Assessing the Impact of Fiscal Decentralization on Health Sector:

A Cross Country Analysis

A dissertation submitted to the Pakistan Institute of Development Economic, Islamabad for the partial fulfilment of the requirement of the degree of Master of Philosophy in Public Policy.

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THESIS COMPLETION CERTIFICATE

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DECLARATION

This thesis is my own work, and contains no material which has been accepted for the award of any other degree in any other university or previously published or written by author person, expect due references has been made to the best of my knowledge and belief.

DEDICATION

This thesis dedicated to my Parents and my motivation(S)

For their endless love, support and encouragement.

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All command to ALLAH whose blessing and splendor thrive me thoughts, and prospered my aims by giving me brilliant teachers, supporting parents, my motivation(s), and extraordinary friends, for giving me potential to successful completion of my research. I would like to state my utmost gratefulness to te people who have helped and supported me during my research.

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Abstract

While the devolution of fiscal liabilities is the focus agenda of the governments now a days, so in this regard many studies has been done to elaborate the impact of fiscal decentralization on public services and economic growth. In this study we focus on examine the impact of fiscal decentralization on health outcomes, using panel data of 75 economies, for the period of 1972 to 2018. We used the Baltagi and Wu (1999) test to estimate the regressions, as it provides the batter estimation results for missing values and unbalanced data. We employed the health expenditures and Infant Mortality rate to judge the long run and short run impact of fiscal decentralization on health. To capture the effect of fiscal decentralization we employed the four proxies i) Subnational Tax Revenue, ii) Subnational Government Total Revenue, iii) Subnational Government expenditure decentralization and iv) Vertical Fiscal Imbalance. The findings of the study suggest that when lower level of governments enjoys the liberty of decision making regarding revenue and expenditure, they influence the health sector positively. As our results shows that proper fiscal decentralization process increase the proportion of health spending in GDP and decrease the infant mortality rate. While the dependency on federal transfer lead to have a negative impact on health. The disaggregated results of different level of economies (i.e. High, Medium, and Low Income Economies) has been produced, which will help in comparing the impact of fiscal decentralization on different level of economies.

Chapter 1:

1. Introduction

It has been seen over the past few decades that various developing and transitional economies adopted fiscal decentralization. Policy agenda behind the fiscal decentralization is to provide better social services to the citizens. Fiscal decentralization refers to the devolving the fiscal liabilities by the central government to the local level of the governments for the purpose of increasing the efficient ability in public service delivery and lead to enhance economic prosperity and development (Ewetan, 2016). The "Decentralization Theorem" shows that if there are various priorities for public goods between administrative units, the availability of these goods by federal government on equity basis will generally obtain a low level of efficiency than one that can be achieve by a decentralized provision that allows for disparities within the jurisdictions (Oates, 1972). Oates further describe that it may efficiently make available higher level of economic prosperity in allocation of public resources.

Health sector is one of the key determinant of growth and development of the nations, countries invest in health and education which provide better human capital, which further lead to obtain high level of economic growth. Among many other measure of improving social welfare, fiscal decentralization is one of the important factor which support to enhance the performance of public services delivery.

Decentralization has been the top priority among the policy makers to obtain the benefits of health services at lower level. Decentralization involve shifting of decision making power and authority over management of public health care affairs from federal government to subnational governments. It improves the efficiency of public health goods and services delivery, as the policy maker are closer to local community. It is obvious that devolving the decision making powers to local level will help in maintaining the equity and efficiency, which lead to improved health outcomes, and ultimately obtain improved human capital.

Moreover, decentralization is the process in which governments devolve their financial and administrative powers to the local level of government for the purpose of achieving high level economic prosperity. Decentralization, helps in better provision of public services delivery and more particularly it also promotes health care facilities which lead to obtain batter health outcomes and ultimately better human capital. Centrally managed public services delivery such as Health

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and Education fails to achieve higher level of desire outcomes, rather it should be managed locally. It works on the assumption that the local decision makers are closer to the locality, they batter understand the circumstance and needs of local people, reducing information asymmetries. They can make prompt decision according to the situation and the desires of territory. Further, local authorities can better utilize the resources than a centralized authority, which lead to reduce the cost and wastage of extra resources.

Decentralization also promote community participation which helps in defining the real problems, as the result it reduces cost and focus the exact location and group of people. This is ultimately beneficial for both government and public. Local people also get a suitable channel where they can express their desires. And because of electoral system local authorities are accountable to the local people, they utilize the latest and cost effective techniques to enhance the public services delivery. It encourages the innovation in government policies and promote competition among different governments in provision of public goods.

Decentralization also brought some demerits along with its implications, especially in case of developing countries. This is the fresh debate among the policy makers that, in developing countries the local institutions do not acquire such kind of administrative capacity to implement the process of decentralization properly.

Various developing and developed nations has experienced fiscal decentralization as a policy tool in health sector, outcomes of fiscal decentralization vary across the countries. A lot of work has been done on this topic, but most of the studies relies on case studies or country specific data, and macro level studies include only developed or OECD countries. So, the results of these studies are difficult to generalize. There is hardly any study which deal with both developed and developing countries. So in this study we will bridge the gap by analyzing the impact of fiscal decentralization on health care services by utilizing the data from both developed and developing countries (including Developed, Developing and OECD countries).

1.1 Back ground of Study:

Theory of fiscal federalism concern with the vertical distribution of fiscal powers among the different tiers of governments i.e. Federal to Local. Till 1990s the concept of fiscal federalism was not so much in focus in the fiscal policy decision making, but since last three decades this topic has been emerge in both developed and developing nations. Fiscal Federalism theory is divided

in two eras i.e. the First Generation Theories (FGT) of fiscal Federalism and the Second Generation Theories (SGT) of fiscal Federalism.

The FGT of fiscal federalism refer to the process where the central government, while striving to obtain efficiency and equity, distribute the responsibilities to the local level governments. While the FGT which focuses the significance of transfers for reduction vertical and horizontal imbalances, the SGT elaborate much focus on motives made by sub-national tax collection for enhancing the economic development (Chandra, 2012).

Globally, the countries of the world are competing with each other in gaining the economic growth, for this purpose they use different tools of economic growth. Decentralization is also a one of the tool which can be frequently used in both develop and under developing countries. Because the federally managed resources do not perform successfully, as they are unable to match the exact needs of the local peoples. So the governments rush towards decentralization of public services delivery almost since last three decades, as it successfully meet the social needs of the locality. Decentralization include the devolving of the administrative, political and fiscal powers to the local governments. In this study we discussed the fiscal aspect of decentralization, although both developed and developing countries are adopting the structure of fiscal decentralization very fiercely, but the develop countries shows much more good progress than less develop countries. The reason is this that the developing countries face some administrative capacity issues to extract the good results of fiscal decentralization, while on the other side there is no political will to devolve the powers from center to local level of the government in most of the developing countries.

In decentralization process the policy makers are accountable to the local authorities, that's why the transparency can be easily maintain. The fresh debate among the policy makers is that whether decentralization maintain the quality, equity, efficiency and accountability. (Schwartz et al. 2002), elaborate in their study that if the fiscal decentralization process is not designed well or implementation is not politically motivated, then the consequences of fiscal decentralization are not as good as should be.

To gain the human capital governments invest in health and education which provide the healthy and educated workforce, which further return long run economic prosperity. (Devine, 1985 and O'Connor, 1979) inform that governments made expenditures in health and education sector to

obtain the more productive workforce, which leads towards growth of economy with the help of batter and skilled labor. So, now a days the fiscal decentralization is very ideal choice of the policy makers in provision of social services to the masses.

1.2 Research Objectives:

Main objective of this study is to examine the impact of fiscal decentralization on the provision of public health. Moreover, we will explore whether fiscal decentralization influence policy making regarding public health services. There are some capacity issues attached with implementation of fiscal decentralization in case of developing countries, so we will find how the outcomes of fiscal decentralization vary across the different level of economies. Moreover, we will also find out whether fiscal decentralization is a useful policy instrument in provision of public health services.

1.3 Research Questions:

    i)   How the fiscal decentralization effect the health sector at local level?

    ii)   Whether Fiscal Decentralization performs as a useful policy tool to improve the public health provision?

    iii)   How the results of Fiscal Decentralization vary across the different level of economies?

1.4 Significance of Study:

The trend of decentralization of health services becoming more obvious in many states. The significance of decentralized governance of health systems as to improve decision making at local levels in different tiers of health service delivery is constantly growing.

This effort is an important contribution to add up to the body of available knowledge. This study contribute in fiscal decentralization literature in various manner which has not been done before to best our knowledge. As we analyze the impact of fiscal decentralization on health sector, using the panel data of 75 countries including Developed, Developing and OECD countries, which will inform the policy makers about decision making regarding fiscal decentralization of health sector at local level. Further, we also generate the results of disaggregated economies (i.e. High, Middle and Low income economies) will also help in analyzing the differences in outcomes of fiscal decentralization in different level of economies.

1.5 Organization of Study:

First chapter of this study provides the detailed introduction about decentralization, while second chapter discuss the theoretical and empirical literature related to impact of fiscal decentralization on economy, public services previsions, and health sector. Chapter three contains the detail about

methodology, dataset, sample selection, and estimation technique. While fourth chapter consist of empirical results and discussion of the regressions, and finally the chapter of summery and conclusions also include policy recommendations and limitations.

At the end we added the appendix for the results of different level of economies (i.e. High Income, Middle Income, and Low Income).

Chapter 2:

2. Literature Review

This chapter provide the theoretical and empirical literature of fiscal decentralization and its impact on overall economic growth, public services and health services specifically. We start with discussing the concept of decentralization. Next, we have elaborated the correlation between fiscal decentralization and public services and health sector respectively.

2.1 Concept of Decentralization:

As we have briefly explained in introduction that process of devolving the decision making powers to local level of governments, called decentralization. Decentralization may be of different kind i.e. political, administrative and fiscal decentralization. A complete and comprehensive decentralization process involve all these three kinds. Decentralization may be separated in three different types i. Deconcentration, ii. Delegation, iii. Devolution. In deconcentration, the central government transfer the activities which was previously carries out by it. But the authority of decision making rest with central government, so that local representative remain accountable to the center. In this kind of decentralization local authorities are not fully independent in decisions making, this kind of decentralization mostly run in unitary government system.

