Spatial Disparities, Convergence Clubs and Decentralization: Evidence from Districts of Pakistan

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بسم الله الرحمن الرحيم

APPROVAL SHEET

Spatial Disparities, Convergence Club and Decentralization: Evidence from Districts of Pakistan.

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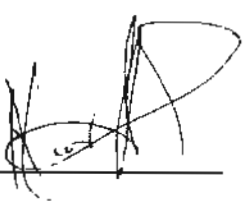
Signature: 

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Dedication

Dedicated to my parents and my whole family,

Who always encouraged me to seek

the light of knowledge.

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LIST OF ABBREVIATIONS AND ACRONYMS

AJK	Azad Jammu Kashmir
CV	Coefficient of Variance
EDA	Exploratory Data Analysis
ESDA	Exploratory Spatial Data Analysis
EU	European Union
FATA	Federally Administered Tribal Areas
FDI	Foreign Direct Investment
GB	Gilgit Baltistan
GDP	Gross Domestic Product
GoP	Government of Pakistan
HDI	Human Development Index
HRCP	Human Rights Commission of Pakistan
IMF	International Monetary Fund
KP	Khyber Pakhtunkhwa
LISA	Local Indicator of Spatial Association
MICS	Multiple Indicator Cluster Surveys
MPI	Multidimensional Poverty Index
NEG	New Economic Geography
NGO	Non Governmental Organisation
NPA	National Plan of Action
NUTS	Nomenclature of Territorial Units for Statistics

OECD	Organisation for Economic Co-operation and Development
OPHI	Oxford Poverty & Human Development Initiative
PBS	Gross Domestic Product
PCA	Principal Component Analysis
PCI	Per Capita Income
PIHS	Pakistan Integrated Household Survey
PSLM	Pakistan Social and Living Standards Measurement
SAARC	South Asian Association for Regional Cooperation
SDGs	Sustainable Development Goals
UNDP	United Nations Development Programme
UNO	United Nations Organisation
WB	World Bank
WDR	World Development Report
WFS	Weighted Factor Square

ABSTRACT

The spatial disparity in human development is often a source of political tension and frustration in a federal system. Pakistan is a spatially diverse state in terms of economic activities, and regional disparities in human development have long been a source of concern in Pakistan. Recent regional development literature has emphasized the importance of looking at the phenomenon of human development through the lens of spatial concepts like density, neighbourhood, and distance. This dissertation focuses on three interrelated analyzes that explore the spatial pattern of human development disparities in Pakistan.

The first analysis aims to analyze the distribution of the human development index across districts of Pakistan through an exploratory spatial data analysis on the development level of the 97 districts for the periods 2004-05 and 2014-15. Second, the club convergence hypothesis is examined in detail going beyond the traditional use of per capita GDP. It investigates the club convergence of 97 Pakistani districts between 2004 and 2015. Finally, this study investigates the impact of fiscal decentralization on the human development index at tbe district level in Punjab, Pakistan. The analyses are based on an augmented human development index, which measures human development level. The indcx is composed of three sub-indices: education, health, and household welfare level; each index further has five indicators. To obtain a final human development index, the indicators are aggregated using Principal Component Analysis (PCA).

The findings of the first analysis indicate a positive global autocorrelation. Thus, a district with a high (low) development has been spatially associated with bordering districts that also have high (low) development levels. The results also display the High-High quadrant in the scatter plot of the human development index, which includes districts of Punjab and Khyber Pakhtunkhwa. At the same time, Low-Low quadrant shows a cluster of most districts from interior Sindh and Balochistan. The second analysis found that, rather than overall convergence, the districts converge to eleven convergence clubs and one divergent group for the human development index. The existence of clubs implies that policies aimed at reducing human development disparities and promoting regional development must consider the specific characteristics revealed by convergence analysis. The third study found that the significant positive effects of fiscal decentralization on the human development index and sub-indices at the district level are conditional on the distance of districts from the capital city — the positive effects of fiscal decentralization increase as the "distance from the city" decreases.

Overall, these findings support the dualistic structure of Pakistan's economic geography, as previously explained by numerous studies. Because geography matters in development, it is proposed that inequalities between districts should be reduced by developing social and economic institutions and infrastructure in underdeveloped districts of the country. By employing spatial econometric techniques such as exploratory spatial data analysis and club convergence analysis, this dissertation contributes to the literature and policy debate on human development disparities and convergences at the district level in Pakistan.

Keywords: Spatial Disparity, HDI, Convergence Clubs, Fiscal Decentralization
JEL Classification Codes: C21, D63, O15, O47, R12

CHAPTER 1

INTRODUCTION

This chapter provides the introduction and motivation for writing dissertation on issue of spatial disparity, convergence club and fiscal decentralization across districts of Pakistan. In particular, the chapter discusses the background information of the three themes of the study. This chapter also explains the gap in the literature and the motivation to conduct this study in tbe sense that no earlier research has been done in Pakistan at district level.

1.1. Motivation

Spatial disparity denotes the imbalance in social and economic indicators of welfare across regions within a country (Venables & Kanbur, 2005). Spatial disparity is an aspect of overall inequality, these inequalities are vital because they are often accompanied by civil wars and political tensions (Venables & Kanbur, 2003; Stewart, 2008; Lessman, 2015). Viewing society as a spatial composition, it has been observed that economic and social practices differ from place to place, in addition to varying natural phenomena, resulting in different and even conflicting spatial distribution pattern and socio-economic differences.

Regional socio-economic inequalities have long been a source of political concern in Pakistan. Pakistan is characterized by imbalances between its important socio-economic indicators (for example health, education & physical infrastructure) across its geographical units (Burki et al., 2010). This shows that growth of country has resulted in uneven progress in economic and social indicators within the country. Some districts have modern human capital and physical infrastructure, while others

have made modest or no improvement by any means. This trend is consistent with the conclusions of World Bank's Global Development Report 2009, which has analyzed why the concentration or clustering of production and population take place typically in any country in a favorable locality especially during the growth process.

According to first ever official report on multidimensional poverty in Pakistan published in 2017, almost 39 percent of population suffers from multi-dimensional poverty, with the highest poverty rates in Balochistan province. Pakistan's Multidimensional Poverty Index (hereafter MPI)[1] has shown a marked decrease in poverty rates, with national poverty rates declining from 55 percent to 39 percent between 2004 and 2015. So far, progress is not smooth across various geographical units of the countryside. Poverty rates are lower in urban areas (9.3%) as compared to rural areas (54.6%).

Inequalities also exist across provinces in country and within provinces across districts. The report showed that more than two-thirds of the population of Balochistan and FATA live in multidimensional poverty. In the other provinces, the poverty rate is 49% in Khyber Pakhtunkhwa, 43% in Sindh and Gilgit-Baltistan, 31% in Punjab and 25% in Azad Jammu and Kashmir. There are large disparities between districts: Islamabad, Karachi and Lahore have poverty rates below 10%, while Barkhan, Harnai and Qilla-Abdullah (districts of Balochistan) have rates above 90%. The report also analyzed that the decline in multidimensional poverty was slowest in Balochistan, while in the last decade the intensity of poverty had actually increased in

[1]The Multidimensional Poverty Index uses a wide-ranging conception of poverty than wealth and income alone. It replicates the deprivation public experience with respect to health, education, and standard of living, and is thus a comprehensive means of understanding and eradicating poverty. For Pakistan, for tbe first time the MPI was developed in 2016 by the UNDP and OPHI.

a number of districts in Sindh and Balochistan. The composition and level of multidimensional poverty for each of Pakistan's 114 districts is also demonstrated in this report (OPHI & UNDP, 2017).

Micro studies and household data sets have also disclosed that a significant disparity in social development indicators also exists among various ethnicities and earning groups (Gazdar, 2000; UNDP, 2004). According to Easterly (2003), Pakistan's growth strategy is a paradox of growth without development. This paradox is the identification of the reality that economic expansion of Pakistan has taken place unjustly across different areas of the country. On the other hand, it is a pain that the issue has been charged with emotions; to overcoming these crises, now is time to launch a rational investigation to make possible effective policy formulation.

The above mentioned challenges call for attention towards studying differences in socioeconomic variables across districts of Pakistan to find out the most ignored group of the people, and also to support in the development of strategies that can lessen these problems of social development and spatial disparity. In light of the problems mentioned above, the study mainly focuses on three themes. Firstly, measure the disparities in the level of human development among districts of Pakistan. Secondly, identify the groups (convergence clubs) of districts in Pakistan that converges to the similar level of steady state. Finally, investigate the effects of fiscal decentralization on human development disparities at the district level in Pakistan.

1.2. Background Information

In the following subsections, we present a brief discussion of background information, problem statement, research objectives, research questions, significance of the study, and contribution of the study. The section 1.2 reviews the background information of each theme. The section also includes three subsections. Section 1.2.1 presents the background information on "Spatial disparities across the districts of Pakistan". Section 1.2.2 provides background information on "Regional Convergence Cluhs in Pakistan". Section 1.2.3 reviews background information on "Fiscal decentralization and spatial disparities in Pakistan". The section 1.3 reviews the problem statement. Section 1.4 presents the study's objectives. Sections 1.5 and 1.6 discuss the research questions and the significance of the study, respectively. The study's contributions are discussed in section 1.7.

1.2.1. Spatial Disparities Analysis

Since the dawn of civilization, human activities and living standards have been unevenly distributed across continents and their regions (Braudel, 1979). Historically, the issue of inequality has been discussed by notable intellectuals (such as, Aristotle, 350 BCE; Hobbes, 1651; Rousseau, 1762; Marx, 1867; Mill, 1873). However, with the emergence and progress of capitalism, disparities have been recognized as an economic fact of transition vital for the economic development. Indeed, Kant (1797) stated that disparity among people was a main source of evil, but also of all that was good.

Amidst growing concerns about rising disparities, the spatial aspects of inequalities have begun to attract the attention of intellectuals (Kanbur, 2005). Spatial disparity

refers to the inequality in economic and social measures of welfare across different spatial locations within a country (Kanbur, 2003). For example, one location may have access to education, healthcare or clean drinking water while another location does not (Gajangi, 2016). There are several overlapping reasons for the existence of international spatial inequalities. History, natural resources, local political economy, human capital, culture and environmental situation have all been identified as elements of influence (Chakravorty, 2005). Spatial disparities as an aspect of the overall disparity have added importance when combined with territorial divisions and ethnic and political tensions that can undermine political and social stability.

The proper measurement of territorial disparities and the investigation of their causes and consequences are, therefore, of particular importance. Spatial imbalances are vital for at least two reasons. First, dissimilarity between regions of a country is a component of overall inequality across individuals at the national level. Secondly, the disparity between regions often goes hand in hand with ethnic and political instability, which undermine political stability and social structure (Kanbur & Venable, 2005). This can increase the risk of civil wars and internal clashes in extreme cases (Deiwiks et al., 2012; Lessmann, 2013).

Inequality among people and geographical units is a critical developmental concern in developing countries today, just as it was in developed countries during their early stages of development (Williamson, 1965). Spatial disparities in education, health and income are key tests for developing economies, and developing countries increasingly fear regional and spatial inequalities. It is believed that in developing and transition economies such as China, Mexico, Russia, South Africa and India, regional and territorial imbalances in economic activities, social indicators and incomes are

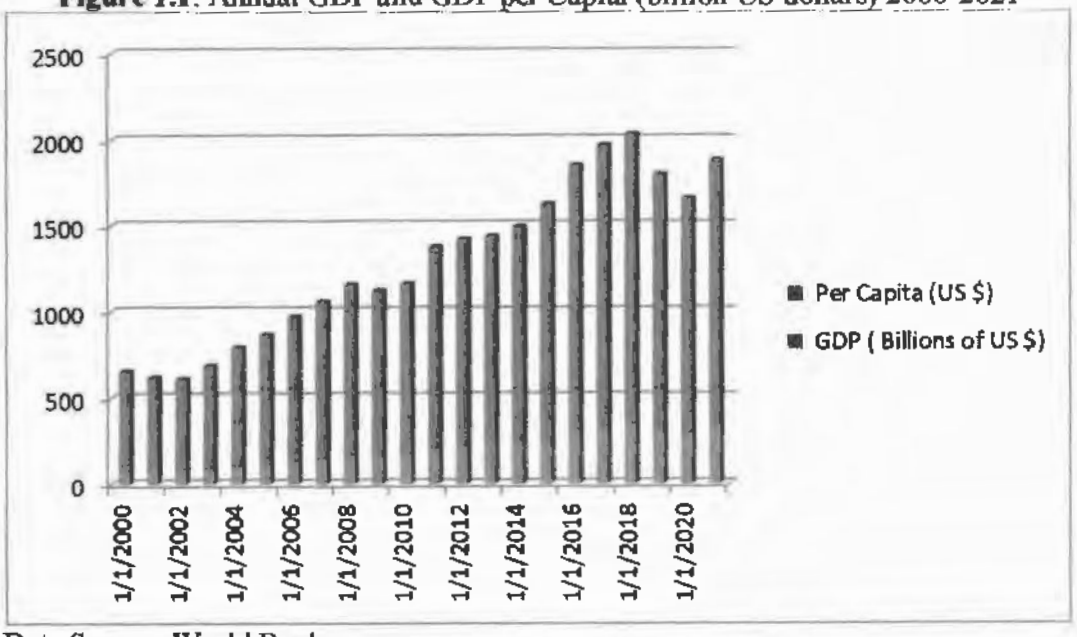
growing (McCormick & Wahba, 2003; Kanbur & Zhang, 2005; Pose & Reaza, 2005; Friedman, 2005).

1.2.1.1. Economic Development and Spatial Inequality in Pakistan: An Overview

Economic Development in Pakistan (2000-2019)

Regardless of a range of above discussed social, economic and political issues at the countrywide and global level during the last two decades, Pakistan has experienced significant economic development following reforms and the free trade. Pakistan's GDP increased from $82.69 Billion in 2000 to $346 Billion in 2021; representing more than four times rise in two decades (see figure 1.1). Furthermore, the country's GDP per capita has increased threefold in the last three years (see figure 1.1). Pakistan's per capita income was around 570 US dollars in 2000, and it is now around 1537 US dollars in 2020.

Figure 1.1: Annual GDP and GDP per Capita (billion US dollars) 2000-2021



Data Source: World Bank

Over the past two decades, Pakistan's economic growth rates revealed significant variations: both remarkable and poor growth rates have been recorded by the economy. Over the last two decades, the country has managed to maintain a moderately decent average GDP growth rate of around 4.6%. The country's GDP growth rate was 5.57% in 2005-06, and then decreased to 0.36% in 2007-08 before steadily increasing to 4.24 percent in 2014-15 (Pakistan Economic Survey, 2014-15). During the climax of the global credit crisis in 2008-09, Pakistan was also one of a handful of countries that even posted positive growth rates.

Spatial Inequality in Pakistan

The question of distribution of income earned from growth becomes vital after economic development of a country, that is, whether or not it will help all segments of the population equally. It ensures the living standard of the common man if the distribution is more or less equal. Pakistan is a spatially diverse state in terms of the location of its economic activities and supplementary features such as ecology, resource endowments, population settlement, and ethnicity. Regional inequalities have long been a source of political concern in Pakistan. The trajectory of Pakistan's growth has resulted in uneven social and economic development, especially in the delivery of public services (Easterly, 2003).

The difficulty of disparity between the territories of Pakistan has a perspective based on its past and due to the differences between the regions (East Pakistan & West Pakistan) in the 1960s, it became a crucial problem (Hamid, 1974; Zaidi, 2015). During the 1980's, the complexity of territorial inequality among the provinces gained an explosive potential. It is essential to note that not only does overall development differ between Provinces, but recent studies have highlighted that there are also

substantial inequalities amongst districts within provinces (Jamal & Khan, 2003). Yet, it is a subject that has been charged with emotions, and to allow successful policy formulation for the problem, now is the time to begin a serious investigation.

Currently, Pakistan is characterized with territorial differences between its development indicators such as physical infrastructure, health, education, and other economic and social indicators (Burki etal., 2010; Ahmed, 2011). In terms of social sector development indicators over the years, Pakistan has performed poorly. For Pakistan, economic geography is essential as growth and development tend to be clustered across country and only some less developed areas have been successful in moving from periphery to the central regions of the economy (Khan, 2003; Burki et al., 2010; Ahmed, 2011). Therefore, for more inclusive growth in all regions, it is necessary that the benefits of growth are shared equitably by all regions of the country.

In Pakistan, the previous two decades have witnessed dramatic, economic, social, demographic and institutional changes that are likely to have spatially significant outcomes. In Pakistan, with the adoption of the 18th amendment in constitution, essential steps towards fiscal devolution are being taken. Furthermore, the seventh National Finance Commission Award (hereafter NFC [2]) enabled the transfer of additional financial resources from the centre to the provinces, giving the provinces a stronger influence over the provision of physical infrastructure, education, and health services. This fundamental shift towards power sharing between the federation and the provinces has far-reaching long-term implications for policy planning, management, and implementation in the country.

[2] The NFC award is the allocation of fiscal assets by the federal government among the provinces of Pakistan annually. The award is constituted in 1973 Constitution of Pakistan under the Article 160.

The majority of the current research on Pakistan's economy is based on data at the provincial level and has overlooked spatial disparity within provinces among the districts. There are few logical and organized records of the data and facts regarding trends in spatial disparities across districts over the past two decades. District level research became even more vital after the 18th amendment[3] passed in April 2010. Public and social services (such as health, education & living standards) happen to be the sole sphere of provincial governments after 18th amendment.

District-level research has the advantage of better explaining the geographical features of socio-economic facts and of providing a comprehensive study of spatial effects (regional spillover & spatial regimes) compared to studies conducted in the country on a provincial level. Analyzing regional differences at district level not only uncovers the most ignored group of the people, but also helps in shaping policies that can reduce these problems of human development and income inequalities.

In light of the challenges mentioned above, the primary goal of this research is to identify imbalances in Pakistan's human development index at the district level. The research investigates the spatial distribution of human development index for 97 districts of Pakistan over the period 2004 to 2015, using exploratory spatial data analysis techniques (hereafter ESDA). Thus, the study provides outcomes for clustering of human development index across Pakistani districts[4].

[3] The eighteenth constitutional amendment to the 1973 constitution has raised the autonomy of provinces to great extent.

[4] The only other exceptions include (Burki et al. 2010) and (Ahmed, 2011) that have considered explicitly in their studies spatial dependencies. Though they have analyzed 56 and 98 districts respectively

1.2.2. Regional Convergence Clubs in Pakistan

The term "convergence" is used in the growth literature to mean a reduction in income gaps and, therefore, a propensity for general equilibrium over time across countries or regions. It is essential to explain why the growth of some economies is faster than others, as the persistent inequalities in income across countries/regions lead to a wide welfare gap and are a source of political and social unrest within the boundaries of a country.

One of the most exciting and difficult debates in economic research has been the topic of convergence. The foundation for the convergence proposition was laid in the mid-18th century writings of Tucker and Hume (Elmslie, 1995). Hume believed in a natural tendency for economies to converge during economic growth, while Tucker disagrees that rich economies maintain their lead over poor countries for indefinite periods of time in trade and possessions of wealth. The debate between Josiah Tucker and David Hume is known as the "rich country-poor country" debate. Their exchange of ideas fostered a non-interventionist (laissez-faire) approach to international trade, which contributed to the adoption of free trade policy in England in the nineteenth century.

This discussion of convergence and divergence is commonly assumed to have begun with Veblen's (1915) assertion that latecomers benefit from development because early developing nations make the mistakes and build the technologies. Thus, subsequent developing nations can acquire knowledge and borrow from them. The principle of "advantages of relative backwardness" by Gershenkron (1952) stated that development is easier for late developing nations.

The majority of researchers involved in the post-World War II growth debate have focused on Solow's 1956 neoclassical growth model. Different predictions are given by various growth models. The neoclassical growth model (Solow, 1956) and the new endogenous growth models (Romer, 1986; Lucas 1988) disagree on how differences in output evolve across regions/countries. In Solow model, within a given technological framework, fixed capital and labor combine to manufacture a certain level of production. Each region will converge to a steady state[5] since input factors exhibit diminishing returns to scale, featured by a stable growth path in long run guided by exogenous factor such as technological innovation.

Endogenous growth models emerge as a new type of model as the neoclassical model fails to explain steady-state growth (Romer, 1986; Lucas, 1988). These endogenous growth models are based on processes such as inter-temporal knowledge spillovers and "learning by doing"[6] averting returns to scale from declining. In this analysis, depending on the initial conditions, different regions would converge towards different long-term equilibria. In fact, in such a case, with essential factors such as human capital, technological level and saving rates diverging, the regions would not converge towards the same levels of steady state growth (unconditional convergence), but rather towards identical convergence clubs (regional economy clubs), with little or no convergence among clubs.

In the majority of studies on convergence, an 'all or nothing' hypothesis is considered: either all countries/regions converge towards the same level of steady

[5] A steady-state economy is one where population growth and production growth are in balance. The birth rate would be equal to the mortality rate in a steady state economy, and the production rate would be equal to the depreciation or consumption of goods.
[6] The idea of *"learning-by-doing"* is given by Kenneth Arrow in 1962 in his explanation of endogenous theory of growth to make clear outcomes of technological change and innovation.

state, or not. The countries/regions can be split into a number of 'convergence clubs'; the countries converge to each other within each club; but diverge across clubs (Baumol, 1986). This attribute is implied by growth models that demonstrate various locally stable steady-state equilibria. These growth theories explain that economies that are similar in their structural characteristics[7] can perhaps however converge towards diverse steady state equilibria if they fluctuate in terms of initial conditions[8] (Azariadis & Drazen, 1990; Galor, 1996). Therefore, a general balanced growth path can only be predicted in a cluster of identical regions, if their initial conditions lie within the basin of attraction of the identical steady state equilibrium, the economies heading towards the matching equilibrium of steady state are believed to shape a club known as convergence club (Galor, 1996).

At country level, Quah introduced the notion of the club convergence bypothesis[9] in 1996; He established a method (not based on a theoretical model) designed to model the dynamics of cross sectional distributions of economies. Quah described that at the global level, per capita income has developed a twin peaked distribution such that there is divergence (no convergence process) among economies. On the other side, economies with its identical performance tend to converge into sub-groups; by this means each economy moves towards itself with a specific growth trajectory equilibrium, which is based on the initial state of the economy.

For Pakistan, one of the key planning goals has been to reduce regional inequalities across the country. Fears of territorial imbalances in development have been described in country programs and policies and attention has been given to the issue in all plans.

[7] preferences, production technology, government policies, etc
[8] capital stock per capita, labor force, income per capita and human capital
[9] Chatterji (1992) describe that a convergence club means the existence of various regions that are forced in the long run to a level of steady state with identical income per capita.

Vision 2025 goals include faster and more inclusive growth as a fundamental topic, recognizing the idea of designing more inclusive growth in the form of growth outcomes for those fragments of the general population, which in recent years have been sidelined by high rates of economic growth.

Pakistan has experienced extraordinary economic development as a result of reforms and free trade. Pakistan's real GDP increased from $23.69 billion in 1980 to $346 billion in 2021; representing more than 15 times increase in 38 years. In addition, real GDP per capita over the same period, which take into account population growth, has increased more than five-fold. But, Pakistan still faces the overwhelming challenge of overcoming its uneven regional development. For Pakistan, economic geography is essential as growth and development tend to be concentrated across the country and only some less developed areas have been successful in moving from the periphery to central regions of the economy (Khan, 2003; Burki et al., 2010; Ahmed, 2011). Therefore, for more inclusive growth at the regional level, it is essential that the growth outcomes should be distributed equally among all the regions of the country.

Despite the rich literature on the subject of regional convergence at the district level, the club convergence level has been almost completely overlooked in the literature. In this perspective, this study empirically analyzes the issue of different districts converging to several steady states across Pakistan and the manifestation of "convergence clubs" as has been proposed by various researchers in the growth literature (see Baumol, 1986; Durlauf, 1995; Galor, 1996).

The Logic of Convergence in Human Development

Human development is essentially defined as the process of broadening people's choices (UNDP, 1990). Importantly, these preferences are not limited and can change over time. However, the three most important choices for people at all stages of development are to live a long and healthy life, to acquire knowledge, and to have access to the resources deemed necessary for a decent standard of living (UNDP, 1990). As a result, convergence in development across countries/regions implies a process of catching up in the various dimensions that can be included in this concept.

The growth of GDP per capita is the most common indicator used to measure and compare the level of development from one region to another. It is suggested by the literature that a different improvement in the development and living standard in various vital dimensions (such as education & health) is not ensured automatically by growth (Easterly, 1999; Easterlin, 2000; Sheram & Soubbotina, 2000). GDP per capita fails to explain the overall advancement in the economy and, therefore, its use as a measure of development has been criticized by several economists (Sen, 1983; Goossens, 2007; Stiglitz et al., 2009; Todaro & Smith, 2011).

In recent growth literature, the renowned economist Sala-i-Martin has suggested that the convergence concept should be applied to estimate the level of human development across regions (Roy & Bhattacharjee, 2009). The approach has been applied recently by several studies, as the human development index has been used as indicator for measuring development across regions (Basel et al., 2020).

The above explanation makes it clear that this convergence in growth indicators such as GDP per capita does not necessarily means that there is also convergence across

countries in human development. For these reasons, in this study, we analyze the club convergence hypothesis by using human development index.

1.2.2.1. Fiscal decentralization and Club Convergence

In economics, the concept of convergence refers to the hypothesis that poorer economies' per capita income will tend to grow faster than richer economies', eventually leading to a convergence of per capita income levels. It has heen argued that fiscal decentralization has the potential to contribute to regional per capita income convergence. Territorial competition presents an opportunity for poorer regions and can be a means of diversifying development strategies that benefit local economies because decentralization allows local governments to play an active role in managing local economic development (Ezcurra & Pascual 2008; Pascual & Rapn, 2004).

Over time, the justification for decentralization has also evolved, moving from focus on aspects such as ethnicity, culture, language or religion to a focus on achieving economic and social transformation (Rodriguez, 2009). Decentralization is considered as a central building block of the development and growth strategy of developing countries by the World Bank and other international agencies (Gopal, 2008). Although the inspiring factors for decentralization vary across countries, yet the central idea is improvement in delivery of public services (Shah & Thompson, 2004). Ensuring the efficient use of resources and improving public living standards are ensured by the transfer of control and resources from center to sub national levels of government (Gordin, 2004).

Theoretically, Brueckner (2004) examined tbe positive effects of fiscal decentralization in accordance with Tiebout's postulates (1956), as well as the

negative effects of the tax competition approach. Depending on the circumstances of the analysis, he arrived at different conclusions. Using an endogenous growth model, Brueckner (2006) concluded that fiscal federalism promotes faster economic growth. Yang and Chu (2012) developed an endogenous growth model and concluded that, in terms of economic growth, a decentralized system outperforms a centralized system, but the difference in social welfare between the two systems is non-monotonic and depends on capital mobility.

On the other hand, it can be argued that the alternative policy of financing regional growth initiatives through intergovernmental grants may exacerbate disparities by discouraging laggard regions from developing their economic and fiscal bases. Similarly, the central government's pursuit of traditional industrial policies is frequently biased in favour of the most high-performing industries; industries that are more likely to be located in more developed, higher-per-capita-income regions (Bardhan, 2002). The major constraints on the ability of less developed and low per capita income areas to realize the potential gains from decentralization during the early stages, on the other hand, would be a lack of sufficient localized pbysical and human capital and institutional settings, as well as a limited revenue base from which local governments and their agencies could draw.

At the same time, there are concerns about whether decentralization will benefit all regions. Decentralization may not benefit all regions equally, with "poor" regions losing competitiveness in comparison to better-off regions, increasing regional inequalities. Fiscal decentralization can be a threat if it is poorly planned, allowing lower-level governments to externalise their costs to others (Hagen et al., 2000; Rodden et al., 2002).

Despite the interest in fiscal federalism and its effects on economic growth, inequality, and public sector efficiency, fiscal decentralization has yet to be addressed in the convergence literature. It is therefore critical to examine the clustering of regions based on measures of their degree of decentralization.

1.2.3. Fiscal Decentralization and Spatial Disparities

Decentralization is a common concern in the economic literature as a way capable of improving efficiency of the public sector. The concept essentially refers to the shifting of power and accountability for the public service delivery from central to sub-national governments (Rondinelli & Nellis, 1983; Rondinelli, 1999). Basically, decentralization can be categorized on basis of the level of sovereignty transferred and powers given to lower tiers of government. Generally, on the basis of devolved responsibilities, decentralization can be classified into three kinds that include administrative, fiscal and political decentralization (Hutchinson, 2004).

Fiscal decentralization talks about the transfer of power from the central to lower tiers of government for the delivery of government services and public finances (Tanzi, 1995). It empowers the sub-national governments through administrative empowerment and fiscal autonomy that can help target better and can abolish unnecessary commitments of the central governments. According to Bird and Smart (2002), for efficient provision of services, those who obtain transfers need a clear authorization, adequate resources and sufficient flexibility to take decisions. Along with lower-level governments, fiscal decentralization may also lead to the efficient and effective governance of central government.

Traditionally, the justification for transferring powers and resources to lower levels of government was based on identity, i.e. to protect a distinct language, history, culture, or religion within large countries with diverse attributes, as discussed in numerous studies (Hechter, 1975; Moreno, 2001). The new regionalist literature justifies the recent wave of decentralization on the basis of lower-level governments' alleged greater ability to overcome the failures of the centralized state, as discussed by Bardhan (2002), to achieve higher economic efficiency (Keating, 1998; Morgan, 2002), and to encourage economic distinctiveness and differentiation in a globalizing and homogenizing world (Pike & Tomaney, 2004).

Spatial inequality is one such issue that has remained a vital concern for many developed regions of the world (Europe & America) as explained by numerous studies in the literature (for instance, Boldrin & Canova, 2001; Neckerman & Torche, 2007; Wu & Gopinath, 2008; Heidenreich & Wunder, 2008), its roots are more deeper in developing world (Hall, 1984). Countries with high population such as China and India are also facing the consequences of territorial disparity as explained by many studies (Liu, 2006; Ghosh & Paul, 2007; Fan et al., 2011).

One of the central doctrines of fiscal federalism is that the financing of local services by local taxes increase both efficiency and accountability. The hypothesis of better economic efficiency of decentralized governments depends on the fundamental views of the fiscal federalism literature. The transfer of authority and resources to lower level of government allows a double improvement in efficiency as theorized by Tiebout (1956) and Oates (1972). There are two most significant economic benefits connected with decentralization. First, the capacity of sub national governments to better match public expenditures to the diverse choices of individuals living in

different areas, hence the allocative efficiency of government is enhanced. Second, the ability to mobilize underutilized resources and create competition among sub-national governments promotes the delivery of better policies. Mobilization of resources to their full potential and greater competition among jurisdictions can lead to greater policy innovation and more efficient provision of public goods and services, thereby increasing the productive efficiency of an economy as a whole (Oates, 1996).

Over the years, the question regarding the impacts of fiscal decentralization on spatial disparities across regions/countries has engaged researchers. Increasing the shift of power and resources to lower tiers of governments can result in convergence among region as a result of tbe anticipation that local government can fulfill the needs of locals more efficiently. They can also formulate policies which are superior and informed and they work to protect or lift up their base of tax in the face of contest from other regions.

On the other hand, the devolution of resources and authority from central authority to the lower level of government may also broaden spatial inequalities because the redistributive response or capacity of the federal authority is reduced. Another justification why fiscal decentralization may not lead to convergence of regions is the quality of government at lower tiers. It is argued that fiscal devolution might worsen the troubles of governmental capability, which could reduce or eliminate the effects of fiscal decentralization on convergence across regions (Prud'homme, 1995; Rodríguez & Ezcurra; Rodríguez & Gill, 2004).

In Pakistan, regional inequality has a perception of the past and it became a major difficulty after independence in the first two decades, due to the issue of regional

disparities between East Pakistan and West Pakistan in the 1960s. Later, this remains a serious issue between the four provinces of the country. Although the issues has often been charged with emotions. The 18th constitutional amendment, in Pakistan's 1973 constitution, approved by parliament in April 2010 is an attempt to strengthen provincial autonomy.

The 18th constitutional amendment boosts provincial autonomy by increasing fiscal authority of the provinces, such as the collection of one of the most revenue generating taxes that is sales tax is shifted to provincial governments from federal. The Amendment requires provinces to pass legislation establishing local government systems and transfer financial, political and administrative authority and tasks to the elected local bodies. After the 18th constitutional amendment, the significance of decentralization and its effects on the territorial inequalities have gained attention.

1.3. Problem Statement

Addressing the issue of spatially uneven development is not only critical for conflict prevention, but also a legitimate developmental goal in itself. Regional socioeconomic inequalities have long been a source of political concern in Pakistan. Pakistan is distinguished by disparities in key socioeconomic indicators (such as health, education, and physical infrastructure) across geographical units (Burki et al., 2010). The issue, however, has frequently been emotionally charged. Finding feasible solutions to the problem is thus only possible if the problem is clearly understood. Researchers and policymakers must understand the different types of inequalities and the factors that contribute to it.

1.4. Objectives of the Research

The following are the study's primary objectives:

1) To highlight disparities in human development level (education, health & household welfare levels) across districts of Pakistan.

2) To identify groups (convergence clubs) of districts in Pakistan that converges to the similar steady state level.

3) To investigate the effects of fiscal decentralization on spatial disparities in human development (education, health & household welfare levels) at the district level in Pakistan.

1.5. Research Questions

The following research questions are addressed in the study:

1) To what extent are there spatial disparities in human development level (education, health & household welfare levels) among districts of Pakistan?

2) Are there any district groups (convergence clubs) in Pakistan that converge to the same steady state level?

3) What are the effects of fiscal decentralization on spatial disparities in human development (education, health, and household welfare) at the district level in Pakistan?

1.6. Significance of the Study

For Pakistan, district level research has become even more important for two reasons. First, in comparison to provincial-level analysis, research at the district level allows for a better explanation of the geographical features of socioeconomic statistics and a more comprehensive investigation of spatial effects (spatial regimes & regional spillover). Second, with the passage of the 18th constitutional amendment in 2010, Pakistan is taking significant steps towards fiscal decentralization. Furthermore, following the seventh NFC award, a larger transfer of funds from the centre to the provinces was permitted. Provinces now bave more influence over education, health, and physical infrastructure.

The fundamental shift in Pakistan towards transferring authority between the federation and the provinces has significant implications for long-term policy planning, management, and implementation. As a result, more research is required as education, health, and other social and public services become the provinces' sole sphere of influence.

1.7. Contributions of the Study

This dissertation promotes the literature and policy debate on human development disparity and convergences at district level research in Pakistan by applying spatial econometric techniques such as exploratory spatial data analysis and club convergence analysis.

The following are the study's major contributions:

- Using spatial exploratory and spatial econometric techniques, the study provides the first detailed evidence on why spatial effects should be considered when analysing socioeconomic issues in Pakistan.
- For Pakistan, most of the research is based on provincial level. While, this analysis has been carried out at a district level. After the 18th constitutional amendment, the significance of decentralization and its effects on the territorial disparities has received a lot of attention. This research considerably enriches the current literature by investigating the impacts of fiscal decentralization on the spatial patterns human development at district level in Pakistan.

1.8. Structure of the Study

The thesis consists of six chapters based on background information, decentralization in Pakistan, literature review, methodologies, estimations and conclusions and policy recommendations of the three themes of the study. Themes include "Spatial disparities across districts of Pakistan", "Regional convergence clubs in Pakistan" and "Fiscal denaturalization and spatial disparities in Pakistan".

The six chapters are classified in the following mode. Chapter 1 presents the background information and objectives of each theme. Chapter 2 discusses the decentralization in Pakistan. Chapter 3 reviews the theoretical and empirical literature. The methodologies of each theme are explained in Chapter 4. Chapter 5 discusses the estimation of each theme. Conclusions and policy recommendations are discussed in Chapter 6.

CHAPTER 2

DECENTRALIZATION IN PAKISTAN

The tendency towards decentralization is widespread phenomenon today in both rich and poor nations. The second chapter talks about the decentralization in developed world, developing world and Pakistan.

2.1. Decentralization as a Global Trend

Progress towards better decentralization was common among developed countries even before the emergence of globalization. Since mid 1970, decentralization has been a growing concern in both the developed and developing world (Rodriguez & Gillô, 2004). Unlike the situation four decades earlier, when the majority of countries were centralized nation states, today more than 90% of nations across the globe have elected sub-national governments, and a large number of countries are transferring responsibilities (fiscal, political & administrative) to these lower levels of government (World Bank, 2000).

The trend towards centralization in the United States, which dates back to the American Civil War or the Great Depression, was completely reversed in the 1980s by Reagan's New Federalism, when states began to improve their sovereignty (Donahue, 1997). In the 1990s and 2000s, state powers in the United States increased under both Republican and Democratic administrations. Canada also saw a slight increase in their significant levels of decentralization (Hooghe et al., 2008).

Many Central European countries engaged in significant decentralization before or during their accession to the European Union, with some already embarking on a

second generation of reforms since transition (Hooghe et al., 2008). Several transition economies in Eastern Europe and Central Asia have also experienced decentralization (Dabla-Norris, 2006). Belgium became a federation in 1993, while in the UK and Spain devolution is a continuous process, not without some controversy.

When the trends towards autonomy of sub-national governments in the developing world are considered, the precise global nature of the phenomenon of decentralization is discovered. It has been at the heart of policy transformations in Latin American, Asian, and African developing countries (Bardhan, 2002). Numerous developing countries have begun transfer of some form of political control to a lower-level government (Dillinger, 1994).

Many Latin American countries that appeared to be decentralized on paper have also undergone significant reforms. In the 1990s, countries such as Mexico and Brazil initiated a revival of federalism (Coutinho, 1996; Rodríguez, 1997; Dillinger & Webb, 1999; Ward & Rodríguez, 1999). In Africa, several countries have undertaken important steps towards the transfer of extensive resources and authority to lower levels of government. Within Sub-Saharan African countries like South Africa, Nigeria, Uganda and most other economies have attempted several tiers of regional autonomy (Ndegwa, 2002).

Devolution has emerged as a dominant paradigm in Asia for the last three decades. In Asia, China, Philippines, Indonesia, and Vietnam have carried out major measures towards regional devolution. These changes have ranged from drastic state reforms, such as the example of devolution of Indonesia in 1999 (Aspinall & Berger, 2001), to steady de facto transformation, such as example of China, where lower-level

governments are granted high levels of fiscal and economic authority (Ma, 1996). Since 1992, a new wave of decentralization has been experienced in India (Sharma, 1999; Bagchi, 2003).

2.2. Decentralization in Pakistan

In Pakistan, the distribution of powers between the centre and federating units has been the most debatable subject over the years. Pakistan also faces the effects of regional disparities at both provincial and district levels. The country has faced large variations in the level of development of different regions and this has resulted in inequalities within and between the provinces of Pakistan (Jamal & Khan, 2003). All of these differences lead to demand and conflict for the shifting of resources to lower-level governments.

2.2.1. Fiscal structure of Pakistan

Pakistan has a federal system governed by the constitution of 1973. Part six of chapter one of the constitution governs the distribution of revenues between the federation and the federating units. Article 160 of the constitution presents a structure for the formation of an NFC in order to make proposals to the President as to: -

i. Tax distribution between the centre and the provinces
ii. The federation providing subsidies to the federating unit
iii. The federal and provincial governments' use of borrowing authority
iv. Any other financial matter referred to the commission by the President

2.2.2. History of Resource Sharing in Pakistan

This section analyzes the history of resource sharing between the federation and the provinces in Pakistan. The section is further divided into four subsections that is resources distribution in pre-independence period, resources distribution in post-independence period, resources distribution during one unit period and resources distribution onward following the constitution of 1973.

