	0.279	299.152	3	5.91	0.709
4	0.159	302.003	4	0.20	0.651
5	0.0061	302.105			
		Test Summary			
Vector AR 1-2 test		F (50, 39)	1.59 (0.068)		
Vector Hetero test		χ^2 (300)	304.22 (0.421)		
Vector Normality test		χ^2 (10)	9.69 (0.47)		

B). Life expectancy Cointegration Results (lefem)					
Rank	Eigen value	Log likelihood	H_0 : rank <=	Trace test	P-value
0		350.1366	0	109.98	0.003**
1	0.75203	373.1453	1	63.961	0.133
2	0.58443	387.6341	2	34.983	0.454
3	0.37225	395.3168	3	19.618	0.460
4	0.29798	401.1545	4	7.9425	0.479
5	0.17516	405.1257	5	1.5879	0.208
6	0.046978				
		Test Summary			
Vector AR 1-2 test		F (72, 22)	1.7998 (0.0614)		
Vector Hetero test		χ^2 (504)	522.74 (0.2729)		
Vector Normality test		χ^2 (12)	12.293 (0.4225)		

* Shows the rejection at 5 % level of critical values. Number of lags included in the analysis 2, Constant is unrestricted. Figures in parenthesis are probability values.

Also, in a patriarchal society like Pakistan women are deprived of basic necessities of life like housing, food and health and education and thus provide a basis for a downtrodden situation of women health.

Gender inequality in access to health care due to economic or social reasons is another channel though which income is affecting life expectancy of female negatively. Gender inequality in access to household wealth also makes women depend on their male counterparts and hence deprived them in economic terms.

Total fertility rate is positively affecting infant mortality rate with a coefficient value of 0.93. It means that increased fertility has a threatening affect on infant survival chances. It is confirming the long debated issue of fertility mortality relationship especially in a developing country setting. It is also in harmony with Malthusian theory which argues that increase in wage, increases the living standard and reduces the age of marriage which in turn increases fertility rate which augments mortality. It is generally considered (especially in developing country) that high fertility is to blame for increased mortality (Yamada, 1985).

The availability of health personnel per capita (doctor per population) also affecting infant mortality negatively indicating that an increase in health personnel availability increases the access to health facilities and has a positive effect on infant survival chances. Health personnel availability, that is doctor population ratio, is negatively affecting infant mortality in the long run with right sign. It shows that with the increase in health personnel will increase access and the asymmetric market of health care services providers will become more symmetric in terms of health education, awareness and better know how to the common men.

Table 6.5: Johansen normalized estimates (long run elasticity)

1. Johansen normalized estimates (long run elasticity) for Infant mortality rates	
pci	-0.2631
tfr	0.9311
popdoc	-0.8744
hepc	-0.110
2. Johansen normalized estimates (long run elasticity) for Female life expectancy	
dhe	0.286
pci	-0.0123
calories	0.927
unemply	-0.024
popdoc	0.0271

Public health expenditures are also affecting infant mortality negatively, meaning that increasing public health interventions especially for mother and child care and shifting emphasis from preventive to curative care will bring a shift in infant mortality rate.

Calories affect is stronger in female life expectancy. The sign of unemployment coefficient is a priori and the value is low because in a traditional society like Pakistan working women concept is still premature especially in rural areas where almost 67 percent of the population is living. Health personnel availability per capita affecting life expectancy positively as it was expected.

The significance of the long run coefficients were tested by restricting beta coefficient equal to zero. This is done to see which variables are uniquely determining the cointegrating vector present in the long run equation. The significance is checked using log likelihood estimates obtained after setting beta coefficients equal to zero, the likelihood ratio test having Chi-square distribution and results including probability values of all the long run coefficients are presented in the above table 6.6.

In IMR equation the variable of mortality (imr) is significant meaning that it can also be modeled as dependent variable while P-value for life expectancy equation shows that it is non-significant and it can only be modeled as independent variable in current setting. Interestingly, none of the other variable is significant in Life expectancy equation while only per capita health spending is non-significant in infant mortality equation (see panel B of table 6.6).

Table 6.6: Testing zero restrictions on the long run parameters (ß-coefficients)

A). Beta restriction test for Infant mortality equation (IMR)					
Variables	IMR	Rpci	hepc	tfr	popdoc
ß-coefficient	1.00	0.26	0.11	-0.93	0.87
LR test: $\chi^2 (\approx 1)$	10.11	5.78	1.64	4.61	14.87
P-value	0.00**	0.02*	0.19	0.03*	0.00**
B). Beta restriction test for life expectancy equation (Lefem)					
Variables	Lefem	Pci	Dhe	Calories	unemply	popdoc
ß-coefficient	1.00	0.012	-0.29	-0.93	0.02	-0.03
LR test: $\chi^2 (\approx 1)$	0.28	0.03	11.28	2.20	0.14	0.005
P-value	0.59	0.86	0.00**	0.14	0.70	0.94

** and * show rejection at 1 and 5 percent level of significance.

6.4.3 Granger causality results

Bivariate Granger causality tests are conducted for the variables of policy relevance. The results are presented in table 6.7. Results of Granger causality confer bidirectional causality between infant mortality and fertility. This result is in line with that of Repetto's hypothesis (1978) of bidirectional causality as well as with that of Chowdhary (1988), Narayan (2004), Schultz (1993) and Palloni and Rafalimanana (1999). The results are in contrast with that of Flegg (1982) and Zakir and Wunnava (1999). While using three as well as four lags the test concludes the same result for total fertility rate and infant mortality causality[31].

Table 6.7: Granger-causality test (using error correction equation)

Causality	Lags used	F-statistics	P-Value	Result
imr⇒dhe	3	0.435	0.730	No Causality
dhe⇒imr	3	1.362	0.277	
imr⇒pci	3	0.624	0.605	No Causality
pci⇒imr	3	1.976	0.143	
imr⇒tfr	3	4.994	0.007	Bidirectional
tfr⇒imr	2	3.067	0.062	Causality
imr⇒ popdoc	3	1.493	0.241	Unidirectional
popdoc⇒imr	3	6.186	0.003	Causality
lefem⇒dhe	2	5.341	0.010	Unidirectional
dhe⇒lefem	3	0.408	0.748	Causality
lefem⇒pci	4	2.345	0.086	Unidirectional
pci⇒lefem	3	0.717	0.551	Causality
lefem⇒tfr	3	0.564	0.644	No Causality
tfr⇒lefem	3	0.137	0.937	
popdoc⇒lefem	3	3.472	0.031	Unidirectional
lefem⇒popdoc	3	2.057	0.131	Causality

⇒ *Shows the direction of causality.*

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[31] In the table 6.7 we only present the results of causality at three lags for majority of variables while for some at two lags. Although, the test is conducted from one up to 4th lag but due to space we are presenting only these results for causality.

The direction of causality also runs from female life expectancy to development health expenditures but not vice versa. It is also an interesting result because; as population grows in age demand for health care also increases (see for example; Barros, 1998 and Murthy and Ukpolo, 1994).

Health personnel availability also causality related with infant mortality and female life expectancy. It is because more availability of doctors will help the population the easy access of health care services and hence prevent unwanted deaths. Therefore, confirms the needs for more health care personnel availability per population.

6.5   Summary

This chapter, using mainly cointegration and causality analysis, tries to seek answer to what factors affecting health status at national level in Pakistan. Trace and Eigen value test statistics confirmed the existence of one cointegrating vector at 5 % level of significance for infant mortality rate (IMR) and 1 % level of significance for female life expectancy. Granger bivariate causality test is employed to see the direction of causality among the variables. In the long run, income is an important factor in determining the health status of infant as well as in later life. An interesting result is unidirectional causality between female life expectancy and per capita income at national level. Health services availability and access appeared to be affecting both the mortality rates and also the female life expectancy. Bidirectional causality between infant mortality and fertility rate is an interesting result of this study.

Chapter 7   Health and Economic Development in Pakistan

7.1   Introduction

It is believed in the past that in an economy, production depends on two factors labor and capital. The new growth theories rely on human capital as major determinant of economic development. It is obvious whenever there is increase in labor productivity it leads to increased output and the economy grows. Beside technological advancement over time, increase in the labor productivity is mainly due to the provision of education and health facilities. The main stream human capital view is narrowly viewing education as the sole factor positively affecting growth. Health which is one of the critical components of human capital formation is not getting much attention in empirical literature. As healthier worker are physically and mentally more strong. Therefore, they are more productive and earning higher wages. Less absent from work and reduced diseased cost also adds to their productive potential. Disability (illness) restricts work potential and reduces income earning ability of the workers which is especially evident from developing countries (Strauss and Thomas, 1998). Studies showed that education, health and fertility indicators are effecting the growth significantly (for example: Barro, 1996, Finlay, 2007). The provision of education and better health facilities (without discrimination) is the key to sustained development that ultimately lead to equity and poverty reduction.

Income increases choices and indirectly expands individual functioning by expanded choices while non income indicators like health and better education measure directly the functioning of the household (Sen, 1998). The relation between health and income is complex and might be running both ways. The channels that explains effects of health on income are: i) labor productivity (Strauss and Thomas, 1998), ii) Educational attainment and better skills, iii) investment in physical capital, iv) Demographic transition change from high population growth to low population growth, reduced mortality and fertility (Bloom and Williamson, 1998 and WHO, 1999), v) Less dependency ratio and therefore more welfare or less poverty in income terms, vi) better utilization of scarce resources like water and sanitation and also health care services (Bloom and Canning, 2001).

As no authentic index or variable exists that predicts the state of health of the population of a country. Therefore, empirical and theoretical studies vary in the use of health status variables. Most commonly found health status variables are life expectancy and child and/or infant mortality rate (Rivera and Currais, 2003). Some studies also used health expenditures as an indicator of health status. For example; World Bank report (1993) explained that differences in health status can better be explained by the differences in health spending in the countries of the world. Rivera (2001) also explored this

relation by using self assessed health status and concluded that public health expenditures significantly improve population health. While Wagstaff and Van doorslaer (1993) estimated that inequality in morbidity rates is less in countries with high public spending on health. It is an established empirical fact there exist a significant correlation between health and income. But what is more interesting is the direction of this relation. Whether causality is unidirectional or bidirectional is not under much empirical scrutiny especially evident from developing country studies. Some of the studies found one way causality running from income to health (see for example; Bloomqvist and Carter, 1997 and Getzen, 2000). Other studies also established this relation with health causing income (see for example seminal theoretical work of Grossman, 1972; Bhargava et. al, 2001 and Webber, 2002). Few studies also pointed out cyclical or spiral relation between health and income as it is health that increases productivity and therefore, economic growth which in turn leads to better health spending and hence increases health status and cycle continues (Brinkley, 2001).

Last decades have seen remarkable improvements in health status for example; life expectancy on an average increased from 40 years in 1950 to 63 years in 1990 and to almost 70 years till 2006 in developing world (World Bank, 2007). The contributing factors includes better nutrition, better water quality and sanitation, innovative medical technologies, improved health care infrastructure and greater access to health care services (Bhargava, et.al. 2001). On each separate factor numbers of studies are available in theoretical and empirical framework. For example, the seminal work of Robert Fogel in the 1990s gets immense importance. Robert Fogel tried to explain Europe, USA and UK's growth and factors affecting this growth over a period of more than two centuries starting from 17th century. It is concluded that nutrition contributes to economic growth. Poor calorie supply increases vulnerability to diseases and hence less potential hour of work for working class reduces their potential to produce more and affect economic growth negatively.

Most of developing countries are following infrastructure oriented policies devised by World Bank while in case of Pakistan, almost every government have opted growth oriented policies by assuming trickledown effect on poor regardless of its distribution effect. This increases poverty and deprivation and the growth is without development (Easterly, 2001). Due to these policies of trickledown health status of population is not much improved because of under investment in health and nutrition sector of Pakistan. Pakistan's health sector can be characterized as chronically under invested, less personnel availability, lesser services availability on regional basis, low population health status in terms of life

expectancy and high mortality due to less availability of nutritious food[32] and health coverage. At global level from 1960 until 2000 the food supply in per capita terms increased by 24 percent. Low supply of food and its unequal distribution in Pakistan is one of the causes of low productivity, low life expectancy and mortality at early stage of life.[33]

This chapter keeping in view the role that nutrition can play in economic development of Pakistan trying to empirically estimate the following hypotheses[34];

Some of the studies estimated impact of health on economic growth and/or development (income per capita) via nutrition channel. A rather large strand of literature exists that relates nutrition with labor productivity and economic growth (see for example; Correa and Cummins, 1970; Heltberg, 2009 and Wang and Taniguchi, 2002). There are two lines of inquiry for estimating the nutrition and income relationship, first is efficiency wage hypothesis and second is calorie demand. There are number of studies that estimated the calorie demand in time series framework using cointegration and causality analysis (see for example; Dawson, 1997; Dawson and Tiffin, 1998; Dawson, 2002 and Subramanian and Deaton, 1996). In estimating the effect of calorie intake on income per capita (efficiency wage hypothesis) there is a rather small number of studies (see for example; Strauss, 1986 and Behrman, Foster and Rosenzweig, 1997), especially this line of inquiry virtually has no studies in time series framework from developing country. This chapter is an effort to fill this gap using 1972 to 2008 annual time series data from Pakistan.

Number of studies also tested the hypothesis that health stock variable has a positive impact on economic development (see for example; Bhargava, 2001). Usually, the health stock variable is measured by Infant and child mortality at national or regional level and life expectancy (see for example; Arora, 2001; Chakrabroty and Das, 2005 and Knowles and Owen, 1997).

Cross country and some of the panel data studies also look at the issue of investing in health (i.e. health spending) and its impact on health status and on economic development (see for example; Barro and Lee, 1994). None of the studies attempted to estimate these hypotheses in one country using time series

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[32]One of the goals is to reduce hunger by half in 2015. Because, malnutrition may affect life expectancy and survival chances of the children and hence affect their productivity as well as severe hunger can cause death (Correa and Cummins, 1970).

[33]Figure of malnutrition and death related to malnutrition in Pakistan are alarming, in the year 1995 (Pelletier et.al., 1995) estimated that out of total 740000 child death a year, half of them is related to malnutrition which is a quite big figure.

[34]Some of the hypotheses explained here are already tested in cross section and panel data context from developing as well as developed countries. The value addition of this chapter is empirically testing these hypotheses in the time series data framework from a developing country perspective.

data. This chapter tries to fill this gap by employing well established unit root and cointegration methodology using annual data from a developing country, Pakistan. Because the link between income and health is controversial therefore an attempt has also been made to estimate direction of causality between health variables and economic development.

This chapter specifically aims to estimate the long run relationship between various measures of health and income per capita as a measure of economic development. An attempt has also been made to see the possibility of causality between health and income variables.

7.2   Model and data

Health is fundamental to economic development. It is a mean to achieve development goals and an end in itself. There are number of studies that used different proxies for human capital like education and other form of human capital skills formation, experience on job and training. Health as a form of human capital has got a little attention specially using data from a developing country.

This chapter is focusing on efficiency wage hypothesis which makes this chapter a unique in this strand of literature. Nutrition is said to affect income positively via its affect on improving labor productivity. Although, the empirical strategy is not capturing the labor productivity affect of nutrition but its impact on income per capita directly.

The general form the of the equation is given as follows;

$$pci = f(p, l, h, x) \qquad\qquad\qquad (7.1)$$

Here P is representing variables like physical capital, l is labor specifically in agriculture sector, x is vector of control variables and h is health variables like life expectancy, fertility, mortality and nutrition.[35]

Basically, in this chapter we have estimated three equations separately; this is done because of the following reasons; first, the aim is to disentangle the impact of nutrition availability on economic development (income per capita) from that of the traditional health variables like life expectancy, mortality, health expenditures and fertility. Secondly, in a rather small time series data it is not possible to add all the variables in single equation. Therefore, to avoid degree of freedom trap we opted this strategy. The different equations that were estimated are given as follows;

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[35] In this chapter health variables are divided into two; first group of variable consists of life expectancy, fertility and mortality rate which I called traditional variables because almost every single study that is reviewed applied one of these variables. While second is our measure of food availability that is average nutrition (calorie) intake per person. This distinction is made to see the impact of different health variables, secondly, this distinction is done because Pakistan's is predominantly an agrarian economy and manual labor needs more nutritive diets for better output.

pci= f (calorie, agrilf, invgdp, pche)   (7.2)

pci= f (agrilf, invgdp, pche, tfr)   (7.3)

pci= f (agrilf, invgdp, pche, imr)   (7.4)

here; *pci* is per capita income in local currency units (i.e., Pakistani rupee), *calorie* is nutrition availability per capita on daily basis, *agrilf* is labor force that is employed in agriculture sector, *invgdp* is investment to GDP ratio, *pche* is per capita health expenditures in local currency units, *imr* is infant mortality rate per 1000 live births, *tfr* is total fertility rate. Above equations in their notational form can be written as;

$$pci_t = \Phi_t + \alpha_{1t} calorie_{t-i} + \alpha_{2t} pche_{t-i} + \alpha_{3t} agrilf_{t-i} + \alpha_{4t} invgdp_{t-i}$$
$$+ \alpha_{5t} tfr_{t-i} + \alpha_{6t} imr_{t-i} + \varepsilon_t$$ (7.5)

Here Φ_t is a constant term which is included as unrestricted in the model, *t-i* is lag length chosen to avoid autocorrelation problem, coefficients $\alpha_1, \alpha_2, \alpha_3 and \alpha_4$ are hypothesized to positively affect to income while α_5 and α_6 are inversely related to income per capita at national level and the term ε_t is white noise error term with zero mean and constant variance. All the variables are used in logarithmic form due to ease of interpretation and following previous literature (see for example; Heltberg, 2007 and Wang and Taniguchi, 2002) and lags of the variables are also included to avoid spurious regression results as data is annual. Sources of data are various including; World Development indicators (WDI CD-ROM 2007), FAO Food balance sheet, Pakistan economic survey various issues, fifty years of Pakistan statistics published by state bank of Pakistan and federal bureau of statistics of Pakistan various publications.

Gross domestic product per capita is used as a measure of economic development because of the fact that it is one of the aggregate indicators of human welfare much in use (see for example; Finlay, 2007; Abbas and Peck, 2007). The idea is to estimate the impact of nutrition on economic development of Pakistan using production function approach including physical capital which is measured by investment over GDP ratio and human capital is measured by different health status variables given above.

The variable of investment to GDP ratio is calculated first converting both the GDP and total gross investment into real terms by dividing it with GDP deflator for the base year 2000-01 and then a ratio of investment over GDP is calculated. Calorie intake is from FAO year book which is average per capita energy (calorie) intake per day, calculated on the basis of per capita dietary energy supply

derived from national food balance sheets (FAO, 2000). Real per capita health expenditures and real per capita income[36] is weighted with GDP deflator for the base year 2000-01, and to get their per capita estimates divided with population figures for each year. Agricultural labor force is the persons in millions related with agriculture (directly or indirectly). Total fertility rate and infant mortality rate are estimated from different demographic and health surveys of Pakistan over the years and given in different publications of the government e.g., economic survey, annual State Bank of Pakistan reports, Federal Bureau of Statistics (FBS) and State Bank of Pakistan's hand book on economy.

Agriculture remained to be a lynchpin for economy of Pakistan and majority of population is directly or indirectly related to this sector. Until 2008 agriculture share to GDP was more than one fourth making it a significant sector contributing to economic growth. Almost 67 percent of the population living in rural areas of the country and hence are affected with the policies that are concerned with agriculture. For growth to be effective in poverty reduction, depends on sectors that contribute to growth and where the poor are concentrated. Studies for example Lipton (1997), Stewart (1978), Datt and Ravallion, (1996, 1998) and Mellor (1999) argued that agriculture sector plays a vital role for broad based poverty as it helps not only in reducing rural but urban poverty as well. Labor force in agricultural is used as a proxy to capture the effect of labor intensive sector on per capita income. It is hypothesized that agricultural labor force exerts a positive impact on per capita income.