Next, the second type of decentralization is delegation which refers to the devolving of some pre-defined activities to the local level along with instructions by the federal government. In this type of decentralization local governments are partially independent in decision making, while the ultimate authority of re-allocation of resources is with central governments. Mostly, in this kind of decentralization involve the devolution of fiscal resources. Since the ultimate authority of decision making is laying with federal governments, that's why this kind of decentralization have some features of principal agent model. While Federal government act as principal and local governments as agent. This kind of decentralization is mostly adopted by the federal governments of newly independent countries.

While the third type of decentralization is devolution, this is the perfect and most recent type of decentralization, most of the developed adopted this technique. This type is somehow different from both of previous types of centralization, the reason is this local government hold the complete control of decision making over fiscal resources, hence the decisions are being taken according to the local need, and ultimately accountable to the local constituencies. Briefly, in this process the

local governments retain full responsibility of fiscal and allocative decision making authority to them, with no interference by the central government.

2.2 Fiscal Decentralization and Public Services:

As decentralization has been a topic of interest among the policy makers since last few decades, so plenty of literature is available on this topic. Many experts express their opinions to elaborate different aspect of decentralization. Basically decentralization meant with transfer of decision making powers from federal government towards lover level of governments. The goal of this is to enhance the public service delivery boosts the competence of local institutions and ultimately achieve provision of improved public services of citizens i.e. Health and education etc. within the country.

Musgrave (1959) suggest that public segment should interfere in the economy in order to cope the inefficiency of the marketplace, Musgrave urge that government should intervene to (I) attain equitable distribution of resources, (II) maintain employment and attain high level of price stability, (III) and create an efficient pattern to use the resources. Decentralization theorem suggest that, fiscal decentralization enhance the economic development and increase the effectiveness of institutions in delivery of public services. Since previous few decades many developing and developed countries adopted decentralization in various sector of government to attain efficient level of growth. While the transfer of authoritative powers to the lower levels shows the positive impression on public services delivery, since locally managed services are better suits to meet the different local wants than federally administrative services (Oates, 1972). Further, traditional theory of Fiscal Federalism suggest that decentralization enhance the economic efficiency which encourage the decision makers to adopt the decentralization reforms (Oates, 1999).

If we examine the effects of fiscal decentralization on overall economic development of any country literature tells us different results, in developed countries there is a positive impact of fiscal decentralization on economic development but in case of emerging economies because of some capacity and accountability issues fiscal decentralization fails to bring out its fruits. Rodriguez-Pose and Kroijer (2009), consuming data of 16 Central and Eastern Europe (CEE) countries found that Fiscal decentralization negatively correlated with economic development in CEE nations during the period of analysis.

A research was conducted to examine the impact of fiscal decentralization on poverty decline and public service delivery in côte d'ivoire (Ivory Coast, West Africa). In this study Sanogo, (2019) suggest that when sub-national governments have autonomy over generation of revenue, it reflects the batter access to the public services and also helps in poverty reduction. Many scholars suggested in their studies that fiscal decentralization perform much batter in develop countries. Fiscal decentralization bring its fruits up to a specific level according to the capacity of the governments. If one implies it beyond that specific level, which is the higher then the capacity of the governments, it will be detrimental for the public sector efficiency (Adam et al., 2014). Although decentralization paly vital role in social and economic development, but it is not an ultimate tool of overall economic growth. As far as it increase the social and economic development, it also negatively affect the international trade i.e. import and export services (Chygryn et al., 2018). In case of public spending the fiscal decentralizations support in a way that more fiscal resources are available to the lower tier of the governments, so the effectiveness of self-government further increase (Kwon, 2003).

Fiscal decentralization also enhance the level of public sector employment, although due to decentralization the central public employment reduce but this reduction could be offset by far more increasing in employment at local level, (Martinez-Vazquez and Yao, 2009).

In a country specific study Akpan, (2011) observe the impression of fiscal decentralization on social outcomes in Nigeria (36 states). While examining the impact of fiscal decentralization on child mortality rate and literacy rate author find out that higher level of fiscal decentralization helps in lowering the infant mortality rate enhancing the literacy rate in the areas of study. Because local management and decision makers are nearer to the population they batter know the necessities of any particular territory. When local governments financed their education expenditure with their own local revenue they tend to increase education quality and also enhance the enrollment (Ahmad, 2016).

(Diaz-Serano and Meix-Liop, 2019), suggest in a study that, fiscal decentralization have positive effect on public services delivery, while the political decentralization do not shows clear results about successfully provision of public goods. In a country specific study of Pakistan Rauf at al. (2017), find out that local government's autonomy in expenditures assignments enhance the public services delivery (Education sector), while fiscal transfer deteriorate it. So the results of this

research work confirms one of the assumption of fiscal decentralization that local governments should be independent enough in revenue generation and expenditure assignments to fully acquire the benefits of fiscal decentralization.

2.3 Fiscal Decentralization and Health Services:

After discussing the impact of fiscal decentralization on provision of public services, now we narrow down our discussion to our concerned topic. Decentralization, other than achieving economic growth also has a significant importance in delivering public services. In health sector when powers are devolved from central govt. to local government it increases the efficiency of health services. Literature inform us that due to fiscal decentralization there is a significant improvement in public health outcomes.

Robalino et al. (2001), conducted a research work to assess the influence of fiscal decentralization on health outcomes, they used political rights and corruption as an explanatory variables and found that the institutions which promote the political rights they have positive impact of fiscal decentralization on infant mortality rate. Moreover, fiscal decentralization performs as an instrument of improving health results in the environment of high level of bribery.

Habibi et al. (2003) assed the human development in Argentina using the panel data of twenty-five years using Education and health as outcome variables, they conclude that allowing provinces to generate revenue by their own resources will helps in reducing the infant mortality rate. Similarly, Asfa et al. (2007) using the data of rural India from the period of 1990 to 1997 found that fiscal decentralization has negative effect on child mortality rate, but without proper politics decentralization or community participation effectiveness of fiscal decentralization is compromise.

The outcomes of decentralization vary across the countries and regions. Khalighian, (2003) assess the case of immunization provision in lower and middle income economies, and explore that in lower income economies the decentralization performed well in immunization coverage. While in middle income economies centralized provision of immunization performed well instead of decentralized one.

Cantarero and Pascual (2008) found through a study that Life Expectancy is positively correlated with health care decentralization and per capita income, while infant mortality rate is negatively linked with health care decentralization and per capita income. Results of the decentralization may

vary among the nations according to their internal political and economic structure. Fiscal decentralization in Canada shows positive contribution in growing the population health (Jimé´nez Rubioa, 2011). Same author conducted a research work to analyze the effects of fiscal decentralization on health services using 20 OECD countries and find that if local governments enjoy the fiscal autonomy they leave important influence on the efficiency of public policy which improve the health services outcomes.

Soto et al. (2012), investigate the influence of fiscal decentralization on health results consuming ten-years data (1998 to 2007) from the 1080 municipalities of Colombia, they employee the child mortality rate as a health outcome indicator. And conclude that fiscal decentralization helps in reduction of infant mortality rate, further they also found that effectiveness of fiscal decentralization is much higher in rich municipalities than poor municipalities.

Uchimura and Jutting (2009), using panel data of 26 provinces of china during the period of (1995 to 2001) conduct a study and suggest that strengthen the fiscal autonomy of the lower tier of the governments (especially in case of developing countries) is necessary to attain higher level of health outcomes. They also elaborate that low level of governance in local institutions hinder the provision of public health services.

Cavalieri and Ferrante (2016) studied the impact of fiscal decentralization on health outcomes across the 20 different regions of Italy, they employed the infant mortality rate to check the health outcomes and vertical fiscal imbalance and tax revenue decentralization as a proxies of fiscal decentralization. They found out a positive and unambiguous impression of fiscal decentralization on health outcomes. Further, they also revealed that fiscal decentralization yield different results on infant mortality rate across the different level of regional wealth, in poorest regions of the country it shows more batter positive results.

Along with increasing public expenditures in health sector health services improve, while the overall health condition of the population also increase by declining the infant mortality rate (F. Cuevas et al, 2017). When the public have universal access to the primary health facilities the overall health outcomes improve, with subject to consideration of some pre-conditions while implementing the decentralization (Nishijima, 2018). (Mbogori and Iravo, 2019) assessed the effect of fiscal decentralization on health consequences in Kenya, consuming the Immunization coverage and number of skilled delivery as health indicators. In this study they founded that, the

fiscal decentralization has a positive and significant impact on health consequences. So the common results of all the studies either they are country specific or group of countries shows that the fiscal decentralization is a useful policy tool to improve the public health outcomes. But with subject to fulfilling the conditions of prerequisites and proper will of implementation of decentralization process.

2.4 Literature Summary:

The previous literature provides sufficient theoretical and analytical evidence of linkages between decentralization and delivery of public service and economic development within the countries. We conclude that, fiscal decentralization has very important role in delivery of public health facilities, and it also responsible for improving the population health with in a country. But with subject to some conditions, which include, capacity of local institutions and community participation in context of political rights. Most of the previous studies relay on country specific data or focus on developed countries. There is hardly a study which covers both develop and developing countries. So in this case it is difficult to generalize the results perfectly. This study will bridge the gap on the basis of existing knowledge by including 75 develop and developing countries. This study will add up valuable insight in the existing international literature regarding the subject of study.

Chapter 3:

3. Data and Methodology

This study plan to investigate the impact of fiscal decentralization on health sector, which cover the 75 developing and developed countries for the period of 1972 to 2018. This chapter contains the theoretical framework, conceptual framework, and model specification, brief explanation of variables, estimation technique, sample selection and source of data.