Resources Distribution in Pre-Independence Period (Niemeyer Award)

The Niemeyer award was used to establish resource distribution criteria prior to independence (under the 1935 Act of United India). Under the act, provinces were granted the authority to charge and collect sales tax. While 50% of the total income tax collection was reallocated to provincial governments. After independence, the same arrangements were followed until the Raisman formula was adopted in April 1952 (Government of Pakistan, 1991).

Resources Distribution in Post-Independence Period (Raisman Award)

Sir Jermy Raisman was tasked after independence with devising a procedure for revenue distribution between the federation and the federating units. The formula was proposed in 1947 and adopted in 1952 (Jaffery & Sadaqat, 2006). As an adhoc measure, 50% of sales tax was specified to the federal government. 50% of income tax were allocated to the Provinces, 45% of these taxes were allocated to East Pakistan while the remaining was distributed among the provinces of West Pakistan, i.e. Punjab (27%), Sindh (12%), KP (8.4%), Bahawalpur (0.6%), Khairpur (0.6%), Baluchistan states union and residual 2.8 %(GOP, 1991).

Resources Distribution under One Unit

In 1955, under one unit, the entire country was divided into two identities (East Pakistan & West Pakistan). Until 1970, the one unit policy remained effective. Two awards were declared during a one unit, namely the 1961 award and the 1964 award.

1961 Award

Unit shares under the 1961 allocation were 54% (East Pakistan) and 46% (West Pakistan), respectively. Due to the collection in their own provinces, 30% of the sales tax was allocated to the federating units.

The 1964 Award

In 1964, the National Finance Commission was established by Article 144 of the 1962 constitution. The shares for the federation and provinces out of the divisible pool were 35:65 % respectively. The share of two units remained unchanged at 54% (East Pakistan) and 46% (West Pakistan). West Pakistan was divided into four Provinces in 1970, so its share of 46 % was distributed among the four new provinces, shares as follows; Punjab (56.5%), Sindh (23.5%), KP (15.5%) and Balochistan (4.5 %).

National Finance Committee 1970

To make recommendations for intergovernmental resource allocation, a committee was appointed in 1970. The recommendations of the committee include finalizing resource sharing between the federation and the federating units at the ratio of twenty and eighty percent respectively. Again, thirty percent of the sales tax was restructured among the federating units in line with the collection from the respective federating unit.

Resources distribution after 1973 Constitution

The National Assembly of Pakistan approved and implemented the constitution in 1973. Under the constitution, the National Finance Commission (hereafter NFC) was established to propose and consider the resource sharing between the federation and the provinces. The fist NFC award was announced in Feb 1974 and became effective from fist July 1975. So far, seven NFC awards are announced after promulgation of constitution in 1973. Of these, three NFC awards were adopted (1974, 1991 & 1997). But, the other three NFC awards constituted (1979, 1984 and 2000) remained unsuccessful due to a lack of consensus, resulting in a deadlock. In 2010, the seventh NFC award was announced. The history of all these NFC awards has been given below in the table 2.1.

Table 2.1: History of NFC Awards

S.No	Award Name	Time of Constitution	Time of Effect
1	1st NFC award	Feb, 1974	1st July, 1975
2	2nd NFC award	Feb, 1979	Inconclusive
3	3rd NFC award	July, 1985	Inconclusive
4	4th NFC award	July, 1990	1st July, 1991
5	5th NFC award	July, 1995 Reconstituted (Dec, 1996)	1st July, 1997
6	6th NFC award	22nd July, 2000 Reconstituted On 13th Nov, 2003	The results remained inconclusive. Presidential order No. 1 of 2006 amending horizontal and vertical distribution of divisible pool was issued under article 160 (6).
7	7th NFC award	10th May, 2010	Consensus award announced.

Source: Ministry of Finance, Pakistan

2.2.3. History of Local Governance in Pakistan

Local government service responsibilities are classified by level of government in the Local Government Ordinances. Local governments have existed in Pakistan since 1959, and have been legitimized through various local government ordinances.

Local Government Reforms during 1958-69

General Ayub enacted the "Basic Democracies Ordinance" in 1959 and the "Municipal Administration Ordinance" in 1960, establishing Pakistan's first local government during martial law. Under the Basic Democracies Ordinance, union councilors were in charge of implementing government strategies in rural areas and providing political assistance to the national government.

A four-tiered hierarchical system was establisbed by the Municipal Administration Ordinance of 1960. The union council, made up of elected members, was the lowest tier. Some members of higher tiers of local government were indirectly elected by these directly elected members, while others were nominated by the government (Batool, 2014). The Commissioner and Deputy Commissioner had the authority to overturn any proceedings or decisions made by local councils at the division and district levels.

Local Governments during 1972-77

The government of Zulfiqar Ali Bhutto decided to replace rural councils with village committees. The committee's primary function was to identify village issues and carry out development plans in the village under the central government's Integrated Rural Development Program (IRDP) (Burki, 1980). Bhutto proposed some decentralization

regulations and schemes. The creation of local councils by each authoritative unit was included in the declaration of tbe 1973 constitution.

Local Governments during 1977-88

Local governments were revived and reformed during General Zia-Ul- Haq's regime, and the Local Government Ordinance 1979 was enacted, which remained in effect in Pakistan until 2000. Non-party local government elections were held in all provinces of Pakistan (Batool 2014). Between 1979 and 1980, the country's local governments were elected. Local governments were valued highly by both Ayub Khan's and later Zia-Ul-Haq's military regimes. However, no efforts were made to empower local governments through constitutional protection.

Local Governments during 2000-09

General Musharraf established a new local government system through the Local Government Ordinance (LGO) 2001. Ordinance created a newly elected district government that was politically linked to local governments at the sub-district level. Musharraf gave elected representatives in local councils financial, administrative, and development powers, and all government agencies reported to the district council. For the first time, Musharraf established the Provincial Finance Commission to provide an institutional framework for allocating resources between provinces and local governments. There was previously only the National Finance Commission (NFC) to provide an institutional framework for resource allocation between the federal government and provinces.

Local Governments during 2010-2022

Since the reconstitution of provincial powers through the 18th constitutional amendment, provincial governments have adopted legislation from the 1979 or 2001 Local Government Ordinances, or a hybrid of both ordinances. As a result, local government legislation after decentralization differs between provinces, making cross-province comparisons difficult.

2.2.4. Eighteenth Constitutional Amendment

In April, 2010, the 18th Amendment lead to fiscal decentralization structure of government of Pakistan. Under the amendment, the federating units have been permitted to collect sales tax on services. The federating units shall effectively enhance their tax base by imposing tax on the real estate sectors and agriculture. In the event of an unexpected disaster, the federal government will provide assistance to the provinces through specific grants.

Table 2.2: Distribution of Revenues under various NFC Awards

Years	*Provinces: Federal*	*Punjab*	*Pashtunkhwa*	*Sindh*	*Baluchistan*
1974	20% : 80%	60.25%	13.39%	22.50%	3.86%
1979	20%: 80%	57.97%	13.39%	23.34%	5.30%
1984	Interim award				
1991	20%:80%	57.87%	13.54%	23.29	5.30%
1997	62.5% : 37.5%	57.88%	13.54%	23.28	5.30%
2000	Interim award				
2010	56%:44%	51.74%	14.62%	24.55	9.09%

Source: Ministry of Finance, Pakistan

In the seventh NFC award, provinces' share of vertical distribution increased from 49% to 57.5%. A new formula based on multiple criteria has replaced the traditional population-based criterion for horizontal resource distribution among provinces. The

resource distribution was based on population (82%), poverty and backwardness (10.3%), revenue collection and generation (5%), and inverse population density (2.7%), as indicated by this new criterion. Khyber Pakhtunkhwa was given 1% of the net divisible pool, recognizing his contribution to the war on terror. According to the new formula, the share of provinces in divisible pool is as follows; Punjab (51.74 %), Sindh (24.55 %), Khyber Pakhtunkhwa (14.62 %) and Baluchistan (9.09%). Punjab has given up 1.27% of its share, Sindh 0.39%, and Khyber Pakhtunkhwa 0.26%, while Balochistan's share has increased. Table 2.2 explains the interprovincial revenue distribution under various NFC awards.

After the 18th constitutional amendment, the significance of decentralization and its effects on the territorial disparities has received a lot of attention, since the shifting of power and resources from central to provincial governments. Despite the obvious importance of the subject, there is not enough research that systematically analyzes its causes. This research considerably enriches the current literature by investigating the impacts of fiscal decentralization on the spatial patterns of the human development level for both pre and post decentralization periods at district level in Pakistan.

CHAPTER 3

LITERATURE REVIEW

There is an abundance of work in assessing the issue of spatial inequality in the rest of the world, only limited studies have focused the issue for Pakistan. The second chapter talks about the theoretical literature and empirical evidence relating to the issue of spatial inequality. The chapter is further divided into five sub sections. The first three sub seetions further comprise theoretical literature and empirical evidences on three themes of the study. These three themes include; spatial disparities analysis, club convergence hypothesis, and link between spatial disparities and fiscal decentralization. The fourth sub section presents overall summary of theoretical and empirical literature. The last sub section discusses linkages between the objectives.

3.1. Spatial Disparities Analysis

Although, in current years the studies on territorial inequality of developing world remain in a growing phase, there has been an expansion of fresh investigations on spatial disparities both theoretically and empirically (Henderson & Thisse, 2004). The first part of literature review comprises theoretical literature while second part consists of empirical evidences.

3.1.1. Theoretical Literature

The unequal spatial distributions of social and economic activities are one of the most incredible features of life. The dimensions of time and space always determine the economic and social activities. Theoretical economic models often integrate time, however, for a long time mainstream economists did not pay much attention to space

and geography[10]. The significance of space was recognized recently in the literature concerning territorial imbalances, whereas older approaches about regional inequality were attributed by a relative silence about the regional level problems. Theoretical literature on regional disparities analysis is further divided into aspects of regional disparities and theories of regional disparities.

3.1.1.1. Aspects of Regional Disparities

Before studying the theories of regional disparities, it is essential to understand the main aspects of regional disparities.

Regional disparities within one country/region or between multiple countries/regions are categorized in to three types that include physical, economic and social disparities (Yuill & Wishlade, 1997; Kutscheraur et al., 2010; Skokan & Tvrdon, 2011). According to Wishlade & Yuill (1997), the following features describe the relevant types of disparities:

I. Territorial disparities are used to estimate the natural atmosphere of a certain region with its benefits and drawbacks. These factors mean mostly to assess environment and climate conditions, the progress and accessibility of infrastructure, density of population and its changes over time.

II. Economic disparities talk about the economic outlook of the region and its opportunity to contribute to employment, with further consideration given to the structure of the economy. GDP per capita is the most renowned and traditional indicator for the abovementioned purpose. Furthermore, the

[10] There are some exceptions to this general rule. Over the years, a number of researchers such as Jane Jacobs, Nicholas Kaldor, and Gunnar Myrdal have argued for the acknowledgment of regions as major 'building blocks' of the economy.

evaluation of the economic position in the area also consists of the investigation of tax revenues, transport services and demographic trends.

III. Social disparities refer to the level of earnings and standards of living, with a focus on employment indicators that is unemployment and its structure, employment trends, etc.

3.1.1.2. Theories of Regional Disparity

Even though the concept, tools and impacts of economic integration have been employed in the New Economic Geography(Fujita and Krugman, 2004), However, the concept was predicted by several theories prior to the New Economic Geography, including Perroux's (1950) growth pole theory, Myrdal's (1957) polarization and spread concepts, and Hirschmann's (1966) spread concept. In his "growth pole theory," Perroux (1950) proposed that not all business units can help advancement. An economic growth pole is a unit that is capable of being the engine of development for its neighbouring units.

Profits and regional inequalities are the result of business location selection, according to Myrdal (1957). Once developed, the chosen location grows and interacts with its surroundings. Myrdal defines the interaction as a collective causation process. Because of the mobility of its labour and capital to the growth pole, the process causes "backwash effects" on the underdeveloped location. As a result, tbe polc grows at the expense of other areas. The pole serves as the economic agglomerations polar for neighbouring underdeveloped areas. The resulting spatial pattern was called a core-periphery pattern by Hirschmann (1966). He also emphasised that, while the concentration of economic activities causes divergence effects and increases

economic disparities between the core and the periphery at first, the benefits will eventually spread to the periphery as the economy grows. The growth gap is likely to close in the long run.

In the literature on regional growth, there are several classes of models that present various concepts of regional inequality. The concept has evolved from the neoclassical theory of trade and growth to the location theory, external scale economies, and, finally, the central place theory (Dawkin, 2003). Initially, most researchers concentrated on the connection between geography and economic activity. The focus has shifted to the mechanism of spatial imbalances in growth and the process of convergence (Neary, 2001).

Neoclassical Growth Model

The standard assumptions of constant returns to scale and perfect competition build up the neoclassical model. The Ricardian and Heckscher-Ohlin (HO) trade models are two key neoclassical theories that present two distinct concepts of regional inequality based on comparative advantage. Regional comparative advantage is based on technological differences in the Ricardian model, whereas it is based on resource endowment disparities in the Heckscher-Ohlin model. If goods are mobile but factors remain static, both theories predict an increase in regional spatial inequality based on comparative advantage.

The Ricardian model asserts that if a region achieves absolute advantage in technological forms, its workers will earn more before or after economic integration; the Heckscher-Ohlin (HO) model's factor price equalization theorem asserts that regional variation in income can only be explained by differences in regional industry

structures. In the HO model, if factors are movable, all labourers will travel to the region with the greatest absolute advantage, whereas migration will cause interregional convergence.

Based on the standard neoclassical assumptions of constant returns to scale and perfect competition, the models empbasized the role of government as limited to infrastructure investments that influence the mobility of goods, labour, and other factors. Governments may have little ability to affect centripetal forces derived from comparative advantage resources or originating from technology, but they can reduce inequality by lowering factor mobility or increase regional specialization or disparity by lowering goods mobility.

Endogenous Growth Model

The new endogenous theory of growth in macroeconomic focused on the significance of knowledge spillovers; it tends to overlook the spatial aspect (Romer, 1986; Lucas, 1988). Endogenous growth theory removes the exogenous factor from the growth model and views growth as an endogenous process. The accumulation of human capital investment is assumed to be technological progress in this case. This technological advancement leads to more efficient capital and labour utilization, allowing for continued growth.

Both the neoclassical and endogenous growth models have overlooked the role of space in shaping economic growth. However, in the last thirty years, this neglect of geography in economics has begun to be corrected. The importance of location is formalized in the New Economic Geography (NEG). Economists' attention has now shifted to the new economic geography, and thus more emphasis is being paid to the

dynamics of geographic income inequalities and spatial patterns of inequality (Krugman, 1991; Krugman & Venebles, 1995; Puga & Venebles, 1997; Ottaviano & Puga, 1998; Darlauf & Quah 1999; Fujita et al., 1999; World Development Report, 2009).

New Economic Geography

In recent years, New Economic Geography has challenged neoclassical growth theory's explanation of spatial variation in economic development (NEG). Stimulated by the work of Krugman (1991), a comprehensive new subfield of economics has emerged, now generally known as the Geographical Economics or "New Economic Geography" . The term "New Economic Geography" refers to the work of economists such as Paul Krugman, who won the Nobel Prize in Economics in 2008, and others who developed models to explain unequal spatial economic development, particularly the phenomenon of spatial clustering of economic activities. Krugman's and other economists' work has reintroduced geography to the world of economics.

New economic geography provides micro-founded and an integrated approach to spatial economics. It highlighted the significance of elements of clustering resulting in an imbalanced distribution of income and economic activity across territories. The method has been applied to the emergence of territorial inequalities, economics of cities, and the origins of disparities globally.

In Krugman's model (1991), there are two regions (North & South) and two commodities (agricultural & manufacturing). Agricultural commodities are similar, produced under perfect competition and constant returns; while manufacturing commodities are differentiated, produced under monopolistic competition and scale

economies. The single input to production is labor; agricultural workforce is immobile while manufacturing workforce is mobile.

The transportation costs are costless for agricultural commodities, but are costly for manufacturing commodities. When transportation costs are higher for manufacturing commodities, then regions are symmetric and manufacturing is spread in both regions; however, when transportation costs drop, manufacturing become concentrated in North region and the South region become an agricultural periphery. The concentration of manufacturing workforce creates larger markets in the North, which consecutively lesser the production costs due to economies of scale.

The above theoretical discussion shows that economic progress tends to occur at the local level where interactions between economic agents are mainly dense. Simultaneously, for the creation of a local competitive advantage, socio-institutional aspects also play vital role. Yet, not all places are featured by such positive circumstances and national growth is often led by a small number of fast growing and innovative locations within a country, generally coinciding with large urban areas. As a result, when observing the performance of local level governments, that concentration of development in these same few regions is not surprising resulting in the territorial imbalances at the national level.

3.1.2. Empirical Literature

For the last three decades, empirical studies are focusing on the association between geographical factors and territorial imbalances. For various countries, there are proofs that disparities within territories are as important as disparities across territories. The empirical literature on spatial distribution of socio-economic indicators across

countries/regions can be further categorised into case studies of developed countries and developing countries.

In the case of developed world, Studies on spatial disparities across regions found mixed results. In the case of the European Union, numerous contributions imply that poor areas have a tendency to fall behind while most well-off regions reveal unrelenting growth (Canova, 1995; Magerini, 1999; Cheshire & Magrini, 2000; Magerini, 2004). In case of European Union and United States, it is revealed that innovation is concentrated highly in very few regions (Carlino et al., 2001; Crecenzi et al., 2007) suggesting that essential characteristics for innovation to succeed are distributed highly unequally. In the same way, it has been proposed that the capability of Europcan Nations to convert knowledge into significant economic activity differs across places in accordance with different qualitative regional social structures and local systems of innovation (Rodríguez-Pose, 1999; Crescenzi &Rodríguez-Pose, 2008).

In case of developing countries, favorable locations become less significant whereas the nature of localized economic development and the significance of social and institutional factors emerged as more fundamental. This is observed by the strong patterns of spatial disparities experienced by most developing regions in the last few decades, observed by the surprising fast growth rates of few places (urban regions) as compared to the other areas within a country.

Regional spatial disparity was widespread in some countries such as Brazil, but it reduces for the period 1981-1997 (Azzoni et al., 2005). However, regional inequality remained steady at lower levels comparatively in other countries. Meanwhile, in the

case of China, it was found that geographic factors are significant statistically in revealing the spatial disparity largely between seashore and non-seashore (Chang, Bao, & Woo, 2002). The returns to the capital investment are more in the coastal provinces of China, than the rest of the country because of spatial and geographic advantages. This high rate of return on investment attracts more foreign direct investment (FDI) and migrant workforce into the region and this enlarge the gap in growth disparity between the coast and non-coast provinces.

Currently, most of the studies focusing spatial disparity are based on a technique known as Exploratory Spatial Data Analysis (ESDA)[11]. Several ESDA based analyzes have been carried out on the subject of regional disparities. For instance, Battisti and DiVaio (2008), Dallerba (2005), Ezcurra et al. (2007), focused on the European countries while Rey (2001) and Vos et al. (2006) investigated the United States. Ying (2000) look into the case of China, Magalhes et al. (2005) analyzed the phenomenon for Brazilian locations, Jensen et al. (2006) and Manfred et al. (2001) studied Austria and Chile, respectively, while van Azema and Oort (2004) focused on the towns in the Netherlands. The lone ESDA analysis done for the case of Pakistan is Ahmed (2011).

For first time for Pakistan, Ahmed (2011) analyzed the agglomeration of growth, income inequality, human development and education spatially across 98 districts of country. Ahmed found that bordering districts share growth and development levels of each others, proving that economic topography does influence growth, development, and territorial disparities of Pakistan. The overall finding can be analyzed that the

[11]ESDA is a set of procedures utilised to spatially visualize and portray distributions; discover spatial outliers or atypical locations; find out patterns and scope of spatial association, hot spots or clusters; and recommend spatial regimes or other types of spatial heterogeneity (Anseliin, 1988; Haning, 1990; Ertur & Galo, 2003; Van, 2004; Gatrell, 1995). Instead of trying to develop explanations, ESDA intends to search for relations (Haning, 2003).

district wise distribution of growth, income inequality, human development and education, demonstrates a major trend for levels of human development and socio-economic disparities to cluster in Pakistan.

For Pakistan, most of the studies on socio-economic issues are based on provincial level (Hamid & Hussain, 1992; Pasha et al., 1996; Khan & Jamal, 2003; Aamir & Jamal, 2003; Naqvi, 2007; Siddique, 2008; Burki et al., 2010; Arif, 2010). These studies overlook the significance of social interactions among the districts within the provinces[12].

The above empirical evidence clearly indicate that there is an abundance of work in assessing the issue of spatial inequality in the rest of the world over the past three decades; only limited studies have focused the issue for Pakistan. This not only draw attention towards investigating regional differences within the country in order to discover the most isolated subset of the people in terms of health, literacy and income, but in addition, also support the formulation of course of action that can eliminate these problems of dissimilarities in income and human development. So, for Pakistan, the study provides some of the first logical study on clustering of human development indicators across districts.

3.2. Literature on Club Convergence

The convergence issue has been the subject of heated debate in recent years. A large number of research studies on economic convergence have been conducted in recent years, at both the national and local levels. On the other hand, despite the abundant studies, the concept of club convergence has been neglected relatively.

[12] Exception include Ahmed (2011)

This chapter discusses the theoretical literature and empirical evidences relating to club convergence. In particular, we have further divided the main literature into two parts. The first part comprises theoretical literature while second part discusses the empirical literature.

3.2.1. Theoretical Literature

Theoretical literature on club convergence is further divided into concept of convergence, convergence and growth theoretical basis and concept of club convergence hypothesis.

Convergence Concepts

The debate on convergence has been fueled by difference in economic performance of regions in their rates of growth to find out that whether regions differing initially are converging to same level of steady state. The debate has drawn attention largely on the authenticity of three competing hypotheses (Sala-i-Martin, 1990; Sala-i-Martin & Barro, 1992). Over the years following three types of convergence concepts have been analyzed in the growth text.

i. Absolute Convergence Hypothesis

In the long run, income per capita of regions is converging over time regardless of initial conditions of economies.

ii. Conditional Convergence Hypothesis

In the long run, income per capita of regions that are alike in their structural features (technologies, preferences, population growth rates, government policies etc.) are

converging over time inspite of differing initial conditions of economies (human capital, capital stock per capita, labor force & income per capita).

iii. Club Convergence Hypothesis

In the long run, income per capita of regions that match in their structural attributes are converging over time only if their initial conditions are also matching.

Convergence and Growth Theoretical Basis

The issue of convergence was first addressed by neoclassical growth theory, as it forecast it as one of the essentials of economic growth. The Harood-Domar model[13] was modified in 1956 by Solow by adding-up labour as a factor of production consequently completing the equation of growth. Solow also argues that the countries with higher capital stock per capita has low rate of return on capital. Therefore, as a result of arbitrage, capital will run to the poorer nations from rich nations. This accumulation of capital will help the countries to converge. Advocates of the neoclassical pattern following Solow (1956) analyzed that inequalities are bound to lessen with growth (Sala-i-Martin & Barro, 1995).

On the other side, the theories of endogenous growth (Romer, 1986; Lucas, 1988; Aghionn & Howit, 1998), Institutional Theory (Lundvall, 1992; Nelson, 1993) and the New Economic Geography (Krugman, 1991; Venables, 1999) have a tendency to

[13]R.Harrod (1939) and E.Domar (1946) made the first effort to make clear economic growth, through level of saving and capital productivity. In the economic literature these early efforts develop into a model referred to as Harrod-Domar model and hence base was laid down for advancement of exogenous model of growth.

be in conformity with the fundamental statement of Myrdal (1957) that growth is a growing spatial practice, which is expected to widen disparities.

The theory of endogenous growth founded by Romer (1986) considers technology as endogenous and is conditional on decision making method of economic agents. Consequently, within the frame of theory of endogenous growth, the model of club convergence is the result of the spreading of technological enhancement from high developed economies. These endogenous growth models laid the foundation of concepts such as "inter-temporal knowledge spillovers" and "learning by doing" which prevent returns to scale from falling. According to this notion, national and regional economies conditional on initial conditions would converge to diverse long run equilibria.

The major constituent of one region's development within the institutional theory is represented by institutions that set up the technological obstacles of economic functions' hierarchies. The ability of the economy can be controlled by these institutions to develop and make use of own resources. When the institutional competence in space is distributed unevenly, the institutional aspect does matter in agglomeration of economic activities intensifying concentration of highly developed activities into developed areas. These institutions have an important distinctiveness that they smooth the progress of research and development, novelty, business assistance, and these all are referred to as "innovative systems" (Nelson, 1993).

New Economic Geography involves splitting of economies into dissimilar clusters, rich or central-core regions and poor or 'peripheral' ones with increasing inequalities and divergence among clusters. Regional clusters represent the outcome of

agglomeration phenomena of some factors on certain fields, among which significant associations are given. The theory mainly emphasizes in economies of scale, market integration, transportation costs, and local markets, encouraging the shared consequences of economic concentration in the middle of the area with the benefits acquired on labour force market and from highly developed technologies localization (Krugman, 1991; Venables et al, 1999).

Club Convergence Hypothesis

Convergence clubs hypothesis states that the convergence can only be realized across groups of economies that possesses some common features. A number of growth theories demonstrate that countries or regions which are somewhat identical in their structural characteristics[14] could still converge to different steady state equilibria if they differ in terms of initial conditions (Barro & Sala-i-Martin, 1992; Chatterji, 1992; Durlauf & Johnson, 1995; Quah, 1996; Azariadis, 1996; Galor, 1996). A common balanced growth path within a group of similar economies can only be possible if their initial conditions are in the basin of attraction of the same steady state equilibrium —a phenomenon commonly known as the club convergence hypothesis.

The notion of convergence clubs was first defined at the end of the eighties by Baumol and Wolff (1988). They defined it as a group of economies in which technology transfer, international trade and investment, and the spread of education were the primary factors driving productivity levels and industrial structures to the industrial core (Delong & Dowrick, 2003). The concept gained more attraction as a result of the innovative efforts of Barro and Sala-i-Martin (1992). This type of work

[14] such as production technology, government policies, preferences, etc

can be found in several early examples (such as Chatterji, 1992; Quah, 1993; Durlauf & Johnson, 1995; Azariadis, 1996; Galor, 1996).

At the country level, Quah (1996) introduced a methodology for modelling the dynamics of countries' cross-sectional distributions, which did not rely on a theoretical model. Quah made a statement that in the world economy the so called "twin-peaks" theory is observable. According to Quah, the convergence clubs exist at the upper and lower ends of the income distribution; while the middle class is disappearing. According to him, diverging growth rates are experienced by economies as a result of their difference in human capital level and henceforth, would not converge.

3.2.2. Empirical Literature

Empirical literature mainly comprises two parts. First part discuss studies in context of various methods employed for studying club convergence, while, the second part cover both cross country and country specific studies on club convergence.

In context of various methods employed for studying club convergence, empirical studies have reached various outcomes concerning the quantity and features of groups, particularly influenced deeply by the methods employed. The empirical methods used were chronological series tests of unit root and co-integration (Evans & Karas, 1996; Evans, 1998; Kutan & Yigit, 2005; Guetat & Serranito, 2007; Siklos, 2010; Lopez & Papell, 2012) and cross-section augmented Solow regression (Evans & Karas, 1996; Evans, 1998; Kutan & Yigit, 2005; Guetat & Serranito; Barro & Sala-i-Martin, 1992). Phillips and Sul (2007) proposed a non-linear factor model based on panel convergence clustering. Phillips and Sul emphasized the importance of

heterogeneity in the growth transitional dynamic over time and across countries. There has been a surge in economic convergence research since Phillips and Sul.

By using a simple non-linear model, Wolff and Baumol (1988) concluded the existence of two clubs: a high income convergence club and a low income divergence one. Linking the economic gap[15] at some time with the particular economic gap at a previous time and incorporating more influences of those former levels, Chatterji (1992) established the existence of two convergence clubs which are mutually exclusive: one comprising the rich nations and another consisting of the poor ones.

By employing regression tree analysis and utilizing income per capita as a development measure, Quah (1993) investigated the club convergence preposition for 105 economies covering period 1960-1990. Quah observed a growing twin-peak, involving division of regions into two dissimilar income groups. Differing from the established view of conditional convergence, Quah stressed that scope for heterogeneity contribute to the convergence process and thus steady state for the countries with similar characteristics would be different from other groups. The same was repeated and tested further more rigorously by Quah. At the same time, tbe similar findings were reported by Durlauf and Johnson (1995), where by employing regression tree analysis for 121 economies; they found evidence of multiple steady states equilibria. Their findings suggested that the formation of club convergence is determined by the diversity of existing human capital levels and its growth.

Furthermore, contributing to the idea that there can be numerous steady state equilibria, models for club convergence was developed by Galor (1996). According to

[15]The difference between the per capita GDP of the richest economy and per capita GDP of the other economies

Galor, economies with same characteristics do have a tendency towards common steady-state equilibrium in the long run, but there is divergence across different groups of equilibria. Stengos and Liu (1999) in turn, using the semi-parametric partially-linear technique, and Hansen (2000), employing threshold regression, founded that convergence is apparent only for economies with range of middle and upper income.

The empirical studies on club convergence firstly paid attention to the cross-country trends and patterns, whereas the issue of regional convergence received rising attention in the last two decades. In literature, there are studies both on convergence clubs across countries and convergence club across regions with in same country.

Cross-Country Studies

Several studies on convergence clubs have been conducted in various countries. Bartkowska and Riedl (2009) investigated the formation of convergence clubs in per capita income among 206 European regions from 1990 to 2005. They employed a novel regression based convergence test developed by Phillips and Sul (2007). The study found the existence of convergence clubs, showing that European regions form five different groups converging to their own equilibrium paths. Borsi and Meitu (20015) investigated the phenomenon of club convergence in Europe over the period 1970-2010. It was revealed that there is no convergence for whole sample, while, convergence clubs were formed on geographical basis.

For Latin America, Quiroga (2011) investigated 32 economies for 108 years dividing it in to three periods i.e. exporting phase (1990 to 1930), industrialization phase (1931 to 1974), and globalization phase (1975 to 2007). The results of the study concluded

that during last two phases there was strong proof of convergence among clubs that did well in industrializing and building bigh quality institutions. Several other studies also have analyzed the phenomenon of club convergence for various Latin American countries for various time periods (such as King & Barrios, 2019; Dobson, 2016; Martin & Vazquez, 2015; Rodriguez-Benavides et al., 2014).

For Asia, Tam (2018) has examined convergence across sixteen Asian economies based on income, consumption and government spending. Findings of the study revealed that there was no confirmation of convergence in full sample. On the other hand, they found convergence for each macroeconomic variable within clubs, showing that poorer economies have a tendency to catch with wealthier ones.

Country Specific Studies

A number of studies have been conducted on convergence clubs across regions with in same country. Income convergence across Chinese regions was investigated for 31 provinces of china by Tian et al. (2016) for period covering 1978-2013. The study discovered two convergence clubs and recommended that human capital, investment, and openness increase the likelihood of regions joining the higher income club. Li et al. (2018) conducted a comparable study for 2286 Chinese regions from 1992 to 2010. The study discovered six convergence clubs and coneluded that important factors such as population density, per capita fixed assets, and industrialisation influence the formation of convergence clubs.

Aksoy et al. (2019) investigated the club convergence in income per capita across Turkey's 81 NUTS-III regions from 1987 to 2017. They discovered five clubs in the first period, 1987-2001, and six clubs in the second period, 2004-2017. Furthermore,

the findings revealed that the most important determinants influencing club formation in Turkey are initial per capita income, total credits, and human capital. Lyncker and Thoenesen (2017) identified four convergence clubs for the period 1980-2011 while investigating the determinants of club convergence for 194 European NUTS-2 regions. Along with ecological factors such as capital city effects and north-south division, the study found that initial income per capita, initial human capital, and initial labour force participation ratc all contribute to the formation of higher or lower-income convergence clubs.

According to the above literature, the majority of the current research on club convergence is limited to the use of per capita GDP. The concept of club convergence has recently been expanded to include the use of the human development index for convergence across different countries or regions.

Club Convergence Studies based on Human Development Index

After criticism by several renowned economists such as Sala-i-Martin, on the use of GDP per capita as proxy for convergence in human development across countries or regions, a number of empirical studies based on human development index have been conducted in last decade. Some of tbese studies are discussed below.

In a recent study, Basel et al. (2020) attempted to analyze the club pattern and transitional behaviour of 102 economies by using human development index covering period 1996-2015. The results of the study revealed four convergence clubs and transition is found during 2008. The results showed that the clubs are determined by initial level of development and globalization. The club convergence hypothesis for Spain was studied by Montanes et al. (2018), based on income and human

development index, covering the periods 1980 to 2007 and 1980 to 2014 respectively. The study concluded that the figure of clubs declines for the period 1980 to 2014 demonstrating that the great recession has inverse impacts on the provincial disparities.

The club convergence hypothesis is analyzed in terms of economic and social aspects of development for 178 countries over the period 1990-2010 by Szendi (2014). The results show that there is a little economic and social convergence in the world. Four convergence clubs were found which show the usual global tendencies. The issue of convergence of human development was analyzed by Roy and Bhattacharjee (2009) among key states of India through convergence analysis by using HDI data for the period 1981-2001. The study revealed that that low HDI states are emerging at a higher rate than high HDI states, consequently leading to the convergence in human development.

A review of the literature reveals that the majority of studies on club convergence are clearly limited to the use of GDP per capita. A few studies have recently used development indices to investigate the phenomenon of club convergence across countries/regions. So far, no research has been conducted in Pakistan to investigate the club proposition at the district level in terms of the broad aspects of development.

3.3. Literature on Decentralization and Spatial Disparity

3.3.1. Theoretical Literature

Theoretically, it is uncertain whether over time territorial inequalities rise or decline or regions converge or diverge. In this regard, understanding three theories of economic literature are vital. According to Neoclassical Growth Theory by Solow (1956), absolute or conditional convergence between regions is predicted if savings, production technology, and preferences are similar. On the other side, endogenous growth theory (Romer, 1986; Romer, 1990) predicted a more differentiated result, where regions could converge, diverge or grow parallel. The New Economic Geography (Krugman, 1991) also believes in the possibility of all three development paths. On the other hand, none of these theories take into consideration the role of government in these processes, mainly relating to the federal system.

In the 1950s and 1960s, the theory of fiscal federalism emerged in public finance. Three major figures define this public-sector perspective: Richard Musgrave, Kenneth Arrow, and Paul Samuelson. Especially, outstanding two papers on the nature of public goods by Samuelson (1954, 1955), understanding of the importance of the private and public sectors by Arrow (1970), and enormous volume on public finance by Musgrave (1959) put forward an active and constructive role for the government sector in terms of correcting various types of market failures, ensuring a fair distribution of income, and macroeconomic stabilization.

Functions of public sector explained by Richard Musgrave's (1939) are regarded as the basis for theories of fiscal decentralization. Musgrave defined three functions of

government: allocation, stabilization, and distribution. The three functions are not appropriate uniformly for all tiers of governments, and for efficiency it is obligatory that each function is properly allocated to the level. Musgrave opined that federal government should have the responsibility of income redistribution and macroeconomic stabilization, whereas sub-national governments should make sure the efficiency of public goods provisions within their jurisdiction. Because sub-national authorities are more close to citizens and are well aware of their preferences.

The literature shows that there are constraints on both redistributive and macroeconomic stabilization policies at sub national levels of government, whereas only allocative responsibility appears to be fitting to theory of fiscal decentralization. The role of decentralized authorities to perform macroeconomic stabilization function is limited because of the constraints like no access to monetary prerogative and highly open economies at local level. Likewise, mobility of households and firms limits the redistributive potential of decentralized governments. Thus, the allocative function seems to be fitting to capacity of decentralized governments while the responsibilities for Richard Musgrave's macroeconomic stabilization function and redistributive functions must be performed by the federal government.

From theoretical perspective, regarding the link between decentralization and regional inequalities, there are two types of arguments that guide the debate; first one oriented to the theory of public choices, which proposes decentralization as a tool to reduce regional disparities (Brennan & Buchanan 1980; Weinngast, 1995; Mckinon, 1997; Weingast & Qian, 1997; Shah & Shankar, 2003; Gill et al., 2004), whereas the second one is the key to increase the authority of central government to reduce regional disparities (Prud'homme, 1995; Rodríguez-Pose & Ezcurra Rodríguez& Gill, 2004).

The theoretical literature on fiscal decentralization has mainly focused on the evidently positive impact of larger fiscal authority to lower-level government for both allocative and productive efficiencies (Tiebout, 1956; Oates, 1972; Brennan & Buchanan, 1980). Tiebout (1956) and Oates (1972) hypothesise that the shifting of power and resources to lower levels of management brings about twofold enhancement in efficiency. Oates (1972) explained that a larger role of sub-national governments allow a better understanding of the preferences of citizens. While according to Tiebout (1952), decentralization raises levels of competition among units of federation, which in turn can create novelty and develop the welfare of the population.

There are several criticisms of devolution, beside the efficiency gains. Opponents of fiscal decentralization argue that only well-endowed federating units would benefit from fiscal decentralization, consequently rising regional inequalities (McNab & Martinez, 2003). The shifting of authority and resources to sub national level of government disproportionally supports areas with superior socioeconomic endowments and improved institutions to achieve allocative and productive efficiencies (Cheshire & Gordan, 1998).

Furthermore, because decentralization weakens the central government's ability to play an equalising role, it may result in a shift in economic development from the periphery to the core (Prud'homme, 1995; Rodrguez-Pose & Ezcurra Rodrguez & Gill, 2004). Therefore, the general opinion is that decentralization and greater spatial disparities are the two sides of the same coin, and that there is clearly a tension between chasing the objectives of equality in service provision and better decentralization and choice (Besley & Ghatak, 2003). According to Prud'homme

(1995), deprived regions could not compete with the wealthier ones and that would cause the deprived regions getting poorer and well-off regions richer. Prudhomme explains inter-jurisdictional competition as a vicious circle and sum up that decentralization can be the mother of segregation consequently.

Moreover, Prud'homme argued that fiscal decentralization limits the scope for central government intra-regional transfers aimed at reducing regional income disparities. Too much decentralization makes it difficult for the federal government to achieve goals of income redistribution and macroeconomic stability. Because of limited resources, macroeconomic stabilization becomes difficult for the federal government during emergency period. The distributions of resources among regions are improved by a more centralized public sector as it tends to transfer resources to the poorer regions from the richer regions. Most clearly, because fiscal decentralization means taking away resources from the central government, it worsens the capacity of inter-regional redistribution which may be intended towards regional convergence.

Economic and political factors may contribute to increased regional inequalities as a result of decentralization (Gill, 2005). The playing field is considered uneven from an economic standpoint, with significant disparities in institutional capacity (local administration) and socioeconomic endowments (Gill & Rodriguez-Posé, 2005). Politically, decentralization may reduce poor regions' authority over the allocation of financial resources and transfers.

The aforementioned theoretical literature explains that there are opinions of both converging and diverging effects of fiscal devolution on regional inequality.

3.3.2. Empirical Literature

Fiscal decentralization is regarded as one of the vital tools to promote efficient public service delivery. The link between decentralization and spatial disparities are mainly based on evaluating the link of fiscal decentralization with economic indicators, such as inequality and poverty. Despite numerous studies, the debate over the effects of fiscal decentralization on regional inequality is still indecisive.