Health is important (Straussman and Thomas, 1998) to consider in case if the economy is based on labor intensive technology, like agriculture sector in Pakistan as most of the work is manual and hard. Nutrition availability in this regard has strong implications for improving labor productivity and hence economic output in the economy. Nutrition availability in Pakistan is increased and is trended upward. In Pakistan malnutrition is not only affecting health of the population in general but of children and mothers in particular and a serious hitch to economic development (Badruddin et.al, 2008). It is assumed that nutrition availability can influence income per capita positively (see for example; Correa and Cummins, 1970; Fogel, 2004 and Heltberg, 2009).[37]

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[36] Real per capita GDP is calculated by: (Nominal GDP in local currency/total population)*(100/GDP Deflator). Remaining financial variables are also converted to their per capita terms using the same formula.

[37] There are number of channels through which nutrition availability can impact income at national level positively; first by its impact on labor productivity (see Straussman and Thomas, 1998), second its impact on increasing health life expectancy and more investment on education, third it reduces malnutrition and hence diseases and increase participation in labor market activities. In this chapter we are only interested to see the aggregate impact using only the availability of calories per capita because of the lack of the other time series data sets to capture the indirect affect of nutrition.

In this chapter an effort has been made to include the traditional variables of health output like mortality and fertility as well as input variable like health expenditures to see their impact on economic development relative to that of nutrition availability.

7.3   Results and discussion

The simple descriptive statistics shows us that there is a fivefold increase in real per capita income over a period of almost four decades in Pakistan while for the same period the increase in per capita health expenditures in real term is from 41 Pakistani rupees to a maximum of 240 rupees which is even less than 0.7 percent of the GDP (see appendix of this chapter for descriptive statistics detail). Total Fertility rate which was once highest at around 7 children born by women of child bearing age (i.e., 15-49 years) decreased to almost 3 children. Infant mortality has also reduced from 127 per thousand live birth in 1970s to around 70 per thousand live births in 2008 which is a a remarkable achievement with the given endowments in health sector of Pakistan but it is still high compare to country of its region (see figure 7.1).

Figure 7.1: Trend graphs of different variables

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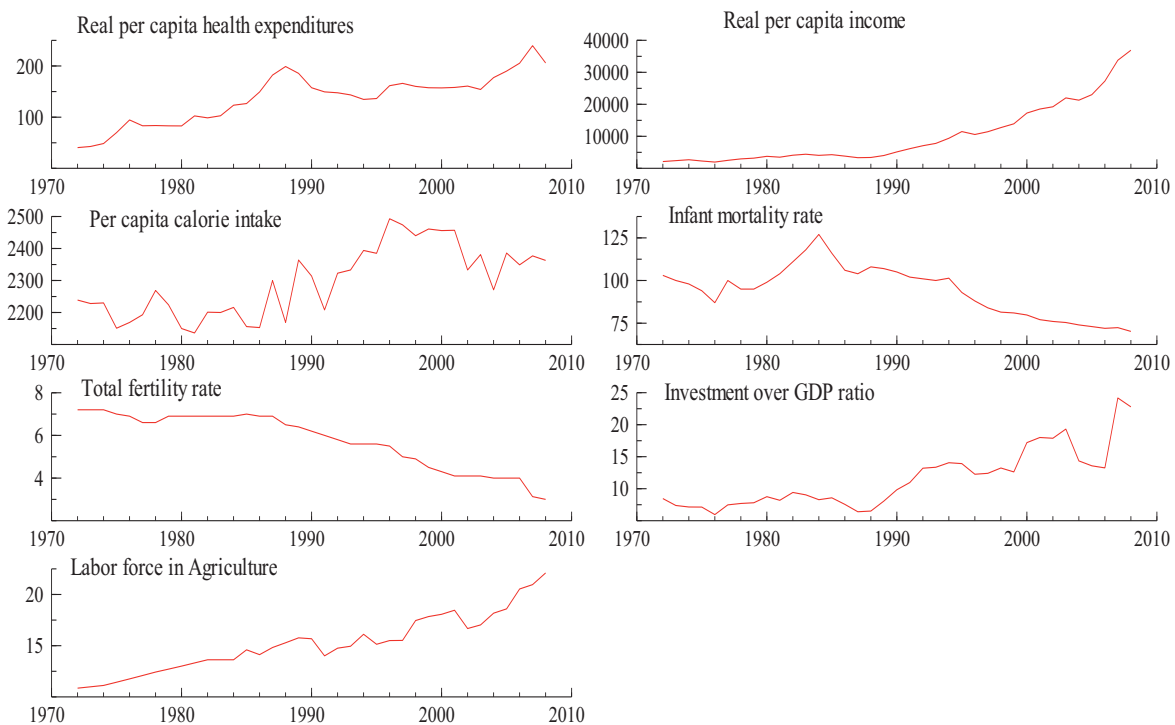
7.3.1 Order of integration (unit root analysis)[38]

In order to analysis the data for cointegration and causality analysis, it is necessary first to check for the order of integration of each time series. Dickey Fuller (DF) and Augmented Dickey Fuller (ADF) tests are employed to check the order of integration of each variable. Because if the variables are non stationary it means that there is no long run mean value for variables to return, their variance is time dependant and changes every time. Regression of these types of time series produces bias results and hence policy conclusions cannot be drawn. Therefore, DF and ADF tests are applied for testing the presence of unit root. As annual series can have a time trend thus in estimating the equation for ADF we also introduce the trend variable. It is concluded that all variables having unit root i.e. I (1) and hence need first differencing, the results are summarized and given in table (7.1 a, b). The variable of total fertility (*tfr*) is appearing to be not integrated of order one even after first differencing with drift term in Augmented Dickey Fuller test (ADF) but when trend is included with drift it becomes stationary after first differencing (see table7.1b). While *tfr* is first difference stationary in Dickey Fuller test (see table 7.1a).

Table 7.1a: Dickey Fuller (DF) Unit Root test Results (level and differenced form)

Variables	DF in Level Form	DF Differenced Form		
	Drift	Drift	Drift and Trend	Order of Integration
pche	-3.03*	-4.89**	-4.86**	I (0)
pci	0.964	-4.73**	-4.72**	I (0)
calori	-1.070	-9.69**	-9.54**	I (0)
imr	-0.247	-5.01**	-5.31**	I (0)
tfr	1.874	-5.13**	-6.03**	I (0)
invgdp	-0.660	-5.90**	-5.86**	I (0)
agrilf	-0.30	-4.272**	-6.53**	I (0)

* shows the significance level at 5% and ** at 1% level. Number of lags used 2.

The last column in table 7.1 b is showing the order of integration of each variable after first difference. It is clear that all variables are first difference stationary or in other words they contain one unit root i.e., they are integrated of order one I (1).

Table 7.1b: Unit root results of ADF tests in differenced form

Variables	ADF in Differenced Form				
	With Drift		With drift and Trend		
	1	2	1	2	Order of integration
pche	-4.5**	-3.44*	-4.54**	-3.44*	I (0)

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[38] Detailed elaboration of the each test for DF and ADF is given in methodology chapter of this dissertation. We did not reproduce the test equations in this chapter.

pci	-4.2**	-3.02*	-4.29**	-3.10*	I (0)
calori	-5.6**	-4.14**	-5.56**	-4.07**	I (0)
imr	-3.8**	-3.11*	-4.11**	-3.53*	I (0)
tfr	-2.27	-1.81	-3.22*	-2.90*	I (0)
invgdp	-3.52*	-3.42*	-3.42*	-3.51*	I (0)
agrilf	-4.000**	-0.1561	-3.965**	-4.124**	I (0)

*show significance level at 5% and ** at 1% level. For the sake of simplicity we are presenting results of only up to two lags with drift and trend terms.

7.3.2 Cointegration and causality analyses

After checking the order of integration of all the variables, Johansen maximum likelihood information method is applied to estimate the number of cointegrating vectors. The results of the number of cointegration vectors estimated using Eigen value and Trace test is given in the table 7.2 below.

Table 7.2: Eigen value and Trace statistics (Tests for no. of cointegrating vectors)

Rank	Eigen value	Log likelihood	H_0 : rank <=	Trace test	P-value
		236.634	0	87.935**	0.001
pci	0.703	258.504	1	44.195	0.105
pche	0.467	269.808	2	21.587	0.332
calori	0.314	276.597	3	8.009	0.472
agrilf	0.196	280.532	4	0.139	0.710
invgdp	0.003	280.602	5		
Test Summary					
Vector Portmanteau (5)			117.206		
Vector AR 1-2 test			F(50,76)	1.124 (0.320)	
Vector Normality test			Chi2 (10)	8.770 (0.554)	
Vector Hetero test			F(150,60)	0.901 (0.697)	
Vector Hetero-X test			Chi2 (300)	329.28 (0.118)	

** Shows the rejection at 1 % level of critical values.
Number of lags included in the analysis: 1. Constant is unrestricted.

The results of trace test and Eigen value statistics (table 7.2) confirm that there is only one cointegrating vector between per capita income and other variables. It means that the variables of the model are bound to a long run relationship and are moving together on a long run mean and their variance is time invariant. Given that cointegration is established in the variables and it is therefore necessary to test α and β matrix restricting them equal to zero. Because, α and β matrix are very important for further testing.

In our model we have estimated an equation in which dependant variable is development proxy by income per capita at national level, hence it can be written as a function of the remaining variables and the requirement of these remaining variables in the α matrix to be equal to zero. We have estimated α and β-coefficients in this way by restricting them equal to zero which is a test of weak exogeneity. This test is conducted using likelihood ratio test (LR-test) having chi square distribution and the results of both α and β-coefficients are presented in table 7.3.

The significant value of per capita health in panel 1 (α-coefficients) in table 7.3 explains that one can also model per capita health expenditures as dependant variable as well as labor force in agriculture.

Table 7.3: Restriction test on the long run parameters (α and - β coefficients)

1). α -coefficients					
Variables	pci	pche	calori	agrilf	invgdp
α -coefficient	-0.130	-0.09	0.17	-0.02	0.029
LR test: chi square	1.623	13.73	0.41	4.552	0.188
P-value	0.202	0.0002**	0.523	0.033*	0.665
2). β -coefficients					
β -coefficient	1.000	0.41	0.12	-1.45	0.132
LR test: chi square	18.68	1.32	1.361	4.134	20.47
P-value	0.000**	0.251	0.244	0.042*	0.000**

**show rejection at 1 percent level of significance and * at 5 percent level of significance.

Our aim here is to estimate the impact of these variables on income per capita therefore we normalized the remaining variables on per capita income and estimated the long run elasticity of the remaining variables, elasticity estimates are presented in table 7.4 for different models estimated.[39] The long run coefficients (β-coefficients) are also estimated using zero restriction test this is done to see which variable uniquely constituting the single cointegrating vector. The results for β-coefficients are presented in the panel 2 of table 7.3. The variables like per capita income, labor force in agriculture and investment to GDP ratio is significant. Investment is significant in the long run because it has a lagged economic impact, as investment is a long term process.

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[39] Here we are only presenting restriction test results for the first model, as this model is our basic model the rest of the model are estimated and used to calculate the long run elasticity for comparing it with the first model.

The Johansen normalized estimates (long run elasticity) are calculated and are given in table 7.4 below. First, the magnitude of the per capita health expenditure is relatively low around 0.23. Our elasticity estimate implies that a one percent increase in health expenditures in Pakistan (measured in per capita terms), leads to an increase in income of around 0.23 percent. The estimated elasticity of health expenditures per capita for OECD countries using panel data approaches is around 0.5 to 0.6 (Narayan, 2007). While for a panel of Asian countries Narayan (2010) estimated elasticity of around 0.16 to 0.26. Interestingly, our estimate falls in the range of Asian economies.

Elasticity of investment (measured as investment over GDP ratio) is well above unity and is 1.42 which is higher than the estimated elasticity for OECD countries around 0.3 to 0.5 (Narayan, 2007). This measure is also in conjunction with estimated elasticity of Asian economies estimated by Narayan (2010) around 1.36 to 2.32.

The value of the coefficient of nutrition availability is above unity which is very nice result in case of Pakistan. As a developing as well as agriculture dependent economy majority of economic activities in Pakistan are related to agriculture which is a labor intensive sector and hence needs more energy in terms of calorie requirement. Webber (2002) estimated that the effect of calories per head on economic growth was positive but insignificant and concluded that investing in health in the form of nutrition might not have impact on economic growth. One reason for this result can be that the study of Webber (2002) used panel data from heterogeneous countries from less developed to industrialized and transition economies, so it might have the problem of aggregation of countries at different level of development. Whereas, the results of the Wang and Taniguchi (2002) estimated that there is a positive and significant impact of nutrition on economic growth.

The impact of the health outcome variables like infant mortality and fertility is with a priori sign but the magnitude of fertility is higher than that of mortality which is interesting result. One reason might be that Pakistan already has a high unemployment rate an increasing fertility means increase in dependency ratio and hence a negative impact on per capita income. While the same negative impact of infant mortality is observed on income per capita in Pakistan but the magnitude is less than 0.5.

Test for serial correlation and normality as well as conditional heteroskedasticity are also conducted to check any of these problems in the estimation of different equations that may exist and the summary statistics is given in lower panel of table 7.2. There is no such problem of normality of residual as well as of heteroskedasticity exists. Once the long run relation among variables is established, in Johansen

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framework, one can also estimate Granger bivariate causality using simple OLS regression with difference form of the dependant as well as independent variable.

Table 7.4: Long run elasticity estimates (Johansen normalized estimates)

Variables	Model 1	Model 2	Model 3
calorie	1.088	-	-
agrilf	1.752	0.711	1.373
invgdp	1.42	1.275	1.433
pche	0.23	0.47	0.36
imr	-	-	-0.480
tfr	-	-0.89	-

Use of error term, estimated during cointegration analysis, can be made by including its lagged value. The results of Granger bivariate causality[40] analysis are presented in table 7.5. Causality analysis shows that there is unidirectional causality running from nutrition per capita to income per capita. This is an interesting result in case of Pakistan because as an agricultural and labor intensive economy Pakistan needs a healthy labor force (due to labor intensive nature of agricultural work) which is directly affected by the availability of diet and nutrition to them. Income is not affecting calorie demand because family ties are very strong in rural areas of Pakistan and that social fabric leads to gifts and barter type of exchange of food commodities at the time of needs due to which there is less influence of income in determining calorie demand.

Table 7.5: Granger bivariate causality test results

Direction	F-statistics (P-value)	Lag length	Results
$pci \rightarrow calorie$	1.909 (0.135)	1	No
$calorie \rightarrow pci$	2.708 (0.049)*	1	Yes
$pci \rightarrow invgdp$	6.898 (0.00)**	3	Yes
$invgdp \rightarrow pci$	7.651 (0.00)**	3	Yes
$pci \rightarrow pche$	5.478 (0.001)**	3	Yes
$pche \rightarrow pci$	6.158 (0.00)**	3	Yes

* and ** shows level of significance at 1 percent and 5 percent. $\rightarrow$ Shows the direction of causality.

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[40] For detailed methodological description of causality analysis and F-test used to estimate the causal relation see methodology chapter of this dissertation.

This is in contrast with Dawson and Tiffin (1998), Dawson (2002) and Neeliah and Shankar (2008).[41] Causality is also running, both ways, between per capita health expenditures and income confirming that investing in health is a viable option for government of Pakistan that triggers economic development which is voiced in World Health Organization's Macroeconomic commission report (2001) that investing in health is justified on the grounds of human development that will guide the path to economic development.

Nutrition is an important aspect of productivity increase and also improving health conditions of human being. The relation between income and different measures of health like mortality, fertility, health expenditures and nutrition availability is controversial. This study finds a unidirectional causality relation running from calorie to income hence proving the efficiency wage hypothesis. While the case of reverse causality that is income causing calorie intake is not proved hence rejecting the calorie demand hypothesis that is widely investigated by the researchers (Dawson, 2002 and Dawson and Tiffin, 1998).

7.4   Summary

This chapter is dealing with the affect of nutrition availability and other health related input and outcome measures on economic development of Pakistan using annual data. This chapter aims at identifying the role that nutrition (as a health status variable) can play in economic development of Pakistan and comparing it with traditional health related variables like; infant mortality, fertility and health expenditures.

The analysis is carried out using time series data and applying three step procedures i.e., estimating order of integration of each variable in the first step. If variable are integrated of the same order than we can have estimated a long run cointegration relationship, thus, Johansen cointegration methodology is employed to empirically examine the long run relationship among variables of interest. In the third and final step, Granger bivariate causality analysis is carried out to see the direction of causality.

It is estimated that the per capita income and other variables of health measures are cointegrated and hence are in long run relationship. The magnitude of nutrition is appeared to be statistically significant and stronger than that of the other health related variables. It is found that per capita income is caused

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[41] The aim of these studies mentioned above was to estimate the calorie income relationship as opposed we are trying to estimate the efficiency wage hypothesis type of equation in this chapter. All these studies cited above used time series data from a single country.

by calorie intake and there is no reverse causality between income and calorie intake meaning that increasing food availability has enhancing impact on income at national level.

CH 8　　　　Summary and Conclusions

8.1　Introduction

Health is one of the basic capabilities that generate economic freedom and the progress of a nation depends on it. Better health status is described as an indicator of economic success or failure of the nations (Sen, 1998). The availability of health care services and the physical, biological, epidemiological and socio-economic environment in which a person lives, broadly determines disease pattern, health status and therefore the quality of life.

Number of reforms and political efforts to improve the population health are underway in developing countries but results are yet to be seen. In case of Pakistan, despite of economic improvement, social and demographic indicators presents a dismal picture. Nevertheless, Pakistan still has one of the highest infant mortality rates and low life expectancy compared with the other developing countries of the region and of its income level. In addition, there is also significant inequality in the distribution of financial and human resources in health sector. Still, Pakistan's spending on health sector is lower than one percent of GDP and this trend is continuing since independence. Although, growth in terms of income per capita is significant over the last five decades but this has less impact on health spending and hence on health status of the population in general.

The main goal of this dissertation is to empirically examine the relationship between health and economic development in Pakistan. This dissertation also aims at looking the role of different policy relevant factors affecting public health expenditures and health status improvements, in historical context, in Pakistan. Also, an attempt has been made to see the likely impact of health expenditures, health status and nutrition on economic development (per capita income) of Pakistan using mainly cointegration analysis.

One of the empirical chapters (chapter five of thesis) tries to answer; what macroeconomic factors determine public health expenditures in Pakistan? This chapter empirically estimates the factors affecting the public resource allocation to health care services in a time series framework to get a better know how for optimal resource distribution. It is estimated, using Johansen cointegration methodology, that per capita health expenditures and a set of other variables of the model are integrated of the order one i.e., I(1) and are bounded together in the long run relationship. It means that in the long run per capita public health expenditures and other variables of the system are moving together and any short run disturbance to the (estimated) system will be corrected for in the long run. This is proved by

plotting estimated error term of the regression equation.[42] It will take almost three years, for the estimated system to come to the equilibrium aftershock occurs which is relatively fair in developing economies like Pakistan. In other words we can also interpret the error correction term that once a shock occurs to the economy it will adjust almost 37 percent in the first years after the shock.