3.1 Theoretical framework: Impact of fiscal decentralization on health Sector:

Fiscal decentralization is known as the transformation of fiscal responsibilities to the local governments. The assumption on which the fiscal decentralization rely is, the local decision makers are well aware of local circumstances rather than center, so they can batter fulfill the local needs. On the other hand the public get a suitable channel to convey their problems, and local decision maker can batter deal with their problems, as they can use different experimental techniques of resolving the problems. The main role of local administration is this, they can utilize the financial resources efficiently and reduce the costs rather than central managers. So if the decentralization is properly designed and are politically motivated implemented will gain the equity, efficiency, quality in health care services, which will further provide batter health outcomes (Schwartz et al. 2002). Accountability is also a very useful indicator of decentralization through electoral system, because the local decision makers are elected from the local population that's why are held accountable to the locals. And if they do not perform well they will be replaced by another. For example the hospitals through local decision makers are accountable to the local electoral.

When local level of governments have liberty in political and administrative decisions making regarding financial matters, health services provision will be improve (Uchimura and Jutting (2009) Jime´nez Rubioa, (2011)). While the administrative structure, and living standard of masses vary across the region/localities, so there is a fear that fiscal decentralization will create inequalities. Because the poorly administrated local governments fail to get the benefits of decentralization, while the strongly administrated governments will perform batter and gain the benefits of fiscal decentralization, same in the case of poor regions they can't collect enough revenue to fulfill their local needs, so they have to rely on central governments (Shen and Zu, 2015).

The public health services acquire the properties of merit /public good, that's why the problem of free ride may emerged. Therefore, due to the problem of free riding an unequal distribution of resources may also emerged across the population. To avoid the problem of free riding the intervention of local administration is very important.

The above discussion revealed the assumptions and techniques of a successful fiscal decentralization process. So, the theory of fiscal decentralization based on the fact that it enhance the overall public services delivery and efficient allocation of resources in health sector also at local level. But along with all these stuff the administrative capacity and financial status of the local governments must be keep in mind while implementing the decentralization.

3.2 Conceptual Framework:

Decentralization is a process of devolving powers to local tier of the government. In a perfect decentralization process, local governments are independent in decision making regarding revenue generation and expenditure assignment with subject to institutional performance. The following figure presents the devaluation map, where it is elaborated that local governments generate revenue from direct and indirect taxes as well as fees at local level, while expenditures are utilized in public investment and provision of social services to the general public. But all of this cannot be achieved without having high level of accountability and transparent institutions as discussed in the second generation theory of fiscal federalism (See Figure 1).
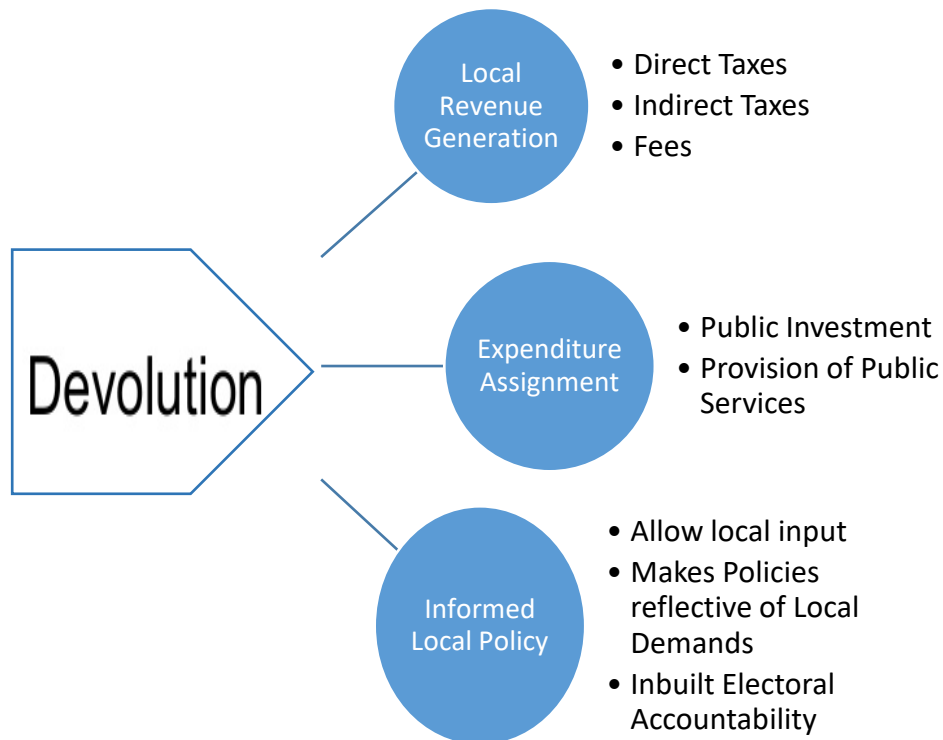
Figure 1: Sources of impact for a successful Local Government system

As a result of fiscal decentralization, fiscal powers are devolved to local level and it enhance the fiscal autonomy of the specific government. The public get a suitable channel of expressing their problems and then resolve them, so the confidence of general public improve on government institutions. Furthermore, public will add input in decisions making which will facilitate to the policy makers in decision making. When the local governments will be independent in decision making and closer to the local people, they will batter aware of the needs of the locality, so they can make better decisions regarding public services delivery. As the result, there is a significant improvement in provision of public services, which will further lead towards improved human capital (i.e. healthy and educated work force). And batter human capital i.e. healthy and skilled labor force will further help in achieving economic growth. Decentralization is also use as a tool of accountability, because the local decision makers are elected from the local population so if they do not perform well they will be replaced. So we can say that decentralization also a tool of achieving accountability.

3.3 Hypothesis:
Study's main hypothesis discuss below:

H₀: Fiscal decentralization has no significant impact on provision of health care facilities.

H₁: Fiscal decentralization does have a positive impact on provision of health care facilities.

3.4 Empirical Model and Variables:

The models we have employed in our study are based upon the (Ahmed, 2016), (Cavalieri and Ferrante, 2016), and (Hababi et al, 2003) studies. In order to investigate the input from the governments we use health spending i.e. Public health expenditure percentage of GDP. This variable reflects the response of local governments to the health sector in short run. So in first equation H denote the health spending which is a dependent variable.

$$lnH_{it} = \alpha + \beta_{11}lnFD_{jit} + \beta_{12}lnDr/Pt_{it} + \beta_{13}lnGDP_{it-1} + \varepsilon_{ij} \qquad \textbf{\textit{i}}$$

In equation (II) *INF* represents the health outcomes i.e. Infant Mortality rate, which is also a dependent variable.

$$lnINF_{it} = \alpha + \beta_{21}lnFD_{jit} + \beta_{22}GE_{it} + \beta_{23}lnPCI_{it} + \beta_{24}lnDRUG_{it} + \beta_{25}lnDr/Pt_{it} + \varepsilon_{ij} \qquad \textbf{\textit{ii}}$$

The *ln* shows the natural log, *i* represents the country and *t* shows time.

- *lnH* is natural log of Public health expenditure percentage of GDP
- *lnINF* is natural log of Infant Mortality rate
- *lnFD* is natural log of Fiscal Decentralization
- *lnGDP* is natural log of Gross Domestic Product (One year lag)
- *lnDr/Pt* is natural log of Physicians (per 1,000 people)
- *lnPCI* is natural log of natural log of Per capita GDP
- *lnDRUG* is natural log of Smoking prevalence in females

3.5 Explanation of Variable:

The Explanation of variables is given below:

Public Health Expenditure Percentage of GDP:

Health spending is a very critical component of national health systems. This variable refer to the general government expenditure spent on health sector. We have employed this indicator as an input variable. It support in measuring the share of GDP, different governments spare for public health. As the literature suggest that higher the level of public service spending as percentage of

GDP, batter will be the output of public service delivery (Mbogori, & Iravo, 2019) and (Ahmad 2016).

Infant Mortality Rate:

Infant mortality is the death rate of newly born children till the age of one year per 1000 live births (World Bank, 2018). We have learnt from the literature that infant mortality rate has been very useful measure to assess the health outcomes. The reason is, it reflects the health of child and pregnant women, furthermore it is quite sensitive to the policy change such as decentralization rather than other indicator i.e. life expectancy (Habibi et al. 2003), (Asfaw et al. 2004), (Uchimura, Jutting 2009), (Dolores Jime´nez Rubio, 2011), etc. Therefore, to assess the long term outcomes, we employee the infant mortality rate as a health care indicator for the reason that local representative's active participation can positively influence better response from the local community.

Fiscal Decentralization:

Our main and very important variable of interest is fiscal decentralization. It involves the shifting of fiscal, administrative and political power of decision making regarding expenditure and/or revenue to the lower tire of the government. In this study we employee three different kind of measures as a proxy of fiscal decentralization. We expect to inform policy making in resource allocation through this variable. We represent these four measures by "j" in above equations.

    i.   Tax revenue decentralization (Sub-nation Government):

Tax revenue capture the share of subnational government's tax revenue to the general government's share of tax revenue.

$$\text{Tax Decentralization} = \frac{\text{SN govt. Tax revenue}}{\text{GG tax Revenue}}$$

    ii.   Revenue Decentralization (Subnational Government):

Revenue decentralization ratio computed the share of subnational governments as the proportion of general government revenue.

$$\text{Revenue Decentralization} = \quad \underline{\text{SN govt. revenue}}$$

GG Revenue

iii.   Expenditure Decentralization (Subnational Government)

Expenditure decentralization is the ratio of different level of subnational government's spendings to the general government spending.

Expenditure Decentralization =   SN govt. spending
                                                  GG spending

iv.   Vertical Fiscal Imbalance (Subnational Government):

This variable indicate the difference between subnational government revenue and expenditures.

Vertical Fiscal Imbalance = 1-   SN govt. revenue
                                              SN govt. spending

Gross Domestic Product:

Gross domestic product is defined as the market value of final goods and services produced in a specific country and within given period of time. On the basis of previous literature Uchimura, Jutting (2009), and Cavalieri, Ferrante (2016) we have incorporated GDP variable in first equation. We took the one year lag of GDP to capture the effect of change in size of GDP of the countries on health expenditures.

GDP Per capita:

GDP per capita derived from the division of gross domestic product by total population, it is very often used indicator in different studies, as it helps in measuring the overall economic performance of the country. Per capita income has positive relation with health. As the wealthier person will choose batter diet and good job rather than a less wealthy person (Jime´nez Rubioa, 2011). On the basis of existing literature (Robalino et al. 2001) and (Mbogori, & Iravo, 2019), we use this variable to indicate the economic condition of the countries.