The links between devolution and territorial imbalances have been analyzed by both cross-country and country specific studies (Barrios & Strobl 2009; Bonet, 2006; Canaleta et al., 2004; Akai & Sakata, 2002; Liu & Lin, 2000; Zou, 1998). So, tbe empirical literature can be categorized into case studies of single country and cross country researches of developed and developing economies.

Cross-country Studies

The cross countries empirical literature can be further categorized into studies of developed and developing economies. Various studies focused on the impacts of fiscal decentralization on spatial disparities for developed countries (Kyriacou et al., 2013; Pascual & Ezcura, 2008; Canaleta, 2004; Lessmann, 2009). For developed countries, most of the empirical studies found positive relationship between fiscal decentralization and spatial disparities, with the exception of a single study (Rodriguez & Gill, 2003).

The association between fiscal decentralization and regional disparities was examined by Kyriacou et al. (2013) using a panel of 24 OECD countries from 1984 to 2006, and discovered that decentralization reduces inequalities in case of good governance but increases disparities in bad governance. Rodriguez and Ezcurra (2010) used a panel of

26 countries (19 high income & 7 low income) to examine the impact of fiscal decentralization and discovered that political and expenditure decentralization reduces regional inequalities in high income economies only, while significantly increasing them in low income economies.

Considering both a cross-section and a panel of 17 OECD economies for the period 1980-2001, Lessmann (2009) concluded findings in the favour of useful impacts of decentralization for both developed and developing economies. He analyzes that the argument against higher level of fiscal decentralization is not justifiable since the expansion of fiscal decentralization results in reduction in regional disparity because of improvement in resources allocation across regions.

The useful impact of fiscal decentralization on reducing spatial disparities in developed world was also found by Canaleta et al. (2004) by utilizing cross-sectional data of 17 economies within the OECD for the period 1975-2000, they estimated that regional disparity is reduced during the fiscal decentralization period. Furthermore, as long as decentralized economies witness higher convergence pace, fiscal decentralization leads to regional convergence.

On the other side, there is a study which found a direct connection between devolution and rising regional inequalities for developed countries. Rodriguez and Gill (2003) analyzed the evolution of regional inequalities and decentralization processes in 12 countries (8 developed & 4 developing countries) for period 1980-2008 and found that with the only exception of Brazil, there is a widespread general trend towards divergence across the world.

With a few exceptions (such as Rodriguez &Gill, 2003), the majority of studies conducted in the developed world revealed a positive relationship between fiscal decentralization and regional inequality. The majority of empirical studies on the relationship between fiscal decentralization and spatial disparities in developing countries found contradictory results. Shah and Shankar (2003), Gill and Rodrguez (2004), and Ezcurra and Rodrguez (2004) conducted research on developing countries (2010). Some of these studies are discussed below.

Regional inequalities in low income and medium income economies increase after the implementation of fiscal decentralization as explained by Rodriguez-Pose and Ezcurra (2009). In contrast, fiscal decentralization policy in rich economies may have a positive or neutral impact on regional inequality. So, the study presents some evidence of devolution to increase regional disparities in developing world, but no strong association for high developed economies. Anwar (2004) examined fiscal decentralization issues in 33 developing and transition economies from 1980 to 1999 and discovered that in transition economies, subnational government expenditures on education and health show declining trend, whereas in developing economies, expenditures on education and health are increasing over time.

The above discussed results for cross country studies show that most of researcbes on the developed world have a tendency to conclude a positive connection between devolution and spatial imbalances, whereas the conclusion is mixed from research focusing on developing economies. Furthermore, the debate shows that the phase of development might be vital, as efficiency results in developing world from decentralization are less evident relative to industrial countries.

Country Specific Studies

The literature shows that for single country studies, the evidence is mixed and inconclusive. Most studies, such as Qiao et al. (2008) and Zhang and Kanbor (2005) for China, Araujo (2007) for Brazil, Pike and Tomaney (2009) for the UK, Hill (2008) for Indonesia, Warner and Pratt (2005) for the US, Azfar and Livingston (2002) for Uganda, Gulati and Husain (2002), Bagchi (2003) for India, and Bonnet (2006) for Colombia, found a positive relationship between decentralization and territorial disparities. Several of these studies are discussed further below.

The relationship between fiscal decentralization and regional inequalities in Brazil was analyzed by Araujo (2007) for the period 1980-2014 and found a useful connection between fiscal decentralization and regional disparities. The results show that fiscal decentralization has been a vital tool for reducing income inequality among states. Kiran (2005) analyzed the impacts of decentralization at state level in India by applying a model based on panel data for sixteen states for period covering 1980 to 2001. The findings of the study show that tbe impact of decentralization on the social sector and the advantages differ from state to state, but overall, at the expense of regional disparity, fiscal decentralization have positive impacts on the economic growth.

The association of fiscal decentralization with health and education was investigated by Habib, et al. (2003) for provinces of Argentina. The study concluded that the disparity in educational outcome and infant mortality rate between rich and poor provinces reduces considerahly between 1970-1994 due to rise in per capita expenditure on health and education in low-income provinces. The impact of decentralization on social assistance was conducted for Albania by Alderman (1998)

and findings revealed positive impacts. Faguet (2001) concluded that fiscal decentralization assist in improvement of public services and help the masses to access social services more efficiently in case of Bolivia. King and Ozler (1998) found that the school management at sub national level helped in score achievements in case of Nicaragua.

On the other hand, numerous other studies of single country found that decentralization is either not related or negatively associated with territorial disparities. These studies include; Wei and Wu (2001) for China, Calamai (2009) for Italy, Hill (2008) for Indonesia, Hosio and Akai (2009) for the US, Kim (2003) for Korea, and Filmer (2002) for Argentina. Some of these studies are discussed below.

The impact of fiscal decentralization on regional disparity was studied for Indonesia by Hill (2008). The study found ineffectiveness of fiscal decentralization regarding its impact on regional disparity given the relatively short period of its implementation. Fjeldstad (2001) investigated about the role of fiscal decentralization in public sector delivery for Tanzania. The study found that several factors such as inadequately defined taxes, high corruption, and distortion in provision of public service could further worsen the distortion, if decentralization is enlarged without assessing the ability of local bodies.

For china, West and Wong (1995) found that delivery of public services through decentralization is lower in underdeveloped regions of china. Similarly, Ravallion (1998) in study of Argentina, conclude that decentralization led to inequality and the provinces which were deprived were unable to provide public services efficiently.

Similarly, Azfar and Livingston (2002) concluded that fiscal decentralization has a negative impact on the provision of public services in Uganda.

The above discussed literature for country specific studies shows that the evidence is mixed and inconclusive.

Empirical Studies for Pakistan

For Pakistan, most of the research is based on provincial level disparities. Limited empirical evidence can be found addressing spatial disparities at district level (For instance, Munir, 2017; Ahmed, 2011; Akhtar, 2008; Jamal & Khan, 2003). Some of these studies are discussed below.

The impact of devolution on territorial inequality in the health and education sectors at both inter provincial and intra regional phases was investigated by Munir (2017). The study concluded that, a result of fiscal decentralization, the situation is slightly improved for both indicators at the provincial level. On the other hand, still there are severe dissimilarities in the level of inequality across rural and urban areas. Akhtar (2008) analyzed the varying tendency of inter-provincial and inter-district level imbalances for the period of 1998-2005, and found that social inequality has reduced, but consumption inequality has increased at the federal and provincial level.

Assessing the diverse elements of inter-temporal regional inequalities at the interprovincial and inter regional level for the period of 1980 to 2000, Jamal and Khan (2003) showed that the level of inequality has increased in Khyber Pakhtunkhwa, Sindh and Baluchistan. Tbey further analyzed that these three provinces are affected badly by the rising level of disparity at the inter-provincial and intra-regional level.

Sikander and Shah (2010) studied the existing social disparities at district level in Punjab. The study found that essential social services are available easily in the provincial capital and the districts away from the provincial capital are facing the problems of high disparity in the provision of basic social services. Jamal and Malik (1988) studied the varying tendencies of regional development and identify the ranking of the Sindh districts for period 1972-1981. They concluded that the study suggest mixed outcome as some districts are ranked higher, while, the development place of other districts has turned down.

The empirical literature for Pakistan shows that the majority of studies on the relationship between fiscal decentralization and regional disparities are conducted at the provincial level. The impacts of fiscal decentralization on social inequalities such as education, health, and household welfare are not studied at the district level. The study fills this void by investigating the effects of fiscal decentralization on human development index at the district level.

3.4. Summary of Literature

The above literature includes theoretical and empirical studies on the clustering of socioeconomic activities, club convergence hypotheses, and link hetween spatial disparities and fiscal decentralization.

The theoretical discussion demonstrates that economic growth and development tend to occur in areas with a high density of interactions between economic agents. Simultaneously, socio-institutional factors play an important role in establishing a local competitive advantage. However, not all areas benefit from such favourable conditions and national growth. Development is frequently led by a small number of

rapidly growing and innovative locations within a country, which are typically located near large urban areas. So, the theoretical literature demonstrates that the role of geography has long been noted, although economists ignore geography in modern growth economics and macroeconomics until 1990s.

The theoretical literature expands on the concept of club convergence and the factors that influence the formation of club convergence. The literature shows that Countries with similar structural characteristics, such as production technology, government policies, preferences, and so on, can converge to different steady-state equilibria if their initial conditions differ. Finally, the theoretical literature examines the relationship between fiscal decentralization and spatial disparity, concluding that there are differing perspectives on the converging and diverging effects of fiscal decentralization on regional disparity.

The empirical literature clearly shows that, over the past three decades, there are numerous empirical studies on assessing the issue of spatial inequality in the rest of the world. Most of the empirical studies focusing issue of spatial disparities include research on; clustering of socio-economic factors across countries/regions, testing of club convergence hypothesis across countries/regions, and link of spatial disparities and fiscal decentralization.

The empirical literature also indicates that the studies on these spatial issues firstly paid attention to the cross-country trends and patterns, whereas the issue of regional convergence (convergence club across regions with in same country) received rising attention in the last two decades. The review of empirical literature also shows that most of the studies on club convergence are limited to the use of GDP per capita.

Recently, a few studies have used development indices for studying the phenomenon of club convergence across countries/regions.

For Pakistan, most of the studies on socio-economic issues are based on provincial level and have neglected the issue of spatial disparities among the districts within the provinces[16]. So far, no research has been done to investigate the clustering of socio-economic indicators and club proposition at district level with regards to the extensive aspects of development. Similarly, the impact of fiscal decentralization on human development disparities (such as education, health, & household welfare) is also not analyzed at district level.

Overall, this situation draw attention towards exploring the issue of spatial disparities across districts of Pakistan to discover the most deprived clusters of population in terms of health, literacy, and household welfare. Moreover, it also supports the formulation of guidelines that can reduce these issues of inequality in human development indicators at district level in Pakistan.

In light of the problems mentioned above, this dissertation promotes the literature and policy debate on human development disparity and convergences. The study mainly focuses on three themes. Firstly, measure the disparities in the level of human development among districts of Pakistan. Secondly, identify the groups (convergence clubs) of districts in Pakistan that converges to the similar level of steady state. Finally, investigate the effects of fiscal decentralization on disparities in human development at the district level in Pakistan.

[16] Exception includes Ahmed (2011)

3.5. Linkage between the Objectives

The preceding literature on regional development has emphasized the importance of viewing human development through the lens of spatial concepts such as neighbourhood, density and distance. This dissertation focuses on three interconnected analyzes that investigate the spatial pattern of human development disparities in Pakistan.

The first analysis aims to analyze whether neighborhood matters in the distribution of the human development index across districts i.e. whether a district with high (low) development has been spatially associated with districts with high (low) development levels. The second theme investigates the level of spatial disparities by analyzing convergence in human development index through convergence club phenomenon.

Following the identification of district clusters and outliers through the first theme, the second theme assists in identifying the level of disparity at the district level in Pakistan, i.e. the greater the number of clubs, the greater the disparity, and vice versa. Overall, the first two themes identify the pattern of human development disparities in Pakistan at the district level. The final theme examines how fiscal decentralization affects human development index and sub-indices at the district in Pakistan.

CHAPTER 4

METHODOLOGY AND DATA

This chapter discusses the data base and research methodology applied for analyzing data. The chapter is further divided in to three sub sections. Section 4.1 discusses the research methodology of first theme "Spatial disparities across the districts of Pakistan". Section 4.2 presents the research methodology of second theme "Regional convergence clubs in Pakistan". Section 4.3 reviews research methodology of third theme "Fiscal decentralization and spatial inequality in Pakistan".

4.1. Spatial Disparities Analysis

In this section, we explain the model and theoretical framework within which we perform empirical analysis.

4.1.1. Theoretical Framework for Spatial Analysis

Spatial Analysis

Conventional statistical inferences such as traditional regressions are inadequate, because spatial effects and troubles of spatial data analysis[17] are not taken into consideration by these measures (Espa & Benedetti, 1996; Beardsley & Gleditsch, 2006; Hays & Franzese, 2007). Consequently, to take into consideration spatial analysis and troubles of spatial data analysis, a detail spatial analysis is mandatory.

Various justifications call for the utilization of exploratory and explanatory techniques that can clearly consider geographic effects. In geography, a basic notion is that

[17] Spatial effects and issues in spatial data analysis include identification of spatial outliers & clusters, spatial autocorrelation & lack of spatial independence.

neighboring locations normally share more resemblances than distant locations. This is known as "Tobler's first law of geography" (Tobler, 1970). Furthermore, because an unequal distribution of socioeconomic features determines the economic topography of most economies, spatial analysis is becoming increasingly important in policy (World Development Report, 2009).

Spatial Effects

Spatial effects are categorized in to major two forms: spatial heterogeneity and spatial dependence. Spatial heterogeneity is the manifestation of instability in the manners of the associations under investigation. On the other hand, spatial dependence refers to the dependence in cross sectional data sets mostly found between observations.

When the factors under analysis are from dissimilar localities across space, then assuming structural stability or non-stationarity over space is a very unrealistic assumption. Standard regression studies that do not consider the problem of spatial dependence can probably yield biased estimators and defective significance tests. Statistics of Spatial autocorrelation are proposed as a remedy to measure, detect, and analyse the dependence level among observations.

Measuring Spatial Effects

Spatial dependence is used to find out spatial association between geographical units in a system. These queries are properly responded by employing the notions of neighbourhood articulated in terms of contiguity (shared borders) and distance.

Spatial Weight Matrix (W)

For defining neighborhood in this study, two fundamental approaches are used: contiguity (shared borders) and distance. Weights matrices based on contiguity consist of rook and queen. Under the rook criterion, areas are neighbors if there is a common border, not vertices. Weight matrices based on distance comprises distance bands and *k* nearest neighbors.

Based on the above two notions, four weight matrices are constructed to investigate the spatial distribution of the human development index and sub-indices. A rook contiguity matrix, k 7 nearest neighbor matrix, k 4 nearest neighbor matrix, and W-150 miles matrix define neighbours as all regions located within a great circle distance with a cut-off of 150 miles. Finally, the matrices are row standardized, which is a recommended practice when the distribution of the factors under consideration is likely biased due to errors in sample design or a forced aggregation method. Due to space constraints, we only present the Binary Contiguity Matrix and the k 7 nearest neighbor matrix:

Binary Contiguity Matrix

To enforce a neighborhood composition on a dataset spatially, a spatial weight matrix is the compulsory device. Tbe binary contiguity is the most widely used method of describing a type of adjacency as expressed in a spatial weight matrix (Cliff & Ord, 1981). In the literature on spatial statistics, W represents the composition of geographical associations between various points in space. Binary relationship defines neighbors as, 1 for neighbors, 0 for non-neighbors. We perform all of our work in GeoDa.

Below given is a spatial weight matrix considered for three units:

$$W = \begin{pmatrix} 0 & W_{12} & W_{13} \\ W_{21} & 0 & W_{23} \\ W_{31} & W_{32} & 0 \end{pmatrix}$$

Where, W_{ij},*i* and *j* relationship value might be 1 and 0, if they have a vertex or a border. The **W** matrix can be utilised to estimate the significance of a spatial unit within the system, as it presents spatially the characteristics of a system.

The K_7 Nearest Neighbor Matrix

$$w_{ij}(k) = 0 \ if \ i = j$$

$$w_{ij}(k) = 1 \ if \ d_{ij} \leq D_i(k) \ and \ w_{ij}(k) = w_{ij}(k) / \sum j \ w_{ij}(k) \ for \ k = 7 \qquad (4.1)$$

$$w_{ij}(k) = 0 \ if \ d_{ij} > Di(k)$$

Where d_{ij} is great circle distance between centroids of district *i* and *j* and *Di (k)* is tbe 7th order minimum distance between districts *i* and *j*, so that eacb region *i* has seven neighbors exactly.

Distance-band weights

It is possible to obtain the simple spatial weights matrix generated by a distance measure when *i* and *j* are considered neighbours, wherever *j* falls within a critical distance band from *i*

More precisely, $w_{ij}=1$ when $d_{ij} \leq \delta d_{ij} \leq \delta$, and 0wij=0 otherwise, where δ is a preset critical distance cutoff.

To avoid isolated (islands) caused by an overly stringent critical distance, the distance must be chosen in such a way that each location has at least one neighbor. This distance satisfies the max-min criterion, indicating that it is the greatest of the nearest neighbor distances.

4.1.2. Model

The use of spatial econometric methods has achieved popularity with this more attention on issues of regional development and improvement of spatial data analysis (Arbia, 2006). Researchers have established how physical location and geographical spillovers are now as vital as otber macroeconomic factors in growth (Quahm, 1996; Trehan & Moreno, 1997).

There are several diverse methods used to discover correlations in space. The technique that is used commonly is exploratory spatial data analysis (hereafter ESDA). This study utilises technique ESDA.

Mapping the Distributions

Prior to estimation of models with data, GeoDa [18](one of diverse software packages for performing ESDA) is employed to create quartile maps and scatter plots. It maps the variables used in the study and explore spatial patterns visually through map.

Exploratory spatial data analysis (ESDA)

ESDA is a subgroup of Exploratory Data Analysis (EDA). EDA is operated where the investigator focused a deeper view of the data and tries to make some sense of it.

[18]GeoDa (short for Geographic Data Analysis) GeoDa is planned as a complement to current GIS purpose, not as an alternate. For example, GIS associated processes which are not applied within GeoDa comprises shape files/ merging/aggregating data, dissolving shape files, map projections, and changing shape files.

EDA was developed in 1977 by John Tukey. ESDA is a set of procedures utilised to visualize and portray spatial distributions[19]; discover spatial outliers or atypical locations; find out patterns and scope of spatial association, hot spots or clusters; and recommend spatial regimes or other types of spatial heterogeneity (Anselin, 1988; Haning, 1990; Ertur & Galo, 2003; Van, 2004; Gatrell, 1995). Instead of trying to develop explanations, ESDA intends to search for relations (Haning, 2003). In this study, the ESDA techniques employed consist of the computation of Global level indicators (Moran's *I*) and analysis at local level (LISA).

Measures of Spatial Autocorrelation

There are various definitions of spatial autocorrelation. According to Cliff & Ord (1973), if the presence of a feature in a locality makes its presence in bordering locality more or less likely, such phenomena reveal spatial autocorrelation. According to Sokal and Oden (1978), spatial autocorrelation analysis determines whether the observed value of a variable in one area is independent of values of the variable in neighboring areas. Fingletonm and Upton (1985) define spatial autocorrelation as, methodical spatial dissimilarity in values across a map, or patterns in values recorded at localities with the given localities.

When characteristics are alike in locality, then it would be regarded as positive spatial autocorrelation. When characteristics are different in locality, then it would be considered as negative spatial autocorrelation. When characteristics are not dependent on locality, they are regarded as zero autocorrelation (Holt, 2007). We estimate some spatial tools to estimate the spatial distribution of development and sub-indices now that the weight matrix has been characterized. Visualisation and tests of both global

[19] A spatial distribution is the arrangement of a phenomenon across the earth's space.

and local Moran's *I* statistics are part of spatial autocorrelation analysis (Anselin et al., 2006).

Global Spatial Autocorrelation

Global spatial autocorrelation is a technique used to detect overall clustering. To discover the global spatial autocorrelation in the data, this study uses Moran's statistics.

Moran's I statistics

Moran's *I* statistic is the most important indicator of overall spatial autocorrelation. Originally, it was proposed by Moran in 1948, and popularised through the standard work by Ord and Cliff (1973). Primarily, the Moran's *I* is the widespread employed measure due to its simplicity in understanding and its further splitting into a local statistic alongside presenting graphical data regarding presence or absence of spatial clustering.

It is judged by means of a null hypothesis test of random locality. The negative response of null hypothesis suggests a spatial structure, which gives further details about the distribution of data. For all variables, it estimates the level of linear connection between its value at one locality and the spatially weighted average (mean) of adjacent values (Anselin, 1995; Anselin et al., 2007) and is formalised as follows:

$$I_t = \frac{\sum_{i=1}^{n}\sum_{j=1}^{n} W_{ij}(k)x_{it}x_{jt}}{\sum_{i=1}^{n}\sum_{j=1}^{n} x_{it}x_{jt}} \qquad (4.2)$$

w_{ij} is the (row-standardised) degree of association between the spatial units *I* and *j* and the variable of interest in district *i* at year *t* is represented by x_{ij} (determined as a

deviation from the mean value for that year). Positive spatial autocorrelation is pointed out, if Values of I is bigger than the expected value E (I) = −1/ (n − 1), while negative spatial autocorrelation is indicated, if Values of *I* is lesser than the expected value.

Local Indicators of Spatial Association

The Moran's *I* only measures the presence global of spatial autocorrelation; it does not give data on the accurate locations of spatial patterns (Holt, 2007). So, LISA is essential to measure the magnitude and location of spatial autocorrelation (Anselin, 1994). Thus, this research utilises *local indicators of spatial association* (here after LISA). The method displays for each location the presence or absence of significant spatial outliers or clusters. It specify local clusters that are significant (low–low or high–high) or spatial outliers locally (low–high or high–low).

The mean of the Local Moran statistics is related to the value of Global Moran's *I* (Anselin 1995; Anselin et al., 2007).

$$I_i = \left(\frac{x_i}{m_o}\right) \sum_j W_{ij} x_j \quad with \quad m_o = \sum \frac{x_i^2}{n} \tag{4.3}$$

Where $w_{i\,j}$ represents the elements of the row-standardised weights matrix W and x_i (x_j) is the observation in district $i(j)$.

4.1.3. Spatial Unit of Analysis, Variables Description and Data Source

Spatial Unit of Analysis

In Pakistan, due to the large quantity of data collected at a provincial level, socio-economic researches are mostly rooted in analysis at provincial level. However, provinces of Pakistan have severe 'within' differences in forms of their development levels, economic structures, language, cultures, geography and natural resources. Consequently, formulation of regional policy needs to analyse social and economic issues at lower level. As a result, in this study 'district' of Pakistan is the spatial unit of analysis. A unit of analysis at lower level is not being used because territorial level below the district level has reliability problems.

Variables Description

In this study, we attempt an ESDA analysis for 97 Pakistani districts using an augmented index for measuring disparities in human development level. The human development index is divided into three components: education, health, and household welfare. Each sub-index is built on five indicators. In Pakistan, data on per capita income are not available at the district level. Household welfare indicators better reflect the level of per capita income at district level. Therefore, household welfare index is used a proxy for per capita income (Wasim & Munir, 2017). Three indicators of child health are included in health index because; out of total eleven health indicators developed by PSLM, six indicators are related to child health.

These indicators are regarded as the major objectives of development as advocated in the sustainable development goals (SDG'S) of UNDP. The Principal Component

Analysis[20] (PCA) is used to aggregate these indicators to get sub-indices and a final human development index (Basel et al., 2020). By using this human development index and sub-indices, we investigate the ESDA analysis of 97 districts for the periods 2004-05 and 2014–15. The list of indicators used to compute sub-indices and final human development index is given in Table 4.1 below.

Table 4.1: List of indicators of education, health and household welfare level

S. No	Human Development Index		
	Education Index	**Health Index**	**Household Welfare Index**
1	Adult Literacy level (15 years and older population)	Child affected by diarrhea in last thirty days (aged under 5)	Households by housing ownership
2	Population that has completed primary or higher level	Treatment of diarrhea in children (aged under 5)	Household with Gas
3	Net enrolment rate at the secondary level (aged 11-13)	Children that have been immunized (aged 12-23)	Households with electricity
4	Net enrolment rate at the Matric level (aged 14-15)	Health Consultation (number of individuals who consulted for treatment that is percentage of total individuals fallen sick during last two weeks)	Households with flush toilet
5	Population that has attended school ever	Prenatal Consultations	Households with RCC Roof

Data Source

This study uses district level data on Socio-economic indicators for 97 districts in the country for the periods 2004-05 and 2014–15. Data is collated from Pakistan Social

[20] PCA is a method for analysing and identifying data patterns, as well as expressing the data to show similarities and variations. It converts a large number of linked variables into a smaller number of uncorrelated variables while retaining the information in the large set. These unconnected variables that are extracted from the original set variables via their correlation matrix are referred to as principle components (Basel, et al., 2020).

and Living Standards Measurement survey (hereafter PSLM), which has been conducted annually since 2004 by Pakistan's Federal Bureau of Statistics (hereafter FBS). For Pakistan, the PSLM is the only source data on socio-economic variables at the district level. PSLM consist of statistics on socioeconomic attributes, for example health, education, household quality and services. Data is collected from following PSLM Surveys of 2004-2005 and 2014-2015.

Data Limitations

Data for the study is taken from PSLM Surveys for the periods 2004-05 and 2014–15. Currently, there are 160 districts in Pakistan. These PSLM surveys don't include districts of Gilgit-Baltistan, Kashmir and Ex-Fata districts which were merged in Khyber Pakhtunkhwa in May, 2018. So, PSLM surveys collect data from 116 districts across four provinces of Pakistan. Due to missing observations, 19 districts are excluded from this study's data. Appendix A3 contains detail of the dropped districts.

4.2. Regional Convergence Clubs

4.2.1. Theoretical Framework for Club Convergences

Theoretical foundationof club convergence is originated in neoclassical growth model. While empirically, the concept can be dated back to Baumol (1986). Theoretically, within the neoclassical framework, there are two techniques to club convergence anticipated by Drazen and Azariadis (1990) and Galor (1996), which are fundamentally a reconstruction of the neoclassical model.

a) The first theoretical approach to club convergence within the neoclassical framework was proposed by Azariadis and Drazen (1990). Azariadis and Drazen (1990) present a technique that permits for several equilibria and club convergence.

The neoclassical model is reformulated in Azariadis and Drazen's framework in such a way that it generates multiple equilibria, a model where multiple steady states appear due to the presence of externalities. Once a threshold stage of human capital is arrived, such externalities results in increasing social returns to scale. According to Azariadis and Drazen, over long period of time, some economies manage to maintain high growth rates; others move forward at satisfactory if not impressive rates; whereas others still appear to stagnate in traps of little growth, steadily displaying low growth rates or comparatively low phases of economic advancement, or both.

In looking for detail for club convergence, standard neoclassical model was augmented by Azariadis and Drazen (1990) with technical externalities that consist of a 'threshold property', to generate manifold, locally established balanced growth paths in equilibrium. The following production function was employed by Azariadis and Drazen:

$$Y_t = A_t F(k_{i,t}) \tag{4.4}$$

A_t Illustrate a scale factor. As proposed by Romer (1986), production factors are categorised into social and private, where the private are inputs owned by individual producer. The external effect, A_t describe how manufacturers are working in situations with constant returns to scale, but the economy as a whole is growing. Furthermore, Azariadis and Drazen (1990) assume that the scale factor is determined by the capital-labor ratio:

$$A_t = A(k_t) = \phi, \quad \forall k_t \tag{4.5}$$

They found that, if the notion of a threshold value of k^* is launched it is probable to discover two non-trivial solid steady-states. Figure 4.1 depicts this probability by presenting a split in the k growth, which is dependent on the original capital-labor ratio. These 'threshold effects' or bifurcations, illustrate essential dissimilarities in the dynamic manners of regions resulting from deviations in social returns to scale, as deliberate by the scale factor A_t.

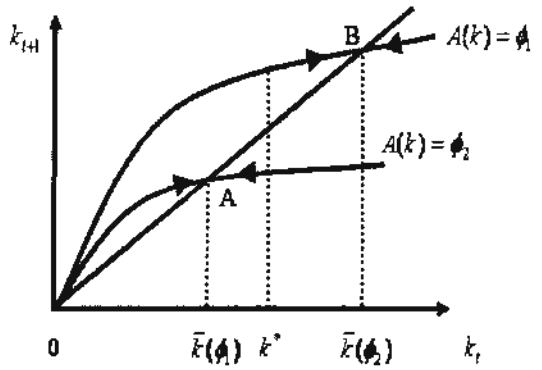


Fig. 4.1: Threshold effects (Drazen and Azariadis, 1990)

b) Within the neoclassical framework, the second theoretical technique to club convergence was put forwarded by Galor (1996). In the Galor case, the supposition of diverse tendencies to save out of profits and wages is enough to generate multiple convergence points. This happen since regions, which at any point in time vary in shape of the profits and wages distribution, will comprise various average (mean) propensities to save out of overall earnings, even if they have the identical individual propensities to save out of profits and wages.

Galor paid attention to variations in the propensity to save and performed s as follows.

$$k_{t+1} = \frac{(1-\delta)k_t + s^w f(k_t) + (s^r - s^w) f'(k_t) k_t}{1+n} = \zeta(k_t) \tag{4.6}$$

Galor (1996) discovered that the non-linear dynamic method can be featured by various stable equilibria local expressed in terms of equation (4.6), reliant on the features of the production function. Galor presume a production function based on constant elasticity of substitution (CES). Further, Azariadis–Drazen model is supported by Galor by arguing that standard modes of enlarging the conventional Solow model enhanced the probability that the accurate data creating process followed a various steady states models rather than a single steady state model.

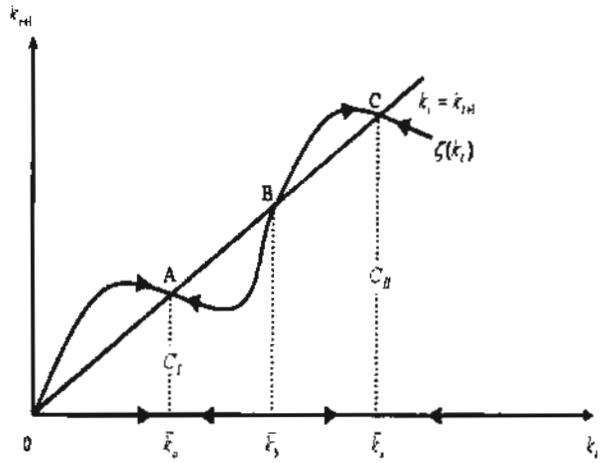


Figure 4.2: Club Convergence in Neoclassical Model (Galor, 1996)

Accordingly, any primary regional distribution of the capital and labour ratio developed into polarized pattern steadily as two local clusters (C_I and C_{II}) emerge over time. Within these clusters, there exists a negative association between the growth rate and initial level of output per worker in the transitional stage. Regardless of the fact that regions display the similar rates of population and growth depreciation, the regions are divided in to two convergence clubs.

The endogenous theory originated by Paul Romer (1986) considered technical progress as endogenous and determined by a decision making procedure of economic agents. For that reason, within the arrangement of endogenous growth theory, the club convergence model is accredited to the diffusion of technical advancement from principal regions. The main assumption of the neoclassical model (decreasing returns to capital) was eliminated by this theory.

There are a number of theoretical methods to club convergence within endogenous growth theory proposed by various researchers (such as Baumol, 1986; Chatterji, 1992; Bernard & Jones 1996; Fuente, 2000). In investigating Convergence, Baumol (1986) describes that variations in technology may results in club convergence. Such variations in technology can take place due to conditions in some regions in the early phase of their growth, resulting in advantages in production. Similarly, Cetorelli (2002) argues that as the result of dependence on olden times club convergence is generated, since to a certain extent, technology is based on historical factors.

One of the first efforts in club convergence to formalise the function of the gap in technology and technological diffusion was made by Chatterji (1992). Now, the growth of real income per capita approximates the growth of technology so that the gap in technology between two countries is characterised by the difference in their incomes per capita. The role of diffusion in club convergence phenomenon is described in Figure 4.3, which depicts a connection between the size of the gap and growth in income per capita over a specific interval of time with the leading economy i.e. a region with the maximum per capita income, at the beginning of the time period. This association is believed to be non linear and follows an inverted U-shape, as depicted in Figure 4.3.

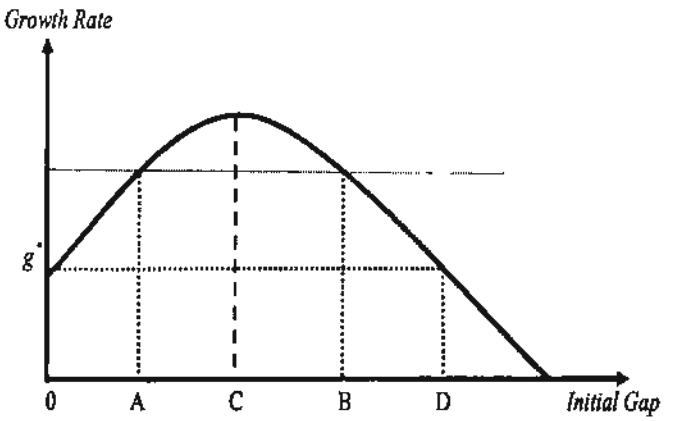


Figure 4.3: Technology and diffusion Club Convergence (Chatterjee, 1992)

Fuente (2000) provide a parallel but an alternate method to the study of gaps in technology and the process of diffusion. This model is founded on the common assumption that technical advancement is based on the level of diffusion in technology from the highly developed economy but income inequalities are ascribed to variations in the physical capital and technology level of investment in, i.e. there is possibility of local novelty in any region.

By means of a Cobb-Douglas framework of technology, Jones and Bernard (1996) stated a single equilibrium is the exception rather than the rule[21] as a result of differences in technological. Bernard and Jones argue that at the cost of the technology diffusion, researches on convergence have overstated the function of accumulation of capital in generating convergence. On the same lines, Fagereberg and Verspagen (1996) argue that any hypothesis that explains phenomena of convergence and divergence has to consider factors linked to diffusion of technology.

[21] Pigliarue (2003) suggested an identical model in which technological accumulation in an economy not only rely on diffusion of technology from the leading economy but also on the fraction of regional contribution in innovation.

4.2.2. Specification of Econometric Models

There are several approaches of testing convergence hypothesis. A number of researchers have adopted these approaches, such as Barro and Martin (1992), Chatterjee (1992), Friedman (1992), Quah (1993), Dewhurst and Chatterjee (1996), Quah (1997) and Phillips and Sul (2007), suggested various techniques and approaches of approximating convergence hypothesis.

For β-convergence test, Barro and Sala-i-Martin (1992) suggested a non-linear regression to discover the connection between the growth rate and initial condition, which is employed broadly in empirical researches. Convergence is declared if poor regions grow more rapidly than rich regions. On the other hand, Lichtenberg (1994) affirms that the conventional β-convergence test is unreliable, if the growth rate of poor economies is much high than the rich ones, such that the rich areas are exceeded at the end with an even larger gap. Furthermore, the t test may be biased by noise generated during data processing. Further claims by Pesaran (2007) that, income per capita will not pass the beta convergence test, if the technology advancement is stochastic, although the fundamental stochastic process of the economy is convergent. Moreover, Lau (2010) asserts that to test β-convergence by employing a cross-section regression might give Galton's fallacy of regression to the mean and bring about biased estimations and incorrect test information. Consequently, when poor economies grow at a quicker rate than rich ones and exceed them with a bigger income gap at the end of the research period, the β-convergence test is incorrect.

Moreover, the coefficient of variance (CV) can be used to measure σ-convergence, which is the ratio of δ (standard deviation) and μ (mean). Decline in regional

imbalances is depicted by declining CV. Furthermore, by estimating on the time trend a regression of standard deviation, σ-convergence may be tested. A negative coefficient corresponds to σ-convergence. As maintained by Friedman (1992) and Quah (1993), σ-convergence is the only suitable estimate of convergence. Phillips and Sul (2007), on the other hand, demonstrated that if the data is non-stationary, typical -convergence is invalid due to the natural growth in variance caused by non-stationarity, such as Brownian motion. Furthermore, Apergis et al. (2012) assert that rejection of the -convergence proposition does not necessarily imply divergence because data transitional dynamics can also cause it.

The third widely used method for testing convergence, as proposed by various researchers, is the cointegration test (such as Bernard & Durlauf, 1996; Evans, 1998;Pesaran, 2007). According to Bernard and Durlauf (1996), cointegration and unit root tests, are appropriate for testing convergence when regions are close to their steady states. Convergence can be measured in the case of two regions by testing the hypothesis that the income gap between these two regions is stationary with a fixed mean (Pedroni & Yao, 2006; Lau, 2010).

To test pair wise convergence, Pesaran (2007) proposed the augmented Dickey Fuller (ADF) regression with an intercept and a linear trend. Furthermore, the linear cointegration test was enhanced by incorporating a Fourier estimate into a standard unit root test, which can simulate a wide range of trend breaks as well as other types of nonlinearity (Becker et al., 2006; Lee, 2012). This technique still has many drawbacks: first, the tests stop working to detect convergence if there are more than one equilibrium; second, if data come from a time of transitional dynamics, cointegration and unit root tests cannot test convergence. Third, if countries are close

to their steady states but income data combine both transitional dynamics and steady states, cointegration and unit root tests may reveal misleading results (Apergis et al., 2012).

4.2.3. Selection of Model

The denial of convergence does not indicate mean no indication of convergence in subgroups. If regions converge to several levels of steady state equilibrium, club convergence might be realised. Various studies have proposed different methods for estimating convergence clubs (such as Chatterjee, 1992; Dewhurst &Chatterjee, 1996;Quah, 1997;Phillips&Sul,2007). To test overall convergence and recognise convergence clusters endogenously, Phillips and Sul (2007)proposed a model. This study also utilises the log t test suggested by Sul and Phillips (2007) to study the transitional behavior of human development index cross districts of Pakistan for the period 2004-2015.

The Phillips and Sul (2007) method is a time-varying model that allows for individual heterogeneity. The technique based on regression is empirically found strong as it categorizes endogenously locations with the same features into single groups known as clubs (Aksoy et al., 2019).

Traditional convergence tests are ineffective when the rate of convergence varies over time. The significance of the log t test is that it is not reliant on any assumptions relating to trend or stochastic non-stationarity of the variable of concern and the common factors in the panel across individuals, which makes it very remarkable as it resolves the problem of unit roots and cointegration when testing convergence in the framework of time series panel.

4.2.4. The log t test

Phillips and Sul (2007) proposed a methodology known as log t test, which allows for individual heterogeneity and various time paths, to investigate for convergence, discover endogenously convergence clusters, and evaluate economic transition behaviour. This study also employs Phillips and Sul (2007) methodology to investigate the transitional behaviour of the human development index across Pakistan's districts from 2004 to 2015.