Unemployment has a significantly negative impact in the long run on health expenditures per capita. This is because of the effect of reduced productivity due of unemployed class and hence reduction in income growth that impede the way to invest in health care. Secondly, unemployment can affect negatively to health expenditures as people less travel and there is a possibility of reduced traffic accidents and other kind of health problems like job related stress and other health effects. One possible way that can adversely affect health of unemployed is mental stress due to lack of jobs but social capital is very strong in Pakistani society and hence provides a cushion for these type of health disorders. Another reason for the negative impact of unemployment coefficient is that majority of people in Pakistan are carrying out unskilled and hard working jobs which increases restlessness and exert negative influence on their health.

Urbanization has a strong impact on health care expenditures relative to income and unemployment. In short run, urbanization variable appeared to be non significant pointing to the fact that migration from rural to urban areas is not a short run phenomenon and people need a fairly long period to settle in the cities. Second reason might be that population growth in urban areas is relatively low due to the availability of reproductive health care services. Public health care knowledge and preventive care in urban areas protect households to fall into seasonal diseases. Third reason can be that social fabric of the urban society is another reason coupled with relatively good infrastructure available and better transportation means adds to the benefit of population and hence reduce the burden on government health spending.

Income is thought to be a strong predictor of health spending at national level (Newhouse, 1977). Most of the recent studies on OECD and/or developed countries estimated elasticity of income more than unity (Okunade and Murthy, 2002 and Roberts, 1999). Income elasticity of health expenditures estimated for Pakistan in this chapter is less than unity which is a contrasting result with most of the

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[42]Error term is estimated using the cointegration equation and is than tested for possible unit root as according to definition of cointegration error term, it should meet the criteria of stationarity. The results for unit root test are given in table 5.3 of chapter 5 of this dissertation.

previous studies.[43] Reason for this might be that Pakistan is still a developing country and people of Pakistan utilize health care services in times of need. Secondly, lack of government hospitals to reach in rural areas means a big market for private doctors and health personnel. This has two implications; one is that the people, when in need, consult private services and thus increase in their out of pocket expenditures (private health spending) and second government feels less responsible in providing universal coverage. These are some of the reasons that partially explain the stagnated health care budget over the years. It is also important to note that if health care is necessity (Font, Gemmill and Rubert, 2009) as is the case in this analysis, for Pakistan, than it is mandatory for government to play a bigger role relative to what the different governments are performing in health sector in terms of allocating resources and their distribution. Because, health sector needs more redistribution of resources and greater access of health care services to the majority.

In short run, Income affect is negatively related to per capita health expenditures actually supports our conclusion that government is less willing to intervene because of lack of competition with the private providers coupled with inefficiency of government's health entities, political factors and corruption.

Another important result that is estimated in modeling the factors affecting health expenditures is that age structure of the population is affecting public health expenditures positively in short as well as in the long run. The magnitude of the age structure variable is stronger in the short run relative to long run estimated coefficient. One of the reasons is that most of the disease burden in Pakistan is communicable (more than 45 percent) and hence need an immediate attention. A significant number of studies reviewed during literature used population of age 65 years and above to capture the affect of age on health expenditures but in our model we applied young age population until the age of 14 years keeping in view that this is one of the largest age group in Pakistan's population pyramid and are more vulnerable to diseases. Aging is an issue in more advanced countries like OECD, USA or others, while in developing countries like Pakistan where more than 45 percent of the population is less than fifteen years of age it is rather logical to use this variable as the prominent factor affecting health care needs. Health care services availability in terms of population hospital ratio is affecting public health expenditures positively the estimated coefficient has a value below unity.

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[43]Almost every single study reviewed used total health expenditures (i.e, Public and private health care expenditures) for estimating empirically the determinants of health expenditures. In case of Pakistan, in this study we have used only public health expenditures in real terms because of limitation of the private health expenditures availability for such a long time period.

Whether health care expenditures and other social and economic factors affect health status of population (for example; mortality and female life expectancy) is the main topic of the second empirical chapter (chapter 6 of the thesis). It is empirically estimated that health spending has a significant impact on life expectancy and infant mortality. Specially, development health spending is a robust predictor of health status of the population in Pakistan affecting female life expectancy positively.

It is estimated that per capita health expenditures are negatively related with infant mortality rate (IMR) and the coefficient (-0.11) depicts the importance of health expenditures in achieving better health status for the population. In another regression of different variables on female life expectancy it is estimated that development health expenditures have a robust and positive impact on health status these results are in line with Stanford and Greenidge (2007) for Latin American study.

Total fertility rate (TFR) appeared to have a significant effect on infant mortality rate with a positive sign and a coefficient of well close to unity (0.93). This area of research is highly important for developing countries like Pakistan where population growth is far above the ground with high and sustained fertility and increased incidence of infant deaths. Causality analysis employed two way causality relations for fertility and infant mortality rate. This reinforcing relationship between fertility and mortality rate is pointing towards the modern economic theory of population which actually suggested the feedback effect between fertility and mortality.[44] This employs that government policy must focus simultaneously on reducing fertility as well as mortality. Because, when the probability that a child survives to adulthood decreases, the parents may wish to replace this loss in their reproductive period (Sah, 1991). This increases the level of fertility because of uncertainty that an infant survives in adult hood and beyond. When survival chances at birth are higher it is more likely that fertility will not be higher. Beside this there is a cost element attached with each child birth regardless whether birth is successful and surviving or not. It means the effective price decreases with each surviving birth and hence fertility cut down.

Affect of medical personnel availability (population doctor ratio) on health status specially in reducing infant mortality is strongly negatively affecting. The sign of the physician population ratio is a priori and is in line with the theory. This result is in contrast with that of Younger (2001). It is estimated by

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[44] For a detail description of the modern theory of population as well as Ricardian theory and Choice theory all that relate fertility to mortality and point out unidirectional or bidirectional causality see for example; Chowdhury, 1988; Chowdhury et. al., 1976 and Cheung, Sharma and Shields, 1986.

Younger (2001) in a cross country growth regression framework that measures of health care personnel availability like doctors per 1000 population have no impact at all on the rate of decline of mortality.[45]

The variable of physician population ratio is affecting positively to life expectancy of female but the magnitude in case of female life is relatively lower (0.03) than that of infant mortality (-0.90). This result is in line with that of Ramesh and Sam (2007), there estimated coefficient for doctor population ratio in OECD countries is well above unity (1.23) and positive in case of life expectancy and negative in case of mortality (-2.50). Flegg (1982) also estimated in his study on underdeveloped countries that the physician population ratio is negatively related with that of infant mortality and ranges from -0.09 to -0.17 which is lower than relative to our estimates. The implication of the positive result for doctor population ratio for female life expectancy and negative for infant mortality is that more number of doctors means better access to health care services, less waiting time and competition in market reduces price of the service as well, thus, leads to better health care delivery to the population. As the measure of doctor population ratio measures the curative emphasis of the health care system (Miller, 1978).

The impact of income is relatively stronger than that of per capita health spending in infant mortality equation while income is negatively affecting female life expectancy due to less significant role women play in the formal economic activities country wide. The economic activities carried out by women (for example; collecting woods, fetching water, cooking and working in fields etc.) are less likely to be paid and recognized as economic. It is due to the cultural and religious factors that the role that women are playing is said to be more symbolic and hardly get an economic return. Nutrition is playing a significant role in explaining life expectancy of female.

The affect of calories (per capita) on national level is the topic of third empirical chapter (chapter seven of the thesis). This chapter tries to empirically examine how per capita calories availability (nutrition availability) as health status variable affects economic development in Pakistan? Also an attempt has been made to compare the coefficient value of nutrition with traditional health variables like IMR, TFR, and public health expenditures. To achieve this objective this chapter models the impact of per capita calorie intake and other social and macroeconomic factors on GDP per capita (as a measure of

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[45] This, it is explained, may be due to the fact that the developing countries data contain possible measurement errors. Secondly, this variable is not much relevant to national level mortality as majority in developing countries lives in rural areas. In our case the positive sign indicates that effectiveness of this policy relevance variable in managing health status of the population. This may be because in this study we have used the data for doctors only who are registered with Pakistan Medical and Dental Council (PMDC), so we are only capturing the effect of doctors that are active in the labor market and are offering services.

development), and tries to find out the long run cointegration relationship between the variables of interest and the GDP per capita. It is estimated that the magnitude with which nutrition affect income is stronger than other health variables like health care expenditures, infant mortality and fertility. Other important observations from the empirical results of chapter seven are summarized as follows;

First, health and income are found to be cointegrated, meaning that various health indicators and income per capita are in long run relationship. The income elasticity of calorie availability is above unity and is 1.088. In an empirical study by Wand and Taniguchi (2002) it is estimated that on average if daily energy supply (DES) is increased by about 500 kilo calorie a day this will induce an increment of about 0.5 percent in GDP. While our results are contrasting compare to that of Webber (2002) which says that the variable of calorie intake per capita is insignificant but positive.

Secondly, in our analysis we found a univariate causality running from calorie intake to income per capita at national level. This is in contradiction with the results obtained by Mushtaq, et.al, (2007) and Wang and Taniguchi (2002), they find bidirectional causality between nutrition and income per capita. Whereas Dawson (2002) and Dawson and Tiffin (1998) find one way causality running from income to calorie intake. These studies actually used a bivariate model for causality and in case of Dawson (2002) and Dawson and Tiffin (1998) they used only three variables, beside income and calorie intake it was food prices that were used and the aim of these studies was to estimate the calorie demand hypothesis. Whereas, our aim in this dissertation is to empirically estimate the efficiency wage hypothesis by modeling calorie availability as independent variable influencing national income.

Third, there exists a reinforcing relationship between per capita income and per capita health expenditures. This is expected in case of Pakistan, because of the two reasons; one is that Pakistan is a labor dependent economy and hence a healthy labor force is needed to carry the burden of the growing economy at large. Secondly, as in Pakistan health is a state responsibility thus, it is necessary for sustaining health expenditure that economy grows and there must be an increase in public health spending that adds to the better living conditions in general and increases individual productivity.

Fourth, Fertility rate is negatively related with that of real per capita income, a result consistent with of that of Barro (1996). The theoretical explanation is that high fertility biases the resource allocation towards childrearing and thus less production of goods and services (Becker and Barro, 1988). In another argument Barro (1998) explained that a high fertility restrict the government to invest more on providing capital for new workers rather than investing more on capital per worker and hence reduces economic production and income growth. Bhargava (2002) concluded that developing countries

commonly observe high fertility that has an impact on demand for health care and education as the work force increase unequally relative to that of population increase. This increases the unskilled workers due to limited resources and hence a retarding affect on income at national level. Finally, the high level of fertility reduces women in affective labor force and hence put a hurdle for economic growth (Bloom, et. al, 2007 and Ashraf, et.al, 2008).

Fifth, investment as ratio of GDP has an elasticity consistently above unity that emphasizes on increasing investment projects and the magnitude of the investment coefficient ranges between 1.27 and 1.43. The effect of investment as ratio of gross domestic product was lower in magnitude than estimated in our analysis but statistically significant and robust to different model specifications (Bhargava et al., 2001)[46]. This result of positive and significant relationship of investment over GDP with income per capita (our dependant variable) is consistent with other studies see for example; Brempong and Wilson, 2004; Barro and Sala-i-Martin, 1995 among others.

8.2   Conclusions

Based on our analysis and the observations that were made during discussion of the important results it is an obvious conclusion that investing in health has positive and strong impact on per capita national income that is evident from number of other empirical studies as well because of the reverse causality between income and per capita health expenditure. Better health spending improves life of the people and enable them to carry out their daily activities properly in other words reduces illness cost and also improves individual productivity hence adds to income growth. This not only helps in avoiding the disease burden and therefore better human capital formation but also assists in contributing to economy positively as active and healthy workers are more productive. Government on priority basis has to establish a task force that can help to evaluate the public health expenditures spent on different heads (development spending vs. non development spending) and to see the impact of the scarce resources that can be utilized in an effective and efficient way. Health sector expenditures must be allocated in a way that increases the provision of necessary infrastructure and easy access to health care services. Focus should be on policies that promote greater access to health care facilities for both mother and

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[46] Bhargava et. al., (2001) estimated that a one percent increase in investment over GDP ratio will boost economic growth around 0.014 percent. There analysis basically analyzed cross country panel data for a period of 1960 to 1990 and for each country they have five observations each for different variables. The reason for there low estimate for investment over GDP ratio might be that they have a mix of countries and the heterogeneity can be a problem if the comparison is between countries that have a different level of development.

kids. It helps on one hand that both mother and kids can enjoy better health and also reduces burden of high fertility and mortality.

Mortality and fertility in our analysis are causally related and hence provide an option that policy has to focus on reducing fertility because it has a greater magnitude and hence a more deteriorating impact than that of mortality. Fertility rate is historically higher in rural areas of Pakistan relative to urban areas, it is therefore necessary that health policy must target the rural areas specifically in awareness creation and increasing knowledge regarding this issue of national importance. Another important positive externality with reducing fertility will be that it reduces the cost of rearing children and women's will have more time for work and can contribute positively in the economy.

Health infrastructure not only matters in long run but also in the short run, therefore, it is a valid reason to establish the health facilities where it is needed as it helps in building links of the population to better facilities near to their residence. That helps in reducing wide spread inequality in access and also helps in timely care of issues like infant mortality and provides help for example in safe pregnancy and reducing disease burden. Although, the growing urbanization is not a problem in short run but has affect in the longer run, thus, establishing health facilities especially in rural areas and urban slums is given priority.

Nutrition appeared to be an important causal factor affecting national income hence supporting efficiency wage hypothesis in case of Pakistan. Thus, policies that improve nutrition availability at household level as well as reduce malnutrition in early years of life will help boost economic development of country.

Instead of growth oriented policies it is better for the newly established democratic government of Pakistan, to make broad based development oriented policies which take account of health human capital as well as investing in health and provision of health personnel and health facilities to majority. Therefore, policies that aim to increase gender equality as well as to promote social inclusion will definitely help in reducing infant mortality and increasing (female) life expectancy in Pakistan.

8.3   Future Research

Private health care expenditures are an important part of the total health spending (development and non development health expenditures) but non availability of private health expenditure data restricted us, in this study, to make use of the public health care spending which limits our conclusions and its robustness for policy lessons. It is, therefore, necessary to develop a record of private health spending as this will help to build an important link between public private partnerships in health sector. This

will also help in better understanding of private health sector and to regularize the sector activities in different health care services provision and also a source of generating revenue for government which can be used in financing public health care spending.

It will be nice if researchers can develop time series or panel data on malnutrition or nutrition availability for labor force working in services, manufacturing and agriculture sector in developing countries (including Pakistan) and analyze the dynamic relationship over a fairly long period of time in cross country or at single country level. While exploring health-income relationship, it will also be interesting to empirically investigating that whether variables of the model are only correlated or causality also exists among them.

One caveat that remained and can be future line of inquiry is that environmental factors must be included in this type of analysis. It is due to the fact that with the structural transformation (manufacturing sector is overtaking agriculture sector) in countries like Pakistan and with the urbanization process there is evidence that there is an increase in pollution, availability of safe drinking water and sanitation facilities will definitely have an impact on public health.

Future research may focus on developing services/health care price index for Pakistan at national level and if possible at provincial level. This helps to see the price movements in services (health) sector which is a major sector contributing almost fifty percent to GDP of the country. The services and/or health price index will also help to understand in a better way price setting mechanism at disaggregated level and therefore helpful in determining the interventions needed to make correction for better functioning of competitive health care markets.

Another important aspect in time series analysis is the issue of structural break. Pakistan in an economy which is characterized as hanging between democracy and dictatorship and regime change is a common phenomenon. Therefore, this political process has strong bearing on policy making process and resource allocation in different sectors of the economy including health. It will be nice in the future, if a variable like regime change or democracy and dictatorship dummy is used to better capture the structural break that improves the robustness of the empirical results.

Reference

Abbas, Q. and Peck, J. F. (2007). Human capital and Economic growth: Pakistan, 1960-2003, The Lahore Journal of Economics, Vol. 13, No. 1, pp. 1-27.

Abbasi, K. (1999). The World Bank and world health, focus on South Asia-II: India and Pakistan. British Medical Journal, Vol. 318, pp: 1132-35.

Abbasi, N. (1987). Urbanization in Pakistan 1951-81. PIDE Research report No. 152, Pakistan Institute of Development Economics, Islamabad.

Abel-Smith and Leiserson. (1978). Poverty, Development and Health Policy. World Health Organization, Geneva, Switzerland.

Abu-Ghaida, D and Klasen, S. (2004). The Costs of Missing the Millennium Development Goal on Gender Equity, World Development, vol. 32(7), pp: 1075-1107.

ADB. (1997). Emerging Asia: changes and challenges. Asian Development Bank, Manila, Philippine.

ADB. (1997). Social sector issues in Pakistan: an over view, Asian Development Bank Manila, Philippine.

ADB. (1999). Health Sector Reforms in Asia and Pacific: options for developing countries. Manila, Asian Development Bank.

ADB. (2005). Key indicators 2005, Asian Development Ban k, Manila Philippine.

ADB. (2007). Key indicators 2006, Asian Development Ban k, Manila Philippine.

Adegbola, O. (1987). The impact of urbanization and industrialization on health conditions: the case of Nigeria, World Health Statistics, Vol. 40, No. 1, pp.74-83.

Afzal, M., Raja, T. A. and Muhammad, A. (1988). Some differentials in infant and child mortality risks in Pakistan 1962-1986, The Pakistan Development Review, Vol. 27, No. 2, pp: 635-642.

Afzal, M., Raja, T. A. and Muhammad. A. (1988). Some differences in infant and child mortality risks in Pakistan 1962-1986. The Pakistan development review 27 (2), pp: 635-642.

Agha, S. (2000). The determinants of infant mortality in Pakistan. Social Science and Medicine 51, pp: 199-208.

Ahmad, E. and Ludlow, S. (1989). Poverty, inequality and growth in Pakistan, The Pakistan Development Review 28: 4 part II, pp: 831-850.

Ahmad, V. and Amjad, R. (1984). The management of Pakistan's economy, 1947-1982. Oxford university press, Karachi, Pakistan.

Ainsworth, M. and Over. M. (1994). AIDS and African development, World Bank Research Observer, Vol. 9, No. 2, pp. 203-240.

Aisa, R. and Pueyo. F. (2004). Endogenous longevity, health and economic growth: a

Alderman, H., Behrman, J. R. and Hoddnott, J. (2003). Nutrition, Malnutrition and Economic Growth, Health Economics Group, Pan American Health Organization (PAHO), Regional Office of the World Health Organization (WHO).

Ali, S. S. and Tahir, S. (1999). Dynamics of growth, poverty and inequality in Pakistan, The Pakistan Development review 38: 4 part II, pp: 837-858.

Ali, S.Z. (2000). Health for all in Pakistan: achievements, strategies and challenges. Vol. 6, Issue 4: pp. 832-37.

Alleyne, G. A. and Cohen, D. (2002). Health, Economic Growth, and Poverty Reduction. The Report of Working Group 1 of the Commission on Macroeconomics and Health, WHO, Geneva.

Amir, A. (2000). Health as a Human Right. Commission on Macroeconomic and Health (CMH), Policy Memorandum No. 3, http://www.cid.harvard.edu.

Amjad, R and Kemal, A.R. (1997). Macroeconomic policies and their impact on poverty alleviation in Pakistan. The Pakistan development review 36:1, pp: 39-68.

Anwar, T. (1996). Structural adjustment and poverty: the case of Pakistan, proceedings of the papers at the 12th annual general meeting of Pakistan society of development economics (PSDE), Pakistan development review 34:4 Part II, pp: 911-926.

Anwar, T. (2004). Trends in income inequality in Pakistan between 1998-99 and 2001, proceedings of the paper at the 19th annual general meeting and conference of Pakistan Society of Development Economics (PSDE), Islamabad, Pakistan.