Doctor to Patient Ratio:

This variable indicate the number of medical physicians available per 1000 population. As increase in ratio of physicians to patients lower infant mortality rate. Therefore, we utilize Doctor Patient ratio (Dr/Pt) to measure the given health facilities in a country.

Smoking Prevalence (Female):

We use smoking prevalence among women as a life style indicator, because smoking is a risk factors with respect to health, and it negatively affect the health indicator.

At the end, we add "ε" standard residual with usual assumption of zero mean. This regression equation will be estimated using statistical software STATA 16.0.

3.6 Sample Selection:

A decent amount of work has been done to assess the impact of fiscal decentralization on public services delivery (i.e. Health and Education etc.). Most of the studies are country specific or about developed/OECD countries, which are difficult to generalize the result because the level of public services delivery regarding health vary across the countries. To overcome this shortcoming, we chose the panel of 75 developed and developing countries for the period of 1970 to 2018. Panel data is consider more reliable over the traditional time series and cross sectional data.

3.7 Data Source:

In this study the main variable of interest is fiscal decentralization, so the IMF's Decentralization Dataset (2018) provide better coverage for the period of 1972-2018. Reaming data of dependent and independent variables i.e. Infant mortality rate, health spending percentage of GDP, GDP, GDP per capita, Physician to patient ratio, Smoking prevalence in female, was obtained from World Development Indicator.

3.8 Estimation Technique:

For the purpose of estimation there are number of statistical model/tests are available. First we run our regression in traditional OLS model, but this model did not showed the desire results. As the wide-range of data set provide batter coverage of different countries and for the number of time period. But the problem with large number of data set is it contain unbalanced dataset and missing observation and non-stationary. The problem of difference in development level, governance, and infrastructure also appear in a large number of data sets. In spite of all these things panel data is very useful measure to carry out policy analysis, because unlike cross sectional studies, it covers

the unabsorbed individual effect of different countries. Furthermore, the results of country specific studies are difficult to generalize.

A large range of panel data contain serial correlation, most of the researcher use fiver year average to overcome this problem. But in case of unbalanced panel data it is unable to utilize this technique, because of incomplete coverage of observations in data. Now we were in need of an estimation technique which consider both autocorrelation and heteroscedasticity. We used Hausman specification test to our equations, to decide whether we use Fixed Effect or Random Effect model for estimations. Because, fixed effect model is very useful estimation for panel data, while random effect model controls the variation among various decentralization status across the countries. The results of Hausman test showed that Fixed Effect model will be suitable, and generate more efficient and suitable results.

As we have an unbalanced panel data which contain missing observations, therefore we need an estimation technique which deal with this problem. And also yield more efficient results in presence of serial correlation and Fixes Effect for heterogeneous countries. Baltagi & Wu (1999), is most appropriate estimation technique in dealing with such kind of data.

Table 1:

Variables Definition and Data Source:

Variable		Definition	Data Source
Health expenditure percentage of GDP	H (Health Spending as share of GDP)	Public Health expenditure by govt. in real US dollars.	World Bank's (2014) fiscal decentralization indicator
Infant Mortality rate	INF (Infmort)	Numbers of infant dies with in the first year of life, per 1000 live birth.	World Bank's (2014) fiscal decentralization indicator
Sub National govt. share of tax revenue	Fdtax	Subnational tax revenue as percentage of total government tax revenues.	IMF's (2018) fiscal decentralization dataset.
Sub National govt. share of total revenue	Fdtpr	Total Subnational revenue as percentage of total government revenues.	IMF's (2018) fiscal decentralization dataset.
Sub National govt. expenditures.	Fdexp	Ratio of subnational government spending to central government spending	IMF's (2018) fiscal decentralization dataset.
Vertical fiscal imbalance.	VFI	Mismatch between sub-national government revenue and expenditures.	IMF's (2018) fiscal decentralization dataset.
Doctor Patient Ratio	Dr./Pt	Numbers of physicians available relative to patient admitted in hospital (per 1,000).	World Bank's (2014) fiscal decentralization indicator
Per Capita Income	PCI	GDP per capita income of residents.	World Bank's (2014) fiscal decentralization indicator
Drug Usage	Drug	Prevalence of smoking and among women.	World Bank's (2014) fiscal decentralization indicator

Table 2:

Justification for list of variables:

Sr. No	Variable	Sources
1	Health Expenditures (Dependent Variable)	Mbogori, & Iravo, (2019),
2	Infant Mortality rate (Dependent Variable)	Habibi et al. (2003), Asfaw et al. (2004), Uchimura, Jutting (2009), Dolores Jime´nez Rubio, (2011), etc
3	Fiscal Decentralization (Independent Variable)	Habibi et al. (2003), Asfaw et al. (2004), Uchimura, Jutting (2009),
4	Gross Domestic Product	Uchimura, Jutting (2009), Cavalieri, Ferrante (2016).
5	GDP Per Capita (Control Variable)	Robalino et al. (2001), Mbogori, & Iravo, (2019), Habibi et al. (2003)
6	Doctor Patient Ratio (Independent Variable)	Author's view
8	Smoking prevalence among female (Control Variable)	Jime´nez Rubioa (2011)

Chapter 4:

4. Empirical Results and Discussions

The aim of this research is to explore the relationship of fiscal decentralization and health sector, either fiscal decentralization boosts the performance of health sector or not. In this regard we have developed economic models and choose suitable estimation techniques, which has been discussed in previous chapter. To test the economic model of our study we have done estimations which will be presented in this chapter. It start with the summery statistics, followed by the results and discussions of health input and output i.e. health spending and infant mortality rate.

4.1 Descriptive Statistics:

Descriptive statistics is an initial stage of data estimations, as it describe the various details of the variables of study. It helps in analyzing the behavior of data. Mean is very common used indicator in measure of central tendency. While standard deviation shows the spread in data, this is very useful technique to measure the degree of dispersion in data set. Higher the level of standard deviation higher will be the disparities in dataset and vice versa.

Table 3: Summary Statistics

Variable		Mean	Std. Dev	Min	Max	Observations
Tax revenue decentralization, Subnational govt.	Overall	0.191	0.172	0	0.997	N = 1822
	Between		0.178	0	0.996	n = 75
	Within		0.059	-0.135	0.647	T-bar = 24.293
Revenue decentralization, Subnational govt.	Overall	0.187	0.149	0	0.892	N = 1413
	Between		0.154	0.002	0.874	n = 71
	Within		0.051	-0.055	0.787	T-bar = 19.901
Expenditure decentralization, Subnational govt.	Overall	0.287	0.171	0.002	0.816	N = 890
	Between		0.172	0.007	0.804	n = 60
	Within		0.035	0.092	0.464	T-bar = 14.833
Vertical Fiscal Imbalance, Subnational govt.	Overall	0.448	0.267	-0.759	0.98	N = 943
	Between		0.248	-0.082	0.929	n = 61
	Within		0.113	-0.509	0.868	T-bar = 15.459
Infant mortality rate, per 1,000 live births	Overall	45.253	39.423	1.6	219.3	N = 10355
	Between		33.046	4.485	142.867	n = 239
	within		20.783	-37.243	168.683	T-bar = 43.326

Current health expenditure, percentage of GDP	overall	6.23	2.729	1.025	25.475	N = 4160
	between		2.574	1.987	16.879	n = 234
	within		0.932	0.715	18.74	T-bar = 17.778
One year lag value of GDP (Constant 2010 US$)	overall	1.64E+12	5.82E+12	2.14E+07	1.64E+12	N = 10157
	between		4.96E+12	3.02E+07	4.43E+13	n = 252
	within		2.24E+12	-2.35E+13	3.78E+13	T-bar = 40.3056
GDP per capita, constant 2010 US $	overall	11578.83	18136.25	161.734	1.96E+05	N = 10392
	between		19086.8	262.927	1.41E+05	n = 252
	within		5545.402	-3.40E+04	76297.58	T-bar = 41.238
Smoking prevalence among female (percentage of adults)	overall	11.754	11.265	0.1	68.1	N = 1678
	between		11.031	0.189	50.411	n = 187
	within		2.346	3.343	35.543	T-bar = 8.973
Physicians available per 1,000 people	overall	1.69	1.365	0.001	8.422	N = 4504
	between		1.142	0.026	5.692	n = 253
	within		0.55	-3.18	5.962	T-bar = 17.802

Source: Authors' Calculation.

Mean of our first variable shows that, on average 0.191 percent of total tax revenue generated by sub-national governments, but it vary across the countries as shown the range i.e. from 0 to 0.99 percent. Within-country variations are shown in third row against every variable, in case of sub-national government tax revenue standard deviation shows 0.059 percent of value. Sub-national total revenue also have 0.187 percent of mean value. Value of standard deviation and large range indicate that there are disparities across the observations of the sample. Similarly, mean value of sub-national government expenditure share is 0.287 percent. While the low level of tax revenue generated by the sub-national governments they mostly depends on transfer from central governments. As the proportion of sub-national tax revenue is low, the percentage of vertical grants is 0.448.

In respect of our dependent variables, proportion of infant children who dies within the one year of their birth is 45 on average out of 1000 live births, and on average different governments spend 6 percent of their GDP for health services, but with large disparities across the sample and it implies the whole data.

While in control variables, mean of GDP lag value is 1.64 (billion US$), while GDP per capita stands 11578.83 (per annum, US$) on average. Smoking prevalence among adult female as life style variable indicate that, on average 11.75 percent females are additive to smoke among the whole population of the country. Finally, on average approximately 2 physicians are available (per 1000 people).

4.2 Results and Discussions:

Empirical testing of the economic model is very essential to check the validity of theory. So in following we have presented the empirical results of our models. In addition, Hausman test recommended us to use FE model, while Baltagi and Wu, (1999) discussed more detail in baseline regression.