The methodology is reliant on a pioneering disintegration of the variable of concern. Panel data are generally decomposed in the following manner:

$$\log y_{it} = \emptyset_i u_t + \varepsilon_{it} \tag{4.7}$$

Where u_t signifies the common factor, φ_i symbolises the component of unit characteristic, and ε_{it} represent the error term. On the other side, in the pattern applied here, the log of income per capita, log y_{it} has a time varying factor illustration that might be resulting from the representation of typical panel data:

$$\log y_{it} = (\emptyset_i + \frac{\varepsilon_{it}}{u_t})u_t = \delta_{it} u_t \tag{4.8}$$

Where, δ_{it} absorb the error term and hence the unit specific factor signify the distinctive fraction that differs over time. Whereas, the first model tried to reveal the manners of the individual *log* y_{it} by the common factor μ_t and two unit characteristic components, φ_i and ε_{it}, the second method look for explaining per capita income by calculating the share (δ_{it}) of the common growth path (u_t) that country i undertakes. So, as to model the transition coefficients δ_{it}, a relative transition coefficient, h_{it}, is built:

$$\text{hit} = \frac{\log y_{it}}{N^{-1}\sum_i^N} = \log y_{it} = \frac{\sigma_{it}}{N^{-1}\sum_i^N} = \sigma_{it} \quad (4.9)$$

So, h_{it} stand for the transition path of economy i relative to the cross section average and has a dual understandings: first, it determine behavior of individual region in relation to other regions, and second, it portrays the relative disappearance of region i from the common growth path μ_t. In the case of convergence, that is, when all regions move in the direction of the identical transition path, $h_{it} \rightarrow 1$ for all i as $t \rightarrow \infty$. Afterward, the cross sectional variance of h_{it}, indicated by $V^2_t = N^{-1}\sum_i (h_{it}-1)^2$, converges to zero. There are a various possible conclusions in the case of no convergence, For example, V_t might converge to a positive number, which is attribute of convergence club, or remain restricted above zero and not converge or diverge.

To discover the null hypothesis, Phillips and Sul (2007) model δ_{it} in a semi parametric form:

$$\delta_i = \delta_i + \frac{\sigma i \xi it}{L(t)t^{\alpha}} \quad (4.10)$$

Where δ_i is fixed, σ_i is an idiosyncratic scale parameter, ξ_{it} is iid(0, 1), L (t) is a function varying slowly (such that L (t) $\rightarrow \infty$ as t $\rightarrow \infty$) and α is the decay rate.

The null hypothesis of convergence can be described as:

$$H_o : \delta_i = \delta \text{ and } \alpha \geq 0 \quad (4.11)$$

It is tested against the alternative hypothesis, H_A: $\delta_i \neq \delta$ for all i *or* $\alpha < 0$. Keep in mind that, different transitional model of regions i and j are noticeable under the null hypothesis of convergence, including momentary divergence, which refers to periods where $\delta_i \neq \delta_j$. Consequently, the technique suggested by Phillips and Sul (2007)help us

to see convergence even in the case of transitional divergence, where other techniques such as stationarity tests (see, Franses &Hobijn, 2000) give inaccurate results. Above all, stationary time series techniques cannot discover the asymptotic co movement of two time series and thus, the convergence proposition is rejected mistakenly.

Taking into account Eq. (4.9), this Phillips and Sul technique explains that the cross-sectional variance of h_{it} has the limiting form under convergence.

$$Vt^2 \sim \frac{A}{L(t)^2 t^{2\alpha}} ast \rightarrow \infty forsome A > 0 \qquad (4.12)$$

The regression based convergence test can be deduced as follow:

$$log(\frac{v1^2}{vt^2}) - 2logL(t) = \alpha + blogt + u_t$$

$$Fort = [rT], [rT] + 1, \ldots., T \qquad (4.13)$$

Where generally $r \in (0, 1)$ and $L(t)$ are function varying slowly. Phillips and Sul (2007) based on Monte Carlo simulations, suggest employ $L(t)=log\ t$ and $r=0.$, for sample sizes below $T=50$. At last, by means of $\hat{b} = 2\ \alpha$, a one sided t test robust to autocorrelation and heteroskedasticity is applied to test the disparity of the null hypothesis $\alpha \geq 0$.

If $t_{\hat{b}} < -1.65$ (significance level 5%)

It means that null hypothesis is rejected.

Steps of log t Test

The test comprises four steps which can be sum up as follows;

First, in view of the last period in the time series dimension of the group, units are arranged in descending order. After that, a club convergence is produced by tests of the log t test. Further, this is done by summing up districts one at a time to a set of the two regions of maximum income at the start and operating the t log test until for this set the $t_{\hat{b}}$ is bigger than −1.65. After that, for this set the log t test is repeated and one by one all of the units left behind in the sample to test whether they converge. If not, then to the remaining units, first three steps are applied. If there are no clubs formed, one may analyzed that those units of economy diverge.

4.2.5. Variable Description and Data Source

Variable Description

There are several methods to study the regional inequalities across countries/regions. From an empirical and operational standpoint, the difference in GDP per capita growth is the most commonly used method for measuring the difference in development processes across regions. A number of economists have criticised the use of GDP per capita as a measure of development, claiming that it fails to explain the country's overall progress (Sen, 1983; Goossens, 2007; Stiglitz et al., 2009; Todaro & Smith, 2011; Schepelmann et al., 2010).

In recent growth literature, renowned economist Xavier Sala-i-Martin has suggested that the concept of convergence can be applied in case of human development (Roy & Bhattacharjee, 2009). For capturing human development, human development Index

encompasses the broader aspect of human welfare that relates to education, health and standard of living. The approach has been applied recently by several studies and human development index has been used as indicator for measuring for measuring development across regions (Basel et al., 2020; Ortega et al., 2015).

In this study, we investigate the club convergence hypothesis using tbe human development index rather than the traditional measure of per capita GDP. The computation of the human development index and its sub-indices is already covered in section 4.1.3.

Data Source

This study uses district level data on Socio-economic indicators for 97 districts in the country covering period 2004–2015. Data is collected from following six PSLM Surveys; 2004-2005, 2006-2007, 2008-2009, 2010-2011, 2012-2013 and 2014-2015. The detail of data source and data limitations is already discussed in suh-section 4.1.3.

4.3. Fiscal Decentralization and Spatial Disparity

4.3.1. Theoretical Framework

Fiscal devolution is the undertaking of task for managing, mobilising and allocating financial resources to and within lower level of governments. It gives attention on the major concerns of fiscal autonomy (who can raise revenues) and financial autonomy (who can spend them). It relates to the problems of revenue mobilisation and intergovernmental transfers at the lower level of government, the budgeting practices across levels of government and monitoring by the federal government among others. The fiscal sides of devolution are to a certain extent essential and tend to influence the accountability structure of local governments and other aspects of the process.

The distribution of responsibilities and resources across levels of government are elements of the institutional structure that influence regional convergence or divergence. The prevalent view is that a greater role for sub-central governments results in better policy matching with citizen preferences (Oates, 1972). By increasing the efficiency of sub-central public finances, fiscal devolution may result in greater regional disparities (Besley & Gbatak, 2003). Conversely, fiscal decentralization is argued to reduce the scope for central government intra-regional transfers aimed at reducing regional income disparities (Prud'homme, 1995). Overall, there are arguments for both converging and diverging fiscal decentralization roles.

a) Fiscal decentralization proponents argue that the potential for growth is greater in poor or lagging economies than in rich ones. Fiscal decentralization works by incentivizing better use of local resources for growth, which should be more feasible in laggard regions than in regions that are already at the efficiency frontier (Rodriguez & Ezcurra, 2010). Fiscal decentralization can spark a virtuous cycle of regional convergence through this channel. Furthermore, fiscal decentralization can help jurisdictions overcome agglomeration forces: fiscal autonomy is an essential tool for peripheral jurisdictions to compete with the gravitational pull of agglomerations (Krugman & Baldwin, 2004).

b) Skeptics of fiscal decentralization argue that it would benefit only well-endowed regions, thereby increasing regional disparities. The playing field is particularly uneven, with significant differences in institutional capacity such as financial capacity and local administration competence, as well as socioeconomic endowments such as productivity, infrastructure, and so on (Rodriguez-Posé & Gill, 2005). Furthermore, competition for mobile factors of production is likely to result in a "race to the

bottom" with ineffective low tax rates, emphasizing the problems of less well-off regions (Wilson, 2015). Finally, even if tax competition results in efficient resource allocation, as in Tiebout's (1956) "voting-with-your-feet model," regional disparities may increase.

4.3.2. Selection of Model

The study follows a cross-section regressions framework, which shows the link of fiscal decentralization with human development index, education index, health index and household welfare index. We estimate regression, consisting of 97 districts for the period 2008-2009 and 2014-2015. Our hypothesis is to test the proposition that, whether move in the direction of more fiscal devolution would be related with low inequalities in development, education, health and household welfare across districts of Pakistan using cross-section regressions framework.

For the cross-section analysis, the basic estimation equation is as follows:

$$\text{Disparity} = \beta_0 + \beta_1 FD_i + \beta_2 \text{Control}_{i+} \varepsilon_i \qquad (4.14)$$

Disparity denotes the different measures (Human Development index, education index, health index & household welfare index) for regional disparity for periods 2008-09and 2014-15. Control_i is a vector capturing some of the control variables; for control variables we employ the following variables: population density and distance of districts to the capital cities. FD represents the Household assets (Proxy for fiscal decentralization).

Given the fact that Fiscal decentralization may not have a direct impact on development level; we investigate whether a rise in the levels of fiscal

decentralization combined with the distance from capital city can alter the development level across districts.

Thus, we added an interaction term of FD and Dstcp flows in Equation (4.14) leading to Equation (4.15).

$$\text{Disparity} = \beta_0 + \beta_1 FD_i + \beta_2 \text{Control}_{i+} \beta_3 FDx\ \text{Dstcp} + \varepsilon_i \qquad (4.15)$$

From Equation (4.15), β_1 estimate the direct effects of FD[22] and, β_2 observes the effect of control variables and β_3 tests changes in development level conditioned on instantaneous variations in both the levels of FD or Dstcp.

To verify the marginal impact of FD on dev in the presence of Dstcp, we take the partial derivative of dev with regards to Dstcp. The partial derivative leads to equation below:

$$\frac{d(dev)}{d(FD)} = \beta_1 + \beta_3 \text{Dstcp} \qquad (4.16)$$

In instances, where both β_1 and β_3 are non-negative values, then partial increases in both FD and Dstcp will result in an immediate increase in development level.

[22] The list abbreviations of the variables used in the model are given in the appendix.

4.3.3. Variables Description and Data Source

Dependent Variables

Human development index and sub-indices are the dependent variables for the study. The detail of computation of human development index is already discussed in sub-section 4.1.3.

Explanatory /Independent Variables

The common measure to assess fiscal decentralization is the share of resources allocated to sub-national governments. The various empirical analyzes use a wide array of indicators. The following decentralization indicators are used alternatively:

a) *Revenue Decentralization*

   Devolution of revenues refers to the share of provincial government in revenue as fraction of revenue of central government.

b) *Expenditure Decentralization*

   Devolution of expenditures refers to the expenditure's share of provincial government expenditure as fraction of expenditure of central government.

c) *Tax Autonomy*

   The ratio of taxes (over which sub-national governments have some base or rate-setting autonomy) to general government tax revenue.

d) *Fiscal Authority*

   Fiscal authority is one additional indicator used which accounts for the degree of authority of local governments in setting rates and bases of local taxes. This indicator is part of a set of regional authority indices which are used to

measure the administrative, political and fiscal authority of sub-national governments.

Data Source

For dependent variables, this research makes use of data from PSLM. We use data from PSLM for the periods 2008 and 2014 respectively. For independent variables, there is no data available for revenue and expenditure decentralization at district level for Pakistan. We use household asset as a proxy for fiscal decentralization. For Household assets data (proxy for fiscal decentralization) at district level, we use data from Multiple Indicator Clustering Surveys (MICS) of Punjab. For this research, the time period chosen is divided further into two sub-periods as a period before decentralization (2008-09) and after the decentralization (2014-15).

The rationale for using household asset as a proxy for fiscal decentralization is that literature witness significant correlation between fiscal decentralization and income inequality, such as Sacchi and Salotti, (2013) for OECD countries and Shahzad and Yasmin (2016) for Pakistan revealed significant association between fiscal decentralization and income inequality at provincial level. For this reason, we use household asset as a proxy for fiscal decentralization at district level for Pakistan.

Data Limitations

Data on household asset is available for 33 districts of Punjab province only. Therefore, this study does not include districts from other three provinces namely; Balochistan, Khyber Pakhtunkhwa and Sindh. The list of districts of Punjab included in the study is given in the appendix A4.

CHAPTER 5

RESULTS AND DISCUSSION

This chapter provides the findings of the study. We have subdivided this chapter into three parts. First part provides results of spatial disparities analysis while the second part contains empirical findings of the club convergence hypothesis. The third section includes findings on the effects of fiscal decentralization on spatial disparities across Pakistan's districts.

5.1. Empirical Findings on Spatial Disparities Analysis

The section is divided into two parts. The first section discusses quartile maps and box plots to know the spatial distribution of a human development index and sub-indices over space. The second part contain formal tests of spatial autocorrelation (global & local), which formally investigate whether the spatial distribution of human development index and sub-indices is random or not.

5.1.1. Mapping the Distributions

The first step for our analysis is to map and examine the data. The mapping provides a look at the spatial components of the dataset and gives important information about outliers and the dominant directions of spatial autocorrelation.

5.1.1.1. Quartile Maps

Quartile map is category of quantile map that sort values for a variable that are then grouped into four bins such that each has the same number of observations. Darker coluors explain higher values, whereas lighter colours illustrate lower values in quartile map. The quartile map is unbiased in terms of class selection and each class

has the same percentage of the range of values. Quartile maps listed in figures 1-8 display the spatial distribution of human development index, education index, health index, and household welfare index for each district for periods 2004-2005 and 2014-2015.

The quartile maps display that most of the eastern and northern districts of Punjab have the highest level of development. Districts of southern/south-eastern Punjab are underdeveloped relative to the developed districts of eastern and central Punjab. In Khyber Pakhtunkhwa, most of the districts belong to the category of high HDI, whereas districts of northern and southern Khyber Pakhtunkhwa join the category of least developed districts.

Balochistan's performance on the district level human development is extremely poor, with the exception of Quetta,. Majority of districts lies in the low development level category. The distribution of districts in Sindh is heavily skewed towards low medium levels of development. With the exception of Karachi and Hyderabad, majority of the districts in Sindh belong to the category of least developed districts.

Overall, the quartile maps showed that there are no major changes in spatial clustering of development level from 2004 to 2015.

Figures 5.1-5.8: Quartile Maps for Human Development Index, Education Index, Health Index and Household welfare Index for the period 2004-05 and 2014-15

Figure 5.1: Quartile Map for Human Development Index (2004-05)

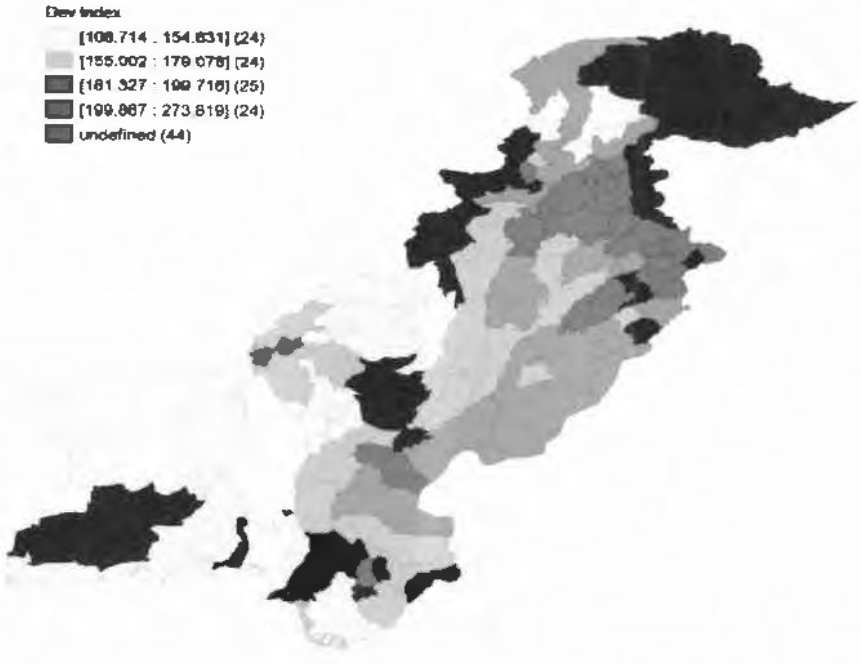


Figure 5.2: Quartile Map for Human Development Index (2014-15)

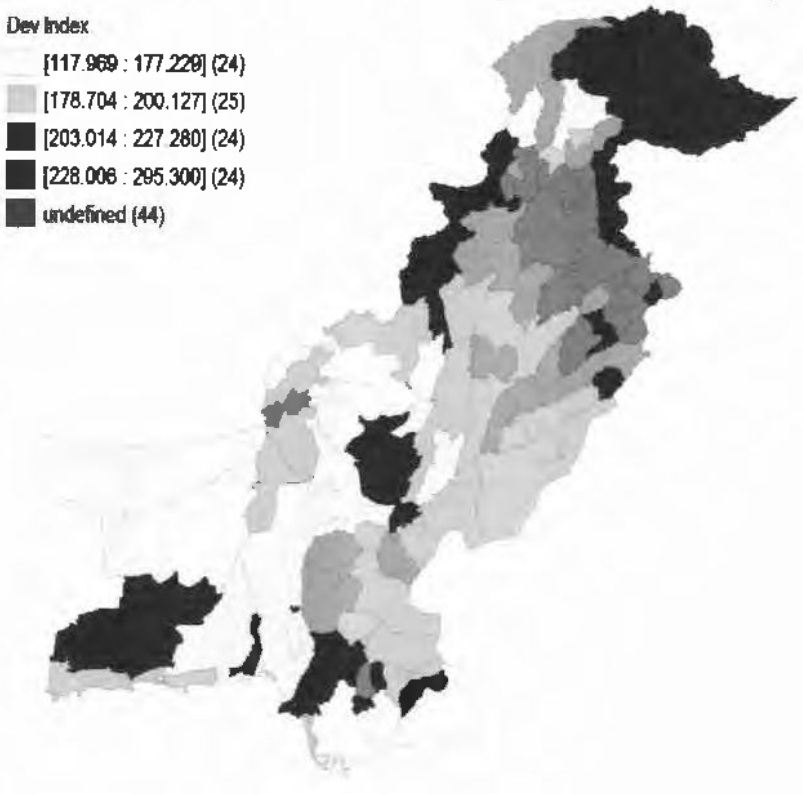


Figure 5.3: Quartile Map for Education Index (2004-05)

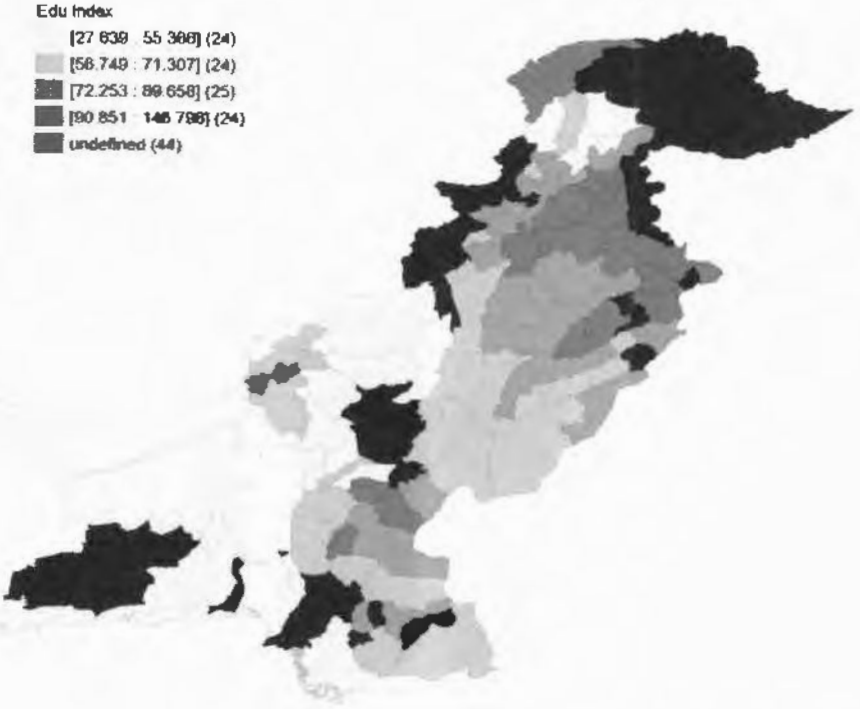


Figure 5.4: Quartile Map for Education Index (2014-15)

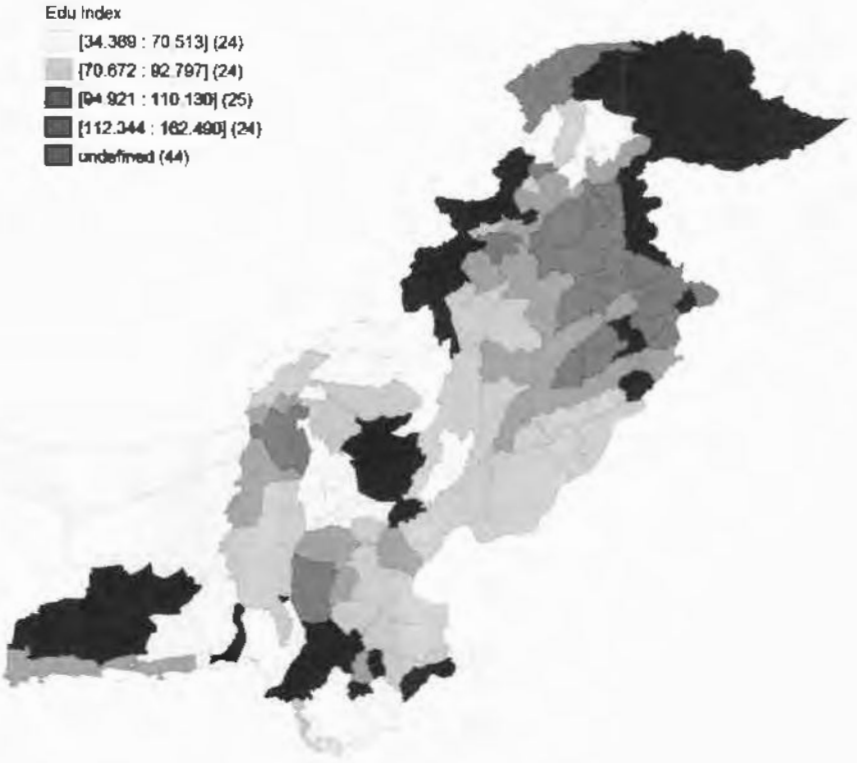


Figure 5.5: Quartile Map for Health Index (2004-05)

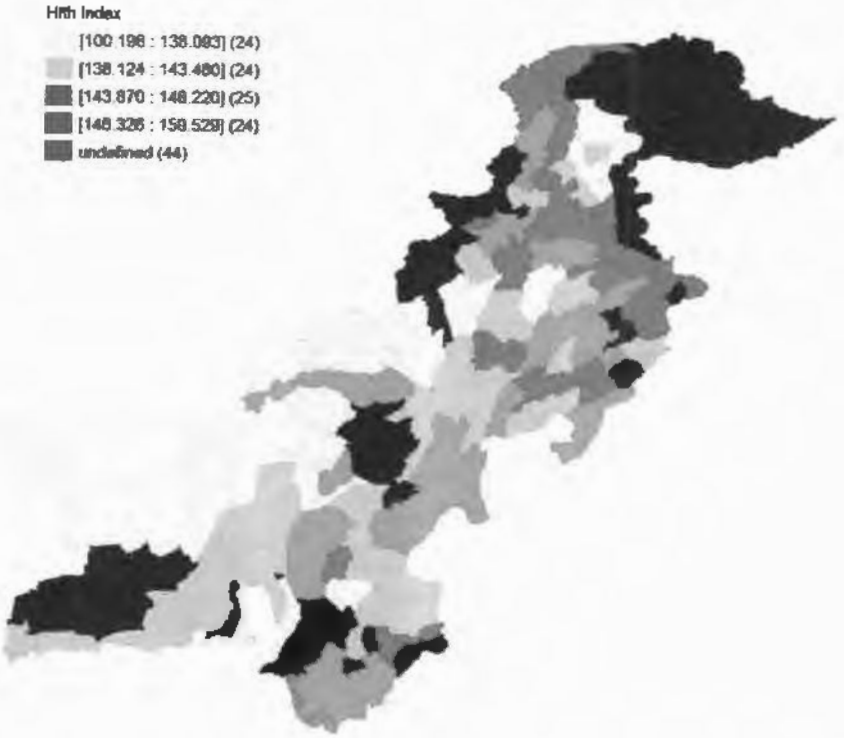


Figure 5.6: Quartile Map for Health Index (2014-15)

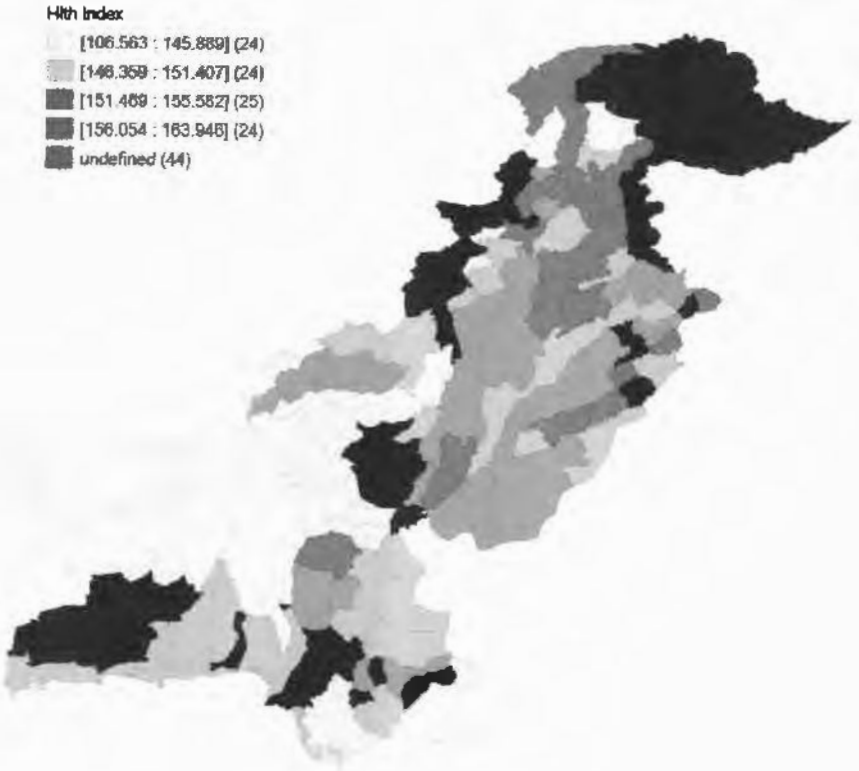


Figure 5.7: Quartile Map for Household Welfare Index (2004-05)

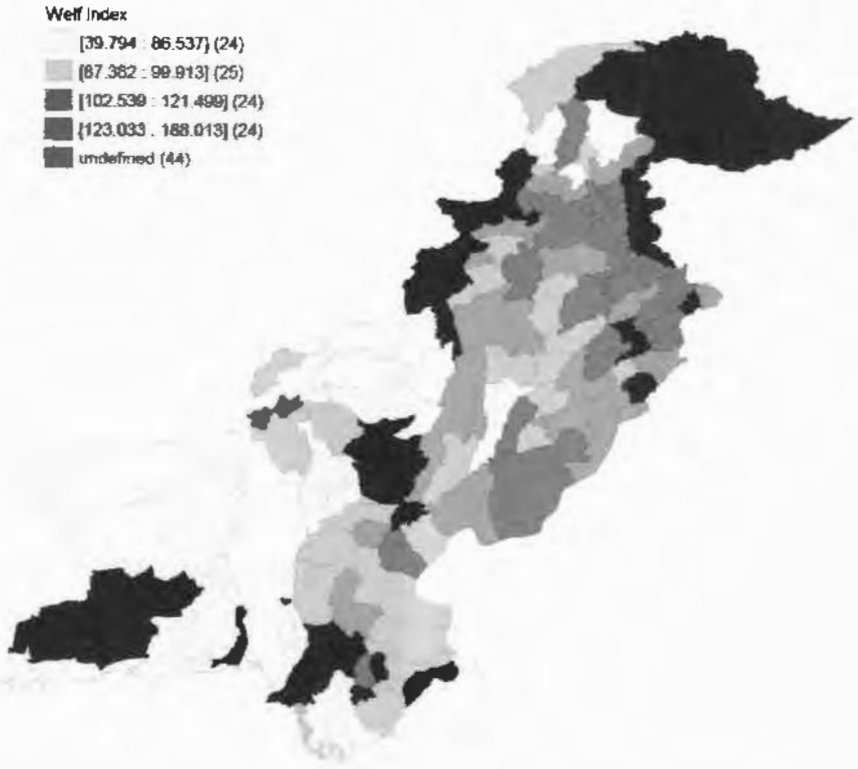
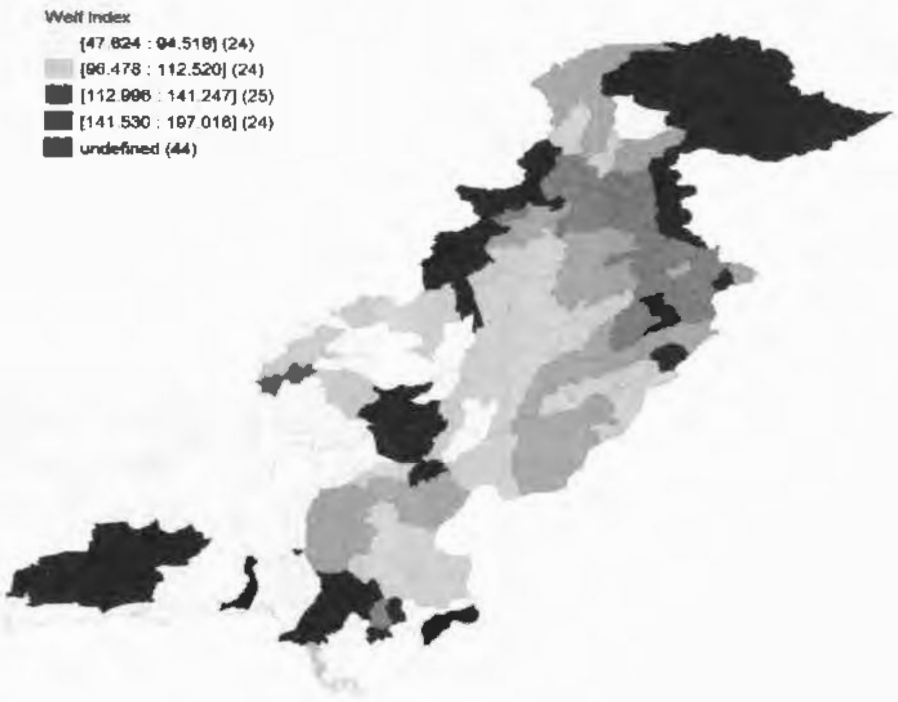


Figure 5.8: Quartile Map for Household Welfare Index (2014-15)



5.1.1.2. Box Plots

Another essential ESDA tool for mapping data distribution is the box plot, which presents five vital facts about a dataset: the lower quartile of the distribution expressed as Q1 represents 25% of the cumulative distribution, the Q2 represents the median, the upper quartile expressed as Q3 represents 75% of the cumulative distribution, and Q4 represents the highest value.

A box plot's main advantage is that it shows outliers, which are defined as values above or below a given multiple (randomly set to 1.5 by GeoDa) of the difference between the first and third quartiles. Such as, a lower outlier signifies a value below [Q1−1.5*(Q3−Q1)] and an upper outlier refer to the value over [Q3 + 1.5*(Q3 − Q1)]. All box plots are based on the same principles. The bar in the centre of the dark area represents the median. The upper part of the dark area corresponds to the third of distribution quartile, while the lower part corresponds to the first quartile of distribution.

The spatial distribution of human development index and sub-indices across districts is explained by the "box plots" displayed in figures 9-16. The figures revealed important information about the upper and lower outliers for human development index and sub-indices. These figures revealed that Islamabad, Lahore and Karachi are the upper outliers for human development index and household welfare index for the year 2004-5. The figures also witnessed Islamabad as the only upper outlier for education index for the year 2014-15. On the other, Kohistan, MusaKhel and QillaSaifullah are the lower outliers for the health index for the period 2004-05. Whereas, for the year 2014-5, the box plot display Bolan, JhalMagsi, Sibbi (Balochistan) and Kohistan (KPK) as the lower outliers for the period 20014-2015.

Figures 5.9-5.16: Box Plots for Human Development Index, Education Index, Health Index and Household Welfare Index for the period 2004-05 and 2014-15