Anwar, T. (2005). Long term changes in income distribution in Pakistan: evidence based on consistent series of estimates. Discussion paper series No. 03, Centre for Research on Poverty Reduction and Income Distribution (CRPRID), Islamabad, Pakistan.

Arif, G. M. and Irfan, M. (1997). Return migration and occupational change: the case of Pakistani migrants returned from Middle East. The Pakistan development review 36: 1, pp: 1-37.

Arif, G.M. and Ibrahim, S. (1998). The process of urbanization in Pakistan 1951-1998. The Pakistan Development Review, 37: 4 part II, pp: 507-522.

Arora, S. (2001). Health, human productivity and long term economic growth, The Journal of Economic History, Vol. 61, pp. 699-749.

Ashraf, Q. H., Lester, A., and Weil, D. N. (2008). When does improving health raise GDP? National Bureau of Economic Research (NBER) paper No. 14449, Massachusetts Avenue, Cambridge MA, US.

Asteriou, D. (2006). Applied Econometrics: a modern approach using E-views and Microfit, Palgrave McMillan, New York.

Badruddin, et.al. (2008). Tawana project-school nutrition program in Pakistan: its success, bottlenecks and lessons learned, Asia Pacific Journal of Clinical Nutrition, Vol. 17 (S1), pp: 357-360.

Banister, J. and Zhang, X. (2005). China, economic development and mortality decline. World development Vol. 33, Issue 1, pp: 21-41.

Barro, R. and Sala-i-Martin, X. (1995). Economic Growth, McGraw-Hill, NewYork, USA.

Barro, R. J. (1996). Determinants of economic growth: a cross country empirical study, National Bureau of Economic Research (NBER), working paper 5698, Massachusetts Avenue, Cambridge MA, US.

Barro, R. J., and Lee, J. (1994). Sources of Economic Growth, Carnegie- Rochester conference series on public policy, Vol. 40, pp. 1-46.

Barros, P. P. (1998). The black box of health care expenditure growth determinants, Health economics, 7: pp: 533-544.

Basta, S., Karyadi, S., and Scrimshaw, N. (1979). Iron deficiency anemia and productivity of adult males in Indonesia. American Journal of Clinical Nutrition, Vol. 32, pp: 916-925.

Beenstock, M. and Sturdy, P. (1990). The determinants of infant mortality in regional India. World development Vol. 18 No. 3, pp: 443-453.

Behrman, J. R. (1990). The action of human resources and poverty on one another that we have yet to learn, World Bank Living Standard Measurement Working Paper No.74, Washington, DC, USA.

Behrman, J. R., Foster, D. and Rosenzweig, M. R. (1997). The dynamics of agricultural production and the calorie-income relationship: evidence from Pakistan, J. Econometrics, Vol.77, pp. 187-207.

Behrman, J. R. and Schneider, R. (1993). An International Perspective on Pakistani HumanCapital Investments in the Last Quarter Century, Pakistan Development Review Vol. 32, No. 1, pp. 1-68.

Bhargava, et. al. (2001) Modeling the effects on health on economic growth. Journal of Health Economics 20, pp: 423-40.

Bhargava. A. (1997). Nutritional status and the allocation of time in Rwandese households, Journal of Econometrics, Vol. 77, No.1, pp. 277-295.

Bidani, B. and Ravallion, M. (1997). Decomposing social indicators using distributional data. Journal of Econometrics 77, pp: 125-139.

Bishai, D. M. (1995). Infant mortality time series are random walks with drift: are they cointegrated with socioeconomic variables? Health economics 4, pp: 157-167.

Bishai, D., Opuni, M. and Poon, A. (2007). Does the level of infant mortality affect the rate of decline? Time series data from 21 countries. Economics and Human biology 5, pp: 74-81.

Blomqvist, A. G. and Carter, R. A. L. (1997). Is health care really a luxury? Journal of Health Economics, Vol. 16, pp: 207-29.

Bloom, D. and Sevilla, J. (2004). The effects of health on economic growth: A production function approach. World Development Vol. 32 No.1, pp: 1-13.

Bloom, D. E. and Canning, D. (2000). The health and wealth of nations, Science, Vol. 287, pp. 1207-09.

Bloom, D. E. and Canning, D. (2001). A New Health Opportunity, Development, Vol. 44, pp. 36-43.

Bloom, D. E. and Sachs, J. D. (1998). Geography, demography and economic growth in Africa. Brookings paper on economic activity (2), pp: 207-95.

Bloom, D. E., Canning, D and Sevilla, J. (2001). The effect of health on economic growth: theory and evidence, National Bureau of Economic Research (NBER) working paper 8587, Massachusetts Avenue, Cambridge MA, US.

Bloom, D. E. and Williamson, J. G. (1998). Demographic transition and economic miracles in emerging Asia, World Bank Economic Review, Vol. 12, No. 3, pp. 419-455.

Bloom, D. E., Canning, D., Fink, G., and Finlay, J. E. (2007). Fertility, female labor force participation and the demographic dividend, National Bureau of Economic Research (NBER), Working Paper No. 13583, Cambridge, MA, USA.

Bourguignon, F. and Morrison, C. (1998). Inequality and Development: The Role of Dualism, Journal of development economics, Vol. 57, pp. 233-257.

Box, G.E.P. and Jenkins, G.M. (1970). Time series analysis: Forecasting and control, San Francisco: Holden-Day.

Box, G.E.P. and G.M. Jenkins. (1976). 'Time series analysis: Forecasting and control', 2nd edition, San Francisco, Holden-Day.

Brenner, M. H. (1979). Fetal, infant and maternal mortality during periods of economic instability. International Journal of health services 3 (2), pp: 145-159.

Brinkley, G. H. (2001). The macroeconomic impact of improving health: investing the r. causal direction. http://www.euractiv.com/en/health/health-expenditure-economy/article-153271 (accessed on 25th May 2009).

Brempong, K. G. and Wilson, M. (2004). Health human capital and economic growth in sub-saharan African and OECD countries, The Quarterly Review of Economics and Finance, Vol. 44, pp: 296-320.

Brown, J. and Pollit, E. (1996). Malnutrition, poverty and intellectual development, Scientific American, 2, pp: 38-43.

Bryce, J., el Arifeen, S., Pariyo, G., Lanata, C., Gwatkin, D. and Habitch, J. P. (2003). Reducing child mortality: can public health deliver? Lancet 362, pp: 159-64.

Buchanan, J. M. (1965). The inconsistencies of the National Health Service, Institute of economic affairs, London.

Caldwell, J. C. (1986). Routes to low mortality in poor countries. Population and development review 12 (2), pp: 171-220.

Caldwell, J. C., Reddy, P. H. and Caldwell, P. (1983). The social component of mortality decline: an investigation in South India employing alternative methodologies. Population studies 37 (2), pp: 185-205.

Campos, J., Ericsson, N. R. and Hendry, D. F. (2005). General to specific modeling: an overview and selected bibliography, Board of governors of the Federal Reserve System International Finance discussion paper number 838. www.federalreserve.gov/pubs/ifdp/

Catalano, R. and Serxner, S. (1992). Neonatal mortality and the economy revisited. International journal of health services 22 (2), pp: 275-86.

Chakraborty, S. and Das, M. (2005). Mortality, human capital and persistent inequality, Journal of Economic Growth, Vol. 10, pp. 159-192.

Charemza, W. W. and Deadman, D. F. (1997). New direction in econometrics practice: general to specific modeling, cointegration and vector autoregression, Edward Elgar Publishing Ltd.

Cheung, W.W., Sharma, S. and Shields, M. P. (1986). A Time Series Model of the Demographic Transition, Discussion Paper Series No. 86-28, Southern Illinois University at Carbondale, USA.

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Chowdhury, A. K. M., Alauddin, A., Khan, R. and Lincoln C. C. (1976). The Effect of Child Mortality Experience on Subsequent Fertility: in Pakistan and Bangladesh, Population Studies, pp: 249-61.

Chowdhury, A. R. (1988). The infant mortality-fertility debate: some international evidence, southern Economic journal, Vol. 54, No.3, pp.666-674.

Correa, H. and Cummins, G. (1970). Contribution of nutrition to economic growth, The American Journal of Clinical Nutrition, Vol.23, No. 5, pp. 560-565.

Council of Europe. (1980). The cost of health care in member states of the council of Europe and Finland, Strasbourg: Council of Europe.

Cox, D. R. (1992). Causality: some statistical aspects. Journal of the royal statistical society. 155, pp: 291-301.

Cullis, J. and West, P. (1979). The Economics of Health, An introduction, Oxford, MA: Martin Robertson, pp. 84-9.

Culyer, A.J. (1990). Cost Containment in Europe, in: OECD 1990, Health care systems in transition (OECD, Paris), pp: 29-40.

Cumper, G. E. (1984). Determinants of health level in developing countries, Research, studies press Ltd, Letchworth, UK.

Currais, L. and Rivera, B. (1999). Income variation and health expenditures: evidence from OECD countries, Review of Development Economics, Vol.3, No.3, pp. 258-67.

Cutler, D. M. (1995). The cost of financing health care. The American Economic Review, 85, pp. 33-4.

Daniels, et al. (2000). Benchmarks of fairness for health care reforms: a policy tool for developing countries. Bulletin of the world health organization, 78 (6): pp.164-73.

Datt, G., and Ravallion, M. (1996). How Important to India's Poor is the Sectoral Composition of Economic Growth? The World Bank economic Review, Vol. 10, No.1. pp. 1-25.

Datt, G., and Ravallion, M. (1998). Farm Productivity and Rural poverty in India, Journal of Development Studies, Vol. 34, No. 4, pp. 62-85.

David, S., Sahn, D. and Younger, S. D. (2000). Inter-temporal changes in welfare: preliminary results from ten African countries, CFNPP working paper No. 94.

Davidson, J.E.H., D.F. Henry and F. Saba. (1978). 'Econometric modeling of the aggregate time series relationship between consumer's expenditure and income in the United Kingdom', Economic Journal, Vol. 88, pp 661-692.

Dawson, P. J. and Tiffin, R. (1998). Estimating the demand for calories in india, American Journal of Agriculture Economics, Vol. 80, pp. 474-481.

Dawson, P. J. (2002). Nutrition in Pakistan: estimating economic demand for calories, Pakistan Journal of Nutrition, Vol. 1, pp. 64-66.

Dawson, P.J. (1997). The Demand for Calories in Developing Countries. Oxford Development Studies, Vol. 25, pp. 361-369.

Deaton, A. (1999). Inequalities in income and inequalities in health. NBER working papers 7141, National Bureau of Economic Research, USA.

Deaton, A. (2002). Policy implications of the gradient of health and wealth, Health Affairs, Vol. 21, No. 2, pp. 13-30.

Deininger, K .and Squire, L (1998). New ways of looking at old Issues: Inequality and Growth, Journal of development Economic Vol. 57, pp. 259-287.

Development. (2004). Declaration of Alma-Ata international conference on primary health care, Alma-Ata, USSR, 6-12 September 1978, Last Word, 47 (2), pp: 159-161.

Dickey, D. A., and S. G. Pantula (1987). Determining the Order of Differencing in Autoregressive Processes. Journal of Business and Economic Statistics, 15: 455-461.

Dickey, D. A., and W. A. Fuller (1981) Likelihood Ratio Statistics for Autoregressive Time Series With a Unit Root. Econometrica, 49: pp 1057-1072.

Dickey, D. A., Jansen, D. W. and Thornton, D. C. (1991). "A Primer on Cointegration with an Application to Money and Income", Review Federal Reserve Bank of ST. Louis, 73 (2), 58-78.

Dickey, D.A., W.R. Bell and R.B. Miller. (1986). 'Unit root in time series models: Tests and implications', The American statistician, Vol. 40, pp 12-24.

Doyal, L. (2000). Gender equity in health: debates and dilemmas, Social science and medicine 51, pp: 931-939.

Dreze, J. and Sen, A. (1989). Hunger and Public action. Oxford: Clarendon press.

Easterly, W. (2001). The political economy of growth without development: a case study of Pakistan. Paper for the analytical narratives of growth project, Kennedy school of government, Harvard University, USA.

Easterly, W. and Rebelo, S. (1993). Fiscal policy and economic growth, Journal of Monetary Economics, Vol. 32, No. 3, pp. 417-58.

Engle, R. F. and Granger, C. W. (1987). Co-integration and Error correction: presentation, estimation and testing, Econometrica, Vol.55, pp. 251-276.

Engle, R. F. and Granger, C. W. J. (1991). Long run economic relationship: readings in cointegration, Oxford University press, Oxford.

Engle, R.F. and C.W.J. Granger. (1987). Cointegration and Error Correction, representation, Estimation and Testing, Econometrica, 55, pp: 251-76.

Evans, R. G., Barer, M. L. and Marmor, T.R. (1994). Why are some people healthy and others not? The determinants of health of populations (Eds.), Aldine De Guyter, Mill River Raod, New York, USA.

Fan, S., Zhang, L. and Zhang, X. (2002). Growth, inequality and poverty in rural China: the role of public investments. International Food Policy Research Institute Report 125, Washington DC.

FAO, (2000). Food and Agriculture Organization of United Nations, Statistical Database online (*www.fao.org*).

Fayissa, B. and Gutema, P. (2005). The Determinants of Health Status in Sub-Saharan African, The American Economist, Vol. 49(2), pp: 60-66.

Feldstein, M. (1967). Economic analysis for health service efficiency, Oxford University Press, Oxford, UK.

Filmer, D. and Pritchett, L. (1997). Child mortality and public spending on health: how much does money matter? Policy research working paper 1864, Washington, DC: World Bank.

Filmer, D. and Pritchett, L. (1999). The impact of public spending on health: does money matter? Social science and medicine 49, pp: 1309-1323.

Finlay, J. E. (2007). The role of health in economic development, Program on the Global Demography of Aging (PGDA) Working Paper No. 21.

Flegg, A. T. (1982). Inequality of income, illiteracy and medical care as determinants of infant mortality in underdeveloped countries. Population studies 36 (3), pp: 441-458.

Fogel, R. (1994). Economic Growth, population theory and physiology: the bearing of long term processes on the making of economic policy, American Economic Review, Vol. 84, No.3, pp. 369-395.

Fogel, R. (2000). Catching up with the economy. American economic review 89 (1), pp: 1-21.

Fogel, R. W. (1997). New findings on secular trends in nutrition and mortality: some implications for population theory, in Rosenzweig, M. R. and Stark, O. (Eds.), Handbook of Population and Family Economics, Vol. 1A, Elsevier Science, Amsterdam, pp. 443-481.

Fogel, R W. (2004). Health, nutrition and economic growth, Economic Development and Cultural Change, Vol. 52, No. 3, pp. 643-658.

Font, C. J., Gemmill, M. and Rubert, G. (2009). Re-visiting the health care luxury good hypothesis: Aggregation, precision and publication biases? Health, Econometrics and Data Group (HEDG) Working paper 09/02, The University of York, UK. http://www.york.ac.uk/res/herc/documents/wp/09_02.pdf

Frank, J. W. and Mustard, J. F. (1994). The determinants of health from a historical perspective. Daedalus (1), pp: 1-19.

Fuller, W.A. (1976). Introduction to Statistical Time Series. Wiley, New York.

Gallup, J.L., Jeffery, D. S. and Andrew, D. M. (1998). Geography and economic development, Chap. in World Bank Annual Conference on Development Economics, Washington, D.C: World Bank, pp.127-78.

Gbesemete, K. P. and Gerdtham, U. G . (1992). Determinants of health care expenditures in Africa: a cross sectional study. World development 20, pp: 303-308.

Gbesemete, K. P. and Jonsson, D. (1993). A comparison of empirical models on determinants of infant mortality: a cross national study of Africa. Health policy 24, pp: 155-74.

Gerdtham, et. al. (1992). An econometric analysis of health care expenditures: a cross sectional study of the OECD countries, Journal of health economics, 11, pp. 63-84.

Gerdtham, U. G. and Jönsson, B. (2000). International comparisons of health expenditure, in Handbook of Health Economics, eds. A. J. Culyer and J. P. Newhouse, North-Holland, The Netherlands, pp. 11- 53.

Gerdtham, U-G. and B. Jönsson. (1991a). Conversion factor instability in international comparisons of health care expenditure, Journal of Health Economics 10, pp. 227-234.

Gerdtham, U-G. and B. Jönsson. (1991b). Price and quantity in international comparisons of health care expenditure, Applied Economics 23, pp. 1519-1528.

Getzen, T. E. (2000). Health care is an individual necessity and a national luxury: applying multilevel decision models to the to the analysis of health care expenditures, Journal of Health Economics, Vol. 19, pp.259-270.

Ghaffar, A., Kazi, B. M. and Salman, M. (2000). Health care system in transition III, Pakistan , Part I, An over view of the health care system in Pakistan, Journal of Public Health Medicine, Vol. 22, No.1, pp: 38-42.

GoP. (1998). Population and housing census of Pakistan 1998: provisional results. Statistical division, Population census organization, government of Pakistan, Islamabad, Pakistan.

GoP. (2003). Economic Survey of Pakistan 2002-03, Economic Advisor's Wing, Finance Division, Islamabad.

GoP. (2004). Economic survey of Pakistan 2005-06, Economic Advisor's wing, Ministry of Finance Islamabad, Pakistan.

GOP. (2005). Economic Survey 2004-05, Finance Division, Economic Adviser's Wing, Islamabad, Pakistan.

GOP. (2006). Economic survey of Pakistan 2005-06, Economic Advisor's wing, Ministry of Finance Islamabad, Pakistan.

GOP. (2007). Economic survey of Pakistan 2006-07, Economic advisor's wing, Ministry of finance, Islamabad, Pakistan.

Granger, C. and P. Newbold, 1974. 'Spurious regressions in econometrics', Journal of Econometrics, Vol. 2, pp 111-120.

Granger, C. W. J. (1969). Investigating causal relations by econometric models and cross spectral methods. Econometrica, 37, pp: 424-438.

Granger, C. W. J. (1980). Testing for causality- a personal view point, Journal of Economic Dynamics and control, 2, pp: 329-352.

Granger, C. W.J. (1981). Some properties of time series data and their use in econometric model specification, Journal of Econometrics, Vol. 16, pp: 121-130.

Granger, C. W. J. (1988). Causality, cointegration and control, Journal of economic dynamic and control, vol. 12, pp 551-59.

Granger, C. W. J. (1988). Some recent developments in the concept of causality. Journal of econometrics, 39, pp: 199-211.

Granger, C. W. J. and Newbold, P. (1974). Spurious regressions in econometrics. Journal of econometrics 2 (2), pp: 111-20.

Greene, W. H. (2000). Econometric Analysis (4th edition), New Jersey: Prentice-Hall, International Inc, London.

Grossman, M. (1972). The demand for health, National Bureau of Economic Research (NBER), New York, USA.

Guilkey, D. and Riphahn, R. (1998). The determinants of child mortality in the Philippines: estimation of a structural model. Journal of development economics 56, pp: 281-305.

GWHA (2008). Pakistan's lady health worker program: country case study of Global health workforce alliance (GWHA) task force on scaling up education and training for health workers, World Health Organization (WHO), Geneva, Switzerland. http://www.who.int/workforcealliance/knowledge/case_studies/Pakistan.pdf

Gugler, J. and Flanagan, W. G. (1978). Urbanization and social change in West Africa, Cambridge University Press, Cambridge.

Gujarati, D. N. (2005). Essentials of Econometrics, second edition, McGraw Hill/ Irwin publication, USA.

Hadley, J. (1982). More Medical Care, Better Health, Urban Institute: Washington DC.

Hakim, F.K. (2001). Economics of Health sector Reforms in Pakistan. Ad Rays Printers Islamabad, Pakistan.