4.3 Health Expenditure Outcomes:

Table 4 shows the empirical results of health expenditure for overall sample. Effect of fiscal decentralization was capture by following four measures:

i.   Subnational Tax Revenue.

ii.   Subnational Total Revenue.

iii.   Subnational Expenditures.

iv.   Vertical fiscal Imbalance

The empirical evidence shows that various fiscal decentralization indicators shows different impacts. As shown in table that subnational tax revenue has positive and significant relationship with health expenditure, it means that rise in subnational tax revenue cause in increasing health spending. More statistically speaking a 1 percent increase in subnational tax revenue will reflect 0.027 percent increase in health spending.

The second measure of fiscal decentralization also shown the similar results as the previous indicator, it has positive and significant relationship with health spending, it suggest that increase in resources generated by the local level of the governments will positively affect the health spending. Empirical results elaborate that a 1 percent increase in total local level of revenue will response in 0.632 percent increase in health spending. If we compare the results both of these measures we will come to know that, health spending respond much more while change in subnational total revenue rather than subnational tax revenue. Which indicate that sub-national governments should be independent enough to raise their own revenue. Next, positive correlation

between health spending and subnational expenditure indicate that when subnational governments increase their own expenditures it will tend to increase in health spending too. This shows that subnational governments do not ignore the health sector while increasing the overall expenditure. The forth measure vertical fiscal imbalance shows the difference between subnational government spending and revenue. So the base line regression suggest that mismatch among subnational spending and revenue will cause in increasing health spending for the overall sample. Our results are supported by the Mbogori, & Iravo, (2019), they also found out that the health expenditure has positive relation with health sector input.

Table 4: Baseline regression for Health Expenditure.

Dependent variable: Health Expenditure percentage of GDP.

Variables	1	2	3	4
GDP	0.065***	0.07***	0.066***	0.072***
	(16.31)	(16.05)	(14.48)	(16.02)
Physician per 1,000 people	-0.021	-0.02	-0.027	-0.003
	(-0.97)	(-0.92)	(-1.08)	(-0.13)
Tax revenue Decentralization , Subnational govt.	0.027**			
	(2.53)			
Revenue Decentralization, Subnational govt.		0.063***		
		(3.55)		
Expenditure Decentralization, Subnational govt.			0.025	
			(1.32)	
Vertical Fiscal Imbalance, Subnational govt.				0.043*
				(1.74)
Constant	0.491***	0.458***	0.469***	0.22***
	(28.84)	(26.21)	(25.59)	(10.75)
Total Observations	761	578	496	527
Countries	64	55	48	51
Average Observations	11.9	10.5	10.3	10.3
Maximum Obs.	17	17	17	17
Hausman test Chi2	30.60	55.40	16.47	11.42
(p-value)	0.0000	0.0000	0.0009	0.0097

Note: All variables are in log form, while the GDP log is contain one year lag. FE model estimated using the Baltigi and Wu (1999). *** p<.01, ** p<.05, * p<.1.
Source: Authors' Calculations.

One year lagged value of GDP have positive strongly significant relationship in all four models, which shows the commitments of governments for health sector that increase in general expenditures of the governments does not lower the health spending for the overall sample.

Finally, results suggest that physician to patient ratio has an inverse relationship with health spending in all fiscal decentralization measures. Which indicate that increase in health expenditures as percentage of GDP tend to reduce the number of physician per patient.

4.4 Outcomes for Infant Mortality Rate:

To measure the health quality we have employed infant mortality rate as outcome variable. In addition to health expenditure we have included three more explanatory variables along with fiscal decentralization to estimate the infant mortality rate. And again Hausman specification test suggest to use FE model.

Subnational tax revenue has negative impact on infant mortality rate, which indicate subnational autonomy regarding tax revenue tend to reduce the infant mortality rate, however the result are insignificant in base line regression for overall sample. Empirical results inform that a 1 percent increase in subnational government tax revenue will lead to 0.013 percent decrease in infant mortality rate. Second measure of fiscal decentralization also generate similar to subnational tax revenue results. The negative sign shows that increase in subnational total revenue tend to reduce the infant mortality rate. In this regression number shows that a 1 percent increase in subnational total revenue will lead to decrease infant mortality rate by 0.037 percent. The findings of both these indicators match with (Habibi et al, 2003), who also found out that tax revenue decentralization, and total revenue decentralization has negative impact of infant mortality rate. Various other studies also confirm the results (Soto et al., 2012; Uchimura & Jutting, 2009 and Cavalieri & Ferrante, 2016).

Subnational expenditure decentralization also negatively correlated with infant mortality rate, estimation results shows that a 1 percent increase in proportion of subnational expenditure will result in 0.018 percent decrease in infant mortality rate. By analyzing the behavior of these measure we can conclude that higher level of subnational autonomy helps in improving the health outcomes. (Cantarero and Pascual, 2008) (Robalino et al., 2001) also find the results similar to us.

Vertical fiscal imbalance is positively correlated with dependent variable. As the increase in mismatch between subnational revenue and expenditure will lead too increase in infant mortality rate. More will be the difference in spending and revenue of subnational government, higher will be the mortality rate among infant children. Which indicate that fiscal deficit at sub-national level is not good for health sector. Our findings are supported by the (Cavalieri & Ferrante, 2016) study.

We used the dependent variable i.e. Health expenditure percentage of GDP of previous equation, as an independent variable to analyze the changing effect of health expenditure on infant mortality rate. Result shows that health expenditures are negatively correlated with infant mortality rate in two of fiscal decentralization measures i.e. Subnational Tax revenue decentralization and Subnational Total revenue decentralization. While in other two measures it shows positive correlation. One explanation for this is that when subnational governments are independent in decision making regarding revenue generation, central government's health expenditure reduce the infant mortality rate. While in case of Expenditure decentralization and vertical fiscal imbalance, subnational governments face corruption and lack of administrative capacity issues respectively.

GDP per capita shows the positive and significant correlation with infant mortality rate in all fiscal decentralization measures. Which indicate that an increase in GDP per capita of the residents in a country tend to increase the infant mortality rate in overall sample. Our findings contradict from the results of (Robalino et al., 2001), (Habibi et al., 2003). While prevalence of smoking among the female shows the negative and significant correlation with infant mortality rate. The finding of (Jime´nez Rubioa, 2011) are different from us, the reason of contradiction among the findings can be that their studies are either country specific or contain a specific group of countries while we are taking the large sample i.e. 75 countries.

Finally, the ratio of physicians to patients is positively correlated with infant mortality rate, but the results are insignificant.

Table 5: Baseline regression for Infant Mortality Rate.

Dependent variable: Mortality Rate per 1,000 live births.

Variables	1	2	3	4
GDP per capita	0.116*** (5.86)	0.167*** (8.44)	0.189*** (8.45)	0.179*** (8.14)
Public Health Exp. percentage of GDP	-0.19 (-0.73)	-0.014 (-0.42)	0.003 (0.07)	0.056 (1.58)
Smoking Prevalence among females.	-0.166** (-2.26)	-0.234*** (-3.45)	-0.234*** (-3.09)	-0.257*** (-3.46)
Physician per 1,000 people	0.003 (0.23)	0.002 (0.14)	0.004 (0.25)	0.002 (0.11)
Tax revenue Decentralization , Sub-national govt.	-0.013 (-1.15)			
Revenue Decentralization, Sub-national govt.		-0.037 (-2.18)		
Expenditure Decentralization, Sub-national govt.			-0.018 (-0.96)	
Vertical Fiscal Imbalance, Sub-national govt.				0.035 (1.15)
Constant	0.065*** (18.00)	-0.129*** (-29.76)	-0.18*** (-33.23)	-0.105*** (20.09)
Total Observations	406	319	276	289
Countries	64	54	48	51
Average Observations	6.3	5.9	5.8	5.7
Maximum Obs.	8	8	8	8
Hausman test Chi2	815.27	815.44	764.70	687.12
(p-value)	0.0000	0.0000	0.0000	0.0000

Note: All variables are in log form. And FE model estimated using the Baltigi and Wu (1999). *** p<.01, ** p<.05, * p<.1.
Source: Authors' Calculations.

Chapter 5:

5. Summary and Conclusion

Since the primary motive of this study is to analyze the impact of fiscal decentralization on health sector. To check this relationship we incorporate the input and output of the health sector, as the governments analyze the short-run and long-run variations in their policies. To carry out the policy reforms financial resources are required, it capture the short-run affects. While long-run result are measures by the results of the specific policy reform. The health expenditure has been used to analyze the short-run effects of fiscal decentralization on health input, while infant mortality rate measured the long-run output of decentralization reforms for health sector.

Empirical results of this study provide that different decentralization measures provide different results. The main findings of this study suggest that when sub-national governments generate their own tax revenue, they are capable enough to raise health spending to control infant mortality rate. Overall, revenue generation and expenditure assignments has positive relationship with health spending. It recommend that the sub-national governments should be independent enough in decision making regarding revenue generation and expenditure assignment, as it will boosts the performance of subnational governments.

In case of long-run health outcomes which were measured by infant mortality rate, also generate similar result as health expenditures except vertical fiscal imbalance. It shows that highly reliance of subnational governments on federal transfer will have a negative effect on health results. And when the sub-national governments will not be capable enough to deal with fiscal deficit it will negatively affect the health outcomes. So the capacity issues of sub-national government also consider while implementing the fiscal decentralization at sub-national level. And in revenue generation and expenditure assignment, higher autonomy of sub-national governments will lead to generate the batter health outcomes, as the empirical evidence suggest that infant mortality rate have negative relationship with all three fiscal decentralization i.e. Tax revenue decentralization, revenue decentralization, and Expenditure decentralization.

Governments used different policy measures to improve social services within the countries, and fiscal decentralization is one of them. This study provide the evidence that lower level of government are in better position to access the demand and needs in heath sector.

5.1 Policy Recommendations:

This study provide a handsome results, on the basis of with can deliver policy recommendations. Here are some policy recommendations on this basis of this study:

I.   Fiscal decentralization is a useful policy tool to provide the basic public services especially in health sector. But it will be successful when the subnational governments will have autonomy over decision making. In case of developing countries there are some capacity and administrative issues are attach with it. As in our study the results of vertical fiscal imbalance shows that lower level of governments need some check and balance. So the federal governments should have enough ability to effect the implementation process and local policy without effecting the fiscal sovereignty of local governments.