Figure 5.9: Box Plot for Human Development Index for the Period 2004-05

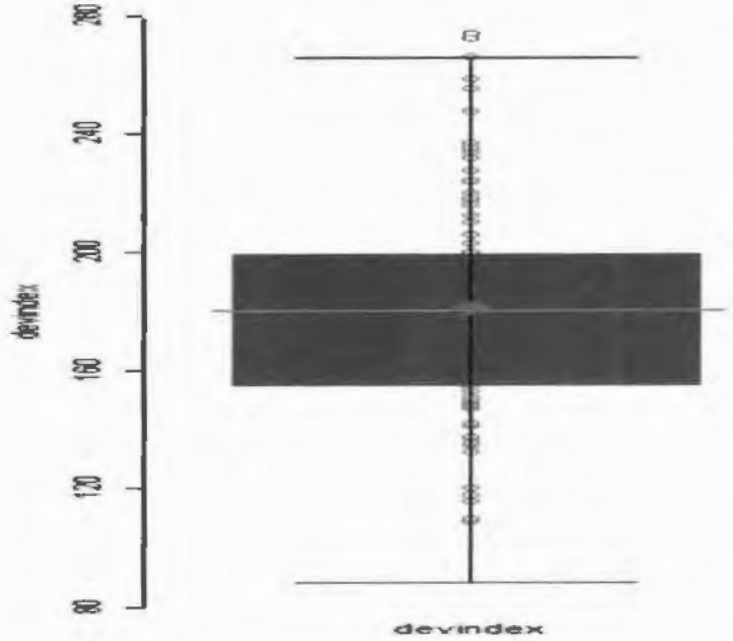


Figure 5.10: Box Plot for Human Development Index for the period 2014-15

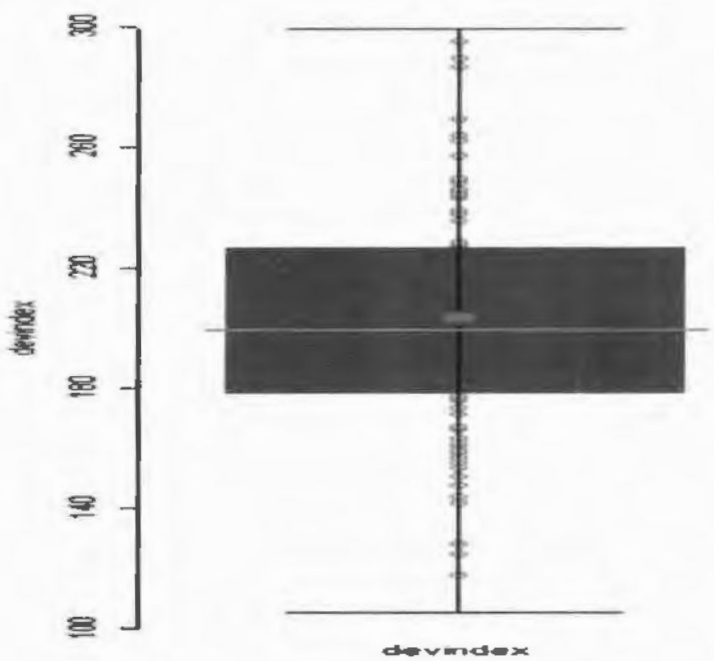


Figure 5.11: Box Plot for Education Index for the period 2004-05

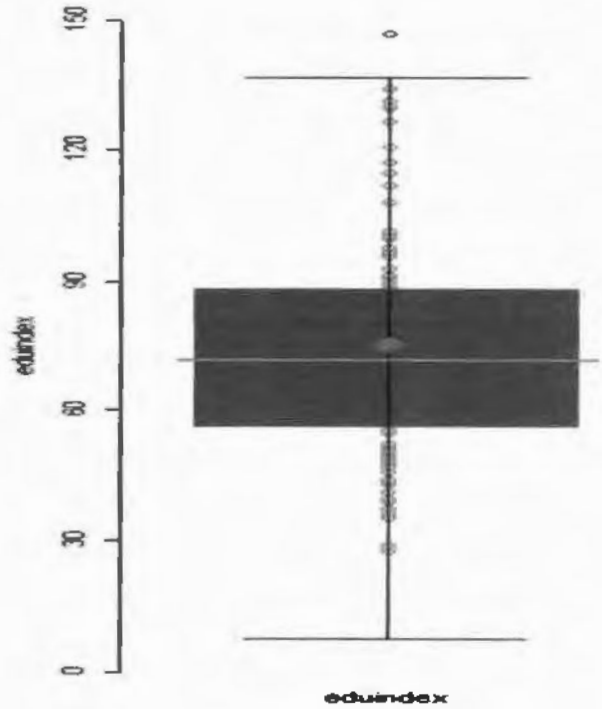


Figure 5.12: Box Plot for Education Index for the period 2014-15

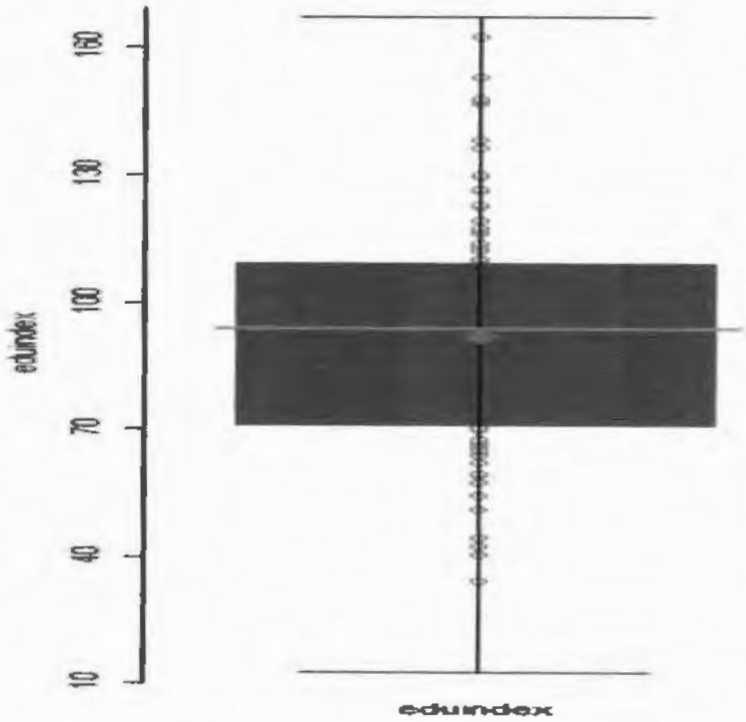


Figure 5.13: Box Plot for Health Index for the period 2004-05

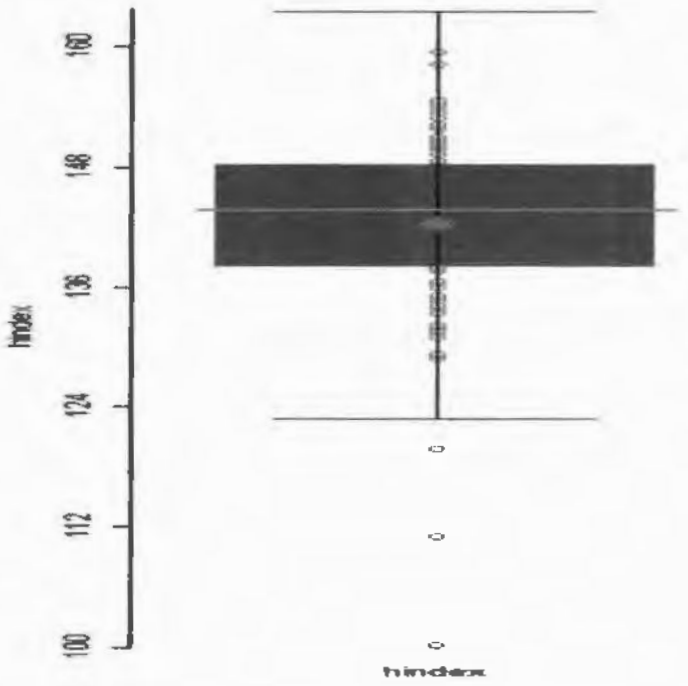


Figure 5.14: Box Plot for Health Index for the period 2014-15

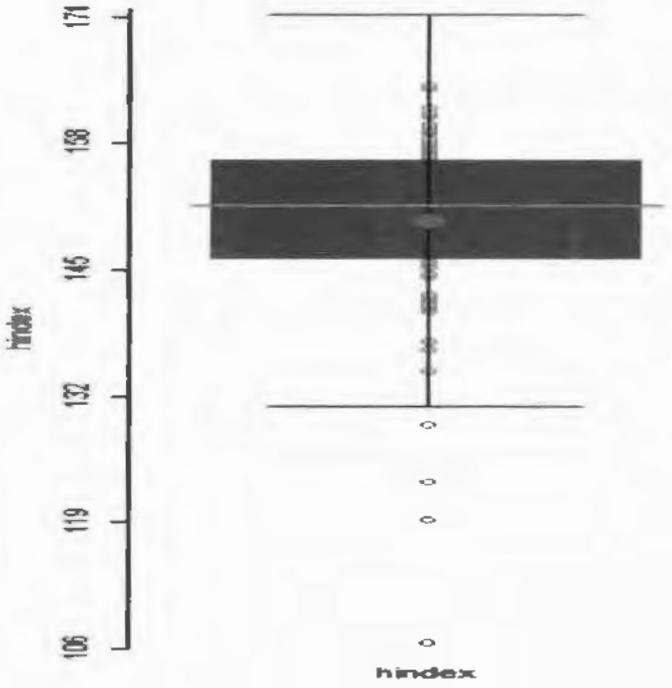


Figure 5.15: Box Plot for Household Welfare Index for the period 2004-05

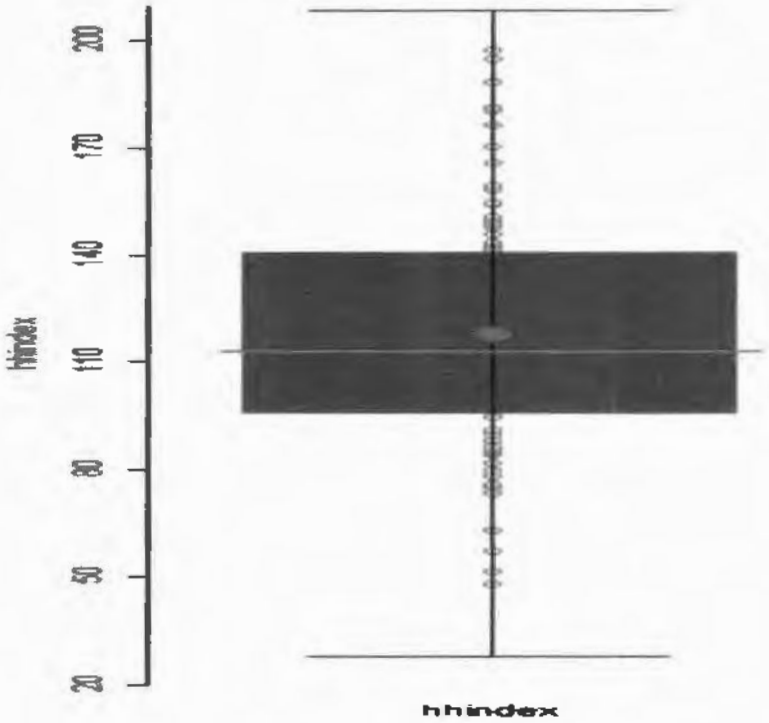
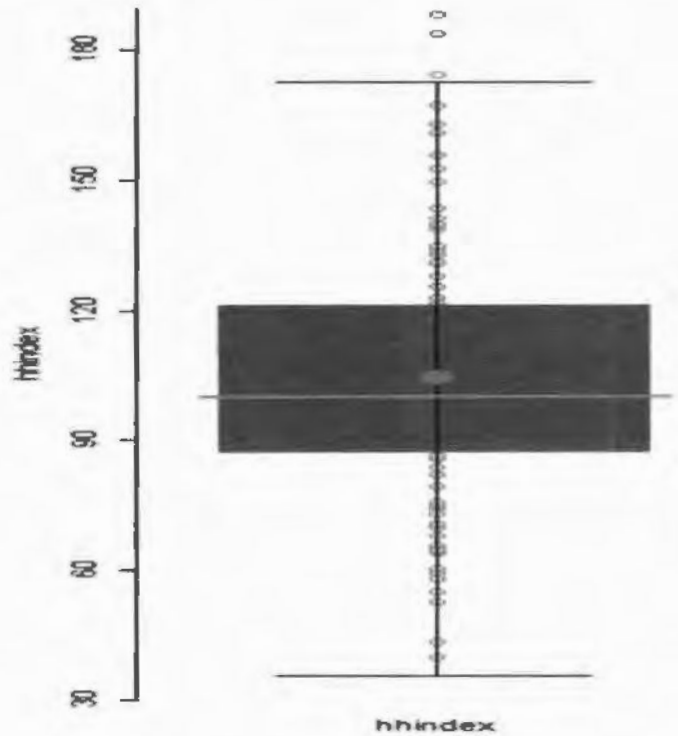


Figure 5.16: Box Plot for Household Welfare Index for the period 2014-15



Overall, the quartile maps and box plot revealed that most of the districts from Balochistan and Sindh have experienced the greatest stagnation in terms of human development level over the period 2004-2015, as box plots revealed most of districts in lowest quartile belong to Sindh and Balochistan for both 2004-05 and 2015 periods. Likewise, quartile maps also show that clusters of least developed districts belong to the provinces of Balochistan and Interior Sindh. On the other side, quartile maps display that majority of districts belonging to Punjab and Khyber Pakhtunkhwa are mapped as developed districts in both periods.

5.1. Spatial Autocorrelation

Box plots and quartile maps are useful tools for identifying the distribution of human development index and sub-indices across districts. On the other hand, they do not investigate properly, whether the spatial distribution of a human development index and sub-indices is random or not. There are a number of explanations that make us think that our variables (human development index & sub-indices) may not be distributed randomly across districts. For example, the distribution of the human development index and sub-indices across Pakistan's districts is marked by divergent clusters as shown in the figures above.

In spatial autocorrelation, the coincidence of locational similarity and value similarity is discussed (Anselin, 1988). To investigate this phenomenon, the Exploratory Spatial Data Analysis (ESDA) method must be used.

5.2.1. Global Spatial Autocorrelation

ESDA is based on the phenomenon of spatial autocorrelation or spatial association, which matches locational similarity with value similarity. "Moran's *I*" is the most commonly used test for spatial autocorrelation (Cliff & Ord, 1981; Upton & Fingleton, 1985). The phenomenon of spatial autocorrelation is assessed by using a test of a null hypothesis of random location. Rejecting the null hypothesis implies the presence of a spatial structure, which reveals more about the distribution of data.

The findings of "Global Moran's *I*" for the human development index and sub-indices for 2004-05 and 2014-15 are shown in tables 5.1 and 5.2 below.

Spatial Autocorrelation of Human Development Index

The first row of table 5.1 and table 5.2 show results for spatial autocorrelation of district human development index for the periods 2004-05 and 2014-15 respectively. Results of the study revealed the presence of significant positive global spatial autocorrelation for human development index at 1% significance level with all the four matrixes. Spatial association between district development levels has increased between 2004 and 2015 from 0.465 to 0.499 (see table 5.1 & table 5.2).

The findings imply that districts with a high (or low) level of development are bordered by districts with a high (or low) level of development.

Spatial Autocorrelation of Sub-indices

The second, third and fourth rows of table 5.1 and table 5.2 show results for spatial autocorrelation of education, health and household welfare Indices for period 2004-05 and 2014-15 respectively. The findings of the study revealed the presence of

significant positive global spatial autocorrelation for all sub-indices at 1% significance level with all the four matrixes. Spatial association between district levels of education reduced between 2004 and 2015, from 0.495 to 0.478, but education index is still positive and significant. While, spatial association for health and household welfare level has increased between 2004 and 2015, from 0.1913 to 0.336 for health level, and from 0.375 to 0.469 for household welfare level (see table 5.11 & table 5.2).

Overall, significant positive global spatial autocorrelation shows that districts with high (or low) levels of education, health, and household welfare are bordered by districts with high (or low) levels of education, health, and household welfare.

Table 5.1: Moran's I and P-Value under Different Spatial Weights (2004-05)

Variables	Queen	Rook	K_4	K_7	W-150 miles
Human Development Index	0.465 (0.001)	0.465 (0.001)	0.468 (0.001)	0.453 (.001)	0.299 (0.001)
Education Index	0.495 (0.001)	0.495 (0.001)	0.481 (0.001)	0.474 (0.001)	0.276 (0.001)
Health Index	0.191 (0.002)	0.191 (0.002)	0.191 (0.004)	0.211 (0.001)	0.141 (0.002)
Household Welfare Index	0.375 (0.001)	0.375 (0.001)	0.399 (0.001)	0.366 (.001)	0.268 (0.001)

Note: The values in parentheses are the p-values.

Table 5.2: Moran's I and P-Value under Different Spatial Weights (2014-15)

Variables	Queen	Rook	K_4	K_7	W-150 miles
Human Development Index	0.499 (0.001)	0.499 (0.001)	0.494 (0.001)	0.507 (.001)	0.373 (0.001)
Education Index	0.478 (0.001)	0.478 (0.001)	0.474 (0.001)	0.470 (0.001)	0.303 (0.001)
Health Index	0.336 (0.001)	0.336 (0.001)	0.394 (0.001)	0.394 (0.001)	0.261 (0.001)
Household Welfare Index	0.469 (0.001)	0.469 (0.001)	0.465 (0.001)	0.482 (.001)	0.370 (0.001)

Note: The values in parentheses are the p-values.

Finally, the Moran's *I* results for district development level clearly show signs of increasing spatial dependence between 2004 and 20015. These findings support the view of new economic geography literature that a region's development levels are determined by the development levels of its neighboring regions. Similarly, the level of education, health, and household welfare in a region is determined by the levels in neighboring regions.

As, all four weight matrixes illustrate significant positive global spatial autocorrelation, therefore, weight matrix based on rook contiguity is used in remainder of our study.

5.2.2. Local Spatial Autocorrelation

Moran Scatter Plots

The global indicator "Moran's *I*" can help identify global spatial autocorrelation, but it cannot detect local patterns of spatial association, such as local spatial clusters or local spatial outliers with high or low values that are statistically significant. Moran scatter plot detects groups of districts classified as clustering of high or low values. Following the suggestion of Anselin (1996), it plots the distribution of the human development index and sub-indices for each district on the horizontal axis against the standardized spatial weighted average (spatial lag, which is the average of the neighbors' values) on the vertical axis.

Moran's scatter plot help us to investigate both global spatial association (because the slope of the line is the Moran's *I* coefficient) and local spatial association. LISA statistics specify major local clusters (high–high or low–low) or local spatial outliers (high–low or low–high).

The Moran scatter plot is categorized into four diverse quadrants in line with the four kinds of local spatial relationship between a district and its neighbors:

1. Quadrant I (expressed as HH representing top right) explains that the development value of the district and "neighboring" districts are high and the spatial difference is not significant.
2. Quadrant II (expressed as LH representing top left) explains that the development value of the district is low, whereas that of the "neighboring" districts is higher, with large spatial differences.
3. Quadrant III (expressed as LL representing bottom left) explains that the development values of the district and "bordering" districts are low and the spatial difference is not significant.
4. Quadrant IV (expressed as HL representing bottom right,) explains that the development values of the district are higher, whereas that of the "bordering" districts are low and the spatial difference is large.

Local Spatial Autocorrelation of Human Development Index and Sub-indices

The classification in the Moran scatter plot is only exploratory of clusters or outliers and cannot explain significance. Figures 17 to 24 demonstrate the Moran's scatter plot for human development index and sub-indices for period 2004-05 and period 2014-15 respectively, by means of the spatial weight matrix based on rook contiguity.

Districts in the first and third quadrants show positive spatial autocorrelation, indicating spatial clustering of similar values. The districts in the second and fourth quadrants, on the other hand, show negative spatial autocorrelation, indicating spatial clustering of dissimilar values.

All the figures indicate positive global spatial autocorrelation, which was observed previously by value of Moran's *I*. Moran scatter plots revealed that the majority of districts are located in the first and third quadrants (HH & LL), with the first quadrant (HH) showing a cluster of districts mostly from Punjab and KP, and the third quadrant (LL) showing a cluster of the majority of districts from Sindh and Balochistan.

Overall, the differences of human development index across districts in Pakistan are caused mostly by the "HH" and "LL" agglomeration effects, while the "HL" and "LH" agglomeration effects are not evident. Moran Scatter plots also show that with the passage of time, "LL" and "HH" accumulation areas tend to expand. These findings reflect the dualistic structure of Pakistan's districts.

Figures 17-24: Moran Scatter Plots of Human Development Index, Education Index, Health Index and Household welfare Index for the period 2004-05 and 2014-15

Figure 5.17: Moran Scatter Plot of Human Development Index for the period 2004-05

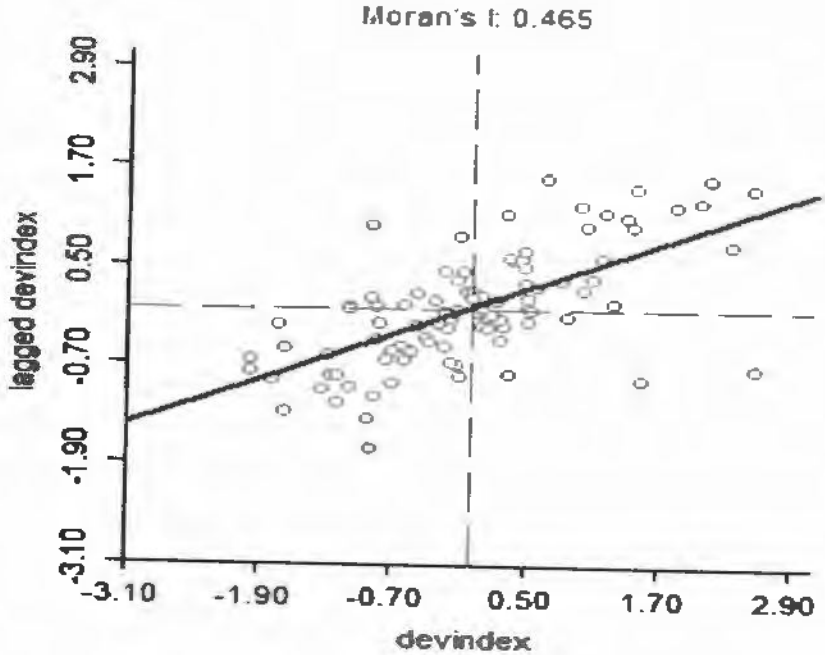


Figure 5.18: Moran Scatter Plot of Human Development Index for the period 2014-15

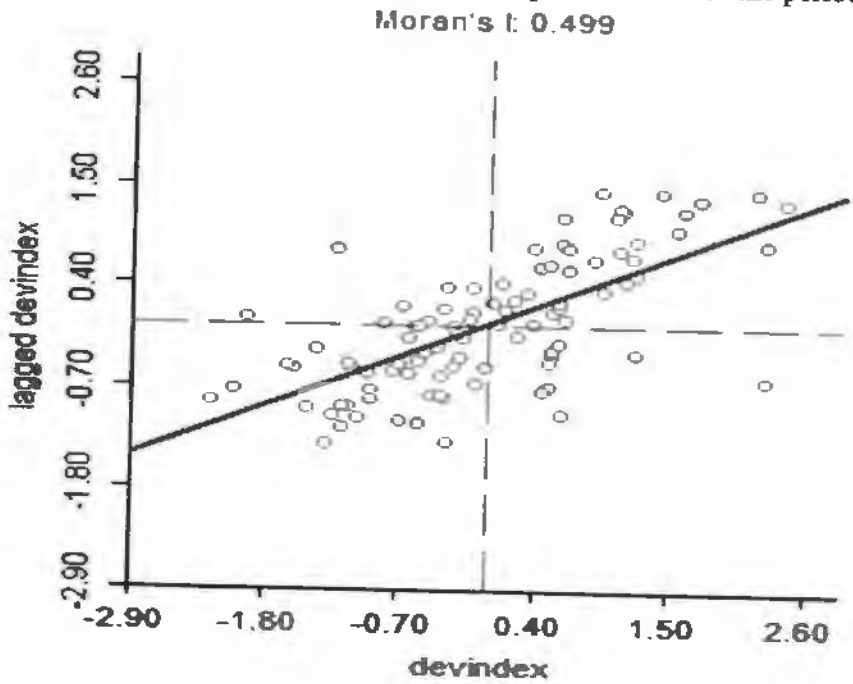


Figure 5.19: Moran Scatter Plot of Education Index for the period 2004-05

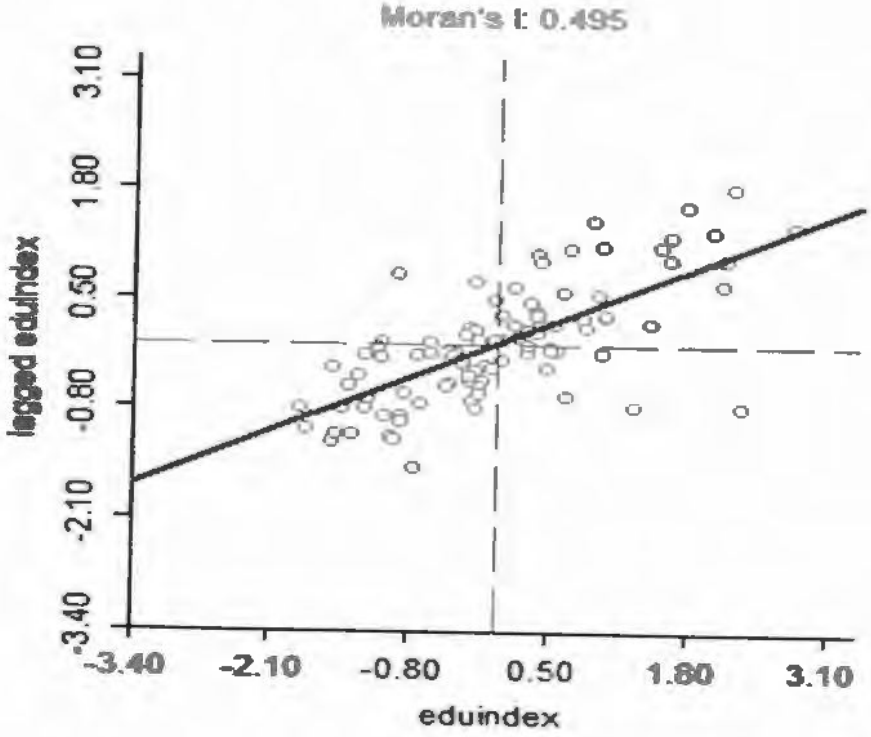


Figure 5.20: Moran Scatter Plot of Education Index for the period 2014-15

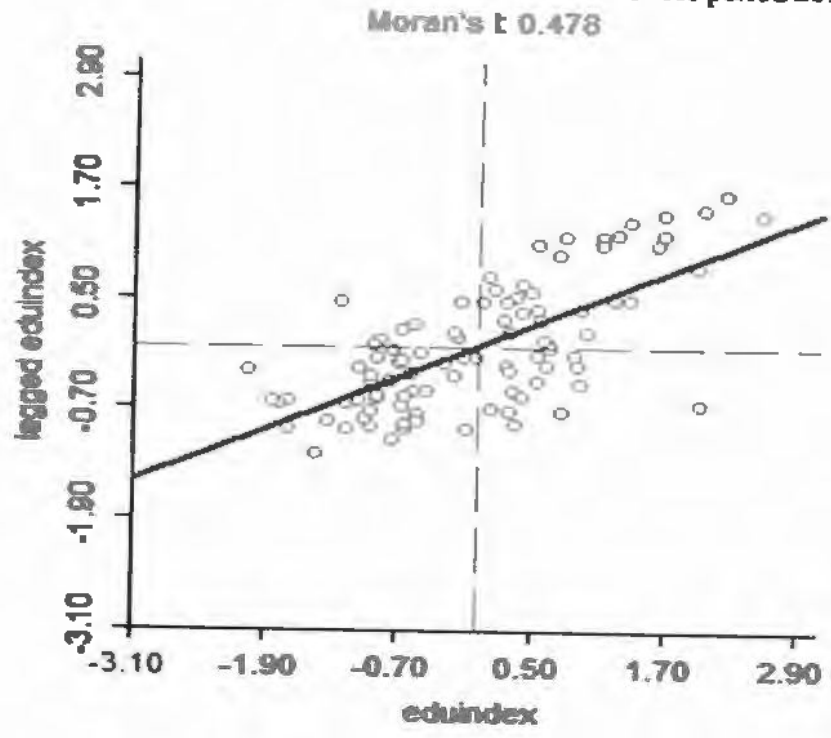


Figure 5.21: Moran Scatter Plot of Health Index for the period 2004-05

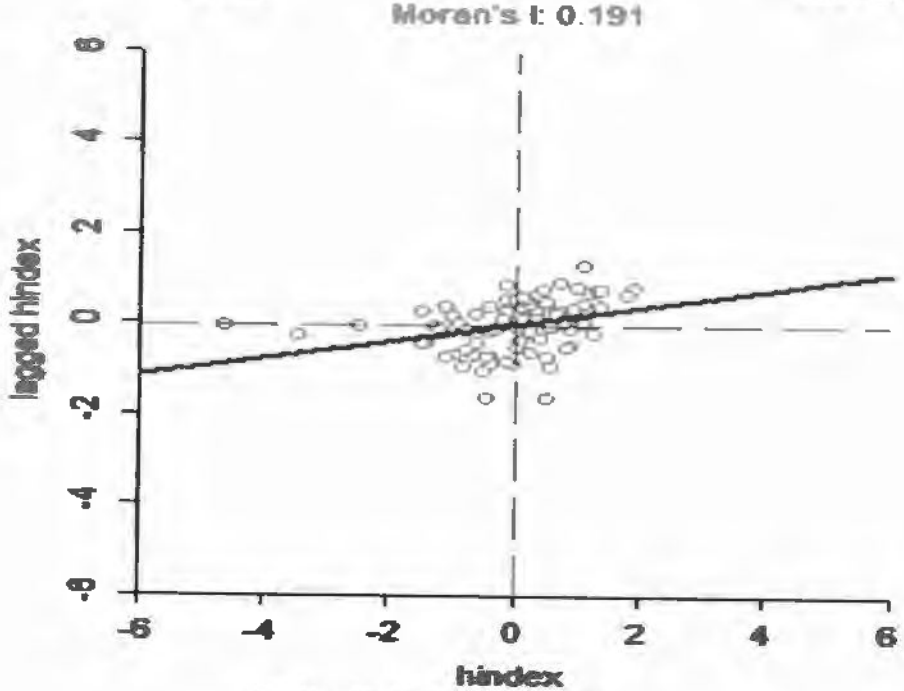


Figure 5.22: Moran Scatter Plot of Health Index for the period 2014-15

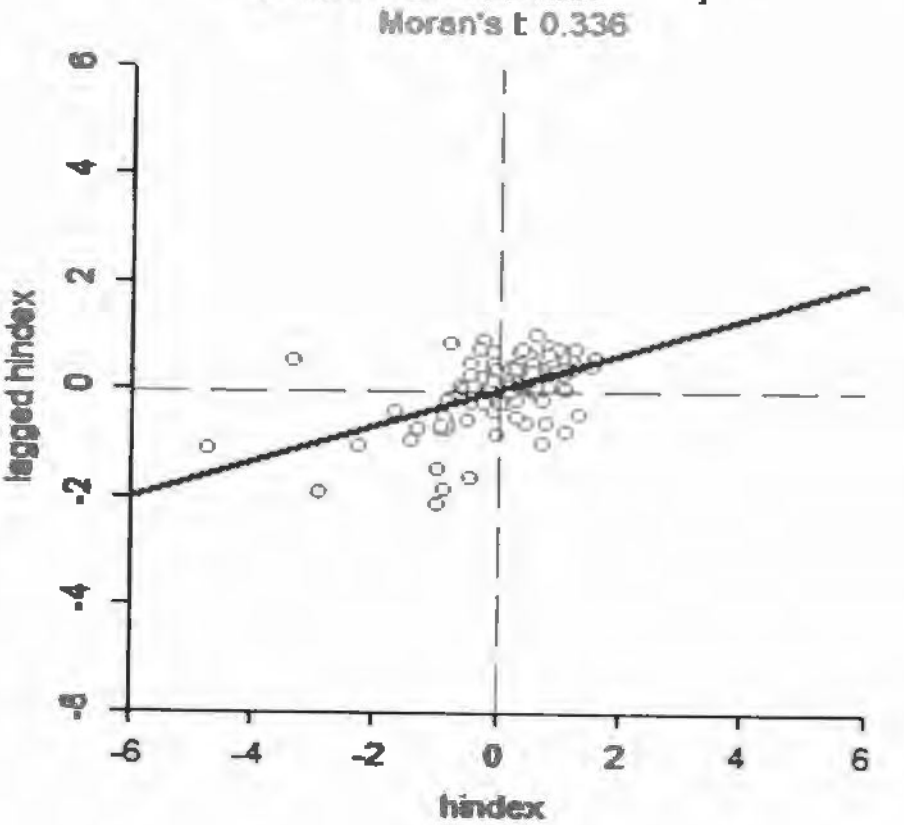


Figure 5.23: Moran Scatter Plot of Household Welfare Index for period 2004-05

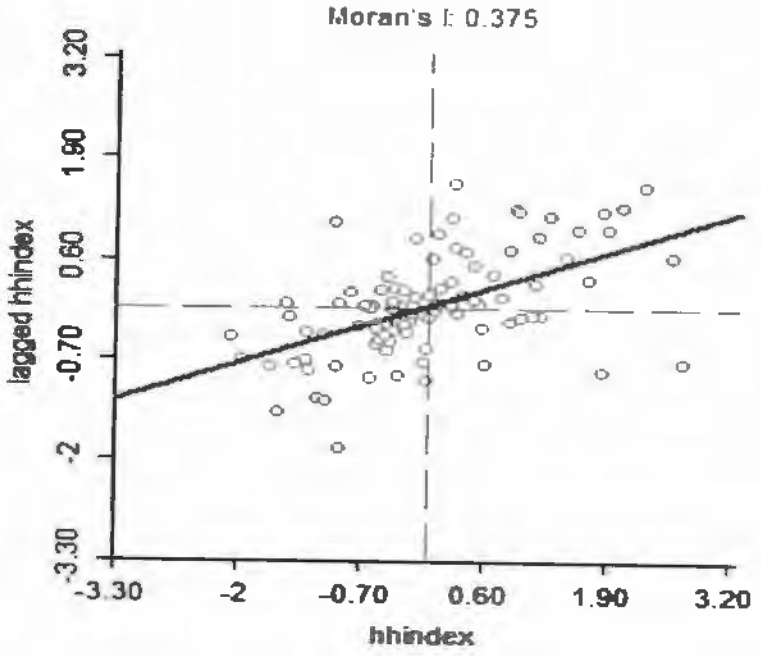
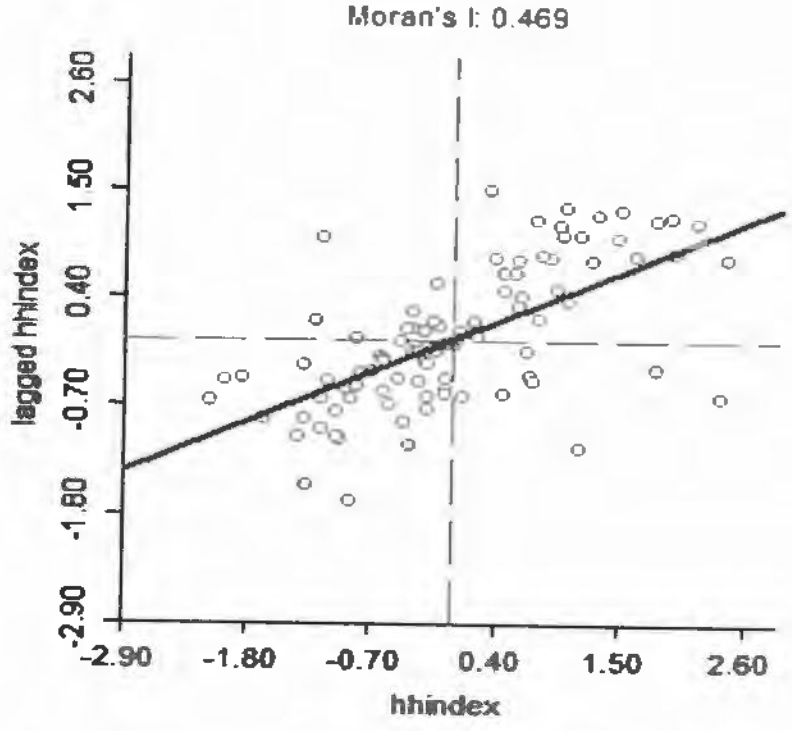


Figure: 5.24: Moran Scatter Plot of Household Welfare Index for period 2014-15



LISA findings demonstrate the presence of local spatial autocorrelation and spatial heterogeneity in the form of two distinct spatial clusters of high and low human development index values (see figure 5.25 & figure 5.26).

Table 5.3: Distribution of Spatial Autocorrelation for Human Development Index (2004-05)

Variables	HH (34)	LH (14)	LL (35)	HL (14)
Human Development Index	Abbottabad, Hangu, Haripur, Mansehra, Peshawar, Kohat, Nowshera, Swabi, Mardan, Attock, Bhakhar, Chakwal, Faisalabad, Gujrat, Mandi Bahaudin, Gujranwala Hafizabad, Islamabad, Jeblum, Kasur, Khanewal, Lahore, Mianwali, Narowal, Pakpatten, Toba Tek Singh, Rawalpindi, Sargodha, Sheikhupura Sahiwal, Sialkot, Vehari, Naushahro Feroze, Sukkur,	Buner, Charsada, Jhang, Karak, Khushab, Lakki-Marwat, Lasbilla, Lodhran, Mithi, Muzaffargarh, Okara, Sanghar, Thatta, Upper Dir,	Awaran, Badin, Bannu, Barkhan, Batagram, Bolan, Chaghi, Dadu, Dera Ismail Khan, Dera Ghazi Khan, Gwadar, Jafarabad, Jakobabad, JhalMagsi, Kalat, Kharan, Khairpur, Khuzdar, Kobistan, Larkana, Loralai, Mastung, Mirpur-Khas, MusaKhel, Nasirabad, NawabSbah, Pashin, Qilla-Abdullah, Qilla-Saifullah, Rajanpur, Shangla, Sibbi, Tank, Zhob, Ziarat.	Bahawalnager, Bahawalpur, Chitral, Ghotki, Hyderabad, Karachi, Layyah, Lower Dir, Malakand, Multan, Quetta, RahimYarKhan, Shikarpur, Swat.

Note: The first and third quadrants show positive spatial autocorrelation, while the second and fourth quadrants show negative spatial autocorrelation.

Table 5.4: Distribution of Spatial Autocorrelation for Human Development Index (2014-15)

Variables	HH (37)	LH (10)	LL (40)	HL (10)
Human Development Index	Abbottabad, Charsada, Kohat, Hangu, Haripur, Lahore, Karak, Lakki Marwat, Lower Dir, Malakand, Swabi, Mansehra, Nowshera, Mandi Bahuddin, Peshawar, Mardan, Attock, Chakwal, Faisalabad, Gujrat, Gujranwala, Hafizabad, Islamabad, Jehlum, Kasur, Khanewal, Khushab, Toba Tek Singh, Okara, Mianwali, Narowal, Sargodha, Rawalpindi, Sheikhupura, Sialkot, Sahiwal, Naushahro Feroze.	Bhakhar, Buner, Jhang, Kohistan, Lasbilla, Pakpatten, Sanghar, Thatta, Upper Dir, Vehari	Awaran, Badin, Bannu, Bahawalnager, Bahawalpur, Barkhan, Batagram, Bolan, Chaghi, Dadu, Dera Ghazi Khan, Gwadar, Jafarabad, Jakobabad, JhalMagsi, Kalat, Khairpur, Kharan, Khuzdar, Lodhran, Loralai, Mastung, Mirpur Khas, Mithi, MusaKhel, Muzaffargarh Nasirabad, NawabShah, Pashin, Qilla-Abdullah, Qilla-Saifullah, Rahim Yar Khan, Rajanpur, Shangla, Shikarpur, Sibbi, Tank, Zhob, Ziarat.	Chitral, D.I.Khan, Hyderabad, Karachi, Larkana, Layyah, Multan, Quetta, Sukkur, Swat.

Note: The first and third quadrants show positive spatial autocorrelation, while the second and fourth quadrants show negative spatial autocorrelation.

Figure 5.25: Local Moran statistics for Human Development Index 2004

Figure 5.26: Local Moran statistics for Human Development Index 2015

Overall, the differences of human development index across districts in Pakistan are caused mostly by the "HH" and "LL" agglomeration effects, while the "HL" and "LH" agglomeration effects are not evident. Moran Scatter plots also show that with the passage of time, "LL" and "HH" accumulation areas tend to expand. These findings reflect the dualistic structure of Pakistan's districts.

Conclusions and Recommendations

The study analyzed spatial distribution of human development index and sub-indices for 97 districts of Pakistan between 2004 and 2015.

The main findings of the section are given as under:

- Quartile maps clearly display that there exist a vast gap in development level across the districts of Pakistan.
- Moran's *I* indicate significant positive global autocorrelation and thus indicating a districts with a high (low) development are associated spatially with bordering districts which also have high (low) development level.
- The findings of Moran's Scatterplots show that for all four indices, most of districts of Punjab and KP lie in the HH quadrant, While the LL quadrant shows a cluster of the of districts mostly from interior Sindh and Balochistan.
- On the whole, these findings prove the twofold structure of Pakistan's economic geography, as explained by previous literature (Such as Hamid & Hussain, 1992; Khan & Jamal, 2003; Naqvi, 2007; Siddique, 2008; Burki et al., 2010; Arif, 2010; Ahmed, 2011). Along with spatial heterogeneity, spatial autocorrelation among districts is also witnessed by the findings of the study as explained by Ahmed (2011).

5.2. Empirical Findings on Club Convergence

In this section, we present the results of the convergence club of buman development index and sub-indices across districts of Pakistan. Each sub-section presents empirical findings on the human development index and three sub-indices, namely the education index, the health index, and the household welfare index.

We use a technique proposed by Phillips and Sul to investigate the convergence proposition and identify club convergence (2007). The econometric methodology is divided into four steps. In the first step, we run *"log t regression"* to test overall convergence. We continue to determine the formation of convergence clubs in the absence of full panel convergence. We use the *"Phillips-Sul club clustering algorithms"* for cub identification.

According to Phillips and Sul, the convergence algorithm may result in overestimation of accurate figures of club (2009). To address this potential issue, we use the *"test of club merging"* to evaluate the merging of neighbouring clubs into larger clubs. Following that, we continue the analysis by looking for club convergence. The log t-test developed by Phillips and Sul (2009) is used to test the merging of two or more clubs into new clubs. Finally, the *"final club classification"* shows the total numbers of clubs after various clubs have been merged.

5.2.1. Club Convergence of Human Development Index

This section discusses the outcome for overall convergence and convergence club of human development index.

Log t Convergence Test

We begin by investigating full convergence in human development index. Initially, we apply the log t regression for human development index of 97 districts of Pakistan over the period 2004–2015. The findings of the study show that the value of t-stat is less than -1.65, which means that the convergence hypothesis is rejected for overall panel convergence (see table 5.5). Furthermore, it implies that convergence in human development index among all the districts is rejected. Consequently, we continue further for the identification of clubs.

Table 5.5: Phillips Sul log t Regression Results (Human Development Index)

Variable	β Coefficient	SE	t-stat
log(t),	-1.307	0.051	-25.644

Note: Convergence test reject the null hypothesis at 1% significance level.

Club Convergence Identification

After determining that there is no overall panel convergence, we proceed to determine the formation of convergence clubs. We use the *"Phillips-Sul club clustering algorithms"* to identify clubs. The results for club identification are shown in table 5.6.

Table 5.6: Club Convergence Results (Human Development Index)

Club	Districts in Club	N	β Coefficient
Club 1	Lahore, Hyderabad, Karachi	3	0.109 (0.550)
Club 2	Jehlum, Chakwal, Gujranwala, Gujrat, Sialkot, Sheikhupura, Malakand, Peshawar, Nowshera, Haripur	10	0.316 (1.433)
Club 3	Faisalabad, Dadu, Abbottabad, Swabi	4	0.152 (0.783)
Club 4	Attock, Sargodha, Khushab, T.T.Singh, Hafizabad, Mandi Bahuddin, Narowal, Kasur, Okara, Multan, Larkana, Lower Dir, Chitral, Charsada, Kohat, Karak, Mansehra, Mardan, Quetta.	19	0.458 (2.224)
Club 5	Sahiwal, Khanewal, Lodhran, Layyah, Sukkur, Nowshero Feroze, Swat , Bonair, Hangu, Lakki Marwat, Pashin, Sibbi, Gwadar.	13	0.390 (1.869)
Club 6	Mianwali, Jhang, Vehari, Pakpatten, Muzaffar Garh, Bahawalnager, Khairpur, Shaheed Benazirabad, Sanghar, Upper Dir, Batagram, Bannu, Kalat, Mastung, Kharan, Zhob, Qilla Saifulla.	17	0.215 (1.052)
Club 7	Bhakhar, Bahawalpur, Rahim Yar Khan, Ghotki, Shikarpur, Mir Pur Khas, Shangla, D.I.Khan, Tank, Ziarat.	10	0.560 (2.621)
Club 8	D.G.khan, Jaccobabad, Khuzdar, Awaran, Lasbilla, Loralai.	6	0.305 (1.382)
Club 9	Thatta, Qilla Abdullah, Musa Khel, Nasirabad, Jafarabad, Jhal Magsi, Bolan	7	0.505 (1.984)
Club 10	Tharparkar, Barkhan.	2	1.493 (2.565)
Club 11	Kohistan, Chaghi.	2	-0.946 (-0.389)
Non Convergent Group	Islamabad, Rawalpindi, Rajanpur, Badin	4	-1.418 (-24.736)

Notes: Results display 11 clubs from row 1 to row 11 and one non-convergent group in row 12. The values in parentheses are the t-statistic. N is the number of districts in each club.