Hall, S. G., and Henry, S. S. B. (1989). Macroeconomic Modeling. Amsterdam (The Netherlands): Elsevier Science Publishers.

Hamilton, J. D. (1994). Time series analysis. Princeton University Press, Princeton, NJ.

Hamoudi, A. A. and Sachs, J. D. (1999). Economic consequences of health status: a review of evidence. Centre for International Development (CID) working paper No. 30, Harvard University.

Hanmer, L., Lensink, R. and Howard, W. (2003). Infant and child mortality in developing countries: analyzing the data for robust determinants. The Journal of Development Studies Vol. 40, No.1, pp: 101-118.

Hansen, H. and K. Juselius. (1995). Cats in rats: Cointegration analysis of time series. Estina, Evanston, Illinois

Hansen, P. and King A. (1996). The determinants of health care expenditure: a co-integration approach, Journal of Health Economics, 15, pp.127-37.

Hassan, K.Z. and Mahmud, S. (2006). Health sector Reforms, in Public Health Challenges in Pakistan by K.Zaki Hassan, Chapter 10, Sama Publishers Karachi, Pakistan.

Harris, R. and Sollis, R. (2003). Applied time series modeling and forecasting, John Wiley and Sons Ltd. West Sussex, England.

Heerink, N. and Folmer, H. (1994). Income distribution and the fulfillment of basic needs: theory and empirical evidence. Journal of Policy Modeling 16, pp: 625-652.

Heltberg, R. (2009). Malnutrition, Poverty and Economic Growth, Health Economics, Vol. 18, No. S1, pp. S77-S88.

Hendry, D. F. (1980). Econometrics- alchemy or science? , Economica Vol. 47, pp: 387-406.

Hendry, D.F. (1984). Monte Carlo experimentation in econometrics, In: Griliches, Z. and M.D. Intriligator (Eds.), Handbook of Econometrics, Volume 2-3, Chapter 16. Amsterdam: North-Holland.

Hendry, D. F. and Ericsson, N. R. (1991). Modeling the demand for narrow money in the United Kingdom and the United States, European Economic Review, Vol. 35, No.4, pp. 833-881.

Hendry, D. F. (1995). Dynamic Econometrics. Oxford: Oxford University Press.

Hendry, D. F. (2004). Causality and exogeneity in non stationary economic time series, Economics department Nuffield college, University of Oxford.

Hill, A. M. and king, E. (1992). Women's education in the third world: an over view, In king E., and Hill, M. A. (Eds), Women's education in developing countries: barriers, benefits and policy, John Hopkins Press, Baltimore, pp.1-50.

Hitiris, T. and Posnett, J. (1992). The determinants and effects of health expenditure in developed countries. Journal of Health Economics, 11, 173-81.

Hobcraft, J., McDonald, J. and Rustein, S. (1985). Demographic determinants of infant and early child mortality: a comparative analysis. Population studies 39, pp: 363-385.

Holden, D. and R. Perman. (1994). Unit Roots and Cointegration for the Economist. Chapter 3, in B.B. Rao, (ed), Cointegration for the Applied Economist, New York: St. Martin's Press.

Hoover, k. D. (2001). Causality in macroeconomics, Cambridge: Cambridge University Press.

Hussain, A. (1999). Employment generation, poverty alleviation and growth in Pakistan's rural sector: policies for institutional change, report prepared for the International Labor Organization, country employment policy review, Pakistan, ILO/CEPR.

Hussain, A., et. al. (2003). Pakistan National Human development Report: Poverty, Growth and Governance, UNDP, Pakistan office, Islamabad, printed by, Oxford University press, Karachi, Pakistan.

Hussain, I. (1999). Pakistan the Economy of an Elitist state, published by Oxford university press, Karachi, Pakistan.

Illiyas, M., Burney, M. I., and Taqi. L. (1997). Environmental hazards. In Illiyas, M. (ed.) community medicine and public health Karachi, pp: 234-257.

Islam, A. (2002a). Health sector Reforms in Pakistan: Why it is needed? Journal of Pakistan Medical Association Vol. 52 (3) pp: 95-100.

Islam, A. (2002b). Health sector Reforms in Pakistan: Future Directions. Journal of Pakistan Medical Association Vol. 52 (4) pp: 174-82.

Issa, H. and Ouattara, B. (2005). The effects of private and public health expenditure on infant mortality rates: does the level of development matters? Department of Economics, University of Wales, UK.

Jack, W. (1999). Principles of health economics in developing countries, World Bank Institute (WBI), Washington DC.: USA.

Jamal, H. (2004). Does Inequality matters for Poverty Reduction? Evidence from Pakistan's Poverty Trends, Research Report No. 58. Social Policy and Development Centre (SPDC), Karachi, Pakistan.

Jamison, D. T., Moseley, W.H., Measham, A. R. and Bobadilla, J. L. (Eds.). (19939. Disease control priorities in developing countries, published for the World Bank by Oxford University Press, New York, USA.

Johansen, S. and Juselius, K. (1990). Maximum likelihood estimation and inference on cointegration – with application to the demand for money, 'Oxford Bulletin of Economics and Statistics 52, pp: 169-210.

Johansen, S. (1988). 'Statistical analysis of cointegrating vectors', journal of economic dynamics and control, Vol. 12, pp 231-2544.

Juan Antonio Casas Z. (2000). Investment in Health and Economic Growth: A perspective from Latin America and the Caribbean, Pan American Health Organization (PAHO), Washington DC; USA.

http://www.paho.org/English/HDP/HDR/ACHR-00-08.pdf

Judge, K., Mulligan, J. and Benzeval, M. (1998). Income inequality and population health. Social science and medicine 46 (4-5) pp: 567-579.

Karatsaz, G. (2000). On the determination of the US aggregate health care expenditure, Applied Economics, Vol. 32, pp. 1085-1099.

Kemal, A. R. (1994). Structural adjustment, employment, income distribution and poverty, in Pakistan Development Review (PDR), Vol.33 No. 4.

Kemal, A. R. (2002). Macroeconomic policies and poverty in Pakistan, chapter 3 in Pakistan human condition report 2002, Centre for poverty reduction and income distribution (CRPRID) Islamabad, Pakistan.

Khalid, H. S. and Mukhtar, E. M. (2002). The future of girls' education in Pakistan: a study on policy measures and other factors determining girls' education, UNESCO, Islamabad.

Khan, A. and Bhutta, Z. A. (2001). Maternal Health and Malnutrition in Pakistan: a situational analysis. Aga Khan university and UNICEF, Aga Khan university press, Karachi, Pakistan.

Khan, A. H. (1997). Growth, employment and poverty alleviation, in Poverty alleviation in Pakistan: Present scenario and future strategy (ed.) by Mohibul Haq Sahibzada, Institute of Policy Studies, Islamabad.

Khan, M.A. (2002). Health and Poverty. In Pakistan Human Condition Report 2002, Social Sector II, Chapter 8, CRPRID, Islamabad Pakistan.

Khan, M.A. (2003a). Public Expenditure, Poverty and Human Development: The Experience of Pakistan in Pakistan Human Condition Report 2003, Government of Pakistan, Planning Commission: CRPRID, Islamabad.

Khan, M.M. (2006). Health Policy analysis: the case of Pakistan. Dissertation submitted to faculty of Medicine, University of Groningen, The Netherlands.

Khattak, F.H. (2001). Economics of Health Sector Reforms in Pakistan, Ad-Rays printers, Blue Area Islamabad, Pakistan.

King, R. and Levine, R. (1993). Finance, Entrepreneurship and Growth Theory and Evidence, Journal of Monetary Economics, 32 (3), pp. 513-42.

Kitts, J., and Roberts, J. (1996). The health gap: beyond pregnancy and reproduction. Ottawa, IDRC.

Klasen, S. (2002). Low schooling for Girls, Slower Growth for All? World Bank Economic Review Vol.16, pp. 345-373.

Klein, RJ and Hawk, SA (1992). Health status indicators: definitions and national data, Healthy people 2000 stat notes (1) pp: 1-7.

Klinger, A. (1985). The Fight against infant mortality. In J. Vallin and A. D. Lopez, (Eds.) Health policy, Social policy and mortality perspective. IUSSP, Ordina Editions.

Knowles, S. and Owen, D. (1997). Education and health in an effective labor empirical growth model, Economic Record, Vol. 73, pp. 14-28.

Lashari, T. (2004). Pakistan's national health policy: quest for a vision, the Network Publication, Islamabad, Pakistan.

Lee, R., Mason, A. and Miller, T. (2000). Life cycle saving and the demographic transition: the case of Taiwan, Population and Development Review (supplement), Vol. 26, pp. 194-222.

Leu, R. (1986). The public-private mix and international health care costs, in: A.J. Culyer and B. Jonsson, eds. Public and private health services (Basil Blackwell, Oxford).

Lichtenberg, F. R. (2004). Sources of US longevity increase 1960-2001. The quarterly review of economics and finance 44, pp: 369-89.

Lipton, M. (1997). Why poor people stay Poor: Urban Bias in World Development. Cambridge: Harvard University press.

Lucas, R. (1988). On the Mechanics of Economic Development. Journal of Monetary Economics, Vol. 22, No.1, pp 3-42.

Lütkepohl, H. and Krätsiz, M. (2004). Applied time series econometrics, Cambridge University Press, UK.

Macinko, J., Frederico, C. G. and De Souza, F. M. (2006). Evaluation of the impact of the family health program on infant mortality in Brazil, 1990-2002, J. Epidemiol. Community Health, Vol.60, pp. 13-19.

MacKinnon, J. G. (1991). Critical values for cointegration tests, R. F. Engle and C. W. J. Granger (Eds.), in Long run economic relationships: readings in cointegration, Oxford University Press, Oxford, UK.

Maddala, G. S. (1992). Introduction to econometrics, second edition, McMillan Publication, USA.

Malik, S. J., Aftab, S. and Sultana, N. (1994). Pakistan's economics performance 1947 to 1993: a descriptive analysis. Sure Publishers Karachi, Pakistan.

Mankiw; N. G., Romer, D. and Weil, D. N. (1992). A contribution to the empirics of economic growth, Quarterly Journal of Economics, Vol. 107, No. 2, pp. 407-437.

Manning, L. M., and Andrianacos, D. (1993). Dollar Movements and Inflation: a Cointegration Analysis, Applied Economics, 25, 1483-1488.

Marmot, M. (2002). The influence of income on health: views of an epidemiologist. Health Affairs, Vol. 21, No.2, pp.31–46.

Mayer, D. (2001). The long term impact of health on economic growth in Latin America, World Development, Vol. 29, No. 6, pp. 1025-1033.

McGuire, A., Parkin, D., Hughes, D. and Gerard, K. (1993). Econometric analysis of national health expenditures: can positive economics help to answer normative questions? Health economics, 2, pp. 113-126.

Mehmood, S. (2000). Pakistan, Political roots and development 1947-1999. Oxford university press, Karachi, Pakistan.

Mellor, John W. 1999. "Pro-poor Growth: The Relation between Growth in Agriculture and Poverty Reduction." Abt Associates, Bethesda, Md.

Messias, E. (2003). Income inequality, illiteracy and life expectancy in Brazil. American Journal of public health 93, pp: 1294-96.

Miller, C. A. (1978). Infant mortality in the U.S., Scientific American, Vol. 253, No. 1, pp: 31-37.

Mills, A. and Gilson, L. (1988). Health Economics for developing countries: A survival kit, Health Economics and Financing Program, Working Paper No. 01/88, LSHTM, London, UK.

MoH. (1990). National Health Policy of Pakistan 1990, Ministry of Health, Islamabad, Pakistan.

MoH. (1997). National Health Policy of Pakistan 1997, Ministry of Health, Islamabad, Pakistan.

MoH. (2001). National Health Policy of Pakistan 2001, the way forward, an agenda for change, Ministry of Health, Islamabad, Pakistan.

Mosley, W.H. and Chen, L.C. (1984). An analytical framework for the study of child survival in developing countries. In: Mosley, W.H., and Chen, L. C. (Eds.), Child Survival: Strategies for Research. The population council, New York, pp: 25-45.

Mturi, A. J. and Curtis, S. L. (1995). The determinants of infant and child mortality in Tanzania. Health policy and planning 10 (4), pp: 384-94.

Murinnen, J. M. (1982). Demand for health: a generalized Grossman model, Journal of Health economics Vol.1 No.1 pp. 5-28.

Murray, C. J. L. and Chen, L. C. (1996). In search of a contemporary theory for understanding mortality change. Social science and medicine 36, pp: 143-155.

Murthy, N. R. V. and Okunade, A. A. (2000). Managed care, deficit financing and aggregate health care expenditure in the United States: a cointegration analysis. Health Care Management Science, 3, pp. 279-85.

Murthy, N. R. V. and Ukpolo, V. (1994). Aggregate health care expenditure in the United States: evidence from cointegration tests, Applied Economics, Vol. 26, Issue, 8. pp. 797-802.

Muscatelli, V. A. and Hurn, S. (1992). Cointegration and dynamic time series model, Journal of economic surveys 6, pp. 1-43

Musgrove, P. (1996). Public and private roles in health: theory and financing patterns. World Bank discussion paper No. 339 Washington DC.

Mushtaq, K., Ghafoor, A. and Abedullah. (2007). An examination of calorie demand relationship in Pakistan, Pakistan Journal of Nutrition, Vol. 6, No. 2, pp: 159-162.

Narayan, P. K. (2004). The relationship between fertility and infant mortality rates with in the cointegration and granger causality framework: evidence from China, Asian Profile, Vol. 32, No. 1, pp. 1-6.

Narayan, S., Narayan, P. K. and Mishra, S. (2010). Investigating the relationship between health and economic growth: empirical evidence from a panel of 5 Asian countries, Vol. 21, No. 4, pp. 327-424.

Narayan, P. K. (2007). Will investing in health stimulate growth? Evidence from a panel of OECD countries, Working paper, department of Accounting , Finance and Economics, Griffith University, Australia.

Neeliah, Harris and Bhavani Shankar, (2008) "Is nutritional improvement a cause or a consequence of economic growth? Evidence from Mauritius." Economics Bulletin, Vol. 17, No. 8 pp. 1-11.

Nelson, C. R. and Plosser, C. I. (1982). Trends and random walk in macroeconomic time series, Journal of Monetary Economics, Vol. 10, pp. 139-162.

New House, J. P. and Phelps, C. E. (1974). Price and income elasticities for medical care services, in M. Perlman (Ed.) The economics of medical care, The McMillan Press Ltd., London and Basingstoke, pp. 129-161.

Newhouse, J. (1977). Medical care expenditure: A cross-national survey, Journal of Human Resources 12, 115-125.

Nishtar, S. (2007). Corruption in Health sector in Pakistan. Heart file and Transparency international, Islamabad.

Nkrumah, F. K. (1973). Severe anemia associated with malaria in children, Ghana Medical Journal,Vol. 12, No.1, pp. 17-21.

O'Hara, D.J. (1980). Towards a model of the effects of education on health. In: The effects of education on health. World Bank Staff Working Paper No. 405, pp: 34-56.

Okunade, A. A. and Karakus, C. M. (2000) Policy and other determinants of OECD health spending growths, 1968- 97: new evidence with expanded data. 1999 Proceedings of the Business & Economic Statistics Section, the American Statistical Association, Alexandria: VA; pp. 114-18.

Okunade, A. A., and Karakus, C. M. (2001). Unit root and cointegration tests: time series versus panel estimates for international health expenditure models, Applied Economics 33 pp. 1131-1137.

Osterwald-Lenum, M. (1992). 'A note with fractiles of the asymptotic distribution of the maximum likelihood cointegrating rank test statistics: Four cases', Oxford Bulletin of Economics and Statistics, Vol. 54, pp 461-472.

Palloni, A. and Rafalimanan. (1999). The effects of infant mortality on fertility revisited: new evidence from Latin Americca, Demography, Vol. 36, pp. 337-342.

Paris, C and Lillard, L (1994). Health inputs and child mortality, Journal of Health Economics (13) pp: 455-489.

Parkin, D. W., McGuire, A. J. and Yule, B. F. (1987). Aggregate health care expenditures and National incomes: Is health care a luxury good? Journal of Health Economics 6, pp. 109-127.

Parkin, D. W., McGuire, A. J. and Yule, B. F. (1989). What do international comparisons of health care expenditures really show? Community medicine Vol. 11, No. 2 pp. 116-123.

Pasha, H. A., Hassan, M.A., Ghaus, A. and Rasheed, A. (1995). Is the social action Programme in Pakistan financially sustainable? The Pakistan development review, 34: 4 part I, pp: 629-647.

Patel, R. (1991). Socio-economic Political status and women and Law in Pakistan. Faiza Publishers, Karachi, Pakistan.

Patterson, K. (2000). An introduction to applied econometrics: A time-series approach, London: Macmillan Press.

Pelletier DL, Frongillo EA Jr, Schroeder DG, Habicht JP (1995). The effects of malnutrition on child mortality in developing countries, Bulletin of World Health Organization (WHO); Vol.73 (4) pp: 443-448.

http://whqlibdoc.who.int/bulletin/1995/Vol73-No4/bulletin_1995_73(4)_443-448.pdf

PHCR. (2002). Pakistan Human Condition Report 2002, centre for research on income distribution and poverty reduction, Islamabad, Pakistan.

Philips, P.C.B. (1986). Understanding spurious regressions in econometrics. Journal of econometrics Vol. 33, Issue 3, pp: 311-340.

Phillips, P.C.B. and P. Perron (1988). Testing for a Unit Root in Time Series Regression, Biometrika, 75 (2): pp 335-346.

Preston, S. H. (1975). The changing relationship between mortality and level of economic development. Population Studies, 29 (2), pp: 231-48.

Pritchett, L. and Summers, L. H. (1996). The Journal of Human Resources, Vol.31, No.4, pp. 841-868.

Pritchett, L. and Summers, L. H. (1996). Wealthier is Healthier. Journal of human resources 31 (4), pp: 841-868.

Ramesh, M. and Sam, M. (2007). An assessment of OECD health care system using panel data analysis. MPRA paper No. 6122. http://mpra.ub.uni-muenchen.de/6122.

Ramirez, A., Gustav, R. and Stewart, F. (1997). Economic growth and human development, Economic Growth Centre, Discussion Paper No. 787, Yale University, USA.

Ramirez, A., Gustav, R. and Stewart, F. (1997). Economic growth and development. Economic growth centre (EGC) discussion paper 787, Yale University.

Rao, B. B. (1994). Cointegration for the applied economist, Saint Martin Press, New York, USA.

Ravallion, M. (1997). Can high inequality developing countries escape absolute poverty? Economic Letters, Vol. 56, No.1, pp. 51-57.

Reidpath, D. D. and Allotey, P. (2003). Infant mortality rate as an indicator of population health, J Epidemiol Community Health, Vol. 57, pp. 344-46.

Repetto, R. (1978). The interaction of fertility and size distribution of income. Journal of development studies 14, pp: 22-39.

Ribero, R. and Nunez, J. (1999), Productivity and the Household Investment in Health – The Case of Colombia. Inter-American Development Bank, Working Paper R-354.

Rico, A. A., Guerra-Turrubiates, I. A. and De Oca-Hernandez R. M. (2005). Empirical evidence of the impact of health on economic growth, Issues in Political Economy, Vol. 14, pp. 40-57.

Rivera, B. (2001). The effects of public health spending on self assessed health status: an ordered probit model. Applied Economics 33 (10), pp: 1313-1319.

Rivera, C. and Currais, L. (2003). The effect of health investment on growth: a causality analysis, International Advances in Economic Research (IAER), Vol.9, No.4, pp. 312-323.

Rodgers, G. B. (1979). Income and inequality as determinants of mortality: an international cross section analysis. Population Studies 33 (2), pp: 343-51.