II.   As our empirical results shows that, revenue generation of subnational governments have positive impact on health outcomes. So the local governments should really on their own revenue, rather depending on federal transfer.

5.2 Limitations:

A lot of work has been done on this topic, and there is always a need of improvement. Various studies Robalino et al., (2001) and Tresiman, (2000) has used the corruption as a control variable, as corruption is very important factor in examining the effect of fiscal decentralization, especially in lower and middle income countries. It influence the long-run outputs of the health services, and it weaken the administrative capacity of the governments, so in future while carrying out the study this may be include in the economic model. Similarly, to check the relationship of fiscal decentralization and health sector other measures can also be used instead of infant mortality rate.

Furthermore, as our sample was occupied by unbalanced panel data and missing observations, to resolve this issue a GMM model can be used at a small group of sample (i.e. develop countries).

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Appendix A:

7. Literature Summary:

Table A1 provide the detail of variables and estimation techniques employed for analyzing the influence of fiscal decentralization on provision of public services especially in health sector. In explaining the different health indicator Infant Mortality Rate, Life expectancy, Immunization coverage, Prevalence of drugs, and corruption level are the most important variables. While GDP and GDP per capita are commonly used indicators in all public services provisions studies.

During the Analysis of relation among fiscal decentralization and health sector, the previous studies suggest that fiscal decentralization helps in promotion of health outcomes. But the outcomes of fiscal decentralization vary across the economies, it has been seen that developed countries batter gain the benefits of fiscal decentralization while other under develop/developing economies face difficulties while gaining the benefits of fiscal decentralization. So, it is necessary that before the implementation of decentralization process one must consider the prerequisites and shortcoming of it.

Table A1: Summary of Empirical Studies:

Basic Info	Dependent Variable(S)	Explanatory Variables	Main Results
Asfaw et al. (2004), India (1990 to 1997), Panel Data, estimated as "Hausman Specification Test"	Mortality Rate, Infant (per 1,000 live births)	Rural fiscal decentralization. GDP per capita. Literate women (%age of pop). Political decentralization index.	Fiscal decentralization has significantly negative impact on rural infant Mortality rate. States where the community participation in decision makings have not any positive effect on infant mortality rate.
Dolores Jime´nez Rubio, (2011), Canada (10 provences). 1979 to 1995, Panel Data, Fixed effect Model.	Mortality Rate, Infant (per 1,000 live births)	Per capita income (provincial). Health are Blocks, per capita. Federal Governments Grants, Direct (non-grant) per capita federal Direct per capita Health Expenditures by Federal.	Decentralization effect infant mortality rate negatively in Canada. Decentralization has positive effect on health services in Canada.

		Per capita Health expenditures by municipal govt. Health expenditure private (per capita) Literacy rate. Smoking prevalence among female. Low level of birth weightiness. Decentralization of Health sector.	
Hiroko Uchimura, Johannes Jutting,2009 (1995 to 2001), China (26 Provinces), Panel Data	Child Death Rate per 1,000 live births	Fiscal Decentralization (Vertical Balance, Aggregate county expenditure to total provincial expenditure), GDP per capita, Rural to urban people ratio, Fertility Rate, Illiteracy rate.	In developing countries the week institutional capacity is a hurdle in successful fiscal decentralization process. To achieve the batter health outcomes of fiscal decentralization in emerging economies, it is necessary to improve the fiscal arrangements of lower level of the governments.
Mbogori, M. M., & Iravo, M. A. (2019), Kenya, 2012 to 2017, Panel Data.	Immunization coverage Number of skilled delivery	County GDP per capita, Transfer from national government on health, Ration of County/National Gov. expenditure on Health, Foreign aid, Literacy level, Population density	Fiscal decentralization positively affect the health outcomes in the country of the study.
"Robalino et al. (2001)", Cross Countries Analysis, Panel Data, Fixed effect model.	Child Death Rate, per 1,000 live births.	Proportion of locally managed expenditures to the ratio of centrally managed resources, GDP per capita (PPP), Corruption, Political rights	Economies which have greater political rights in institutional environment, fiscal decentralization has positively effect on child death rate. While dramatically fiscal decentralization also have positive result on the health consequences in presence of corruption in institutions, however the positive outcomes of fiscal

			decentralization tend to be smaller.
D. Cantarero, Marta Pascual (2008), Hausman specification test, Spain	Life Expectancy, Child Mortality Rate, (per 1,000 live births).	Fiscal Decentralization, Per capita GDP, Physician per 1,000 peoples, Acute Care Beds per 1,000 population.	Outcomes of the fiscal decentralization propose that child mortality rate is negatively correlated with FD, Wile GDP per capita, Fiscal Decentralization have positive impact on Life Expectancy.
Dolores Jiménez-Rubio,(2011), Twenty OECD Countries, Error Correction Model (ECM)	Mortality Rate Infant, (per 1,000 live births).	Per Capita GDP, Literacy Rate, Health expenditures as proportion of total GDP, Consumption of Alcohol and Tobacco.	Empirical results inform that fiscal decentralization has positive and very significant effect over the health outcomes, as it reduces the infant mortality rate. But the condition is this, local governments have complete autonomy in revenue generation.
Victoria Eugenia Soto, Maria Isabel Farfan (2012), Colombia (1080 Municipalities, 1998 To 2007)	Child death rate, (per 1,000 live births)	Subnational share of health expenditure, Assignments of funds from federal government as ratio of total health expenditures, Municipalities population, Households with displeased wants, Years of metropolises certification status.	Empirical results suggest that fiscal decentralization helps inn reduction of infant mortality rate, which further improve health outcomes. However the reduction in child death rate is high in rich municipalities rather than non-rich municipalities.
Busemeyer (2008), OECD Economies, Period 1991–2001, Using panel-corrected standard errors	Public Education expenditures, Primary and secondary education Expenditures, Expenditures on tertiary education.	Fiscal decentralization. Social Expenditure by Govt. Per capita GDP. Proportion of population aged 65+ to people aged 5–29.	High level of fiscal decentralization attracts the increasing in education expenditures. Further, for the purpose of taxpayer's attraction from the different regions competition between local governments increase.
Iftikhar Ahmad (2016) 62 countries, Panel Data, Baltagi and Wu Test (1999).	Government education spending per student. Ratio of teachers to students.	Ratio of public education expenditure to GDP per capita, GDP per capita,	When the subnational governments are independent in decision making, fiscal decentralization perform very well in context of education

		Government spending, Urbanization, Dependency ratio. Number of peoples aged 65 and above, Number of peoples aged 5–14, Tax revenue Decentralization, SN govt. Revenue Decentralization, SN govt. Vertical contributions by central govt. as share of sub-national government income.	outcomes. While the dependency upon federal transfer hinder the education sector efficiency.
Habibi et al. (2003). Argentina (23 provinces). Period of 1970 to 1994 (25 Years), Panel Data, Fixed effect model.	Number of pupils admitted in secondary school (pre 1000 primary pupils). Mortality Rate, Infant (per 1,000 live births)	Ratio of income obtained through co-participation. Royalties and provincial taxes revenue as proportion of total revenue. Proportion of locally collected revenue to the locally occupied properties. Per capita GDP (Provincial) Expenditures by the provinces (Total per capita). Public employees (per 1,000 provincial population)	When the provinces are independent in decision making regarding tax revenue, infant mortality rate will dramatically decline by 70%.

Appendix B:

8. High Income Countries:

In order to compare the results of different level of economies for the determination of the authentication of fiscal decentralization, we have generated the results of High, Middle, and Low level of economies separately. The variables are in log form, while the one year lag has been taken for log of GDP. Appendix A contain the regression results of high income countries.

The dependent variable was regress with all the proxies of Fiscal decentralization one by one. Table B1 to Table B4 shows the results of Health expenditure percentage of GDP, while Table B5 to Table B8 elaborate the results of child mortality rate.

Health Expenditures Percentage of GDP:

Table B1: Regression Results for Tax Revenue Decentralization, Subnational Govt.

	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
			Dependent Variable: Health Expenditure % of GDP.				
Tax Revenue Decentralization, Subnational Govt.	0.027	0.021	1.29	0.196	-0.014	0.068	
Physician per 1,000 people	0.153	0.044	3.47	0.001	0.066	0.239	***
GDP (One year Lag)	0.015	0.020	0.76	0.449	-0.024	0.054	
Constant	1.468	0.464	3.16	0.002	0.559	2.377	***
Mean dependent var		1.948	SD dependent var			0.273	
Overall r-squared		0.286	Number of obs			259.000	
Chi-square		14.303	Prob > chi2			0.006	
R-squared within		0.189	R-squared between			0.178	

*** p<.01, ** p<.05, * p<.1

Table B2: Regression Results for Revenue Decentralization, Subnational Govt.

	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
			Dependent Variable: Health Expenditure % of GDP.				
Revenue Decentralization, Subnational Govt.	0.077	0.029	2.67	0.008	0.020	0.133	***
Physician per 1,000 people	0.142	0.043	3.32	0.001	0.058	0.227	***
GDP (One year Lag)	0.036	0.023	1.59	0.112	-0.008	0.081	
Constant	1.119	0.523	2.14	0.032	0.094	2.143	**

Mean dependent var		1.978	SD dependent var			0.308	
Overall r-squared		0.410	Number of obs			187.000	
Chi-square		19.605	Prob > chi2			0.001	
R-squared within		0.180	R-squared between			0.255	

*** p<.01, ** p<.05, * p<.1

Table B3: Regression Results for Expenditure Decentralization, Subnational Govt.

	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
				Dependent Variable: Health Expenditure % of GDP.			
Expenditure Decentralization, Subnational Govt.	0.089	0.045	1.99	0.047	0.001	0.176	**
Physician per 1,000 people	0.130	0.047	2.75	0.006	0.037	0.222	***
GDP (One year Lag)	0.028	0.027	1.05	0.295	-0.024	0.080	
Constant	1.283	0.621	2.07	0.039	0.065	2.501	**
Mean dependent var		1.988	SD dependent var			0.313	
Overall r-squared		0.343	Number of obs			176.000	
Chi-square		14.313	Prob > chi2			0.006	
R-squared within		0.237	R-squared between			0.173	

*** p<.01, ** p<.05, * p<.1

Table B4: Regression Results for Vertical Fiscal Imbalance, Subnational Govt.