As seen from the table 5.6, results clearly show that the human development index across 97 districts converged initially to eleven clubs as t-stat are larger than -1.65 significantly. Four districts including Islamabad, Rawalpindi, Rajanpur and Badin belong to non-convergent group.

Club Merging Tests (Convergence between the Clubs)

According to Phillips and Sul, the convergence algorithm may result in an inaccurate number of clubs (2009). We tackle this challenge by applying *"club merging test"*. Phillips and Sul (2009) proposed the log t test to test the merger of two or more clubs into new clubs. Clubs can merge to form a new club if the convergence hypothesis is satisfied jointly. Log t test is applied on all the pairs of clubs (see table 5.7).

Table 5.7: Club Merging Test Results (Human Development Index)

Initial Clubs	N	Clubs Merging Test	β Coefficient	Final Clubs	N
Club 1	3	Club 1 + Club 2	-0.317 (-2.410)	Club 1	3
Club 2	10	Club 2 + Club 3	-0.048 (-0.297)	Club 2	14
Club 3	4	Club 3 + Club 4	0.070 (0.484)	Club 3	19
Club 4	19	Club 4 + Club 5	-0.585 (-9.119)	Club 4	30
Club 5	13	Club 5+ Club 6	-0.108 (-0.755)	Club 5	16
Club 6	17	Club 6 + Club 7	0.184 (1.077)	Club 6	9
Club 7	10	Club 7 + Club 8	-0.233 (-1.593)	Club 7	2
Club 8	6	Club 8+ Club 9	-0.347 (-3.400)	Non Convergent Group	4
Club 9	7	Club 9 + Club 10	0.490 (1.971)		
Club 10	2	Club 10 + Club 11	-1.934 (-25.119)		
Club 11	2	Club 11 + G~12	-1.463 (-27.558)		
Non Convergent Group	4				

Notes: The tilde symbol (~) represents the non-convergent group. The values in parentheses are the t-statistic. The number N represents the number of districts in each club.

Final Clubs Classification

The club merging results revealed convergence between four groups. The 2nd and 3rd clubs merge to form a club of 14 districts, while 5th and 6th clubs merge to form a club

of 30 districts. The 7th and 8th clubs merge to form a club of 16 districts, while the 9th and 10th clubs combine to form a club of 9 districts. After convergence between four groups, the final club classification showed seven convergence clubs and one divergent group (see table 5.8).

Table 5.8: Final Clubs Classification (Human Development Index)

Final Clubs	Districts in Club	N	β Coefficient
Club 1	Lahore, Hyderabad, Karachi	3	0.109 (0.550)
Club 2	Jehlum, Chakwal, Faisalabad, Gujranwala, Gujrat, Sialkot, Sheikhupura, Dadu, Malakand, Peshawar, Nowshera, Abbottabad, Haripur, Swabi.	14	-0.049 (-0.297)
Club 3	Attock, Sargodha, Khushab, T.T.Singh, Hafizabad , Mandi Bahuddin, Narowal, Kasur, Okara, Multan, Larkana, Lower Dir, Chitral, Charsada, Kohat, Karak, Mansehra, Mardan, Quetta	19	0.458 (2.224)
Club 4	Mianwali, Jhang, Vehari, Sahiwal, Khanewal, Pakpatten, Lodhran, Layyah, Muzaffar Garh, Bahawalnager, Khairpur, Sukkur, Shaheed Benazirabad, Nowshero Feroze, Sanghar, Swat, Upper Dir, Bonair, Hangu, Batagram, Bannu, Lakki Marwat, Pashin, Sibbi, Kalat, Mastung, Kharan, Gwadar, Zhob, Qilla Saifullah	30	-0.108 (-0.756)
Club 5	Bhakhar, D.G.khan, Bahawalpur, Rahim Yar Khan, Ghotki, Jaccobabad, Shikarpur, Mir Pur Khas, Shangla, D.I.Kha, Tank, Ziarat, Khuzdar, Awaran, Lasbilla, Loralai	16	-0.234 (-1.594)
Club 6	Thatta, Tharparkar, Qilla Abdullah, Barkhan, Musa Khel, Nasirabad, Jafarabad, Jhal Magsi, Bolan	9	0.491 (1.971)
Club 7	Kohistan, Chaghi	2	-0.946 (-0.389)
Non-convergent group	Islamabad, Rawalpindi, Rajanpur, Badin	4	-1.418 (-24.736)

Notes: The results show seven clubs from row one to row seven, and one non-convergent group in row eight. The values in parentheses are the t-statistic. The number N represents the number of districts in each club.

As seen from the table 5.8, the final club classification show seven convergence clubs and one divergent group. The first club is represented by Lahore, Hyderabad and Karachi. The second club is the integration of Jhelum, Chakwal, Faisalabad,

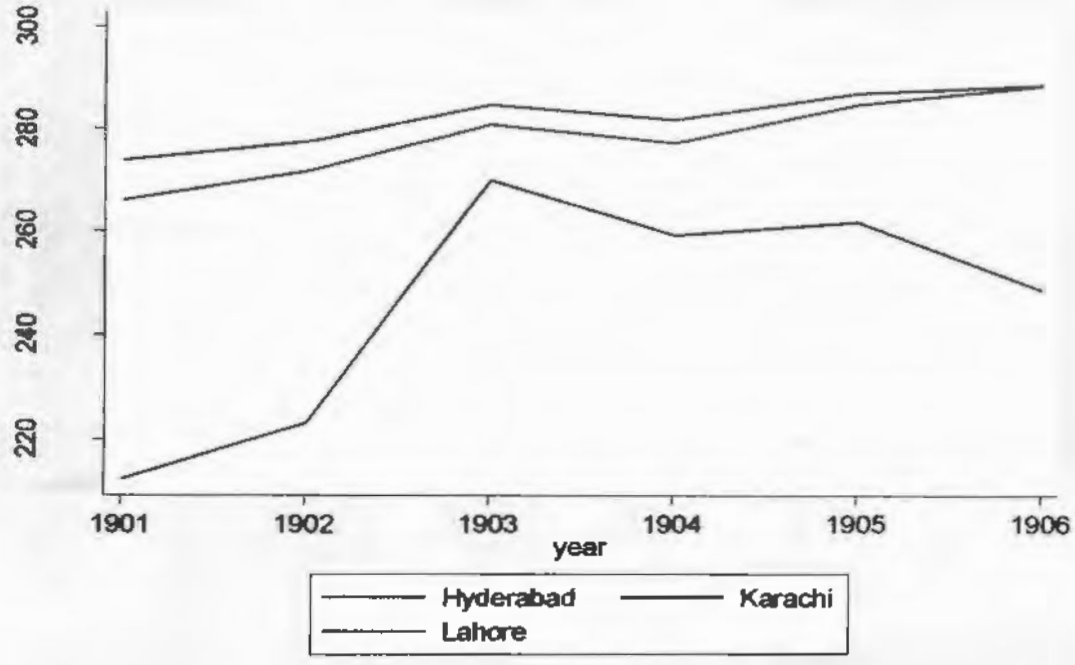
Gujranwala, Gujrat, Sialkot, Sheikhupura, Dadu, Malakand, Peshawar, Nowshera, Abbottabad, Haripur and Swabi. The third club comprises Attock, Sargodha, Khushab, T.T.Singh, Hafizabad, Mandi Bahuddin, Narowal, Kasur, Okara, Multan, Larkana, Lower Dir, Chitral, Charsada, Kohat, Karak, Mansehra, Mardan and Quetta. The fourth club encompasses Mianwali, Jhang, Vehari, Sahiwal, Khanewal, Pakpatten, Lodhran, Layyah, Muzaffar Garh, Bahawalnager, Khairpur, Sukkur, Shaheed Benazirabad, Nowshero Feroze, Sanghar, Swat, Upper Dir, Bonair, Hangu, Batagram, Bannu, Lakki Marwat, Pashin, Sibbi, Kalat, Mastung, Kharan, Gwadar, Zhob and Qilla Saifullah. The fifth club consists of Bhakhar, D.G.khan, Bahawalpur, Rahim Yar Khan, Ghotki, Jaccobabad, Shikarpur, Mir Pur Khas, Shangla, D.I.Khan, Tank, Ziarat, Khuzdar, Awaran, Lasbilla and Loralai. The sixth club consists of Thatta, Tharparkar, Jafarabad, Nasirabad, Qilla Abdullah, Barkhan, Musa Khel, Jhal Magsi and Bolan. The seventh club contains Kohistan and Chaghi. The last non-converging group contain; Islamabad, Rawalpindi, Badin and Rajanpur.

The first club represents most three developed districts of Pakistan that include Lahore, Karachi and Hyderabad. The seventh club comprises the two most backward districts of KP and Balochistan i.e. Kohistan and Chaghi.

Transitional Behavior of Clubs for Human Development Index

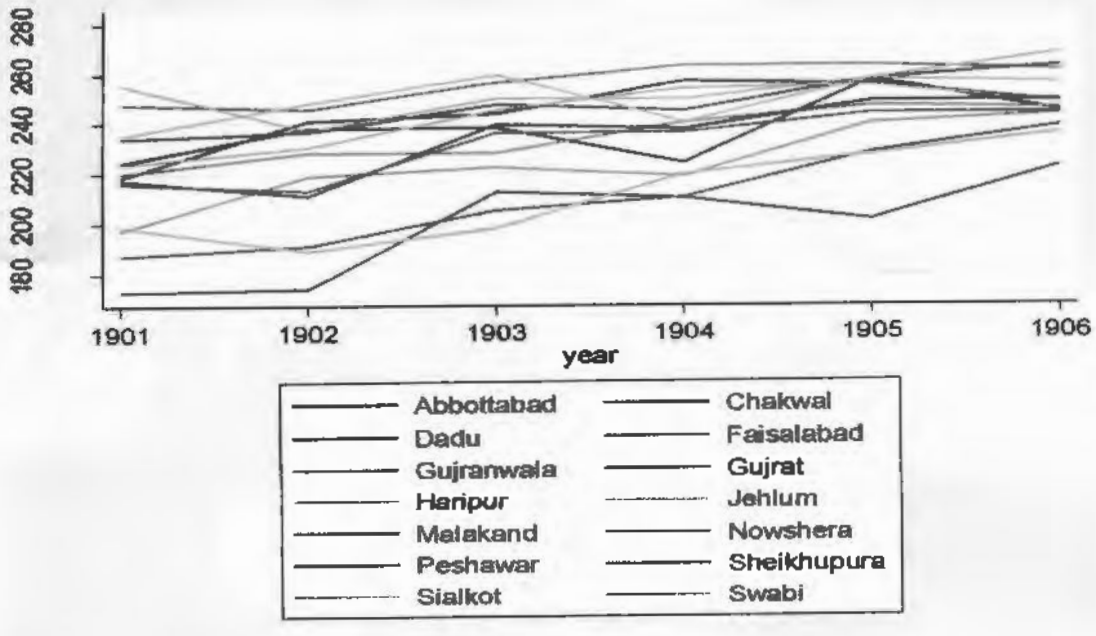
We plot the internal transition path of each district in the club to identify the transition path of clubs for the human development index. For this purpose, we employ Phillips and Sul's (2009) concept of "*transition path curve*". The internal relative transition paths of each district for each of the seven convergence clubs and one divergent group are depicted in Figures 5.27- 5.34.

Figure 5.27: Relative Convergence within Club 1 (Human Development Index)



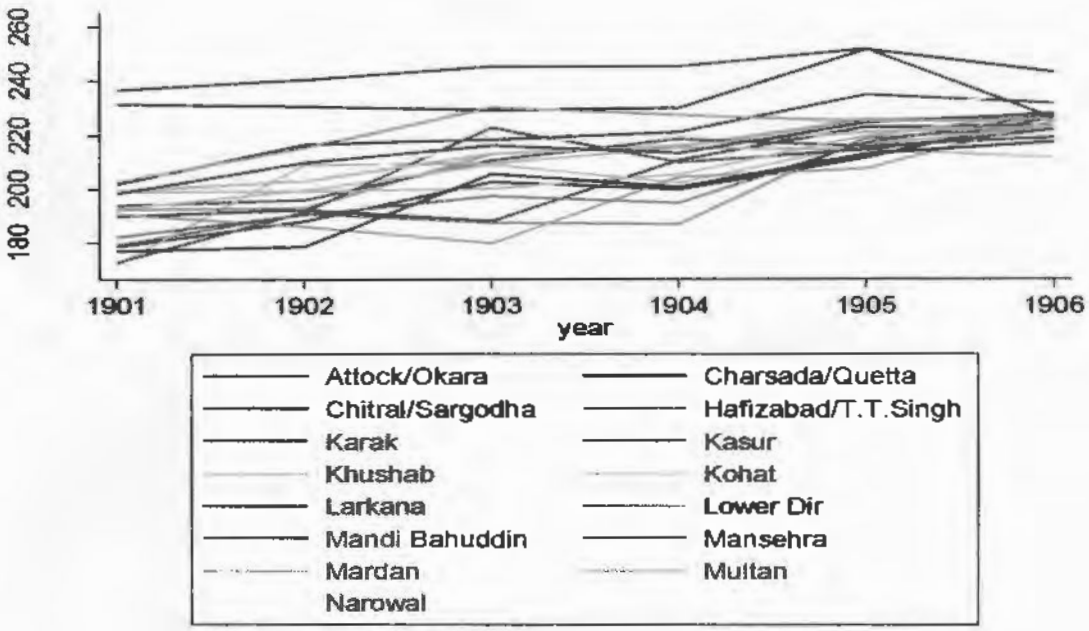
Note: The time periods 1901, 1902, 1903, 1904, 1905 and 1906 denotes the PSLM alternates year data for periods 2004-05, 2006-07, 2008-09, 2010-11, 2012-13 and 2014-15.

Figure 5.28: Relative Convergence within Club 2 (Human Development Index)



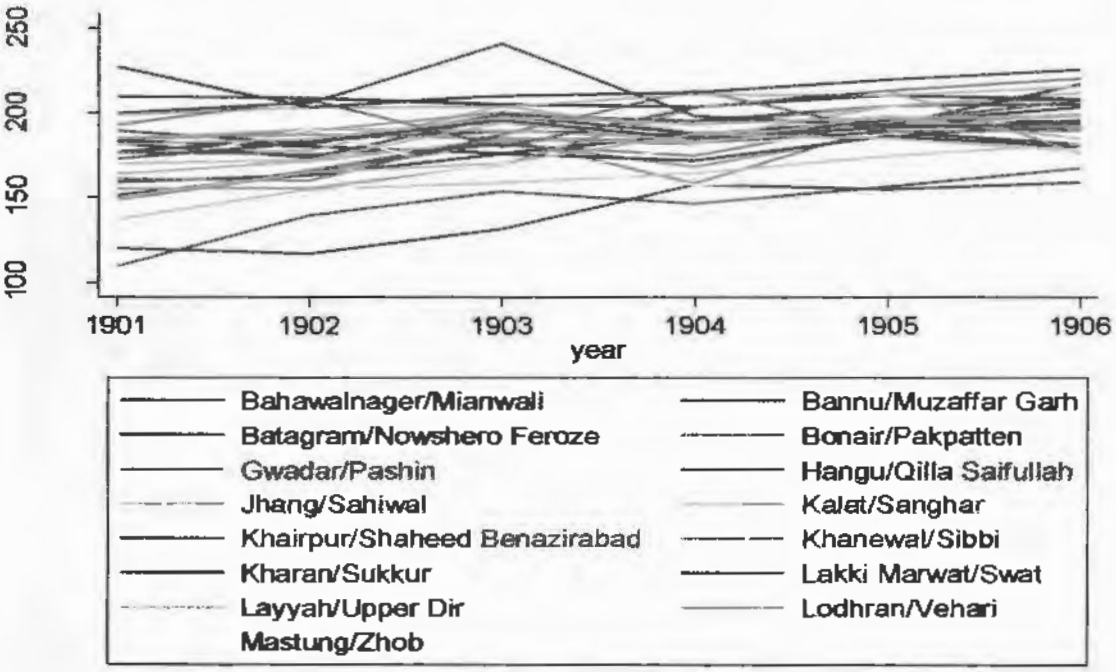
Note: The time periods 1901, 1902, 1903, 1904, 1905 and 1906 denotes the PSLM alternates year data for periods 2004-05, 2006-07, 2008-09, 2010-11, 2012-13 and 2014-15.

Figure 5.29: Relative Convergence within Club 3 (Human Development Index)



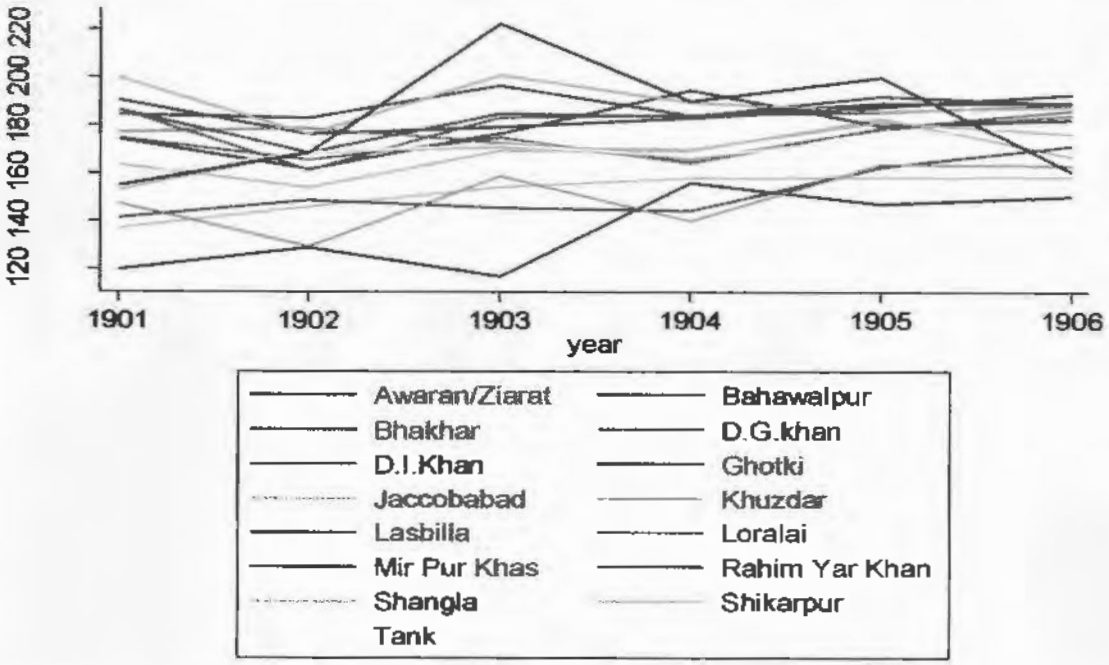
Note: The time periods 1901, 1902, 1903, 1904, 1905 and 1906 denotes the PSLM alternates year data for periods 2004-05, 2006-07, 2008-09, 2010-11, 2012-13 and 2014-15.

Figure 5.30: Relative Convergence within Club 4 (Human Development Index)



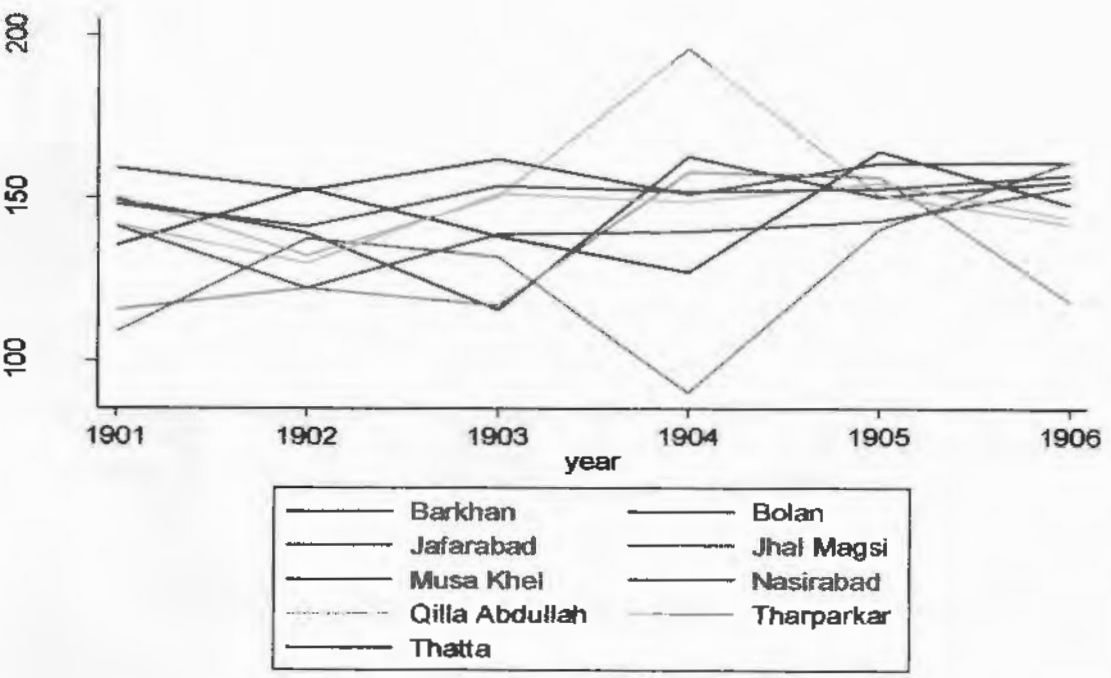
Note: The time periods 1901, 1902, 1903, 1904, 1905 and 1906 denotes the PSLM alternates year data for periods 2004-05, 2006-07, 2008-09, 2010-11, 2012-13 and 2014-15.

Figure 5.31: Relative Convergence within Club 5 (Human Development Index)



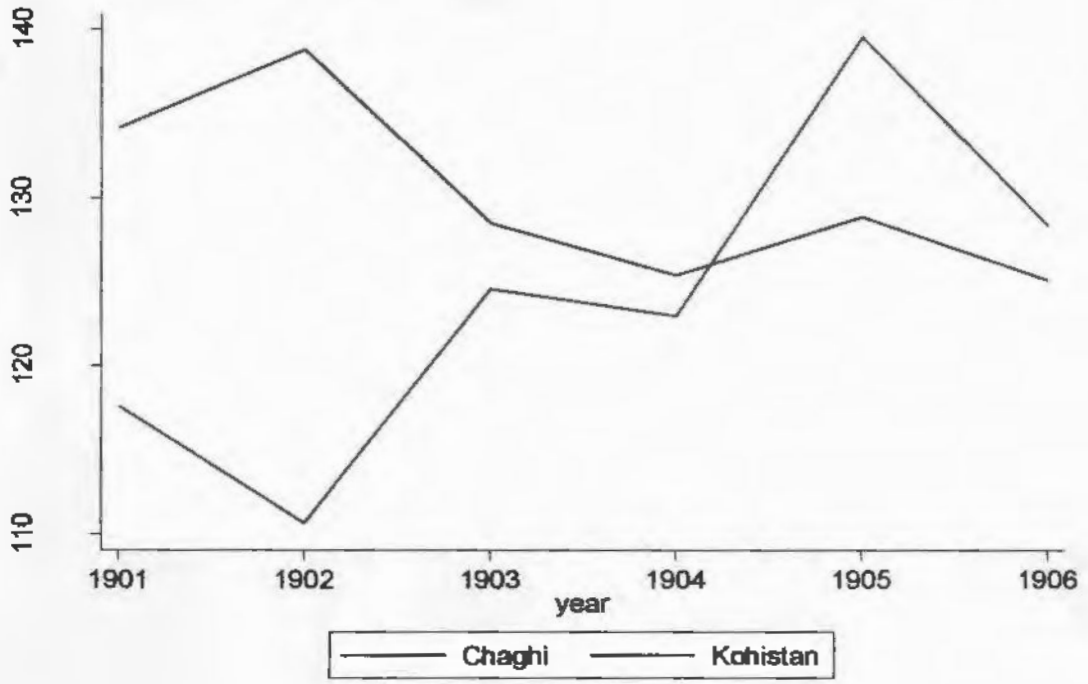
Note: The time periods 1901, 1902, 1903, 1904, 1905 and 1906 denotes the PSLM alternates year data for periods 2004-05, 2006-07, 2008-09, 2010-11, 2012-13 and 2014-15.

Figure 5.32: Relative Convergence within Club 6 (Human Development Index)



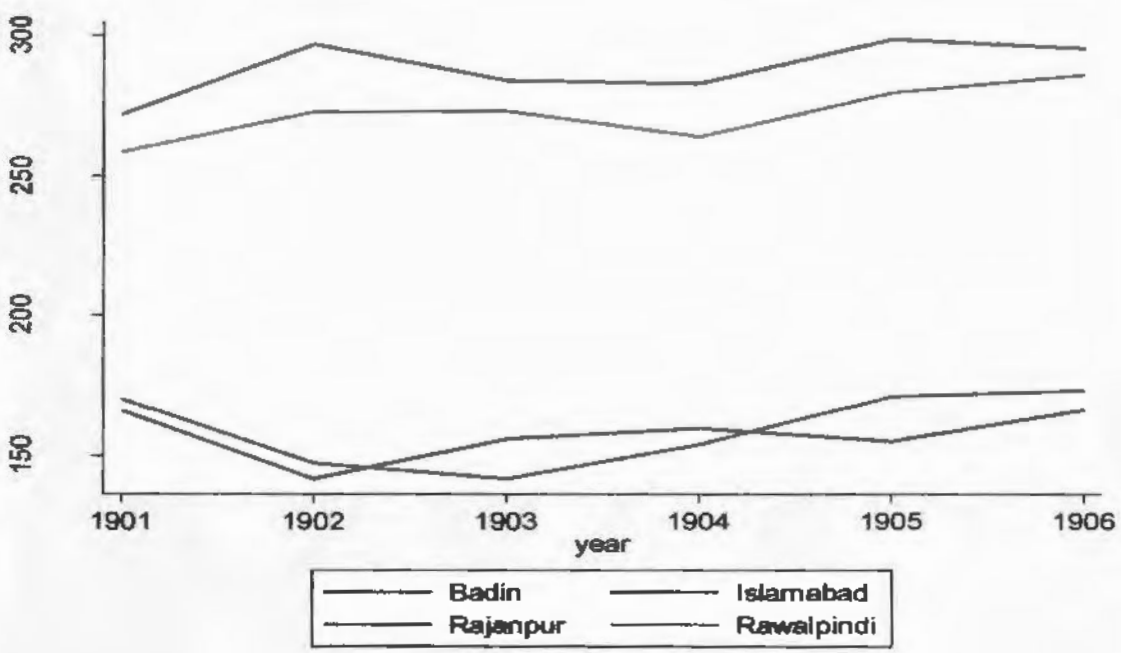
Note: The time periods 1901, 1902, 1903, 1904, 1905 and 1906 denotes the PSLM alternates year data for periods 2004-05, 2006-07, 2008-09, 2010-11, 2012-13 and 2014-15.

Figure 5.33: Relative Convergence within Club 7 (Human Development Index)



Note: The time periods 1901, 1902, 1903, 1904, 1905 and 1906 denotes the alternates year PSLM data for periods 2004-05, 2006-07, 2008-09, 2010-11, 2012-13 and 2014-15.

Figure 5.34: Non-Convergent Group (Human Development Index)



Note: The time periods 1901, 1902, 1903, 1904, 1905 and 1906 denotes the alternates year PSLM data for periods 2004-05, 2006-07, 2008-09, 2010-11, 2012-13 and 2014-15.

As a whole, club 1 comprises districts with higher development level than other clubs. On the other hand, the speed of convergence is taking place more rapidly among the members of club 6 than the other clubs, as indicated by the higher estimate of coefficient and illustrated by curve (see table 5.8 & figure 5.32).

In brief, the above club results indicate that there is no convergence in development level across districts of Pakistan, as the districts are classified into seven convergence clubs and one divergent group. The districts with same development levels are classified within the same group, while the districts with highest and lowest development levels (which do not merge with any club) are classified as non-convergent group.

5.2.2. Club Convergence of Education Index

In this section, we investigate the findings for club convergence of education index across districts of Pakistan.

Log t Convergence test

We begin by testing full convergence in education index. First of all, we apply the log t regression for education index for 97 districts of Pakistan over the period 2004–2015. The outcomes of the regression test revealed that the value of t-stat is less than -1.65. Hence, overall convergence among districts is rejected at 1% significance level (see table 5.9). Consequently, we continue further for the identification of clubs.

Table 5.9: Phillips Sul log t Regression Results (Education Index)

Variable	β Coefficient	SE	T-stat
log(t),	-1.293	0.039	-32.876

Note: Convergence test reject the null hypothesis at 1% significance level.

Club Convergence Identification

After the rejection of convergence in whole sample, we proceed to determine formation of convergence clubs. For cub Identification, we make use of the *"Phillips-Sul algorithms of club clustering"*. The findings show the formation of nine convergence clubs and one non-convergent group (see table 5.10).

Table 5.10: Club Convergence Results (Education Index)

Club	Districts in Club	N	β Coefficient
Club 1	Islamabad, Rawalpindi, Jehlum, Sialkot, Narowal, Lahore, Larkana, Dadu, Karachi, Haripur, Kharan, Gwadar	12	0.401 (1.593)
Club 2	Chakwal, Faisalabad, T.T.Singh, Hafizabad, Mandi Bahuddin, Kasur, Okara, Sheikhupura, Hyderabad, Karak, Mansehra, Abbottabad, Sibbi, Kalat	14	0.104 (0.497)
Club 3	Sargodha, Khushab, Mianwali, Sahiwal, Multan, Khanewal, Lodhran, Layyah, Nowshero Feroze, Chitral, Malakand, Peshawar, Nowshera, Quetta, Mastung, Khuzdar , Awaran,	17	0.293 (1.289)
Club 4	Bhakhar, Jhang, Vehari, Pakpatten, Bahawalnager, Sukkur, Swat, Upper Dir, Lower Dir , Charsada , Kohat, Bannu, Lakki Marwat, Swabi , Qilla Saifullah	15	0.259 (1.173)
Club 5	Muzaffar Garh , Bahawalpur, Sanghar, Batagram, Mardan, Pashin , Bolan	7	0.089 (0.425)
Club 6	D.G.khan, Rahim Yar Khan, Khairpur, Shaheed Benazirabad, Jaccobabad, Shikarpur, Thatta, Mir Pur Khas, Tharparkar, Bonair, Hangu, D.I.Khan, Tank, Ziarat, Lasbilla, Zhob	16	-0.024 (-0.155)
Club 7	Rajanpur, Ghotki, Badin, Shangla, Qilla Abdullah, Loralai, Jhal Magsi	7	0.668 (2.367)
Club 8	Chaghi, Musa Khel, Nasirabad, Jafarabad	4	1.316 (3.105)
Club 9	Kohistan, Barkhan	2	3.984 (7.388)
Non-convergent group	Attock, Gujranwala, Gujrat	3	-0.569 (-4.387)

Notes: Results display 9 clubs from row 1 to row 9 and one non-convergent group in row 10. The values in parentheses are the t-statistic. N is the number of districts in each club.

Results from table 5.10 clearly show that the education index across 97 districts converged initially to nine convergence clubs as t-stat are significantly larger than -1.65. Three districts including Attock, Gujranwala and Gujrat join the non-convergent group.

Club Merging Tests (Convergence between the Clubs)

According to Phillips and Sul, the convergence algorithm may result in an inaccurate number of clubs (2009). We use the club merging test to evaluate the merging of neighbouring clubs into larger clubs. Phillips and Sul (2009) proposed the log t-test to test the merger of two or more clubs into new clubs. All club pairs are subjected to the logt-test. Clubs can be merged to form a new club if the convergence hypothesis is jointly satisfied. Findings are summarized in table 5.11.

Table 5.11: Cluh Merging Test Results (Education Index)

Initial Clubs	N	Clubs Merging Test	β Coefficient	Final Clubs	N
Club 1	12	Club 1 + Club 2	0.094 (0.495)	1st Club	43
Club 2	14	Club 2 + Club 3	-0.070 (-0.424)	2nd Club	22
Club 3	17	Club 3 + Club 4	-0.073 (-0.473)	3rd Club	16
Club 4	15	Club 4 + Club 5	0.005 (0.028)	4th Club	11
Club 5	7	Club 5+ Club 6	-0.354 (-3.319)	5th Club	2
Club 6	16	Club 6 + Club 7	-0.403 (-4.075)	Non-convergent group	3
Club 7	7	Club 7 + Club 8	-0.085 (-0.634)		
Club 8	4	Club 8+ Club 9	-0.703 (-9.491)		
Club 9	2	Club 9 + G~ 10	-1.661 (-37.279)		
Non-convergent group	3				

Notes: The tilde symbol (~) represents the non-convergent group. The values in parentheses are the t-statistic. N is the number of districts in each club.

Final Clubs Classification

The above club merging results revealed that there is evidence of convergence between four groups. The first, 2nd and 3rd clubs merge to form a club of 43 districts while 4th and 5th clubs merge to form a club of 22 districts. The 7th and 8th clubs merge to form a club of 11 districts. After convergence between four groups, the final club classification display five convergence clubs and one divergent group (see table 5.12).

Table 5.12: Final Clubs Classification (Education Index)

Final Club	Districts in Club	N	β Coefficient
Club 1	Islamabad, Rawalpindi, Mianwali, Jehlum, Chakwal, Sargodha, Khushab, T.T.Singh, Faisalabad, Mandi Bahuddin, Hafizabad, Narowal, Khanewal, Lahore, Sahiwal, Kasur, Okara, Sialkot, Sheikhupura, Multan, Lodhran, Layyah, Nowshero Feroze, Larkana, Dadu, Hyderabad, Karachi, Chitral, Malakand, Peshawar, Nowshera, Karak, Mansehra, Abbottabad, Haripur, Quetta, Sibbi, Kalat, Mastung, Khuzdar, Awaran, Kharan, Gwadar	43	-0.202 (-1.465)
Club 2	Bhakhar, Jhang, Vehari, Pakpatten, Muzaffar Garh, Bahawalpur, Bahawalnager, Sukkur, Sanghar, Swat, Upper Dir, Lower Dir, Charsada, Kohat, Batagram, Bannu, Lakki Marwat, Mardan, Swabi, Pashin, Qilla Saifullah, Bolan	22	0.005 (0.029)
Club 3	D.G.khan, Rahim Yar Khan, Khairpur, Shaheed Benazirabad, Jaccobabad, Shikarpur, Thatta, Mir Pur Khas, Tharparkar, Bonair, Hangu, D.I.Khan, Tank, Ziarat, Lasbilla, Zhob	16	-0.024 (-0.155)
Club 4	Rajanpur, Ghotki, Badin, Shangla, Qilla Abdullah, Chaghi, Loralai, Musa Khel, Nasirabad, Jafarabad, Jhal Magsi	11	-0.085 (-0.634)
Club 5	Kohistan, Barkhan	2	3.984 (7.388)
Non-convergent group	Attock, Gujranwala, Gujrat	3	-0.569 (-4.387)

Notes: Results display 5 clubs from row 1 to row 5 and one non-convergent group in row 6. The values in parentheses are the t-statistic. N is the number of districts in each club.

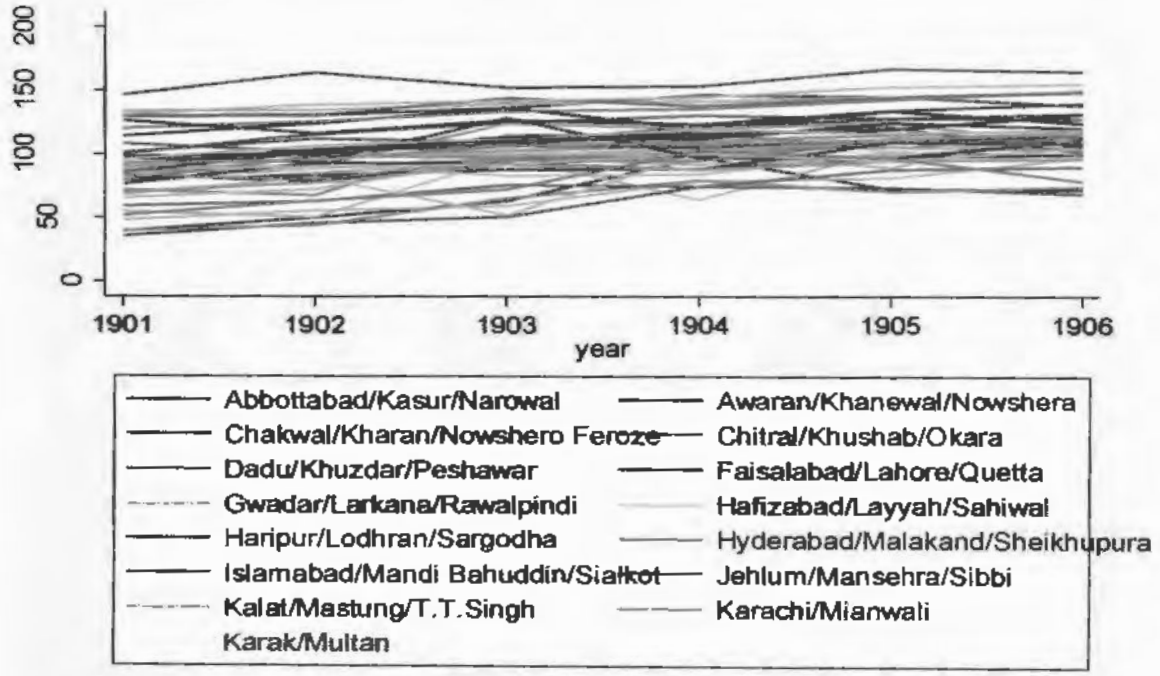
The final club classification revealed five convergence clubs and one non-converging group. Tbe first club is represented by Islamabad, Narowal, Jeblum, Khushab, Sbeikhupura, Chakwal, Sialkot, Mianwali, Kasur, Faisalabad, T.T.Singh, Hafizabad, Okara, Rawalpindi, Khanewal, Sargodha, Mandi Bahuddin, Lahore, Sahiwal, Multan, Lodhran, Layyah, Nowshero Feroze, Larkana, Dadu, Hyderabad, Karachi, Chitral, Malakand, Peshawar, Nowshera, Karak, Mansehra, Abbottabad, Haripur, Quetta, Sibbi, Kalat, Mastung, Khuzdar, Awaran, Kharan, Gwadar. The second is the integration of Bhakhar, Jhang, Vehari, Pakpatten, Muzaffar Garh, Bahawalpur, Bahawalnager, Sukkur, Sanghar, Swat, Upper Dir, Lower Dir, Charsada, Kohat, Batagram, Bannu, Lakki Marwat, Mardan, Swabi, Pashin, Qilla Saifullah, and Bolan.

The third club comprises D.G.khan, Rahim Yar Khan, Khairpur, Shaheed Benazirabad, Jaccobabad, Shikarpur, Thatta, Mir Pur Khas, Tharparkar, Bonair, Hangu, D.I.Khan, Tank, Ziarat, Lasbilla, and Zhob. The fourth club encompasses Rajanpur, Ghotki, Badin, Shangla, Qilla Abdullah, Chaghi, Loralai, Musa Khel, Nasirabad, Jafarabad and Jhal Magsi. The fifth club consists of two underdeveloped districts of KP and Balochistan that include Kohistan, Barkhan. The last group comprising non-converging districts contains Attock, Gujranwala and Gujrat.