Romer, P. M. (1986). Increasing Return and Long Run Growth, Journal of political Economy, 94(5): pp.1002-1037.

Romer, P. M. (1990). Human capital and growth: theory and evidence, Carnegie- Rochester conference series on public policy, Vol. 32, pp. 251-286.

Roubini, N. and Sala-i-Martin, X. (1992). Financial Repression and Economic Growth, Journal of Development Economics, 39, pp. 5-30.

Sachs, J. D. (2004). Health in the developing world: achieving the millennium development goals. Bulletin of World Health Organization, Round table 82 (12), pp: 947-49.

Sah. R. (1991). The Effect of Child Mortality Changes on Fertility Choice and Parental Welfare, Journal of Political Economy, Vol. 99, pp: 582-606.

Said, S.E. and Dickey, D.A. (1984). Testing for Unit Roots in Autoregressive-Moving Average Models of Unknown Order, Biometrika, 71, pp: 599-607.

Sathar, Z. A. (1991). Population policy and demographic change in Pakistan, seminar on eight five year plan (1993-98), Islamabad, Pakistan.

Sathar, Z. A. (1985). Infant and child mortality in Pakistan; some trends and differentials. Journal of Biosocial sciences 17 (3), pp: 351-359.

Scheffler, R. M. (2004). Health Expenditures and Economic Growth: An International Perspective, Globalization Research Centre, Occasional Paper on Globalization, University of South Florida, Vol. 1, No. 10.

Schell, C. O., Reilly, M., Rosling, M. Peterson, S. and Ekström, A. M. (2007). Socioeconomic determinants of infant mortality: a worldwide study of 152 low-, middle-, and high-income countries. Scandinavian journal of public health 35, pp: 288-297.

Schultz, T. W. (1993). Mortality decline in low income world: causes and consequences, American Economic Association (AEA) papers and proceedings, Vol. 83, pp. 337-42.

Schultz, T. P. (2004). Health economics and application in developing countries, Journal of Health Economics, Vol. 23, No. 4, pp. 637-641.

Seddighi, H., Lawler, K. A. and Katos, A. V. (2000). Econometrics: a practical approach, Routledge Publishing, 1st edition.

Sen, A. (1985). Commodities and capabilities, Amsterdam, North Holland.

Sen, A. (1987). The standard of living: lecture II, lives and capabilities, in the standard of living (Geoffrey Hawthorn, Editor) Cambridge: Cambridge University Press, pp: 20-38.

Sen, A. (1995). Demography and welfare economics. Empirica, Vol. 22, pp: 1-21.

Sen, A. (1998). Mortality as an indicator of economic success and failure. The Economic Journal 108, pp: 1-25.

Sen, A. (1999). Development as Freedom, Oxford University Press, UK.

Sen, A. (2002). Health: perception versus observation, BMJ, Vol. 324, pp 860-61.

Shaikh, B. T, and Rabbani, F. (2004). The district health system: a challenge that remains. East Mediterr Health J. Jan-Mar; 10(1-2):pp. 208-14.

Shehzad, S. (2006). The determinants of child health in Pakistan: an economic analysis. Social indicators research 78, pp: 531-556.

Sheikh, B. T, and Rabbani, F. (2004). The district health system: a challenge that remains, Eastern Mediterranean Health Journal, Vol. 10, No. 1/ 2, pp.208-214.

Shryock, H.S., Siegal, J. S. and Associates (1976). The methods and materials of Demography (condensed Ed.) Academic Press, USA.

Siddiqui, R., Usman, A. and Rashida, H. (1995). Determinants of Expenditure on health in Pakistan, The Pakistan development review, Vol. 34 No. 4 pp: 959-970.

Siddiqui, S., Haq, I. U., Ghaffar, A., Akhtar, T., and Mahini, R. (2004). Pakistan's maternal and child health policy: analysis, lessons and the way forward. Health Policy , 69 (1): pp 117-130.

Sims, C.A. (1980). Macroeconomics and Reality, Econometrica, Vol. 48, No.1. pp: 1-48.

Smith, D. G. (1996). Income inequality and mortality: why are they related? British Medical Journal 312, pp: 987-88.

Smith, J. P. (1999). Healthy bodies and thick wallets: the dual relationship between health and economic status, Journal of economic perspectives, Vol. 13, No. 2, pp. 145-166.

Solow, R. (1956). A contribution to the theory of economic growth, Quarterly Journal of Economics, Vol. 70, No. 1, pp. 65-94.

Sorkin, A. L. (1977). Health Economics in developing countries, Lexington Books, Lexington, M.A.

Sorkin, A. L. (1984). Health Economics: An Introduction. Lexington, Mass: Lexington Books.

SPDC. (2000). Social development in Pakistan: towards poverty reduction. Annual policy review report, Social Policy and Development Centre, Oxford University Press, Karachi, Pakistan.

Steckel, R. H. and Floud, R. (1997). Health and Welfare during Industrialization (Eds.), The University of Chicago Press, Chicago, USA.

Stewart, F. (1978). Technology and Underdevelopment, London: Macmillan.

Strauss, J. (1986). Does better nutrition raise farm productivity, J. Polit. Eco., Vol. 94, No.2, pp. 297-320.

Strauss, J., and Thomas, D. (1998). Health, Nutrition and Economic Development, Journal of Economic Literature, Vol. 36, No. 2, pp. 766-817.

Subbarao, K. Y. and Raney, L. (1995). Social gains from female education: a cross national study. Economic development and cultural change 44, pp: 105-128.

Subramanian, S. V., Belli, P. and Kawachi, I. (2002). The macro-determinants of health. Annual review of public health Vol.23, pp: 287-302.

Subramanian, S. and Deaton, A. (1996). The demand for food and calories, Journal of Political Economy, Vol. 104, No.1, pp. 133-162.

Suhrcke, M., Mckee, M., Arce, R. S., Tsolova, S. and Mortensen, J. (2005). The contribution of health to the economy in the European union, Health and consumer protection Directorate General, European Commission, Belgium.

Suwal, J. V. (2001). The main determinants of infant mortality in Nepal. Social Science and Medicine 53, pp: 1667-81.

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Tinker, A., Daly, P., Green, C., Saxeman, H., Lakshminarayan, R., and Gill, K. (1994). Women's health and nutrition: making a difference. Washington D.C: World Bank.

Toor, I. A., and Butt, M. S. (2005). Determinants of Health Expenditure in Pakistan, Pakistan Economic and Social Review, Vol. 943, No.1, pp. 133–150.

Tresserras, R., Canela, J., Alvarez, J. Sentis, J. and Salleras, L. (1992). Infant mortality, percapita income and adult illiteracy: an ecological approach. American journal of public health 82 (3), pp: 435-438.

Uddin, F. and Swati, M.A. (2006). Pakistan's Economic Journey: need for new paradigm. Institute of Policy studies, Islamabad, Pakistan.

UNDP (2005). Human Development Report 2005, International cooperation at a crossroads: Aid, trade and security in an unequal world. New York: Oxford University Press.

UNDP. (1990). Human Development Report 1990: Concept and Measurement of Human Development. New York: Oxford University Press.

UNDP. (1995). Gender and Human development, Human Development Report 1995. Oxford University Press, New York: UNDP.

UNDP. (2006). Human Development Report 2006, Beyond scarcity: power, poverty and the global water crisis, United Nations Development program, NewYork: USA.

UNFPA. (2003). Pakistan population assessment report, Country Assessment report, United Nation population fund (UNFPA), Islamabad, Pakistan. http://www.un.org.pk/unfpa/cpa.pdf

United Nation, (2001). United Nations statement on Food security in Pakistan; Thematic Group on Rural Development and Food Security.

Wagstaff, A. (1986). The demand for health: some new evidence, Journal of health economics Vol.5. No.3 pp.195-233.

Wagstaff, A. and Van Doorslaer, E. (1993). Equity in the finance and delivery of health care: concepts and definitions, in: Van Doorslaer, E., Wagstaff, A. and Rutten, F. (Eds.), Equity in the finance and delivery of health care: An international perspective (OUP, Oxford).

Wagstaff, A. et. al. (2004). Child Health: reaching the poor. American journal of public health Vol. 94, No. 5, pp: 726-736.

Waldmann, R. (1992). Income distribution and infant mortality, Quarterly Journal of Economics, Vol.107, No.4, pp. 1283-1302.

Wang, L. (2003). Determinants of child mortality in LDCs. Empirical findings from demographic and health surveys. Health policy 65, pp: 277-299.

Wang, X. and Taniguchi, k. (2002). Does better nutrition cause economic growth? The efficiency cost of hunger revisited, Food and Agriculture Organization (FAO), Rome, Italy.

Webber, D. J. (2002). Policies to stimulate growth: should we invest in health or education?, Applied Economics, Vol. 34, No. 13, pp. 1633-1643.

Wheeler, D. (1980). Basic needs fulfillment and economic growth: a simultaneous model, journal of Development Economics, Vol. 7, No. 4, pp.435-451.

White, K.L. (1975). International comparison of Medical care. Scientific American 233, pp. 17-25.

WHO (2007). World Health Statistics 2007, World Health Organization, Avenue Appia 1211, Geneva, Switzerland.

WHO. (1999). World Health Report 1999: making a difference, World Health Organization, Avenue Appia 1211, Geneva, Switzerland.

WHO. (2000). Health Systems: improving performance, World Health Report 2000, World Health Organization, Geneva Switzerland.

WHO. (2001). Macroeconomic and Health: Investing in Health for Economic Development. Report of the Commission on Macroeconomics and Health, World Health organization, Geneva, Switzerland.

WHO. (2002). Reducing risks, promoting healthy life, World Health Report 2004, World Health Organization, Geneva, Switzerland.

WHO. (2004). World Health Report 2004, Changing History. World Health Organization, Geneva, Switzerland.

WHO. (2004). World helath report 2004: Changing history, World Health Organization, Avenue Appia 1211, Geneva, Switzerland.

WHO. (2005). Make every mother and child count, World Health Report 2005, World Health Organization, Geneva, Switzerland.

WHO. (2007). World Health Statistics 2007, World Health Organization, Geneva Switzerland.

Wolfe, B. (1986). Health status and medical care expenditures: Is there a link? Social Science and Medicine, Vol. 22, No. 10, pp. 993-999.

Woodward, A. and Kawachi, I. (2000). Why reduce health inequalities? Journal of epidemiology and community health 54, pp: 923-29.

Wooldridge, J. (2002). Econometric analysis of cross section and panel data. Cambridge, MA: The MIT Press.

World Bank (1993). World Development Report 1993, Investing in Health. Washington D.C: World Bank.

World Bank. (1998). Pakistan: Towards a health sector strategy, Health, Nutrition and Population unit, South Asia region, Washington D.C: World Bank.

World Bank. (2002). Poverty in Pakistan: Vulnerabilities, Social Dynamics and Rural Gaps. World Bank Pakistan poverty Assessment Report. Washington D.C: World Bank.

World Bank. (2005). World Development Indicators CD-ROM 2005, World Bank, Washington DC: USA.

World Bank. (2006). World Development Indicators CD-ROM 2006, World Bank, Washington DC: USA.

World Bank. (2007). World Development Indicators CD-ROM 2007, World Bank, Washington DC: USA.

Yamada, T. (1985). Causal Relationships between Infant Mortality and Fertility in Developed and Less Developed Countries, Southern Economic Journal, Vol.52, No.2, pp. 364-370.

Younger, S. D. (2001). Cross country determinants of decline in infant mortality: a growth regression approach. Cornel Food and nutrition policy program (CFNPP) working paper No. 130, Cornell University.

Yule, G. W. (1926). Why do we get some time nonsense correlations between time series? A study in sampling and the nature of the time series, Journal of royal statistical society 89, pp. 1-64.

Zahid, G. M. (1996). Mother's health seeking behavior and childhood mortality in Pakistan. The Pakistan development review (PDR) 35, 4 Part-II, pp: 719-731.

Zaidi, S. A. (1988). The political Economy of health care in Pakistan. Vanguard Books (Pvt.) Limited Lahore, Pakistan.

Zaidi, S. A. (1999). Issues in Pakistan's Economy, First Edition, published by Oxford University press, Karachi, Pakistan.

Zaidi, S. A. (2005). Issues in Pakistan's Economy, Second Edition Revised and Extended, Published by Oxford University press, Karachi, Pakistan.

Zakir, M. and Wunnava, P. V. (1999). Factors affecting infant mortality rates: evidence from cross sectional data. Applied economic letters 6, pp: 271-73.

Zon, A. V. and Muysken, J. (2003). Health as a principal determinant of economic growth, Maastricht Economic Research Institute on Innovation and Technology (MERIT), Infonomics Research Memorandum Series No. 021, Maastricht, The Netherlands.
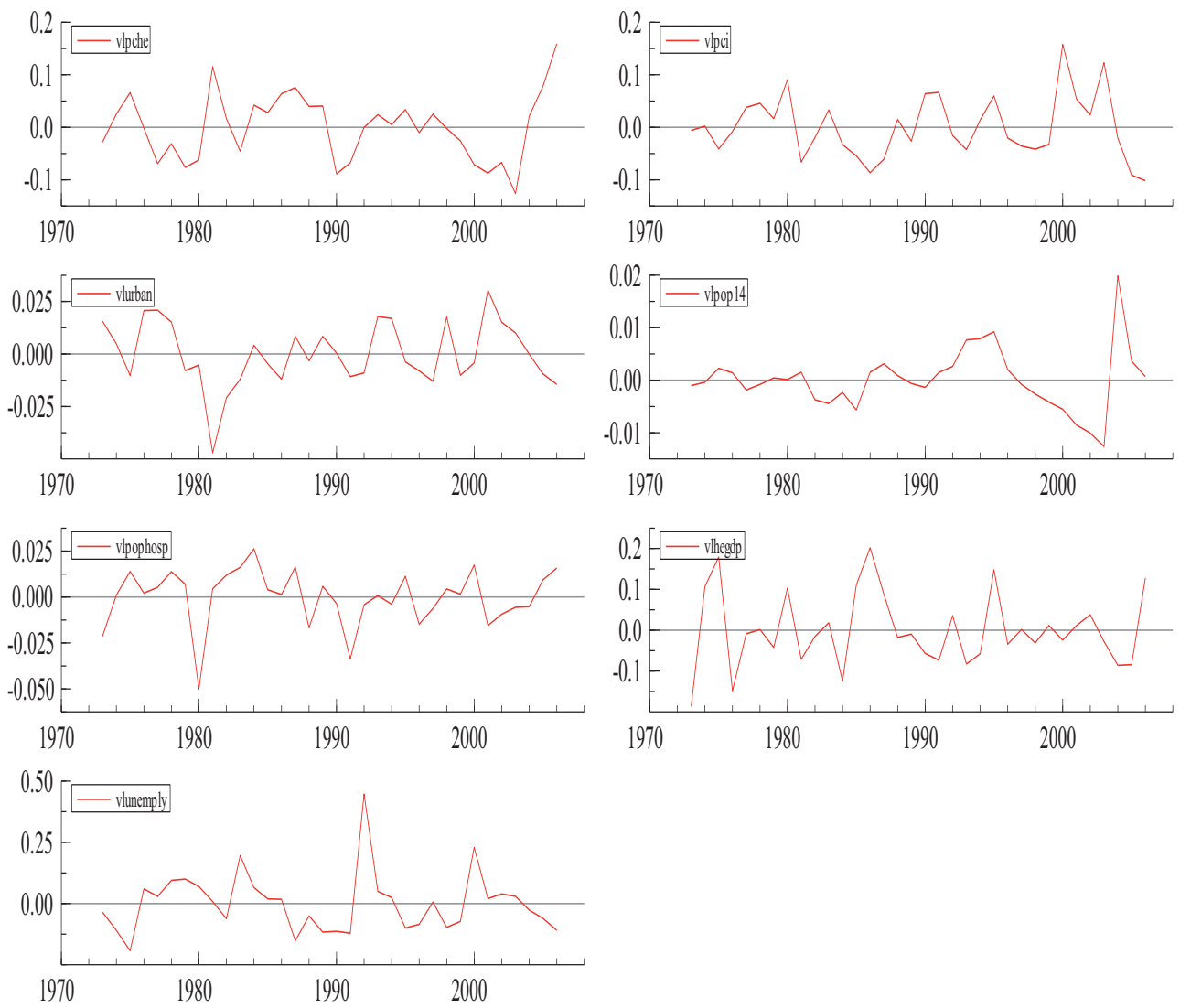
Appendix A