	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
				Dependent Variable: Health Expenditure % of GDP.			
Vertical Fiscal imbalance, Subnational Govt.	0.085	0.092	0.92	0.358	-0.096	0.265	
Physician per 1,000 people	0.137	0.045	3.04	0.002	0.048	0.225	***
GDP (One year Lag)	0.006	0.024	0.26	0.792	-0.041	0.054	
Constant	1.618	0.582	2.78	0.005	0.477	2.759	***
Mean dependent var		1.982	SD dependent var			0.310	
Overall r-squared		0.130	Number of obs			181.000	
Chi-square		10.655	Prob > chi2			0.031	
R-squared within		0.295	R-squared between			0.098	

*** p<.01, ** p<.05, * p<.1

Infant Mortality Rate:

Table B5: Regression Results for Tax Revenue Decentralization, Subnational Govt.

	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
					Dependent Variable: Infant Mortality Rate		
Health Exp. % of GDP	-0.010	0.043	-0.24	0.810	-0.096	0.076	
Tax Revenue Decentralization, Subnational Govt.	-0.019	0.016	-1.19	0.238	-0.050	0.013	
Physician per 1,000 people	0.008	0.041	0.20	0.839	-0.072	0.089	
Smoking Prevalence among females	0.599	0.178	3.36	0.001	0.246	0.951	***
GDP Per capita	-0.083	0.049	-1.70	0.091	-0.179	0.013	*
Constant	0.398	0.007	55.36	0.000	0.384	0.413	***
Mean dependent var		1.657	SD dependent var			0.737	
Overall r-squared		0.325	Number of obs			150.000	
F-test		29.602	Prob > F			0.000	
Akaike crit. (AIC)		-711.621	Bayesian crit. (BIC)			-693.557	

*** p<.01, ** p<.05, * p<.1*

Table B6: Regression Results for Revenue Decentralization, Subnational Govt.

	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
					Dependent Variable: Infant Mortality Rate		
Health Exp. % of GDP	0.034	0.058	0.60	0.551	-0.080	0.149	
Revenue Decentralization, Subnational Govt.	-0.015	0.038	-0.39	0.698	-0.091	0.061	
Physician per 1,000 people	0.020	0.054	0.37	0.714	-0.088	0.128	
Smoking Prevalence among females	0.276	0.159	1.74	0.086	-0.040	0.591	*
GDP Per capita	0.025	0.047	0.53	0.599	-0.069	0.119	
Constant	0.301	0.013	22.56	0.000	0.274	0.327	***
Mean dependent var		1.744	SD dependent var			0.805	
Overall r-squared		0.589	Number of obs			110.000	
F-test		93.660	Prob > F			0.000	
Akaike crit. (AIC)		-500.777	Bayesian crit. (BIC)			-484.574	

*** p<.01, ** p<.05, * p<.1*

Table B7: Regression Results for Expenditure Decentralization, Subnational Govt.

	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
					Dependent Variable: Infant Mortality Rate		
Health Exp. % of	0.036	0.058	0.62	0.534	-0.079	0.151	

	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
GDP Expenditure Decentralization, Subnational Govt.	0.007	0.040	0.19	0.853	-0.072	0.087	
Physician per 1,000 people	0.013	0.053	0.24	0.813	-0.093	0.119	
Smoking Prevalence among females	0.324	0.165	1.96	0.053	-0.004	0.652	*
GDP Per capita	0.014	0.049	0.28	0.778	-0.083	0.111	
Constant	0.289	0.012	23.84	0.000	0.265	0.313	***

Mean dependent var	1.695	SD dependent var	0.777	
Overall r-squared	0.533	Number of obs	106.000	
F-test	82.402	Prob > F	0.000	
Akaike crit. (AIC)	-485.026	Bayesian crit. (BIC)	-469.046	

*** p<.01, ** p<.05, * p<.1

Table B8: Regression Results for Vertical Fiscal Imbalance, Subnational Govt.

					Dependent Variable: Infant Mortality Rate		
	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Health Exp. % of GDP	0.086	0.064	1.34	0.184	-0.041	0.213	
Vertical Fiscal Imbalance, Subnational Govt.	0.107	0.111	0.97	0.337	-0.113	0.327	
Physician per 1,000 people	-0.006	0.060	-0.11	0.914	-0.125	0.112	
Smoking Prevalence among females	-0.292	0.142	-2.07	0.042	-0.574	-0.011	**
GDP Per capita	0.181	0.043	4.18	0.000	0.095	0.267	***
Constant	-0.058	0.011	-5.32	0.000	-0.080	-0.036	***

Mean dependent var	1.750	SD dependent var	0.826	
Overall r-squared	0.049	Number of obs	110.000	
F-test	59.433	Prob > F	0.000	
Akaike crit. (AIC)	-478.450	Bayesian crit. (BIC)	-462.247	

*** p<.01, ** p<.05, * p<.1

Appendix C:

9. Middle Income Countries:

Similar to precious section, this section include the regression results of Middle Income countries. While Table C1 to Table C4 shows the results of Health expenditure percentage of GDP in Middle income countries, and Table C5 to Table C8 contain the regression results of Infant Mortality Rate.

Health Expenditures Percentage of GDP:

Table C1: Regression Results for Tax Revenue Decentralization, Subnational Govt.

	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
				Dependent Variable: Health Expenditure percentage of GDP.			
Tax Revenue Decentralization, Subnational Govt.	0.034	0.024	1.42	0.157	-0.013	0.082	
Physician per 1,000 people	-0.035	0.031	-1.14	0.257	-0.097	0.026	
GDP (One year Lag)	0.067	0.006	10.72	0.000	0.055	0.079	***
Constant	0.305	0.026	11.73	0.000	0.254	0.357	***
Mean dependent var		1.808	SD dependent var			0.343	
Overall r-squared		0.010	Number of obs			212.000	
F-test		44.624	Prob > F			0.000	
Akaike crit. (AIC)		-551.765	Bayesian crit. (BIC)			-538.338	

*** p<.01, ** p<.05, * p<.1*

Table C2: Regression Results for Revenue Decentralization, Subnational Govt.

	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
			Dependent Variable: Health Expenditure percentage of GDP.				
Revenue Decentralization, Subnational Govt.	0.081	0.037	2.18	0.031	0.008	0.154	**
Physician per 1,000 people	-0.031	0.031	-0.98	0.328	-0.093	0.031	
GDP (One year Lag)	0.071	0.007	10.66	0.000	0.058	0.084	***
Constant	0.298	0.026	11.30	0.000	0.246	0.350	***
Mean dependent var		1.798	SD dependent var			0.351	
Overall r-squared		0.013	Number of obs			198.000	
F-test		44.518	Prob > F			0.000	
Akaike crit. (AIC)		-514.622	Bayesian crit. (BIC)			-501.469	

*** p<.01, ** p<.05, * p<.1*

Table C3: Regression Results for Expenditure Decentralization, Subnational Govt.

	Dependent Variable: Health Expenditure percentage of GDP.						
	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Expenditure Decentralization, Subnational Govt.	0.016	0.032	0.49	0.622	-0.047	0.078	
Physician per 1,000 people	0.005	0.031	0.16	0.871	-0.056	0.066	
GDP (One year Lag)	0.021	0.021	1.00	0.319	-0.020	0.062	
Constant	1.295	0.531	2.44	0.015	0.254	2.336	**
Mean dependent var		1.814	SD dependent var			0.356	
Overall r-squared		0.022	Number of obs			207.000	
Chi-square		1.344	Prob > chi2			0.854	
R-squared within		0.035	R-squared between			0.015	

*** p<.01, ** p<.05, * p<.1*

Table C4: Regression Results for Vertical Fiscal Imbalance, Subnational Govt.

	Dependent Variable: Health Expenditure percentage of GDP.						
	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Vertical Fiscal Imbalance, Subnational Govt.	0.050	0.043	1.15	0.248	-0.035	0.134	
Physician per 1,000 people	0.009	0.032	0.28	0.777	-0.053	0.071	
GDP (One year Lag)	0.022	0.021	1.04	0.299	-0.020	0.064	
Constant	1.219	0.528	2.31	0.021	0.184	2.253	**
Mean dependent var		1.805	SD dependent var			0.356	
Overall r-squared		0.042	Number of obs			227.000	
Chi-square		2.716	Prob > chi2			0.606	
R-squared within		0.012	R-squared between			0.035	

*** p<.01, ** p<.05, * p<.1*

Infant Mortality Rate:

Table C5: Regression Results for Tax Revenue Decentralization, Subnational Govt.

	Dependent Variable: Infant Mortality Rate.						
	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Health Exp. % of GDP	0.017	0.054	0.31	0.756	-0.090	0.123	
Tax Revenue Decentralization, Subnational Govt	-0.005	0.021	-0.25	0.801	-0.047	0.036	
Physician per 1,000 people	0.010	0.018	0.53	0.596	-0.026	0.045	
Smoking Prevalence among females	-0.153	0.067	-2.29	0.024	-0.286	-0.020	**
GDP Per capita	0.298	0.021	14.13	0.000	0.256	0.339	***
Constant	-0.351	0.011	-32.36	0.000	-0.372	-0.329	***

Mean dependent var		2.556	SD dependent var			0.559
Overall r-squared		0.026	Number of obs			115.000
F-test		235.554	Prob > F			0.000
Akaike crit. (AIC)		-486.071	Bayesian crit. (BIC)			-469.601

*** p<.01, ** p<.05, * p<.1

Table C6: Regression Results for Revenue Decentralization, Subnational Govt.