Transitional Behavior of Clubs for Education Index

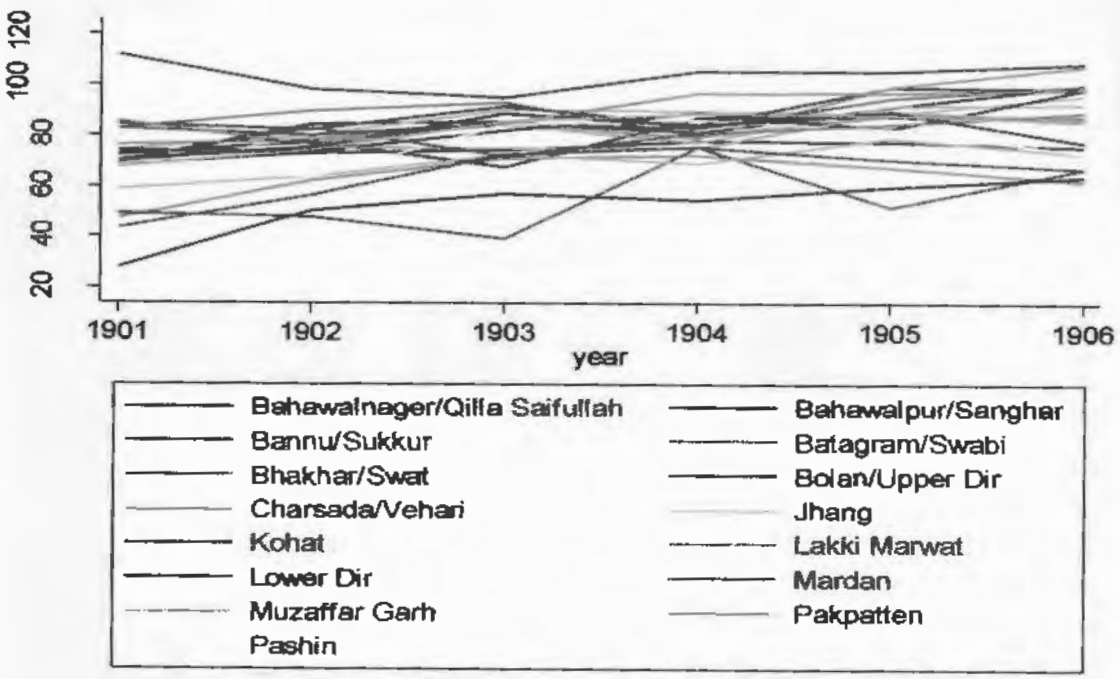
To identify the transition path of clubs of education index, we plot the internal relative transition path of each district within the club. We employ Phillips and Sul's (2009) concept of "*transition path curve*" for this purpose. Figures 5.35- 5.40 show the internal relative transition paths of each district for each of the five convergence clubs and one divergent group.

Figure 5.35: Relative Convergence within Club 1 (Education Index)



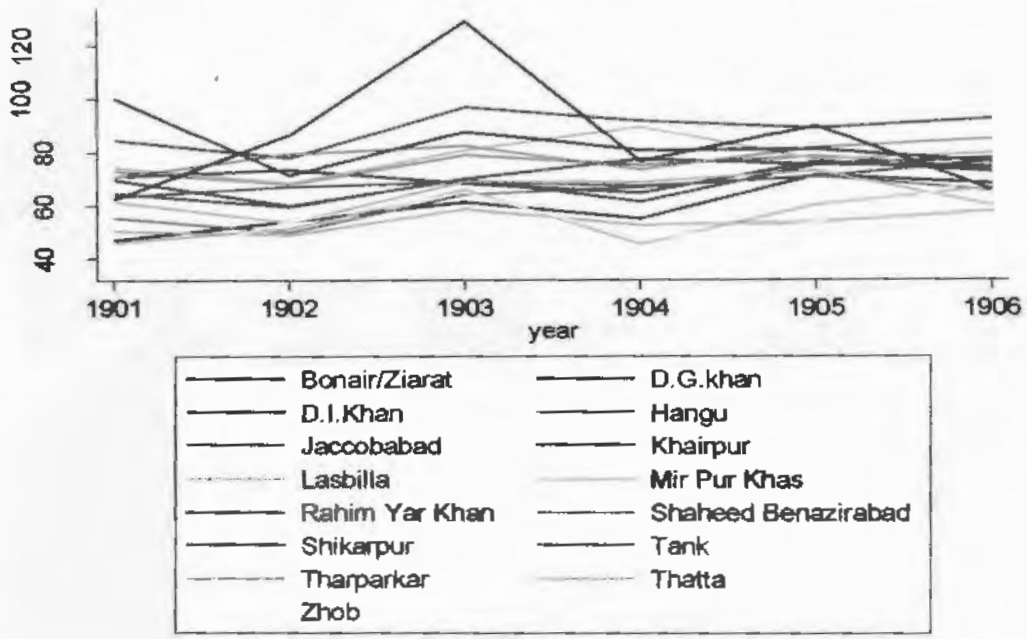
Note: The time periods 1901, 1902, 1903, 1904, 1905 and 1906 denotes the alternates year PSLM data for periods 2004-05, 2006-07, 2008-09, 2010-11, 2012-13 and 2014-15.

Figure 5.36: Relative Convergence within Club 2 (Education Index)



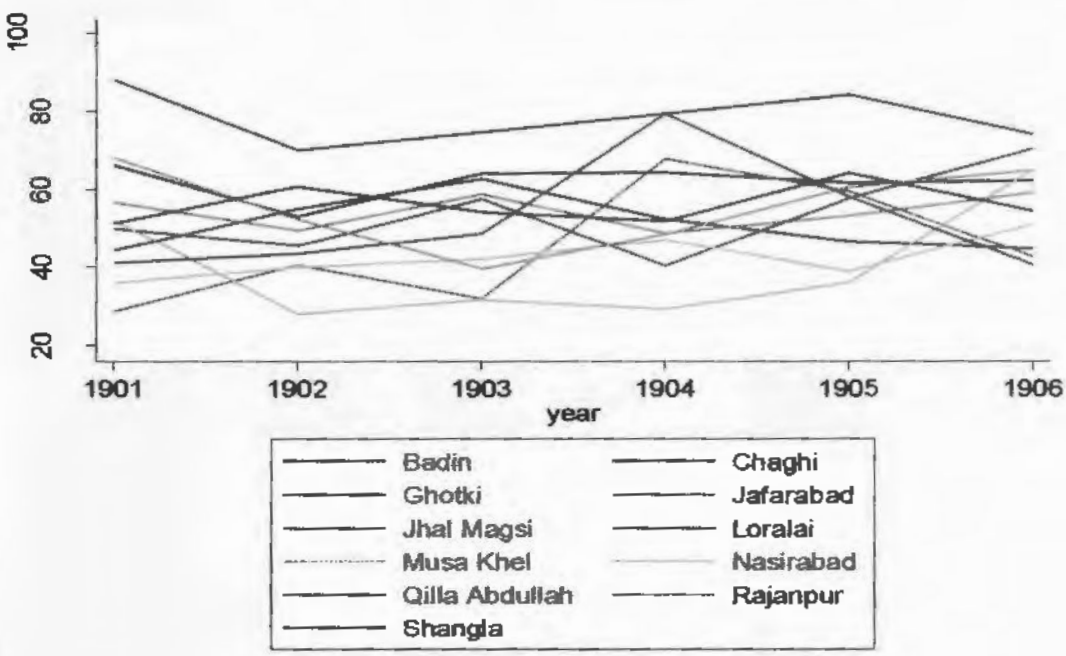
Note: The time periods 1901, 1902, 1903, 1904, 1905 and 1906 denotes the alternates year PSLM data for periods 2004-05, 2006-07, 2008-09, 2010-11, 2012-13 and 2014-15.

Figure 5.37: Relative Convergence within Club 3 (Education Index)



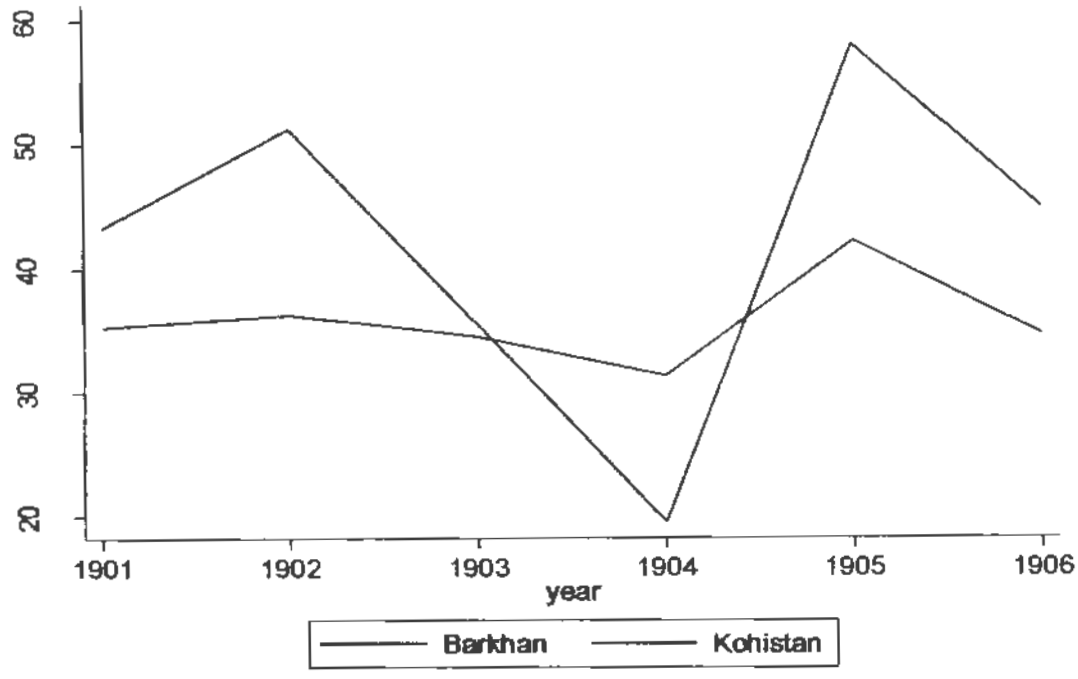
Note: The time periods 1901, 1902, 1903, 1904, 1905 and 1906 denotes the alternates year PSLM data for periods 2004-05, 2006-07, 2008-09, 2010-11, 2012-13 and 2014-15.

Figure 5.38: Relative Convergence within Club 4 (Education Index)



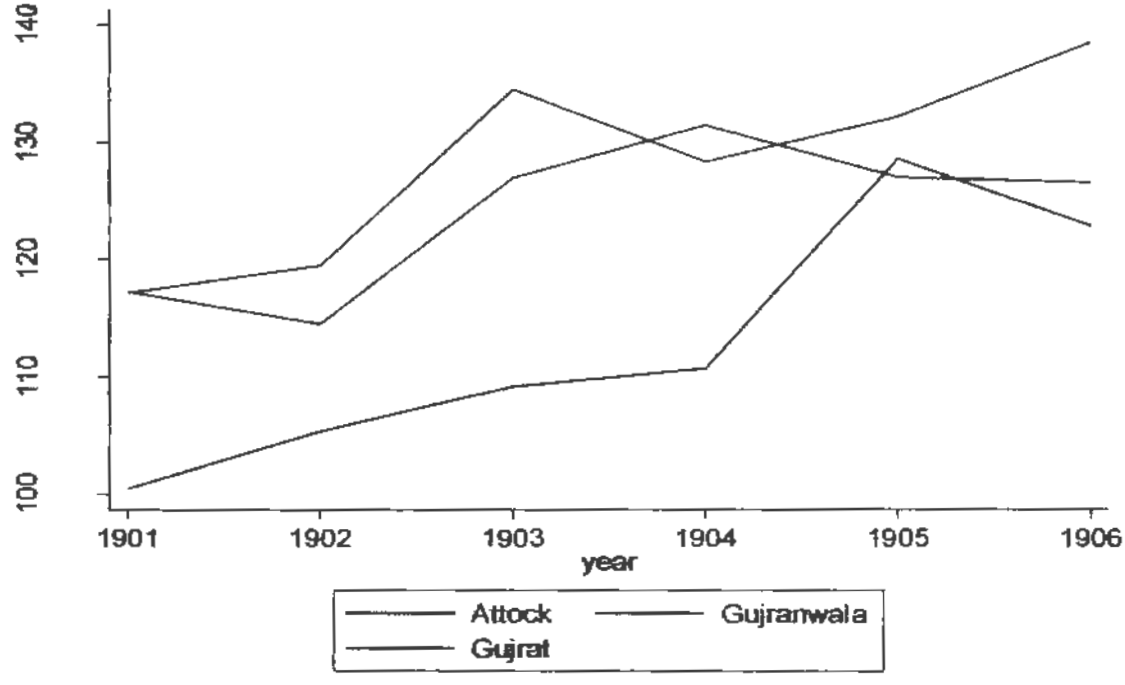
Note: The time periods 1901, 1902, 1903, 1904, 1905 and 1906 denotes the alternates year PSLM data for periods 2004-05, 2006-07, 2008-09, 2010-11, 2012-13 and 2014-15.

Figure 5.39: Relative Convergence within Club 5 (Education Index)



Note: The time periods 1901, 1902, 1903, 1904, 1905 and 1906 denotes the alternates year PSLM data for periods 2004-05, 2006-07, 2008-09, 2010-11, 2012-13 and 2014-15.

Figure 5.40: Non-Convergent Group (Education Index)



Note: The time periods 1901, 1902, 1903, 1904, 1905 and 1906 denotes the alternates year PSLM data for periods 2004-05, 2006-07, 2008-09, 2010-11, 2012-13 and 2014-15.

The above six figures demonstrates the relative transition paths for each of the five convergence clubs and one divergent group. On the whole, Club 1 contains districts with higher education level than other clubs. In contrast, convergence is happening more rapidly among the members of club 5 than others, as explained by the higher estimate of coefficient and illustrated by the curve (see table 5.12 & figure 5.39).

In conclusion, the above mentioned club results clearly indicate that there is no convergence among districts of Pakistan for education index, as the districts are classified into five different convergence clubs and one divergent group. The districts with same education levels are classified within the same group, while the districts with highest and lowest education which do not merge with any club and are classified as non-converging group.

5.2.3. Club Convergence of Health Index

In this section, we present the findings for club convergence of health index across districts of Pakistan.

Log t Convergence test

We start our analysis by examining the full convergence in health index. First, we run the log t regression for the health index for 97 districts from 2004 to 2015. The results show that the t-statistic value is less than -1.65, indicating that the null hypothesis for the entire sample is rejected at the 1% significance level (see table 5.13). Furthermore, it implies that convergence among all districts is rejected. As a result, we must proceed for identification of the clubs.

Table 5.13: Phillips Sul log t Regression Results (Health Index)

Variable	β Coefficient	SE	T-stat
log(t),	-1.539	0.026	-57.709

Note: convergence test reject the null hypothesis at the 1% level.

Club Convergence Identification

In the absence of convergence in whole sample, we proceed to determine formation of convergence clubs. We use the *"Phillips-Sul club clustering algorithms"* for cub identification. Table 5.14 displays the results of the club identification.

Table 5.14: Club Convergence Results (Health Index)

Clubs	Districts in Club	N	β Coefficient
Club 1	Chakwal, Khushab, Qilla Saifullah	3	1.486 (3.080)
Club 2	Islamabad, Rawalpindi, Kasur, Okara, Sialkot, Mandi Bahuddin, Narowal, Lahore, Sheikhupura, Larkana, Dadu, Sargodha, Jehlum, Bhakhar, Shaheed Benazirabad, Faisalabad, T.T.Singh, Hyderabad, Vehari, Pakpatten, Lodhran, Sahiwal, Multan, D.G.khan, Rajanpur, Layyah, Babawalpur, Karachi, Malakand, Bonair, Lower Dir, Chitral, Peshawar, Mansehra, Abbottabad, Charsada, Nowshera, Kohat, Tank, Haripur, Mardan, Swabi, Pashin, Zhob	44	0.227 (4.518)
Club 3	Attock, Mianwali, Jhang, Gujranwala, Gujrat, Hafizabad, Khanewal, Muzaffar Garh, Bahawalnager, Rabim Yar Khan, Sukkur, Nowshero Feroze, Ghotki, Khairpur, Badin, Sanghar, Shangla, Karak, Hangu, Mir Pur Khas, Shikarpur, Tharparkar, Swat , Upper Dir, D.I.Khan, Batagram, Kohistan, Lakki Marwat, Quetta, Qilla Abdullah, Sibbi, Kalat, Awaran, Kharan, Lasbilla, Gwadar, Loralai, Barkhan	38	0.101 (0.556)
Club 4	Thatta, Bannu, Ziarat, Mastung, Jafarabad	5	0.162 (0.801)
Club 5	Jaccobabad , Khuzdar, Nasirabad	3	0.583 (1.109)
Club 6	Chaghi, Musa Khel, Jhal Magsi, Bolan	4	-0.049 (-0.229)

Notes: Results display 6 clubs from row 1 to row 6. The t-statistics are in parenthesis. N is the number of districts in each club.

Results from Table 5.14 clearly show that the health index across 97 districts converged initially to six clubs.

Club Merging Tests (Convergence between the Clubs)

The convergence algorithm, as discussed by Phillips and Sul (2009), may result in an overestimation of the true number of clubs. To address this serious issue, we employ club merging tests to evaluate the merging of neighbouring clubs into larger clubs. We continue our investigation by looking for evidence of club convergence. The log t-test was proposed by Phillips and Sul (2009) for testing the merger of two or more clubs into new clubs. The logt-test is applied to all pairs of clubs, and if the convergence hypothesis is jointly satisfied, they can be merged to form a new club. The results of the club merging tests are shown in Table 5.15.

Table 5.15: Club Merging Test Results (Health Index)

Initial Clubs	**N**	**Clubs Merging Test**	**β Coefficient**	**Final Clubs**	**N**
Club 1	3	Club 1 + Club 2	0.027 (0.233)	1st Club	47
Club 2	44	Club 2 + Club 3	-0.819 (-41.95)	2nd Club	43
Club 3	38	Club 3 + Club 4	-0.049 (-0.376)	3rd Club	3
Club 4	5	Club 4 + Club 5	-1.730 (-27.300)	4th Club	4
Club 5	3	Club 5+ Club 6	-0.840 (-8.495)		
Club 6	4				

Notes: The t-statistics are in parenthesis. N is the number of districts in each club.

Final Clubs Classification

The above club merging results revealed that there is evidence of convergence between two groups. The first and 2nd clubs merge to form a club of 47 districts, while 3rd and 4th clubs merge to form a club of 43 districts. After convergence between four groups, the final club classification display four convergence clubs (see table 5.16).

Table 5.16: Final Clubs Classification (Health Index)

Club	Final Club	N	β Coefficient
Club 1	Islamabad, Rawalpindi, Sargodha, Bhakhar, Narowal, Lahore, Sialkot, Okara, T.T.Singh, Khushab, Jehlum, Chakwal, Faisalabad, Sheikhupura, Vehari, Sahiwal, D.G.khan, Rajanpur, Mandi Bahuddin, Kasur, Multan, Pakpatten, Lodhran , Layyah, Bahawalpur, Dadu, Shaheed Benazirabad, Larkana, Hyderabad, Karachi, Chitral, Malakand, Lower Dir, Bonair, Charsada, Nowshera, Peshawar, Kohat, Tank, Mansehra, Abbottabad, Haripur, Mardan, Swabi, Pashin, Zhob, Qilla Saifullah	47	0.028 (0.234)
Club 2	Attock, Mianwali, Jhang, Gujranwala, Gujrat, Hafizabad, Khanewal, Muzaffar Garh, Bahawalnager, Rahim Yar Khan, Sukkur, Khairpur, Nowsbero Feroze, Ghotki, Thatta, Sanghar, Mir Pur Khas, Tharparkar, Shikarpur, Badin, Swat, D.I.Khan, Shangla, Karak, Upper Dir, Hangu, Kohistan, Bannu, Lakki Marwat, Batagram, Kharan, Lasbilla, Gwadar, Quetta, Qilla Abdullah, Sibbi, Ziarat, Kalat, Mastung, Barkhan, Jafarabad Awaran, Loralai	43	-0.049 (-0.377)
Club 3	Jaccobabad, Khuzdar, Nasirabad	3	0.583 (1.109)
Club 4	Chaghi, Musa Khel, Jhal Magsi, Bolan	4	-0.049 (-0.229)

Notes: Results display 4 clubs from row 1 to row 4. The t-statistics are in parenthesis. N is the number of districts in each club.

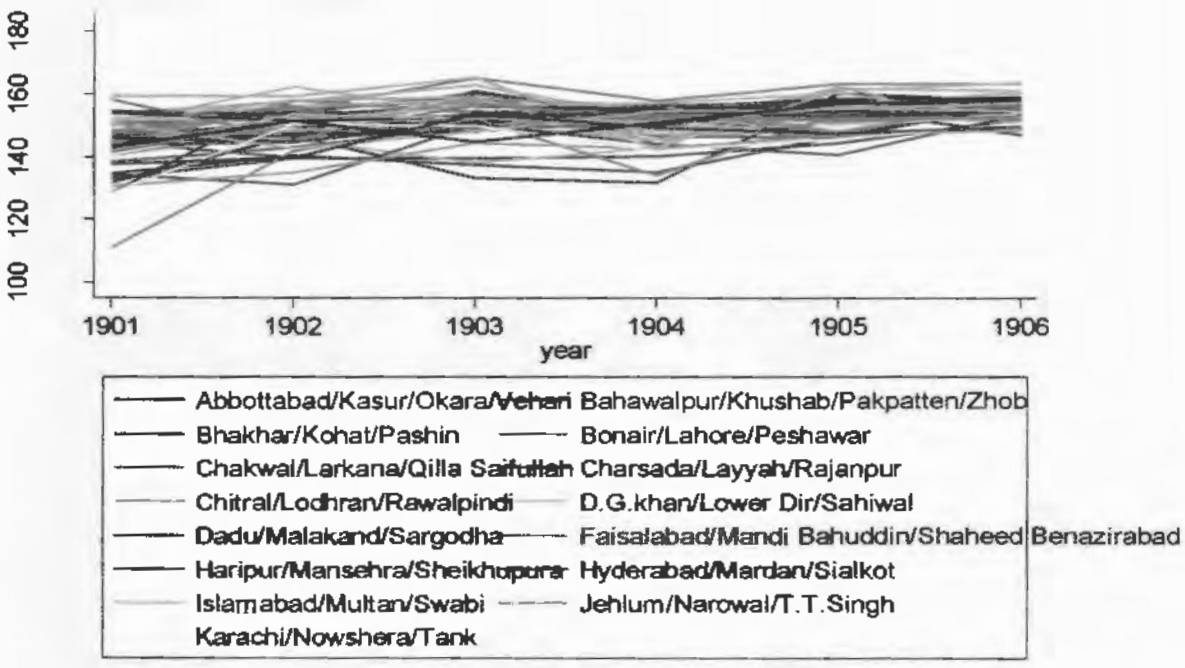
As seen from the table 5.16, the results of final club classification revealed four convergence clubs. The first club is represented Islamabad, Faisalabad, Rawalpindi, Khusbab, Multan, Chakwal, Lahore, Sargodha, Bahawalpur, Okara, Bhakhar, Sialkot, T.T.Singh, Sheikhupura, Mandi Bahuddin, Narowal, Vehari, Kasur, Sahiwal, Pakpatten, Jehlum, Lodhran, D.G.khan, Rajanpur, Layyah, Shaheed Benazirabad, Larkana, Dadu, Hyderabad, Karachi, Malakand, Peshawar, Chitral, Charsada, Nowshera, Bonair, Kohat, Tank, Lower Dir, Mansehra, Abbottabad, Haripur, Mardan, Swabi, Pashin, Zhob and Qilla Saifullah.

The second is the integration of Attock, Mianwali, Jhang, Gujranwala, Gujrat, Hafizabad, Khanewal, Muzaffar Garh , Bahawalnager , Rahim Yar Khan, Nowshero Feroze, Ghotki, Khairpur, Sukkur, Shikarpur, Badin, Thatta, Sanghar, Mir Pur Khas, Tharparkar, Hangu, Bannu, Swat, Upper Dir, Lakki Marwat, Batagram, Shangla, Karak, D.I.Khan, Kohistan, Quetta, Sibbi, Loralai, Lasbilla, Ziarat, Kalat, Awaran, Qilla Abdullah, Mastung, Kharan, Gwadar, Barkhan and Jafarabad. The third club comprises Jaccohabad, Khuzdar and Nasirabad. The fourth club encompasses four least developed districts of Balochistan i.e. Chaghi, Musa Khel, Jhal Magsi and Bolan

Transitional Behavior of Clubs for Health Index

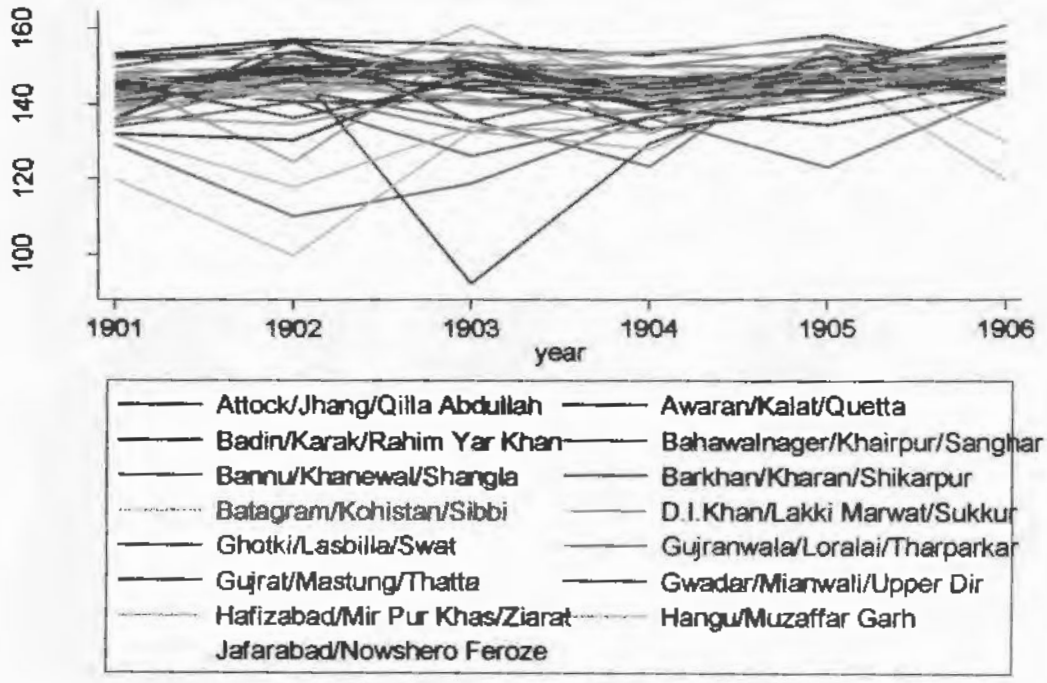
To identify the transition path of clubs of health index, we plot the internal transition path of each district in the club. We use Phillips and Sul (2009) concept of *"transition path curve"*. Figures 5.41-5.44 show the internal relative transition paths of each district for each of the four convergence clubs.

Figure 5.41: Relative Convergence within Club 1 (Health Index)



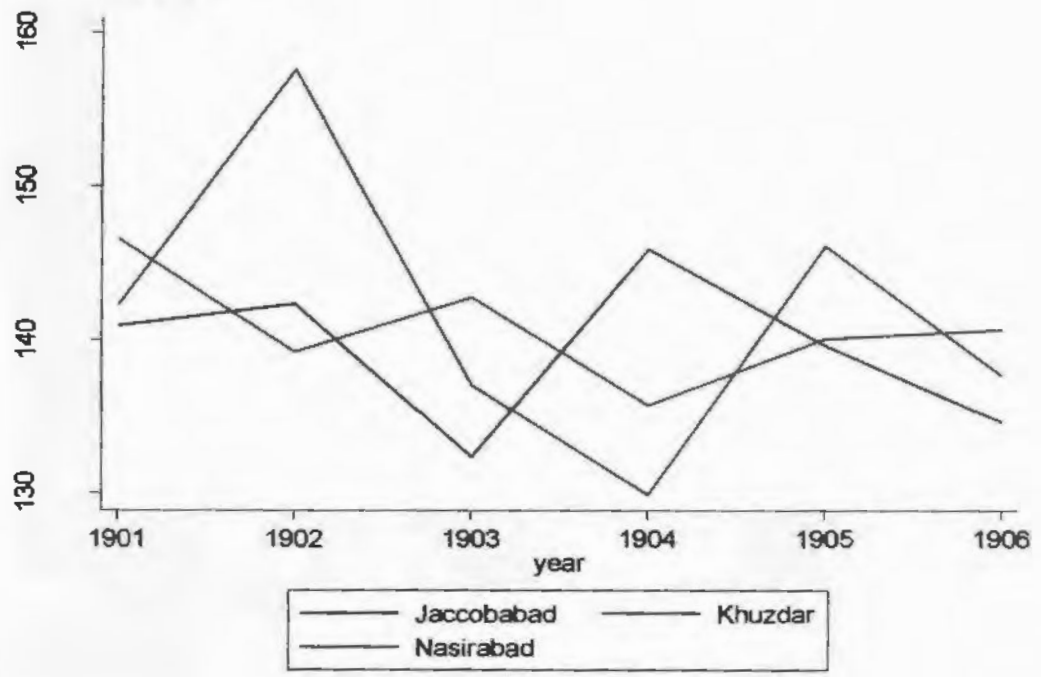
Note: The time periods 1901, 1902, 1903, 1904, 1905 and 1906 denotes the alternates year PSLM data for periods 2004-05, 2006-07, 2008-09, 2010-11, 2012-13 and 2014-15.

Figure 5.42: Relative Convergence within Club 2 (Health Index)



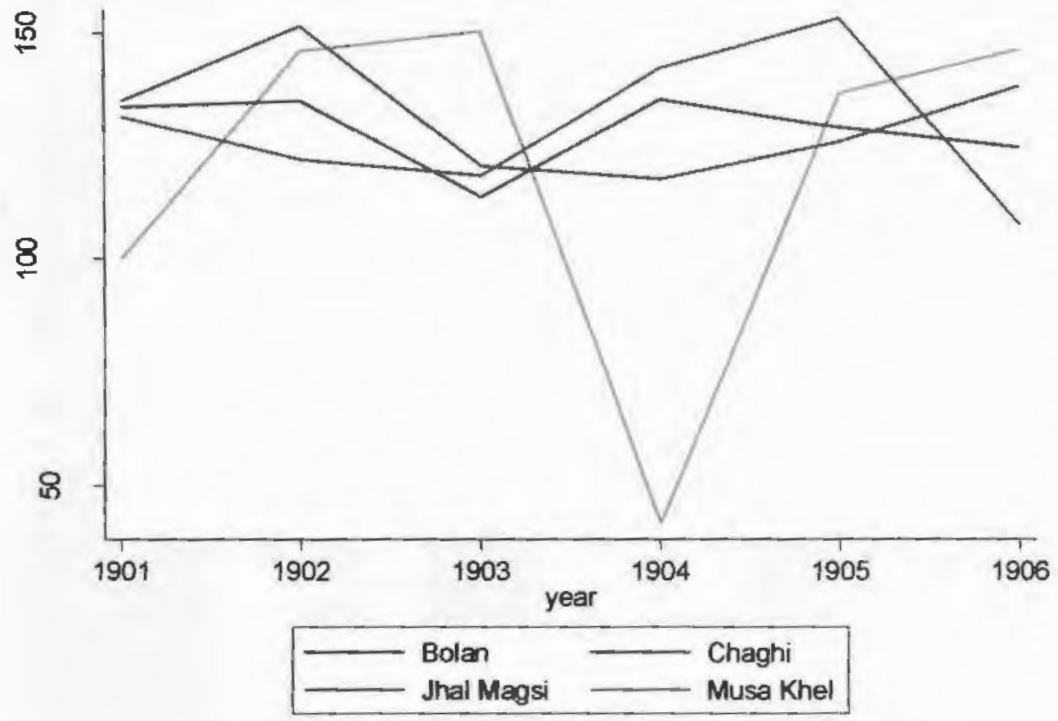
Note: The time periods 1901, 1902, 1903, 1904, 1905 and 1906 denotes the alternates year PSLM data for periods 2004-05, 2006-07, 2008-09, 2010-11, 2012-13 and 2014-15.

Figure 5.43: Relative Convergence within Club 3 (Health Index)



Note: The time periods 1901, 1902, 1903, 1904, 1905 and 1906 denotes the alternates year PSLM data for periods 2004-05, 2006-07, 2008-09, 2010-11, 2012-13 and 2014-15.

Figure 5.44: Relative Convergence within Club 4 (Health Index)



Note: The time periods 1901, 1902, 1903, 1904, 1905 and 1906 denotes the alternates year PSLM data for periods 2004-05, 2006-07, 2008-09, 2010-11, 2012-13 and 2014-15.

The above four figures show the relative transition paths for each of the four convergence clubs. As a whole, club 1 consists of districts with higher health level than other clubs. On the other hand, convergence is proceeding faster among the members of club 3 than the other clubs, as specified by the higher estimate of coefficient in table 5.16 and illustrated by curve in figure 5.43.

Overall, findings clearly indicate that there is no convergence among districts of Pakistan for health index, as the districts are classified into four different convergence clubs. The districts with same level of health indicators are classified within the same group.

5.2.4. Club Convergence Of Household Welfare Index

The findings regarding club convergence of household welfare index across districts of Pakistan are discussed in this section.

Log t Convergence test

We begin by testing full convergence in household welfare index. Initially, we apply the log t regression for household welfare index for 97 districts of Pakistan over the period 2004–2015. The findings show that value of t-stat is less than -1.65 and hence convergence hypothesis for whole sample is rejected at 1% significance level (see table 5.17). Furthermore, it implies that the convergence among all districts is rejected. Consequently, we continue further for the identification of cluhs.

Table 5.17: Phillips Sul log t Regression Results (Household Welfare Index)

Variable	β Coefficient	SE	T-stat
log(t),	-1.267	0.048	-26.388

Note: convergence test reject the null hypothesis at 1% significance level.

Club Convergence Identification

In absence of convergence in full sample, we move on to determine formation of cluhs. For cub identification, we run the *Phillips-Sul algorithms of club clustering test*. Results show that the household welfare index across 97 districts converged initially to nine clubs and one divergent group (see table 5.18).

Table 5.18: Club Convergence Results (Household Welfare Index)

Clubs	Districts in Club	N	β Coefficient
Club 1	Lahore, Hyderabad, Karachi, Malakand, Swabi	5	0.111 (0.527)
Club 2	Islamabad, Gujranwala, Gujrat, Sheikhupura, Peshawar, Nowshera	6	0.107 (0.498)
Club 3	Rawalpindi, Sialkot, Hafizabad, Charsada,	4	0.398 (1.529)
Club 4	Jehlum, Chakwal, Faisalabad, Okara, Larkana, Swat, Lower Dir, Bonair, Kohat, Karak, Hangu, Mansehra, Abbottabad, Batagram, Haripur, Mardan, Quetta, Pashin	18	0.304 (1.264)
Club 5	Mandi Bahuddin, Kasur, Multan, Chitral	4	0.395 (1.510)
Club 6	Sargodha, Khushab, T.T.Singh, Narowal, Sahiwal, Khanewal, Sukkur, Ghotki, Dad, Upper Dir, Shangla, Sibbi, Ziarat, Zhob, Musa Khel	15	0.214 (0.963)
Club 7	Mianwali, Jhang, Vehari, Pakpatten, Muzaffar Garh, Bahawalpur, Lodhran, Layyah, Bahawalnager, Rahim Yar Khan, Khairpur, Shaheed Benazirabad, Jaccobabad, Shikarpur, Sanghar, Nowshero Feroze, Mir Pur Khas, D.I.Khan, Tank, Bannu, Lakki Marwat, Kalat, Kharan, Lasbilla, Nasirabad	25	0.041 (0.229)
Club 8	Bhakhar, D.G.khan , Rajanpur, Badin, Thatta, Kohistan, Qilla Abdullah , Mastung, Gwadar, Loralai, Barkhan, Qilla Saifullah, Jafarabad, Jhal Magsi, Bolan	15	0.093 (0.497)
Club 9	Tharparkar, Chaghi, Awaran	3	0.381 (1.801)
Non-Convergent Group	Attock, Khuzdar	2	-1.315 (-20.953)

Notes: Results display 9 clubs from row 1 to row 9 and one non-convergent group in row 10. The values in parentheses are the t-statistic. N is the number of districts in each club.

Club Merging Tests (Convergence between the Clubs)

According to Phillips and Sul, the convergence algorithm may result in an overestimation of the true number of clubs (2009). To address this issue, we use the club merging test to assess the merging of neighbouring clubs into larger clubs. We continue the analysis by testing for club convergence using the log t-test proposed by

Phillips and Sul (2009); the logt-test is applied to all pairs of clubs. If the convergence proposition is satisfied jointly, they can be merged to form a new club (see table 5.19).

Table 5.19: Club Merging Test Results (Household Welfare Index)

Initial Clubs	N	Clubs Merging Test	β Coefficient	Final Clubs	N
Club 1	5	Club 1 + Club 2	0.106 (0.515)	1st Club	15
Club 2	6	Club 2 + Club 3	0.065 (0.323)	2nd Club	37
Club 3	4	Club 3 + Club 4	0.035 (0.189)	3rd Club	25
Club 4	18	Club 4 + Club 5	0.255 (1.134)	4th Club	15
Club 5	4	Club 5+ Club 6	0.046 (0.238)	5th Club	2
Club 6	15	Club 6 + Club 7	-0.315 (-2.977)	Non-Convergent Group	3
Club 7	25	Club 7 + Club 8	-0.501 (-4.846)		
Club 8	15	Club 8+ Club 9	-0.979 (-17.365)		
Club 9	3	Club 9 + G~ 10	-1.267 (-21.965)		
Non-Convergent Group	2				

Notes: The tilde symbol (~) represents the non-convergent group. The values in parentheses are the t-statistic. N is the number of districts in each club.

Final Clubs Classification

The above club merging results revealed that there is evidence of convergence between four groups. The first, 2nd and 3rd clubs merge to form a club of 15 districts while 4th, 5th and 6th clubs merge to form a club of 37 districts. After convergence between four groups, the final club classification show five convergence clubs and one divergent group (see table 5.20).

Table 5.20: Final Clubs Classification (Household Welfare Index)

Club	Districts with in Club	N	β Coefficient
Club 1	Islamabad, Rawalpindi, Gujranwala, Gujrat, Sialkot, Hafizabad, Lahore, Sheikhupura, Hyderabad, Karachi, Malakand, Peshawar, Charsada , Nowshera, Swabi	15	0.029 (0.150)
Club 2	Jehlum, Sargodha, Mandi Bahuddin, Khushab, Faisalabad, Chakwal, T.T.Singh, Narowal, Okara, Kasur, Sahiwal, Multan, Khanewal, Sukkur, Ghotki, Larkana, Dadu, Swat, Upper Dir, Shangla, Bonair, Lower Dir, Chitral, Karak, Mansehra, Hangu, Kohat, Abbottabad, Batagram, Haripur, Mardan, Quetta, Pashin, Sibbi, Ziarat, Zhob, Musa Khel	37	-0.236 (-1.643)
Club 3	Mianwali, Jhang, Vehari , Pakpatten, Lodhran, Muzaffar Garh, Layyah, Rahim Yar Khan, Bahawalpur, Bahawalnager, Khairpur, Shaheed Benazirabad, Nowshero Feroze, Jaccobabad, Shikarpur, Sanghar, Mir Pur Khas, D.I.Khan, Tank, Bannu, Lakki Marwat, Kalat, Kharan, Lasbilla, Nasirabad	25	0.041 (0.229)
Club 4	Bhakhar, D.G.khan, Rajanpur, Badin, Thatta, Kohistan, Qilla Abdullah, Mastung, Gwadar, Loralai, Barkhan, Qilla Saifullah, Jafarabad, Jhal Magsi, Bolan	15	0.093 (0.497)
Club 5	Tharparkar, Chaghi, Awaran	3	0.381 (1.801)
Non-Converg ent Group	Attock , Khuzdar	2	-1.315 (-20.953)

Notes: Results display 5 clubs from row 1 to row 5 and one non-convergent group in row 6. The values in parentheses are the t-statistic. N is the number of districts in each club.