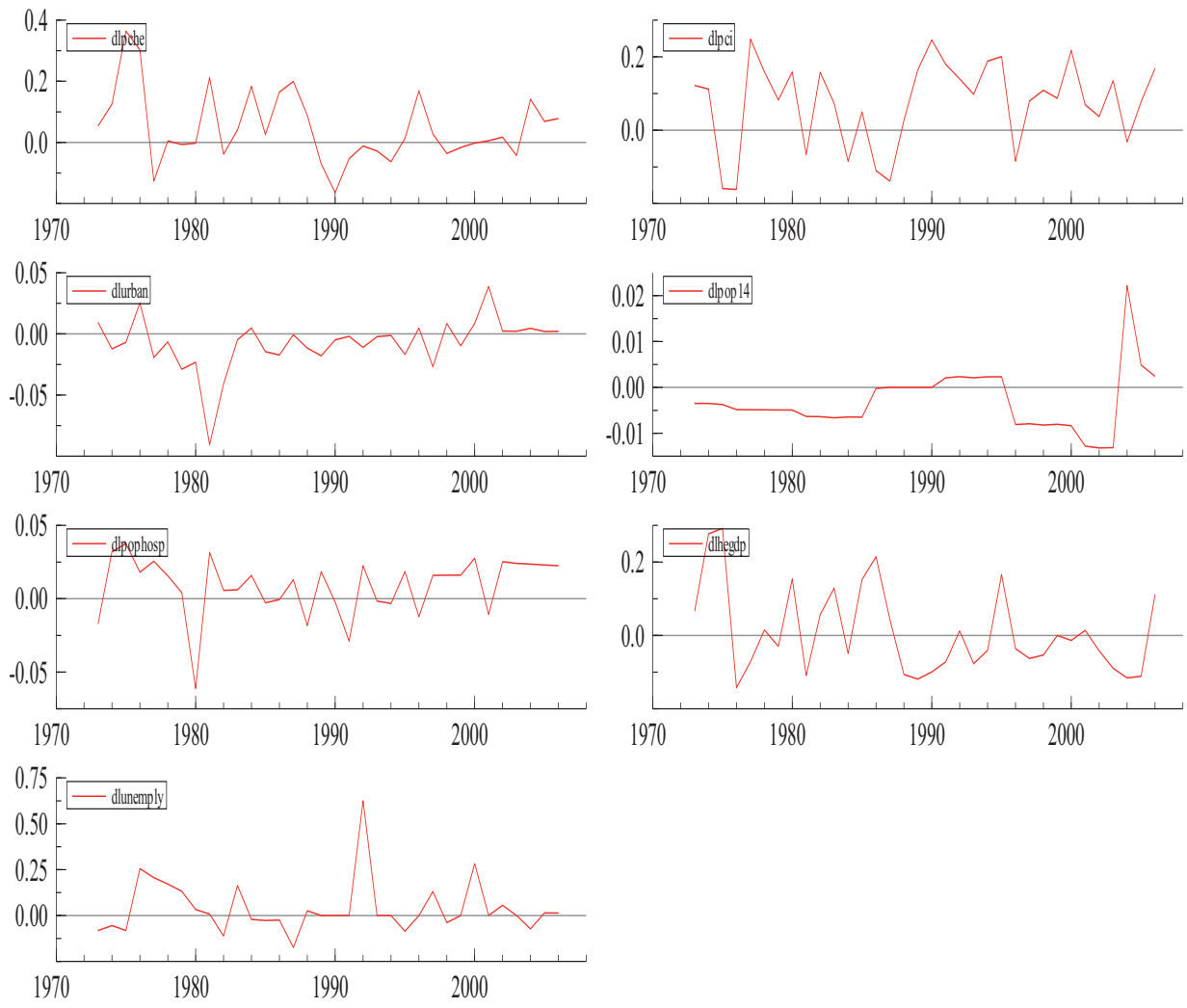## Chapter 5

Figure A1: Fitted and real value plots of the variables used in the model
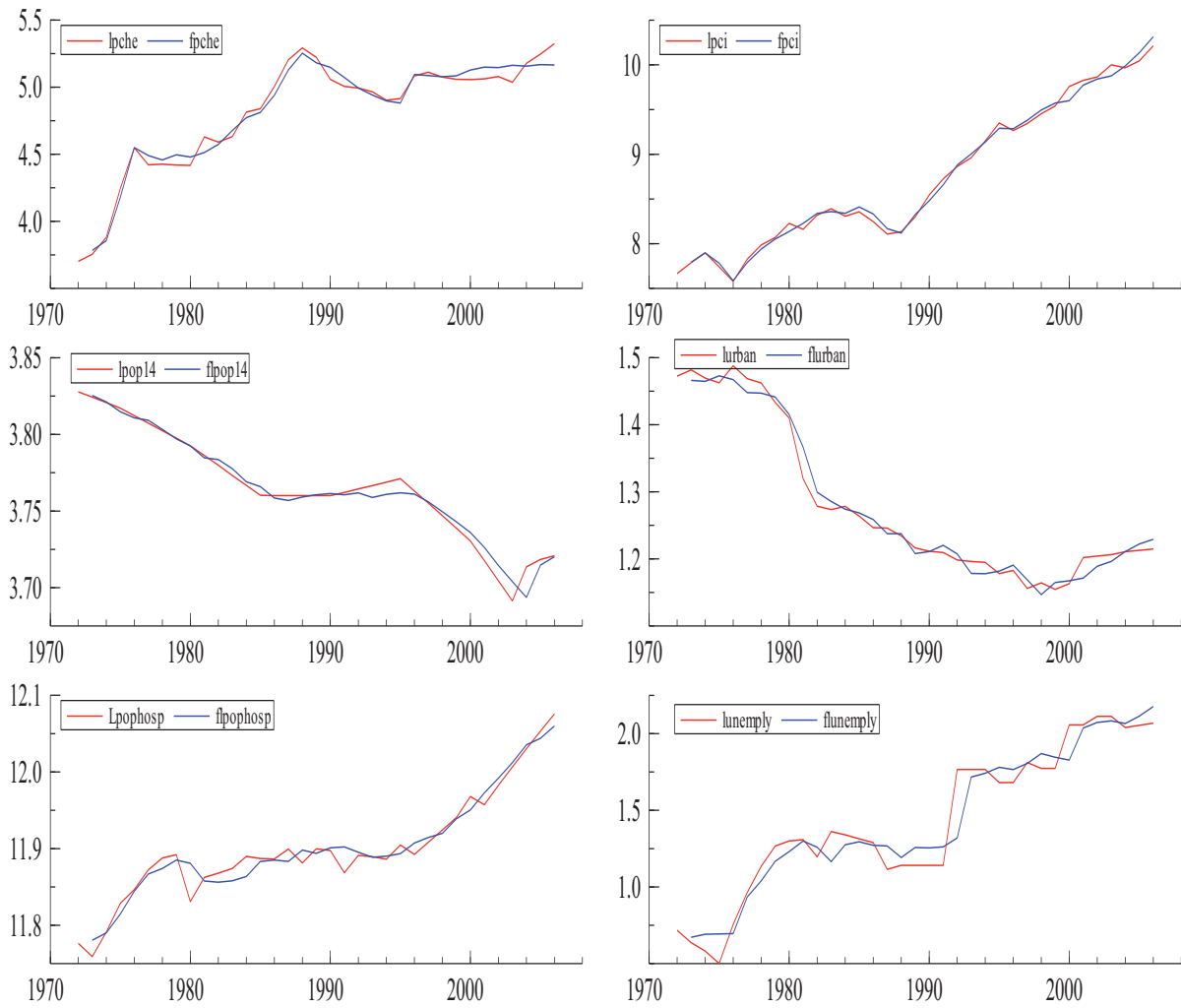
Figure A2: Plots of residuals of the variables after cointegration

Figure A3: Trend analysis graph of variables (log form)

Figure A4: Plots of variables after first difference

Chapter 6

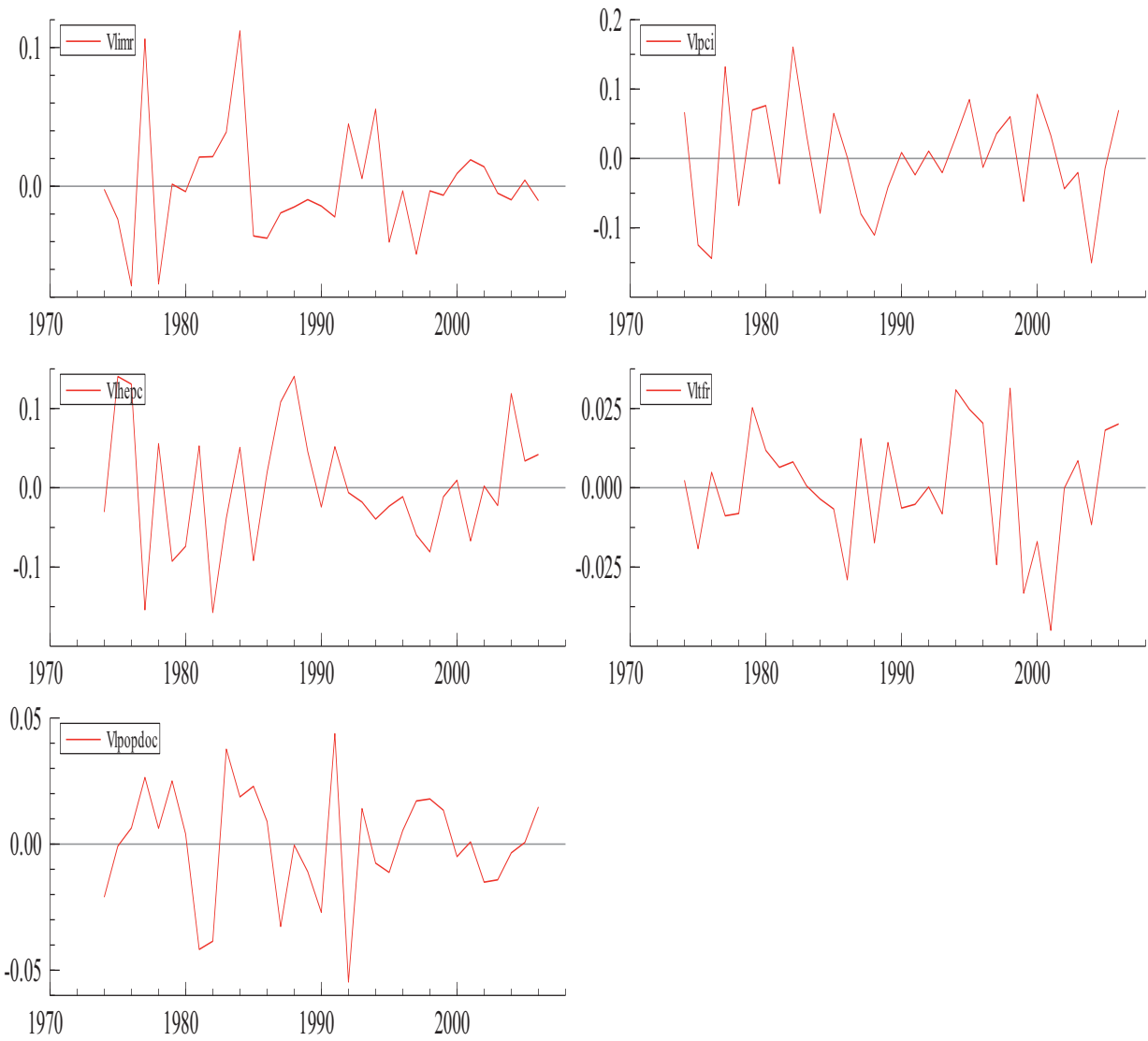**Figure A5: Real and fitted value plots of the variables (IMR Model)**
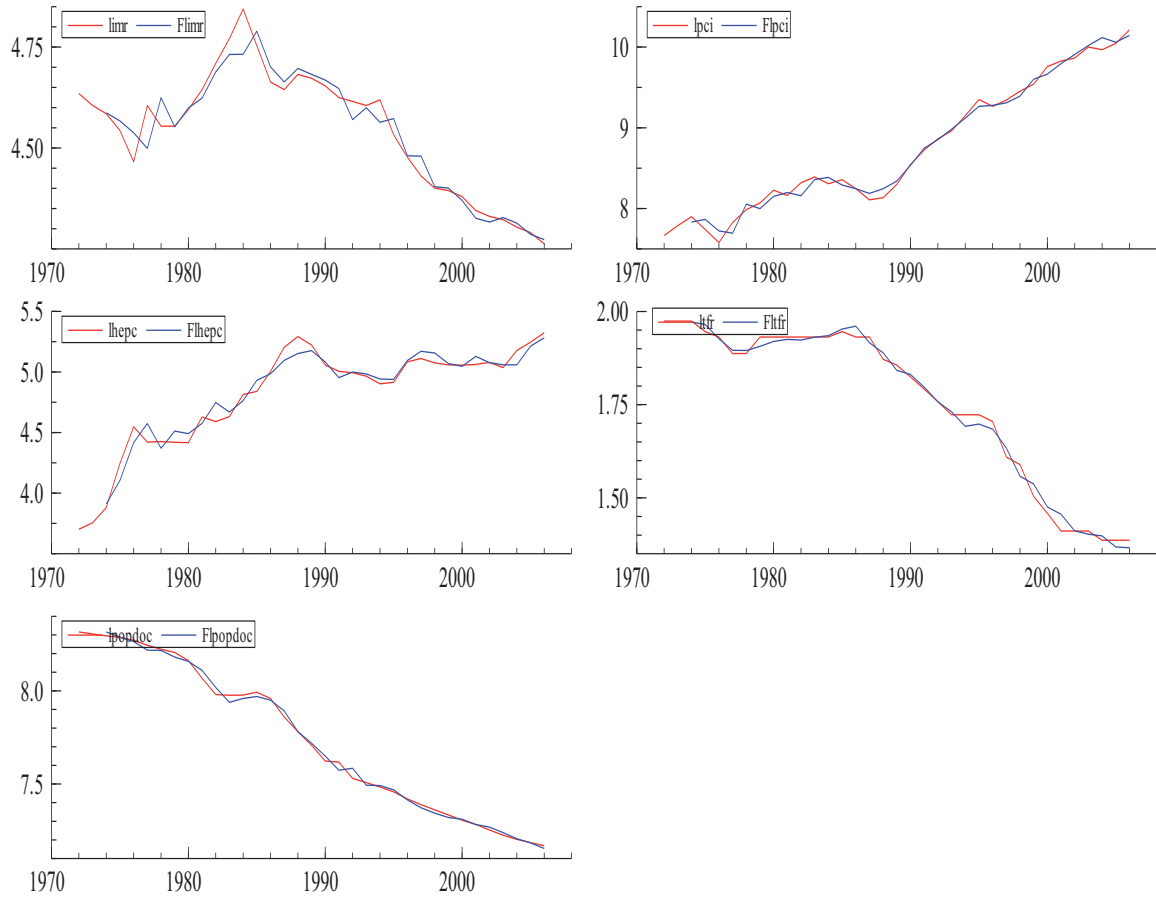
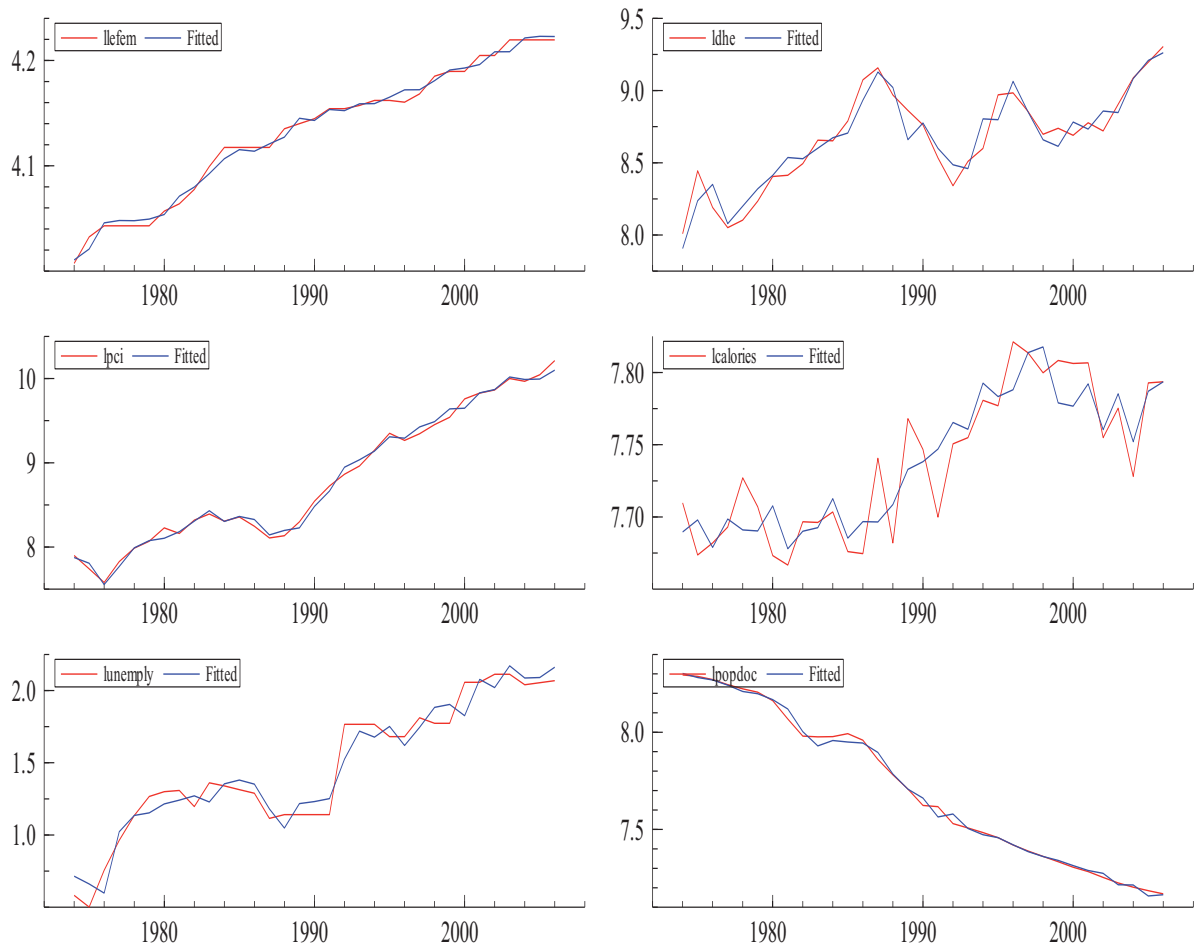**Figure A6: Trend graphs of variables used in analysis (in log form)**
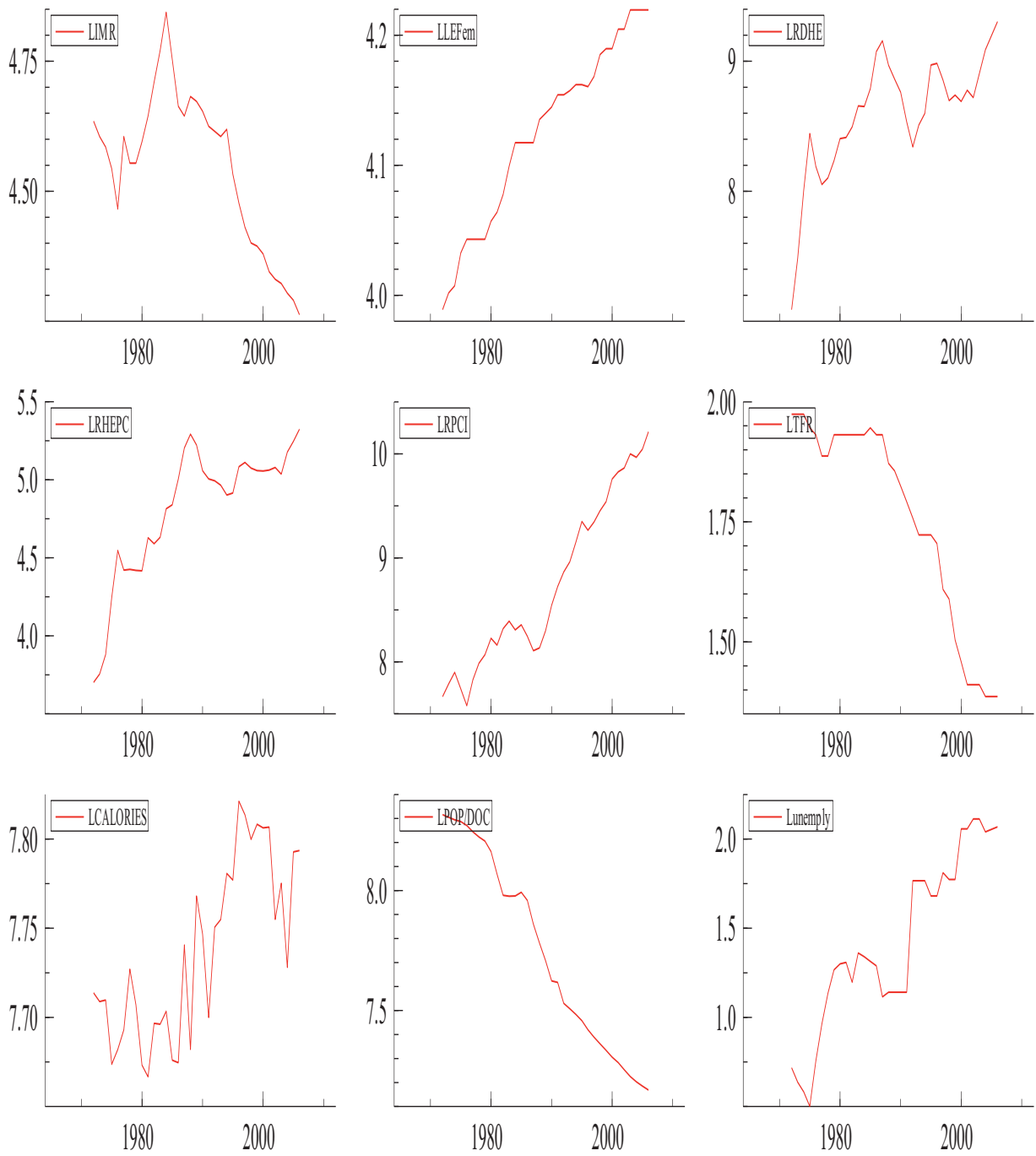
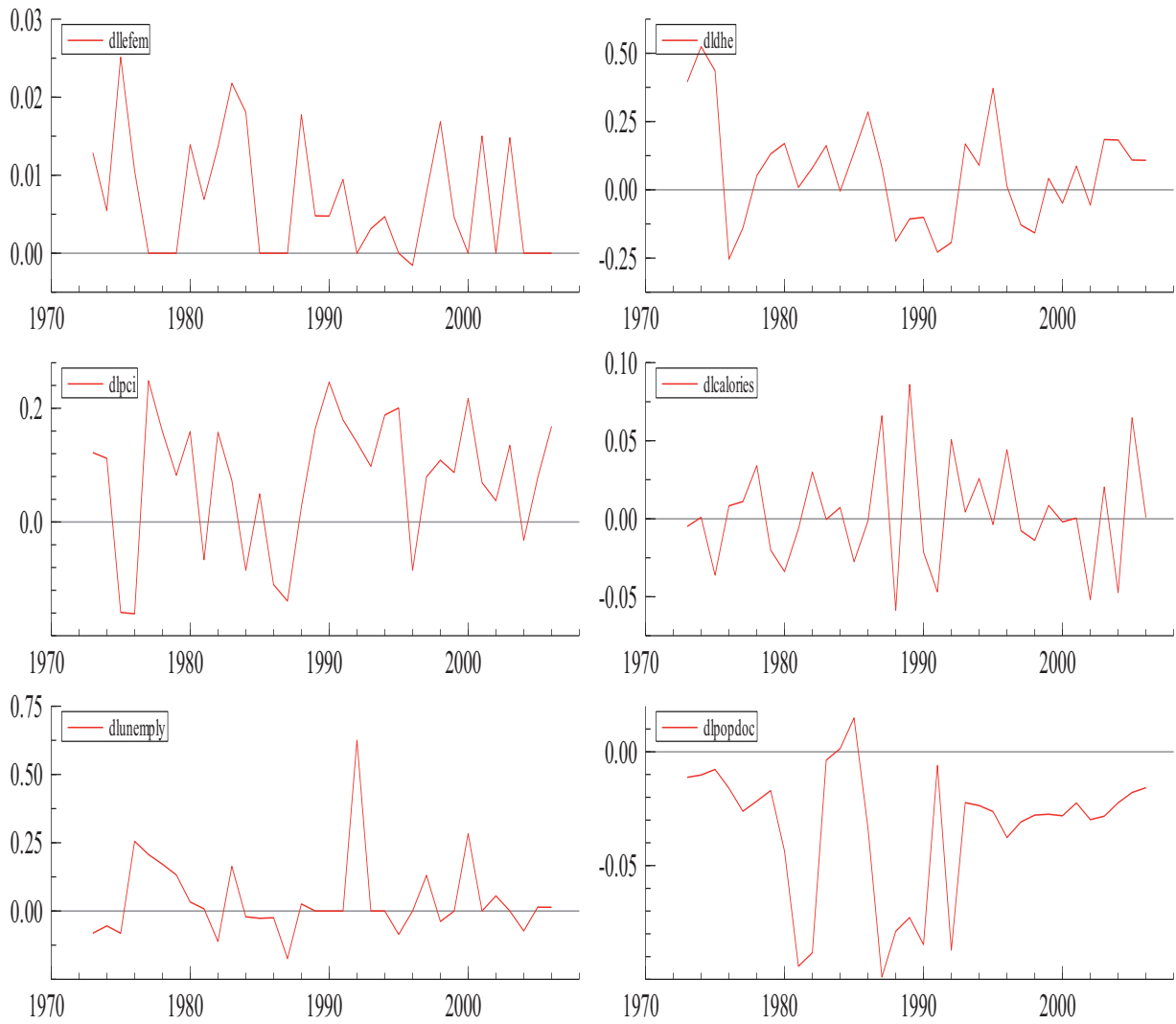**Figure A7: Plots of variables after first difference (IMR Model)**
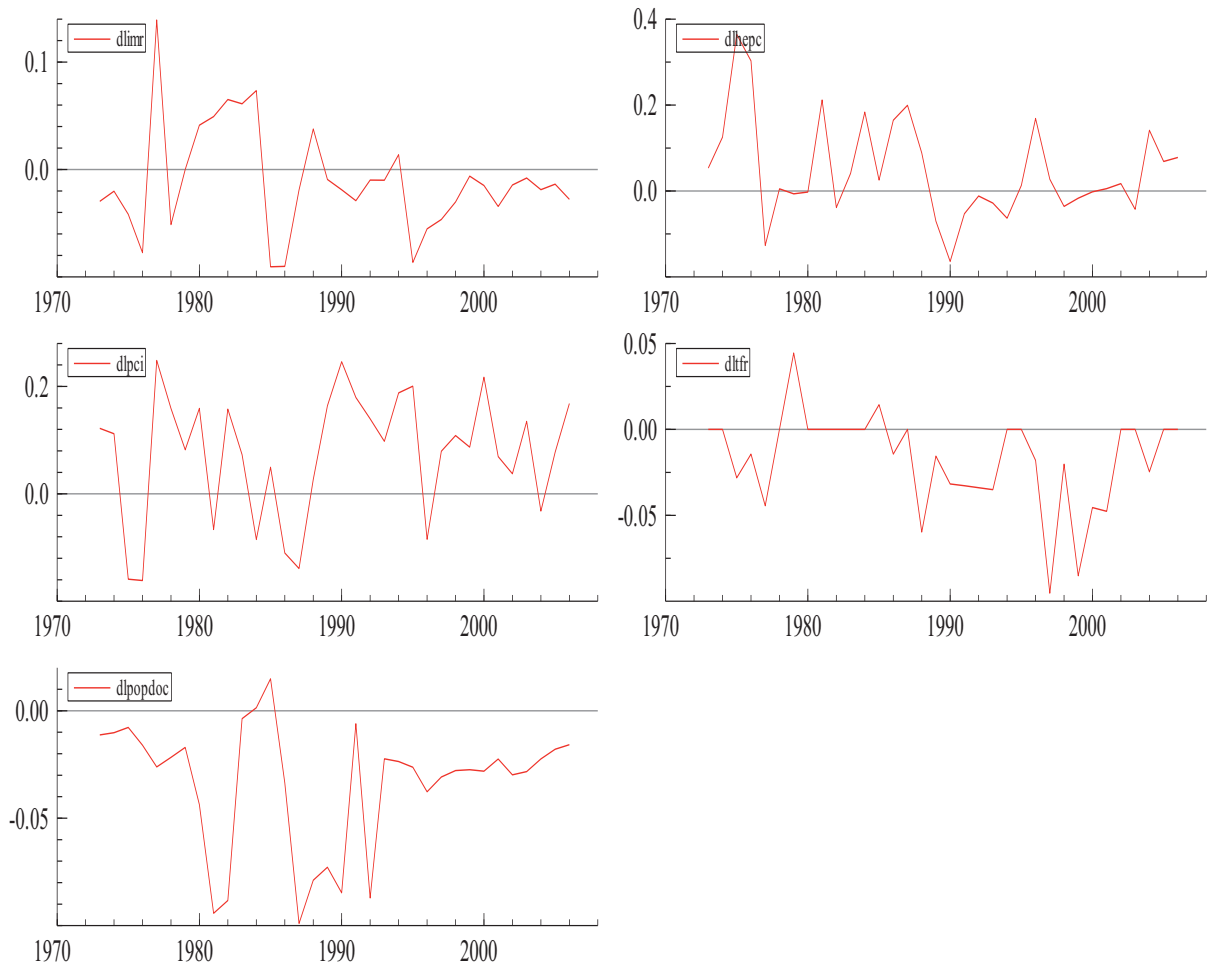
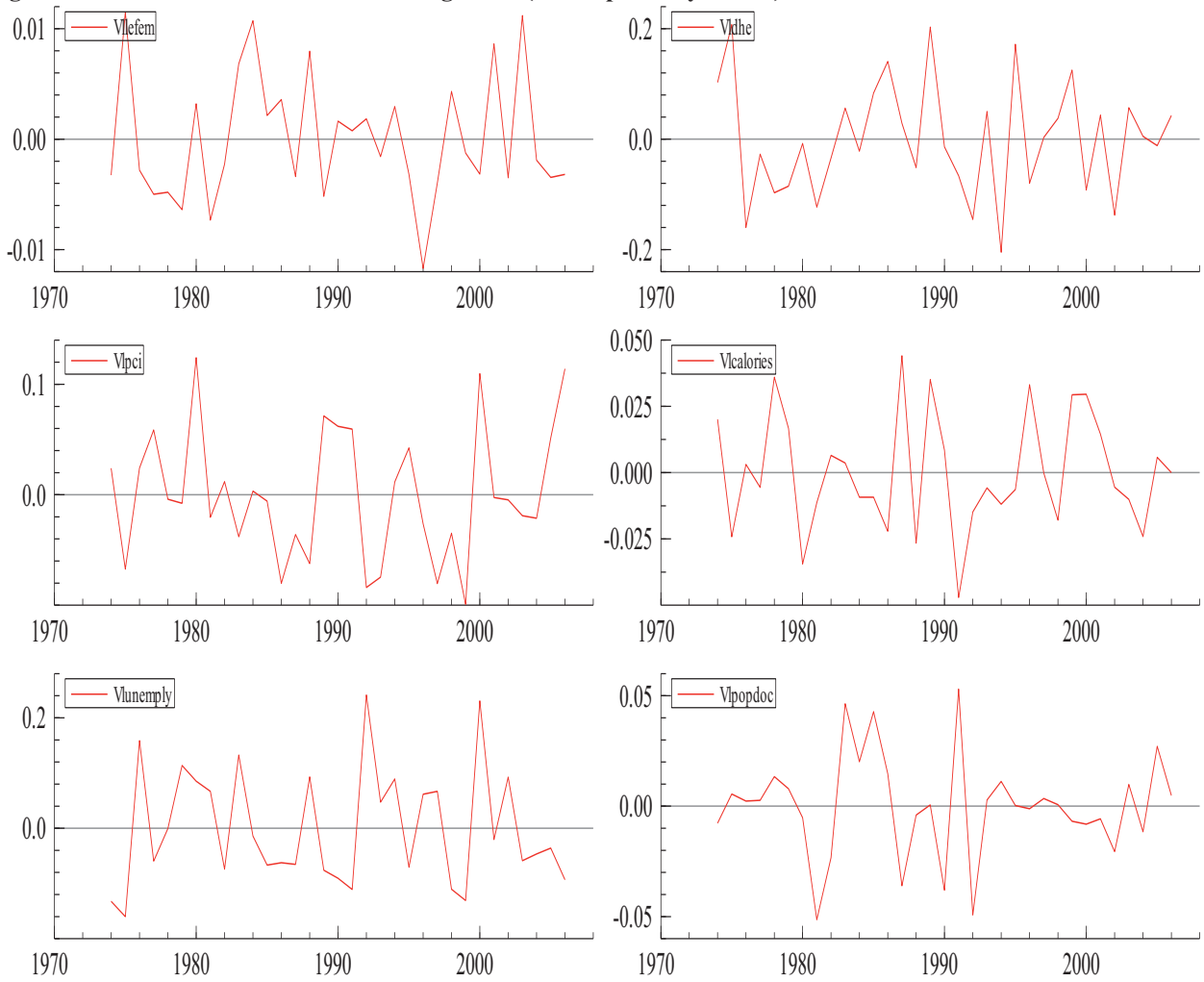**Figure A8: Plots of residuals of the variables after cointegration (IMR Model)**