	Dependent Variable: Infant Mortality Rate.						
	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Health Exp. % of GDP	0.003	0.057	0.06	0.951	-0.109	0.116	
Revenue Decentralization, Subnational Govt.	-0.024	0.030	-0.79	0.429	-0.084	0.036	
Physician per 1,000 people	0.007	0.019	0.39	0.697	-0.030	0.044	
Smoking Prevalence among females	-0.204	0.080	-2.55	0.013	-0.363	-0.045	**
GDP Per capita	0.306	0.024	12.98	0.000	0.259	0.352	***
Constant	-0.315	0.012	-27.01	0.000	-0.338	-0.292	***

Mean dependent var		2.586	SD dependent var			0.570
Overall r-squared		0.057	Number of obs			108.000
F-test		208.308	Prob > F			0.000
Akaike crit. (AIC)		-451.133	Bayesian crit. (BIC)			-435.040

*** p<.01, ** p<.05, * p<.1

Table C7: Regression Results for Expenditures Decentralization, Subnational Govt.

	Dependent Variable: Infant Mortality Rate.						
	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Health Exp. % of GDP	-0.005	0.065	-0.07	0.943	-0.134	0.125	
Expenditure Decentralization, Subnational Govt.	-0.005	0.033	-0.15	0.878	-0.070	0.060	
Physician per 1,000 people	0.011	0.022	0.47	0.640	-0.034	0.055	
Smoking Prevalence among females	-0.251	0.089	-2.82	0.006	-0.429	-0.073	***
GDP Per capita	0.334	0.027	12.35	0.000	0.280	0.388	***
Constant	-0.317	0.014	-21.92	0.000	-0.346	-0.289	***

Mean dependent var		2.583	SD dependent var			0.583
Overall r-squared		0.083	Number of obs			96.000

F-test	188.593	Prob > F			0.000	
Akaike crit. (AIC)	-373.879	Bayesian crit. (BIC)			-358.493	

*** p<.01, ** p<.05, * p<.1*

Table C8: Regression Results for Vertical Fiscal Imbalance, Subnational Govt.

	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
					Dependent Variable: Infant Mortality Rate.		
Health Exp. % of GDP	0.056	0.062	0.91	0.366	-0.067	0.180	
Vertical Fiscal Imbalance, Subnational Govt.	-0.002	0.052	-0.03	0.973	-0.106	0.102	
Physician per 1,000 people	0.010	0.022	0.48	0.633	-0.033	0.054	
Smoking Prevalence among females	-0.235	0.094	-2.51	0.014	-0.423	-0.048	**
GDP Per capita	0.311	0.028	11.14	0.000	0.255	0.366	***
Constant	-0.253	0.014	-18.47	0.000	-0.280	-0.225	***
Mean dependent var		2.634	SD dependent var			0.596	
Overall r-squared		0.022	Number of obs			105.000	
F-test		142.603	Prob > F			0.000	
Akaike crit. (AIC)		-417.668	Bayesian crit. (BIC)			-401.744	

*** p<.01, ** p<.05, * p<.1*

Appendix D:

10.Low Income Countries:

This last section include the regression results of Low Income countries. Table D1 to Table D4 shows the results of Health expenditure percentage of GDP in Low income countries, and Table D5 to Table D8 contain the regression results of Infant Mortality Rate.

Health Expenditures Percentage of GDP:

Table D1: Regression Results for Tax Revenue Decentralization, Subnational Govt.

					Dependent Variable: Health Expenditure % of GDP.		
	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Tax Revenue Decentralization, Subnational Govt.	-0.001	0.014	-0.06	0.950	-0.029	0.027	
Physician per 1,000 people	-0.061	0.069	-0.89	0.374	-0.196	0.074	
GDP (One year Lag)	0.064	0.059	1.10	0.273	-0.051	0.180	
Constant	0.656	1.299	0.51	0.613	-1.890	3.202	
Mean dependent var		2.047	SD dependent var			0.303	
Overall r-squared		0.002	Number of obs			72.000	
Chi-square		2.031	Prob > chi2			0.730	
R-squared within		0.194	R-squared between			0.004	

***p<.01, **p<.05, *p<.1

Table D2: Regression Results for Revenue Decentralization, Subnational Govt.

					Dependent Variable: Health Expenditure % of GDP.		
	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Revenue Decentralization, Subnational Govt.	0.054	0.035	1.53	0.131	-0.017	0.124	
Physician per 1,000 people	-0.150	0.127	-1.18	0.245	-0.406	0.106	
GDP (One year Lag)	0.262	0.124	2.10	0.041	0.012	0.512	**
Constant	-3.610	0.659	-5.48	0.000	-4.935	-2.284	***
Mean dependent var		1.981	SD dependent var			0.295	
Overall r-squared		0.002	Number of obs			55.000	
F-test		2.006	Prob > F			0.083	
Akaike crit. (AIC)		-174.027	Bayesian crit. (BIC)			-165.997	

***p<.01, **p<.05, *p<.1

Table D3: Regression Results for Expenditure Decentralization, Subnational Govt.

					Dependent Variable: Health Expenditure % of GDP.		
	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Expenditure Decentralization, Subnational Govt.	0.034	0.019	1.81	0.070	-0.003	0.072	*
Physicians per	-0.073	0.038	-1.90	0.057	-0.148	0.002	*

1,000 people

	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
GDP (One year Lag)	0.085	0.027	3.15	0.002	0.032	0.137	***
Constant	0.385	0.618	0.62	0.534	-0.827	1.597	

Mean dependent var	2.111	SD dependent var	0.147	
Overall r-squared	0.789	Number of obs	47.000	
Chi-square	44.281	Prob > chi2	0.000	
R-squared within	0.327	R-squared between	0.994	

*** p<.01, ** p<.05, * p<.1

Table D4: Regression Results for Vertical Fiscal Imbalance, Subnational Govt.

	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
				Dependent Variable: Health Expenditure % of GDP.			
Vertical Fiscal Imbalance, Subnational Govt.	0.019	0.039	0.50	0.617	-0.056	0.095	
Physicians per 1,000 people	-0.100	0.071	-1.39	0.163	-0.240	0.040	
GDP (One year Lag)	0.097	0.064	1.53	0.126	-0.027	0.222	
Constant	-0.147	1.413	-0.10	0.917	-2.916	2.621	

Mean dependent var	2.098	SD dependent var	0.172	
Overall r-squared	0.439	Number of obs	48.000	
Chi-square	5.130	Prob > chi2	0.274	
R-squared within	0.283	R-squared between	0.083	

*** p<.01, ** p<.05, * p<.1

Infant Mortality Rate:

Table D5: Regression Results for Tax Revenue Decentralization, Subnational Govt.

	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
				Dependent Variable: Infant Mortality Rate.			
Health Exp. % of GDP	0.085	0.229	0.37	0.713	-0.389	0.560	
Tax Revenue Decentralization, Subnational Govt.	-0.111	0.093	-1.20	0.245	-0.303	0.081	
Physicians per 1,000 people	-0.053	0.160	-0.34	0.741	-0.384	0.277	
Smoking Prevalence among females	-0.497	0.156	-3.19	0.004	-0.820	-0.174	***
GDP per capita	0.211	0.040	5.25	0.000	0.128	0.294	***
Constant	-0.438	0.014	-30.93	0.000	-0.467	-0.409	***

Mean dependent var	1.469	SD dependent var	0.594	
Overall r-squared	0.535	Number of obs	31.000	
F-test	28.426	Prob > F	0.000	
Akaike crit. (AIC)	-143.942	Bayesian crit. (BIC)	-135.338	

Table D6: Regression Results for Revenue Decentralization, Subnational Govt.

Dependent Variable: Infant Mortality Rate

	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Health Exp. % of GDP	-0.040	0.356	-0.11	0.912	-0.782	0.703	
Revenue Decentralization, Subnational Govt.	-0.089	0.059	-1.52	0.145	-0.212	0.033	
Physicians per 1,000 people	-0.305	0.242	-1.26	0.222	-0.809	0.199	
Smoking Prevalence among females	-0.662	0.170	-3.90	0.001	-1.016	-0.308	***
GDP per capita	0.346	0.063	5.47	0.000	0.214	0.478	***
Constant	-0.633	0.032	-19.63	0.000	-0.700	-0.565	***

Mean dependent var	1.590	SD dependent var		0.613
Overall r-squared	0.518	Number of obs		29.000
F-test	53.229	Prob > F		0.000
Akaike crit. (AIC)	-99.401	Bayesian crit. (BIC)		-91.197

Table D7: Regression Results for Expenditure Decentralization, Subnational Govt.

Dependent Variable: Infant Mortality Rate

	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Health Exp. % of GDP	0.084	0.151	0.56	0.587	-0.240	0.408	
Expenditure Decentralization, Subnational Govt.	-0.164	0.039	-4.16	0.001	-0.249	-0.080	***
Physicians per 1,000 people	0.083	0.123	0.68	0.509	-0.181	0.348	
Smoking Prevalence among females	0.877	0.260	3.38	0.005	0.320	1.433	***
GDP per capita	-0.200	0.088	-2.27	0.039	-0.389	-0.011	**
Constant	0.153	0.016	9.66	0.000	0.119	0.187	***

Mean dependent var	1.313	SD dependent var		0.387
Overall r-squared	0.912	Number of obs		22.000
F-test	130.464	Prob > F		0.000
Akaike crit. (AIC)	-115.630	Bayesian crit. (BIC)		-109.084

Table D8: Regression Results for Vertical Fiscal Imbalance, Subnational Govt.

	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
				Dependent Variable: Infant Mortality Rate			
Health Exp. % of GDP	0.281	0.200	1.41	0.182	-0.148	0.711	
Vertical Fiscal Imbalance, Subnational Govt.	-0.073	0.288	-0.25	0.804	-0.691	0.546	
Physicians per 1,000 people	-0.00004	0.178	-0.00	1.000	-0.381	0.381	
Smoking Prevalence among females	1.128	0.388	2.90	0.012	0.295	1.961	**
GDP per capita	-0.263	0.126	-2.09	0.055	-0.533	0.007	*
Constant	0.231	0.022	10.44	0.000	0.183	0.278	***
Mean dependent var		1.313	SD dependent var			0.387	
Overall r-squared		0.445	Number of obs			22.000	
F-test		43.656	Prob > F			0.000	
Akaike crit. (AIC)		-102.035	Bayesian crit. (BIC)			-95.489	

*** p<.01, ** p<.05, * p<.1