Figure A9: Fitted and Real value plots of variables (Life expectancy Model)

Figure A10: Plots of variables after first difference (Life expectancy Model)

**Figure A11: Plots for residuals after cointegration (Life expectancy Model)**

Chapter 7

Table A1: Descriptive Statistics of the variables

Variables	Mean	Standard Deviation	Minimum	Maximum
pche	136.74	48.106	40.53	239.60
pci	10104	9220.8	1957.5	36899
calori	2295.8	107.44	2136.0	2493.0
imr	94.022	14.421	70.200	127.00
tfr	5.763	1.283	3.00	7.20
invgdp	11.524	4.571	5.960	24.18
agrilf	15.213	2.799	10.860	22.110

Table A2: Correlation matrix of the variables

Variables	pche	pci	calorie	imr	tfr	invgdp	agrilf
pche	1.000						
pci	0.704	1.000					
calorie	0.554	0.591	1.000				
imr	-0.461	-0.815	-0.611	1.000			
tfr	-0.742	-0.955	-0.726	0.852	1.000		
invgdp	0.616	0.910	0.662	-0.720	-0.918	1.000	
agrilf	0.881	0.913	0.661	-0.678	-0.920	0.827	1.000

Figure A12: Fitted and Real Value Plots of Each variable (Cointegration equation)
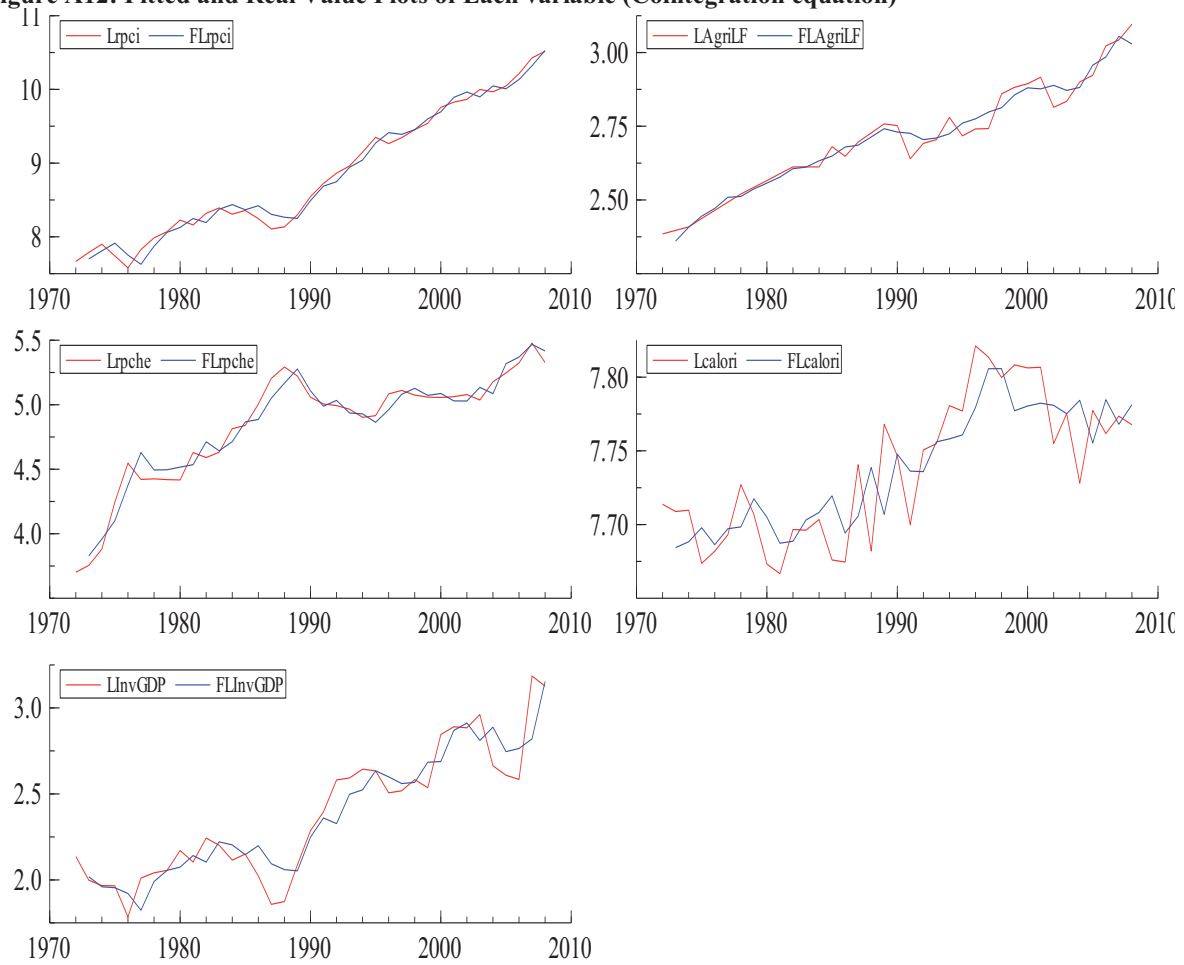
Figure A13: Residual Plots of each variable (Used in the first model)
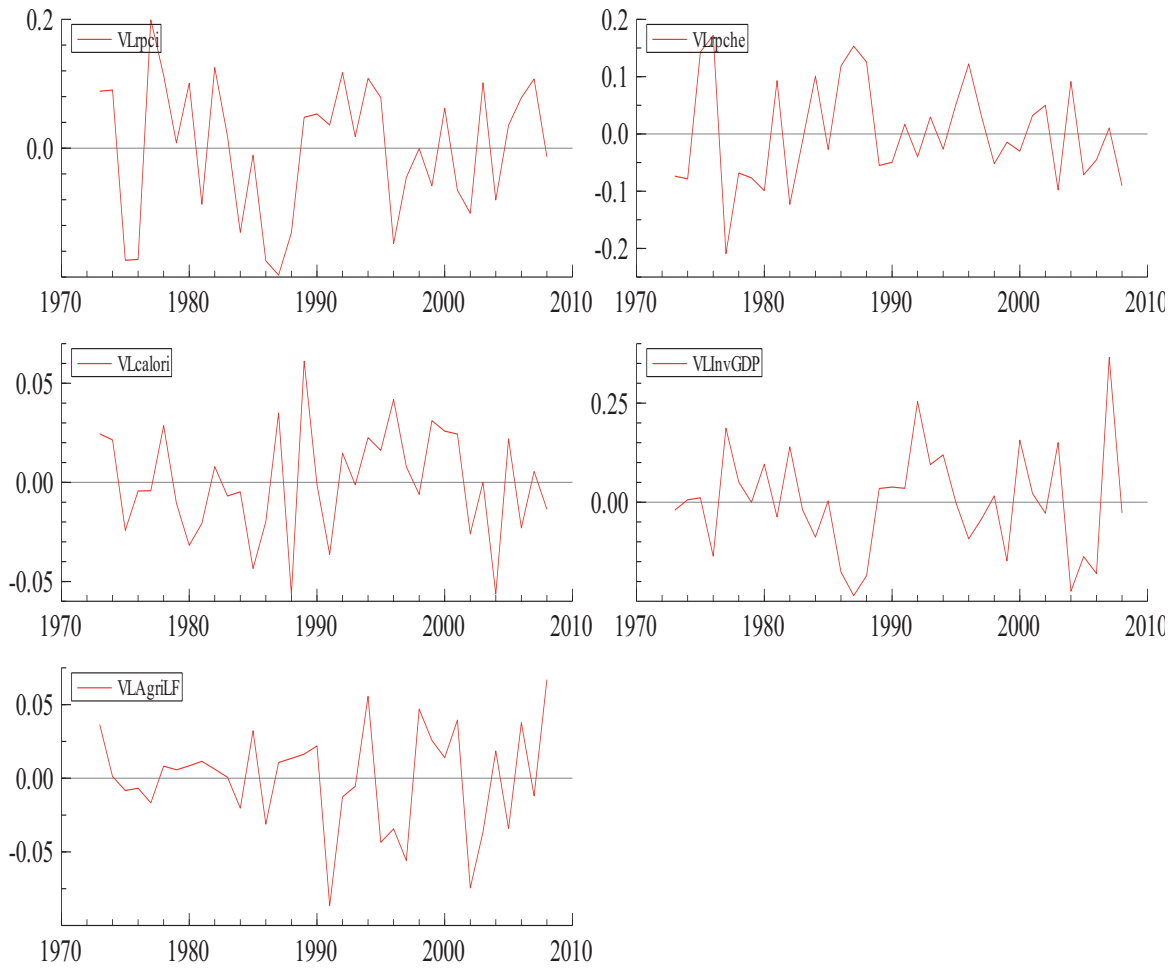
Figure A14: Plots of all the variables used in the first model after first difference