As seen from table 5.20, the final club classification revealed five convergence clubs and one divergent group. The first club is represented by Islamabad, Rawalpindi, Gujranwala, Gujrat, Sialkot, Hafizabad, Lahore, Sheikhupura, Hyderabad, Karachi, Malakand, Peshawar, Charsada, Nowshera, and Swabi. The second is the integration of Jehlum, Sargodha, Khushab, Faisalabad, Chakwal, Kasur, Mandi Bahuddin, Narowal, Okara, Sahiwal, Multan, Khanewal, T.T.Singh, Sukkur, Ghotki, Larkana, Dadu, Swat, Chitral, Bonair, Upper Dir, Kohat, Shangla, Karak, Lower Dir, Hangu,

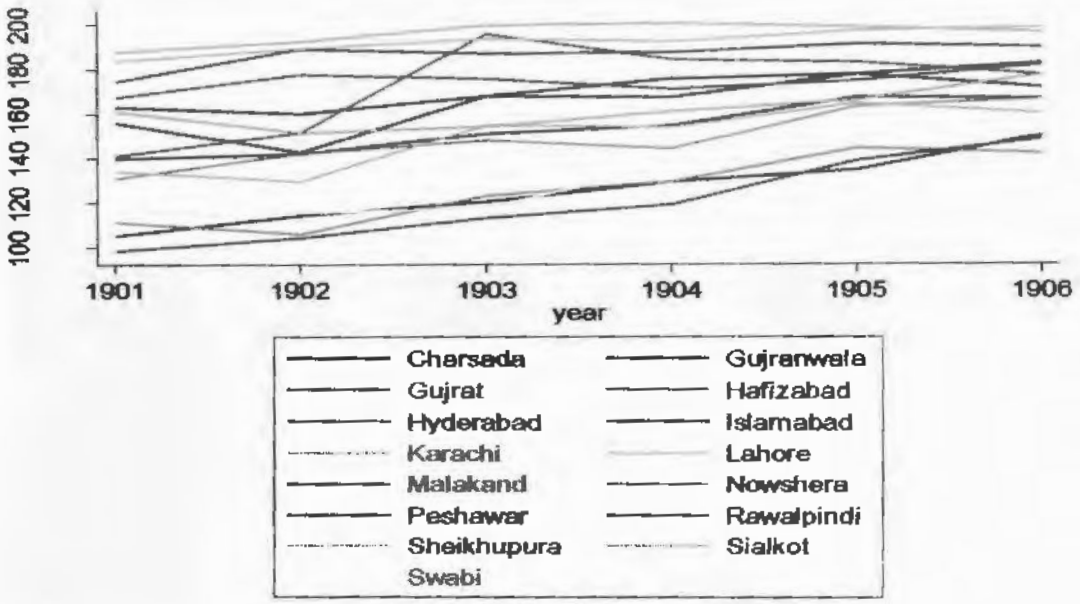
Mansehra, Abbottabad, Batagram, Haripur, Mardan, Quetta, Pashin, Sibbi, Ziarat, Zhob, and MusaKhel.

The third club comprises Mianwali, Jhang, Vehari, Pakpatten, Lodhran, Layyah, Muzaffar Garh, Bahawalnager, Rahim Yar Khan, Bahawalpur, Shaheed Benazirabad, Nowshero Feroze, Jaccobahad, Shikarpur, Sanghar, Mir Pur Khas, Khairpur, D.I.Khan, Tank, Bannu, Lakki Marwat, Kalat, Kharan, Lasbilla, and Nasirabad. The fourth club encompasses Bhakhar, D.G.khan, Rajanpur, Badin, Thatta, Kohistan, Qilla Abdullah, Mastung, Gwadar, Loralai, Barkhan, Qilla Saifullah, Jafarabad, Jhal Magsi, and Bolan. The fifth club consists of one backward district of Sindh i.e. Tharparkar and two underdeveloped districts of Balochistan i.e. Chaghi and Awaran. The last group comprising non-converging districts contains Attock and Khuzdar.

Transitional Behavior of Clubs for Household welfare Index

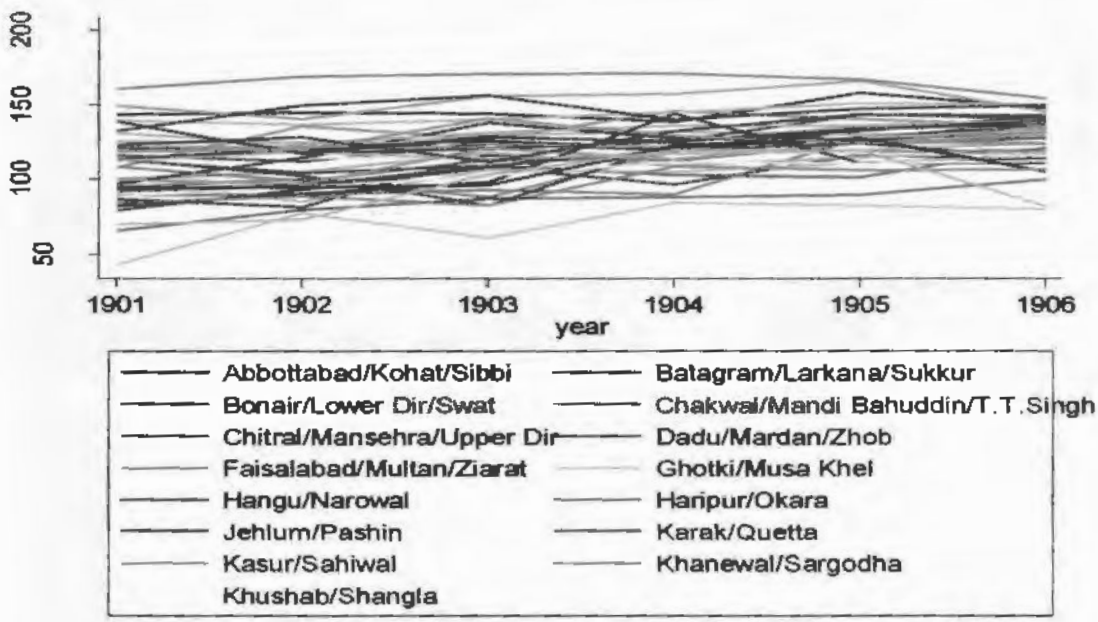
We plot the internal transition path of each district in the club to understand the transition path of clubs of the household welfare index. We use Phillips and Sul (2009) concept of "*transition path curves*" for this purpose. Figures 5.45–5.50 depict the internal relative transition paths of each district for each of the five convergence clubs and one divergent group.

Figure 5.45: Relative Convergence within Club 1(Household Welfare Index)



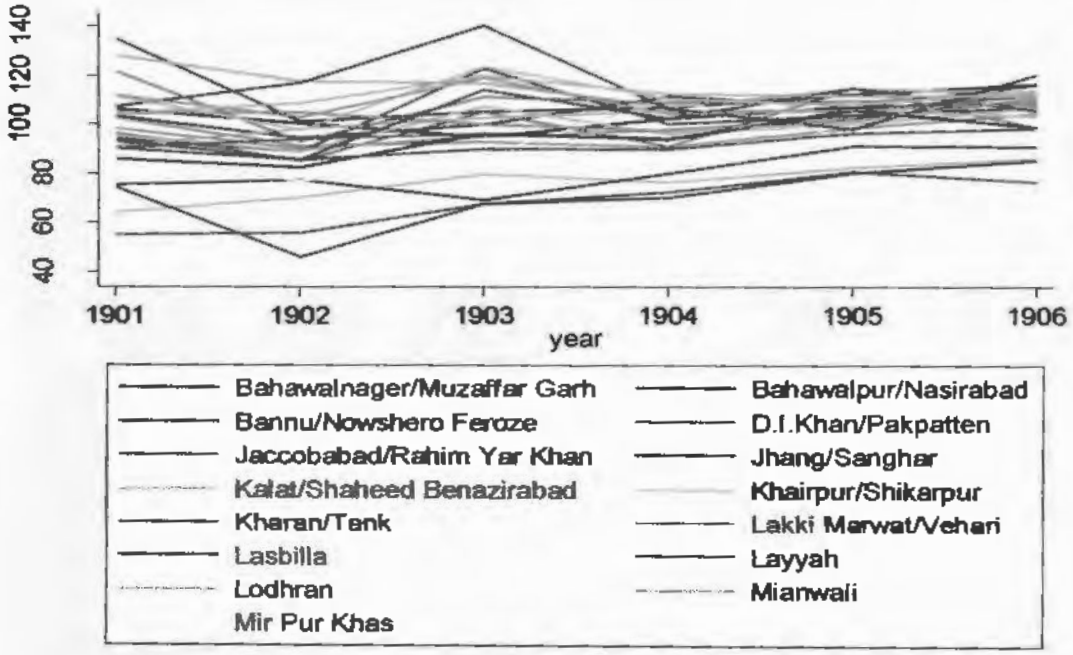
Note: The time periods 1901, 1902, 1903, 1904, 1905 and 1906 denotes the alternates year PSLM data for periods 2004-05, 2006-07, 2008-09, 2010-11, 2012-13 and 2014-15.

Figure 5.46: Relative Convergence within Club 2 (Household Welfare Index)



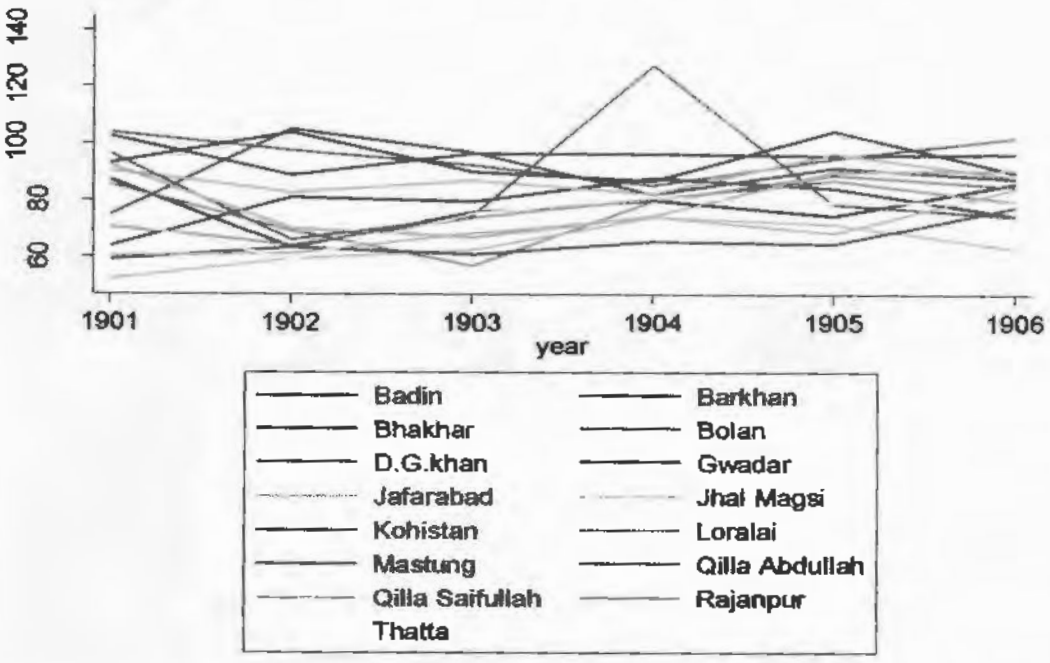
Note: The time periods 1901, 1902, 1903, 1904, 1905 and 1906 denotes the alternates year PSLM data for periods 2004-05, 2006-07, 2008-09, 2010-11, 2012-13 and 2014-15.

Figure 5.47: Relative Convergence within Club 3 (Household Welfare Index)



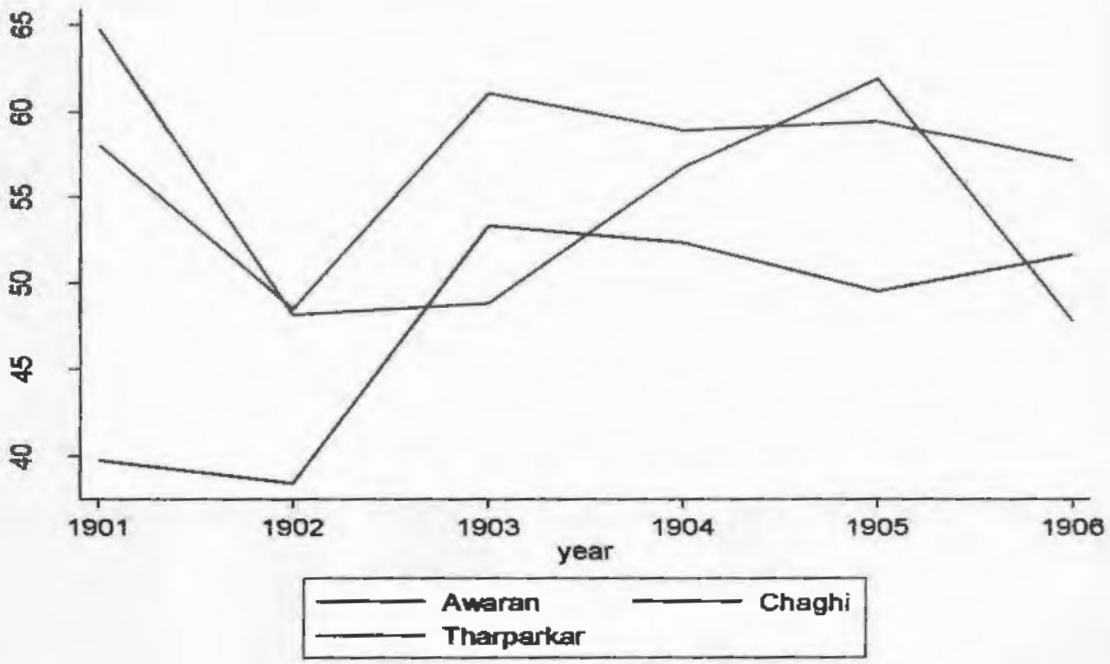
Note: The time periods 1901, 1902, 1903, 1904, 1905 and 1906 denotes the alternates year PSLM data for periods 2004-05, 2006-07, 2008-09, 2010-11, 2012-13 and 2014-15.

Figure 5.48: Relative Convergence within Club 4 (Household Welfare Index)



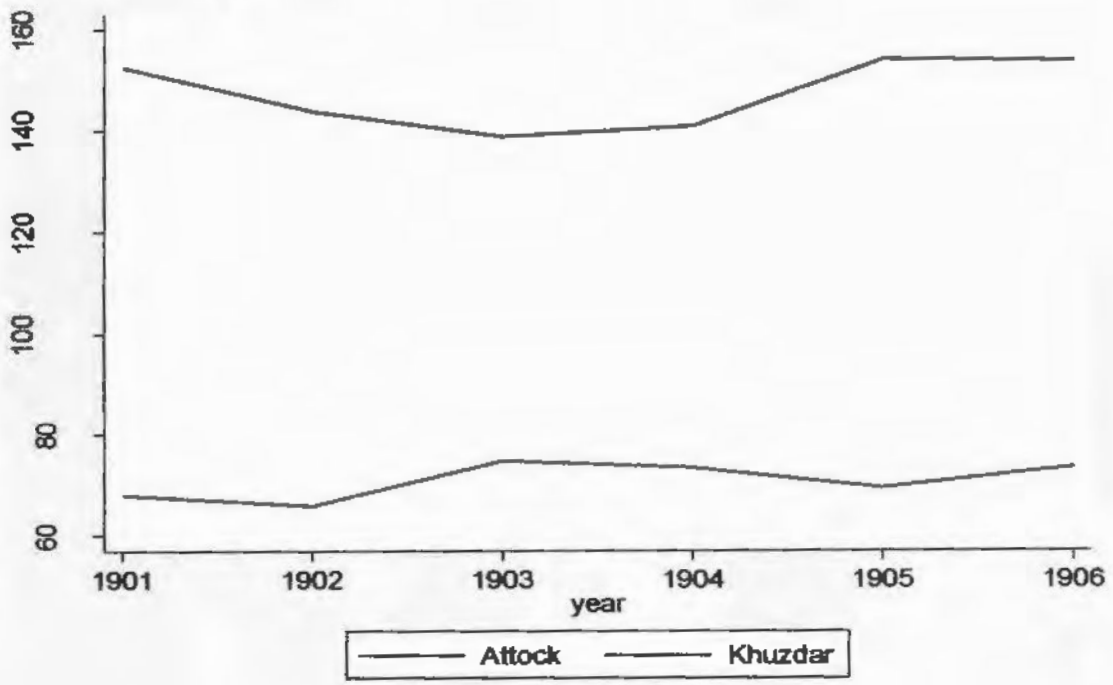
Note: The time periods 1901, 1902, 1903, 1904, 1905 and 1906 denotes the alternates year PSLM data for periods 2004-05, 2006-07, 2008-09, 2010-11, 2012-13 and 2014-15.

Figure 5.49: Relative Convergence within Club 5 (Household Welfare Index)



Note: The time periods 1901, 1902, 1903, 1904, 1905 and 1906 denotes the alternates year PSLM data for periods 2004-05, 2006-07, 2008-09, 2010-11, 2012-13 and 2014-15.

Figure 5.50: Non-Converging Group (Household Welfare Index)



Note: The time periods 1901, 1902, 1903, 1904, 1905 and 1906 denotes the alternates year PSLM data for periods 2004-05, 2006-07, 2008-09, 2010-11, 2012-13 and 2014-15.

The above six figures display the relative transition paths for each of the five convergence clubs and one divergent group. All together, club 1 contains districts with higher household welfare level than other clubs. Convergence is taking quicker among the members of club 5 than other clubs, as shown by tbe higher estimate of coefficient in table 5.20 and illustrated by curve in figure 5.49.

In conclusion, the above mentioned club results clearly indicate that there is no convergence among districts of Pakistan for household welfare index, as the districts are classified into five different convergence clubs and one non-convergent group. The districts with same household welfare index levels are classified within the same group, while the districts with highest and lowest household welfare levels (which don't merge with any club) are classified as non-convergent group.

5.2.5. Convergence before and after Decentralization

To analyze the impacts of fiscal decentralization on convergence across districts, we first estimate convergence club for human development index in both pre and post decentralization periods. After estimation, we analyze the impacts of fiscal decentralization on club convergence on the basis of number of convergence clubs in each period.

Convergence Clubs for Pre-Decentralization Period

Firstly, we estimate convergence club for human development index for pre-decentralization period covering period 2004-2009. The results are presented in table 5.21 bellow.

Table 5.21: Convergence Clubs for Pre-Decentralization Period (2004-09)

Club	Districts in Club	N	β Coefficient
Club 1	Rawalpindi, Narowal, Larkana, Mir-PurKhas, Haripur	5	-2.304 (-3.45e+14)
Club 2	Chakwal, Khushab, Jhang, T.T.Singh, Gujranwala, Gujrat, Okara, Sukkur, Jaccobabad, Bonair, Nowshera, Tank	12	-1.974 (-2.97e+14)
Club 3	Attock, Sargodha, Faisalabad, Hafizabad, Shikarpur,	5	-1.929 (-3.31e+14)
Club 4	Mianwali, Sialkot, Lahore, Vehari, Rahim Yar Khan, Swat	6	-2.515 (-3.28e+14)
Club 5	Bhakhar, Mandi Bahuddin, Kasur, Sheikhupura, Sahiwal, Khairpur, Badin, Lower Dir, Malakand, Peshawar, Hangu, D.I.Khan, Qilla Abdullah	13	-2.998 (-3.13e+14)
Club 6	Multan, Khanewal, D.G.khan, Rajanpur, Bahawalnager, Shaheed Benazirabad, Ghotki, Tharparkar, Karachi, Upper Dir, Shangla, Kohat, Karak, Mansehra, Sibbi, Khuzdar	16	-2.446 (-3.11e+14)
Club 7	Pakpatten, Layyah, Muzaffargarh, Bahawalpur, NowsheroFeroze, Thatta, Chitral, Kohistan, Bannu, LakkiMarwat, Mardan, Pashin, Kharan.	13	-2.259 (-3.32e+14)
Club 8	Dadu, Hyderabad, Sanghar, Abbottabad, Quetta, Chaghi, Ziarat, Kalat, Mastung	9	-2.743 (-3.04e+14)
Club 9	Lodhran, Charsada, Batagram, Awaran, Lasbilla	5	-3.197 (-2.96e+14)
Club 10	Swabi, Ketch	2	-0.907 (-3.31e+14)
Non-convergent group	Islamabad, Zhob, Jehlum, Gwadar, Panjgur, Loralai, Barkhan, Khel, QillaSaifullah, Nasirabad, Jafarabad, JhalMagsi, Bolan	13	-2.485 (-3.13e+14)

Notes: Results display 9 clubs from row 1 to row 10 and one non-convergent group in row 10. The values in parentheses are the t-statistic. N is the number of districts in each club.

The findings revealed that the human development index for pre-decentralization period converged to ten convergence clubs and one divergent group.

Club Convergence for Post-Decentralization Period

We estimate convergence club for human development index for post-decentralization period covering period 2010-2015. The results are presented in table 5.22 bellow.

Table 5.22: Convergence Club for Post-Decentralization Period (2010-15)

Club	Districts in Club	N	β Coefficient
Club 1	Rawalpindi, Narowal, Mir PurKhas	3	-3.114 (-2.95e+14)
Club 2	Jehlum, T.T.Singh, Gujranwala, Bonair, Kalat	5	-1.627 (-2.97e+14)
Club 3	Attock, Chakwal, Faisalabad, Hafizabad, Mandi Bahuddin, Okara, Larkana, Swat, Upper Dir, Malakand, Nowshera, Hangu, D.I.Khan	13	-2.246 (-3.10e+14)
Club 4	Sargodha, Jhang, Sialkot , Lahore, Kasur, Vehari, Sahiwal, D.G.khan , Rahim Yar Khan, Sukkur, Jaccobabad , Shikarpur, Tharparkar, Karak, Tank, Qilla Abdullah	16	-3.025 (-3.35e+14)
Club 5	Khushab, Mianwali, Sheikhupura, Multan, Khanewal, Muzaffargarh, Lower Dir, Chitral, Kohat, LakkiMarwat, Gwadar	11	-1.504 (-3.43e+14)
Club 6	Pakpatten, Layyah, Bahawalnager, Quetta	4	-0.445 (-2.71e+14)
Club 7	Lodhran, Bahawalpur, Badin, Shangla, Mansehra, Kohistan, Bannu , Chaghi , Sibbi	9	-2.531 (-3.24e+14)
Club 8	Rajanpur, Ghotki, Thatta, Peshawar, Pashin, Mastung	6	-2.170 (-3.52e+14)
Club 9	NowsheroFeroze, Dadu, Hyderabad, Karachi, Haripur, Mardan, Ziarat, Khuzdar, Awaran, Lasbilla.	10	-2.316 (-3.16e+14)
Club 10	Sanghar, Charsada, Abbottabad, Batagram, Swabi, Ketch	6	-2.343 (-3.32e+14)
Non-convergent group	Islamabad, Bhakhar, Gujrat, Khairpur, Shaheed Benazirabad, Kharan, Zhob, Loralai, Barkhan, Musa Khel, QillaSaifullah, Nasirabad , Jafarabad, JhalMagsi, Bolan, Kohlu, DeraBugti	17	-1.916 (-3.33e+14)

Notes: Results display 9 clubs from row 1 to row 10 and one non-convergent group in row 10. The values in parentheses are the t-statistic. N is the number of districts in each club.

The findings revealed the formation of ten convergence clubs and one non-convergent group (see table 5.22).

In conclusion, the above mentioned club results indicate that the number of clubs for human development index are exactly the same for both pre and post decentralization periods. The findings clearly indicate that overall there is no convergence among districts of Pakistan for human development index in pre and post decentralization period.

Conclusion and Recommendations

The study analyzed the presence of club convergence for human development index and sub-indices across districts of Pakistan over the period 20014–2015. Instead of using conventional measure like GDP per capita as a basis for studying club convergence proposition, the study focus on broader aspects of human development. We use the augmented human development index to achieve this goal. The human development index is made up of three sub-indices: education, health, and household welfare. Each sub-index is further consists of five indicators. To aggregate these indicators, Principal Component Analysis (PCA) is used. The Phillips and Sul (2007) technique is used to determine the overall convergence and number of convergence clubs across Pakistani districts.

First of all, we analyzed the club convergence hypothesis for overall human development index and sub-indices and results indicated that rather than overall convergence, we found convergence clubs for human development index and sub-indices. The findings also show that the human development index has seven convergence clubs and one divergent group, the education index has five convergence clubs and one non-convergent group, the health index has four convergence clubs, and the household welfare index has five convergence clubs and one non-convergent group.

The study's findings clearly demonstrated that human development levels are unevenly distributed across districts in Pakistan, as evidenced by the large number of convergence clubs for human development index and sub-indices. The results from convergence in sub-indices showed that there is more convergence in health index than education and household welfare index. For health index, out of 97 districts 90

districts converged to two clubs. After health, there is more convergence in education index than household welfare index. Although, the number of clubs is same in both cases, but the leading two clubs comprises 82 districts in case of education index, while in case of household welfare index the leading two clubs encompasses 62 districts.

Overall, the study's findings support the notion that human development is not evenly distributed across Pakistan's districts and thus there is need to design policies that could reduce spatial disparities in human development across districts of Pakistan. Similar results were found by previous studies (Such as Siddique, 2008; Burki et al., 2010; Arif, 2010; Ahmed, 2011)

5.3. Empirical Findings on Spatial Disparities and Fiscal Decentralization

In this section, we examine the effects of fiscal decentralization on the human development index and sub-indices across districts of Pakistan before and after decentralization. For this purpose, we employ cross sectional regression analysis. Furthermore, there are four sub-sections, each sub-section presents findings on human development index and sub-index namely; education index, health index and household welfare index.

5.3.1. Fiscal Decentralization and Human Development Index

We look at the direct and indirect effects of fiscal decentralization and control variables on development levels. To begin, we estimate the direct effects of fiscal decentralization and control variables on development levels using cross-sectional regression analysis. First column of table 5.23 and table 5.24 show the direct effects of fiscal decentralization and control variables on the human development index for pre and post decentralization periods. Findings indicate significant negative association between fiscal decentralization and human development index at district level for both pre and post-decentralization periods. The results further show that the magnitude of this inverse relationship has increased in post decentralization period.

Regarding the control variables, the findings of the study revealed significant negative impacts of "distance from capital city" on development level across districts of Pakistan. While the coefficient values for "distance from capital city "has decreased in the post decentralization period. It means that the negative impact of "distance from the capital city" is more in pre-decentralization period than post decentralization

period. The control variable "Population density" is insignificant in both periods (see table 5.23 and table 5.24).

Next, we test whether the relationship between the development level of districts and fiscal decentralization is conditional on the control variable "distance from capital city". For this purpose, we employ the multiplicative term of fiscal decentralization and distance from capital city (FD*dstcp). After employing the multiplicative term, the results illustrate positive relationship between fiscal decentralization and development level across districts. Fourth column of table 5.23 and table 5.24 show indirect impacts of fiscal decentralization and control variables on human development index for both pre and post decentralization periods. The magnitude of this relationship has reduced in post decentralization period, from 5.379 to 3.080, but still positive and significant (see table 5.23 and table 5.24). This implies that positive impacts of fiscal decentralization on development level are conditional on the "distance from capital city".

Overall, the study's findings revealed that the beneficial effects of fiscal decentralization on development level increase as distance from capital city decreases. So, the useful impacts of fiscal decentralization are conditioned on "distance from the capital city".

Table 5.23: Fiscal Decentralization and Development level in selected districts of Pakistan (2008-2009)

	(1) Development Index	(2) Education Index	(3) Household Welfare Index	(4) Development Index	(5) Education Index	(6) Household Welfare Index
Fiscal Decentralization	-2.921*** (1.115)	-1.833** (0.992)	-2.911*** (0.645)	5.379* (2.490)	5.136*** (1.859)	3.036** (2.733)
Distance to Capital City	-0.097*** (.028)	-0.079** (0.025)	-0.071** (0.0233)	2.069*** (0.576)	1.741*** (0.464)	1.482** (0 .610)
Population Density	0.0007 (0.004)	-0.0002 (0.003)	0.002 (0.003)	0.025 (0.008)	0.020 (0 .006)	0.019 (0.008)
(Fiscal Decentralization) *(Distance to Capital City)	-	-	-	0.022*** (0.006)	0.0192*** (0.004)	0.016 (0.006)
Constant	509.523	290.194	411.540	-287.587	-379.195	-159.632
Observation	33	33	33	33	33	33
R-Squared	0.565	0.448	0.664	0.661	0.559	0.731
F-Stat (P-Value)	24.61	18.59	35.33	53.87	23.61	83.11

Notes: All estimations are done by using OLS robust. *, ** and *** respectively show the significance at 10, 5 and 1 percent significance level. Values in the brackets represent robust standard error. Abbreviations of Variables are already discussed in methodology chapter 3.

Table 5.24: Fiscal Decentralization and Development in selected districts of Pakistan (2014-2015)

	(1) Development Index	(2) Education Index	(3) Household Welfare Index	(4) Development Index	(5) Education Index	(6) Household Welfare Index
Fiscal Decentralization	-3.317*** (0.883)	-2.145*** (0.942)	-3.058*** (0.410)	3.080*** (1.864)	4.318** (1.905)	0.379* (1.761)
Distance to Capital City	-0.083*** (0.023)	-.071** (0.022)	-0.060** (0.020)	1.564** (0.501)	1.594*** (0.507)	0.819** (0.430)
Population Density	0.001 (0.003)	-0.0008 (0.002)	0.002 (0.002)	0.016 (0.005)	0.014 (0.005)	0.011** (0.004)
(Fiscal Decentralization) * (Distance to Capital City)	-	-	-	0.017*** (0.005)	0.017*** (0.005)	0.009 ** (0.004)
Constant	552.005	326.305	430.457	-58.480	-290.501	-102.316
Observation	33	33	33	33	33	33
R-Squared	0.624	0.470	62.160	0.674	0.554	0.534
F-Stat (P-Value)	40.08	24.59	62.16	42.40	26.27	61.26

Notes: All estimations are done by using OLS robust. *, ** and *** respectively show the significance at 10, 5 and 1 percent significance level. Values in the brackets represent robust standard error. Abbreviations of Variables are already discussed in methodology chapter 3.

5.3.2. Fiscal Decentralization and Education Index

To investigate the effects of fiscal decentralization and control variables on the education index, we first estimate the direct impact of fiscal decentralization and control variables on the education level using cross-sectional regression analysis. Tables 5.23 and 5.24, second column, show the direct impact of fiscal decentralization and control variables on the education index for pre and post decentralization periods. The findings show a significant negative relationship between fiscal decentralization and the education index at the district level, for both pre and post decentralization periods. The results further show that the magnitude of this inverse relationship has increased slightly in post decentralization period.

While studying the impacts of control variables, the findings of the study revealed significant negative impacts of control variable "distance from capital city" on education level across districts of Pakistan. The coefficient value for control variable "distance from capital city" has decreased in the post decentralization period. It means that the negative impact of "distance from the capital city" is more in pre-decentralization period than post decentralization period. The control variable "Population density" is insignificant in both periods (see table 5.23 & table 5.24).

Next, we examine whether the relationship between fiscal decentralization and the education index is affected by distance from the capital city. The multiplicative term of fiscal decentralization and distance from the capital city (FD*dstcp) is used. The fifth column in tables 5.23 and 5.24 shows the indirect effects of fiscal decentralization and control variables on the education index for pre and post decentralization periods. The post-decentralization relationship between fiscal

decentralization and district education level has decreased from 5.136 to 4.318, but it remains positive and significant (see table 5.23 and table 5.24). The findings show that the useful impacts of fiscal decentralization are conditional on the variable "distance from the capital city" in both pre and post decentralization periods.

Overall, the study's findings revealed that the positive effects of fiscal decentralization on education levels increase as distance from the capital city decreases. Consequently, positive impacts of fiscal decentralization on education level are conditioned on "distance from the capital city".

5.3.3. Fiscal Decentralization and Health Index

We study the direct and indirect impacts of fiscal decentralization and control variables on the health index through cross sectional regression analysis. The findings of the study revealed that fiscal decentralization and control variables are insignificant regarding their impact on health index in both pre and post decentralization periods. The results are given in appendix.

5.3.4. Fiscal Decentralization and Household Welfare Index

Through cross-sectional regression analysis, we investigate the direct and indirect effects of fiscal decentralization and control variables on the household welfare index. To begin, we calculate the direct impact of fiscal decentralization and control variables on household welfare. The third column of tables 5.23 and 5.24 shows the direct effects of fiscal decentralization and control variables on the household welfare index for pre and post decentralization periods. The findings show a significant negative relationship between fiscal decentralization and the welfare index at the

district level, for both pre and post decentralization periods. The findings also show that the magnitude of this inverse relationship has increased since decentralization.

For control variables, the findings of the study also revealed significant negative impacts of control variable "distance from capital city" on household welfare level across districts. While the coefficient values for control variable (distance from capital city) has decreased in the post decentralization period. It means that the negative impact of "distance from the capital city" is more in pre-decentralization period than post decentralization period. The control variable "Population density" is insignificant in both periods (see table 5.23 & table 5.24).

Then, we examine whether the relationship between district household welfare and fiscal decentralization is affected by distance from the capital city. The multiplicative term of fiscal decentralization and distance from the capital city (FD*dstcp) is used. The sixth column of tables 5.23 and 5.24 shows the indirect effects of fiscal decentralization and control variables on the household welfare index for both pre and post decentralization periods.. Fiscal decentralization's effects are reduced in the post-decentralization period, from 3.03609 to 0.3799, but remain positive and significant (see table 5.23 & table 5.24). The study's findings indicate that the relationship between district household welfare and fiscal decentralization is dependent on distance from the capital city.

Overall, the study's findings revealed that the positive effects of fiscal decentralization on household welfare increase as distance from the capital city decreases. Therefore, useful impacts of fiscal decentralization are conditioned on "distance from the capital city".

Conclusions and Recommendations

Overall, findings revealed that although fiscal decentralization may be independently damaging or even irrelevant to human development index and sub-indices at the district level, distance from capital city can act as an excellent moderator in overturning the insignificant or adverse impact into positive. So, the more the district is close to the capital city, the more the fiscal decentralization in effective in putting useful impacts on development level, educational level and household welfare level. Tbe findings of the study are in line with research done by Wasim ad Muir (2017) on provincial level.

For policy implications, the study recommends that there is a need for transfer of the authority to lower-level government as it can enhance the efficiency and service delivery at lower level. For useful impacts of fiscal decentralization, remote districts from capitals must be provided enhanced infrastructure and connected with the capital and other developed cities. The connectivity could definitely speed up the pace of development in underdeveloped regions and reduce disparity across districts of Pakistan.

5.4. Linkage between the Findings of the Three Tbemes

This dissertation focuses on three interrelated analyzes that explore the spatial pattern of human development disparities in Pakistan. The first theme revealed that whether 'neighborhoods matter' for improving local human development conditions at district level in Pakistan. The second theme investigated the "Cluh Convergence Hypothesis" for districts of Pakistan. Determinants of club formation are not analyzed due to lack

of data at district level. While, the third theme analyze the impacts of fiscal decentralization on human development index at district level in Punjab, Pakistan.

The findings of the study's three themes are interconnected. The findings of the first theme revealed that neighborhood do matter for improving local human development conditions because the development levels of a district in Pakistan are dependent on the development levels of its neighbouring districts. A district with a high (low) development level is spatially associated with neighbouring districts that also have a high (low) development level. The findings of second theme demonstrated that human development level is distributed unevenly across districts of Pakistan, as depicted by the large number of convergence clubs for human development index and sub-indices. Overall, first two themes reflect dualistic structure of Pakistan economic geography.

The last theme analyzes the impacts of fiscal decentralization on the distribution of human development level across districts of Pakistan. The theme revealed that fiscal decentralization may be independently damaging or even irrelevant to human development index and sub-indices at the district level, distance from capital city can act as an excellent moderator in overturning the insignificant or adverse impact into positive.

CHAPTER 6

CONCLUSIONS AND POLICY IMPLICATIONS

This chapter presents the conclusions and recommendations of the study. The chapter is divided into two subsections, first part show main findings of the study and policy implications are proposed in the second part.

6.1. Conclusions

This research has intended to provide a framework for examining the disparity in development level across districts of Pakistan in context of major constitutional development (18th amendment) adopted in April, 2010. The conclusions on three themes of the study are discussed in the following sub-sections.

a) Spatial disparities Analysis

Generally, the studies which make use of OLS to investigate socio-economic issues assume spatial-independence, which could possibly result in inaccurate statistical inferences. This necessitates studies on human development disparities in the light of recent progress in the subject of spatial analysis. It also stressed the need for research on socio-economic issues at lower level.

The study analyzed spatial distribution of human development index and sub-indices for 97 districts of Pakistan between 2004 and 2015. To achieve this goal, we employ quartile maps, box plots, Moran's Scotterplots, and LISA statistics. Overall, the findings of the study show that the distribution of development levels across districts has a significant tendency to cluster in space, implying that geography does matters for Pakistan.

The study concluded that clustering of high and low development districts exists both before and after decentralization. In both years, the largest clusters of high development level districts exist in Punjab and Khyber Pakhtunkhwa, whereas clusters of low development level districts comprise the majority of districts in Balochistan and interior Sindh. The study's findings suggest that districts that share a border may influence each other's development levels. Finally, an analysis of spatial associations for human development index and sub-indices across districts revealed strong spatial associations for all indices, indicating that a district's development levels are linked to the development levels of its neighbouring district.

In summary, the study's overall findings indicate the presence of significant spatial autocorrelation in Pakistan's development levels across 97 districts. As a result, the findings argue that districts should not be regarded as independent observations in quantitative analyzes of socioeconomic phenomena.

b) Club convergence across districts of Pakistan

It is necessary to know whether distribution of development level across districts of Pakistan increases over time or becoming equal or the districts with low human development level will remain lower for long periods and the districts having high development will be higher everlastingly. Convergence studies are employed to find answer of such queries for growth convergence among countries or regions within a country. Although, for many decades economists were interested in these issues, during 1990s the convergence phenomena attracted the attention of economists and econometrician.

We attempt to answer this vital query that whether low development districts can catch up the high development districts, by using club convergence analysis. The study examines the presence of club convergence for development level among Pakistan's districts over the period 2004-05 to 2014-15. Instead of studying the convergence club hypothesis using traditional measures such as GDP per capita, the research focuses on broader aspects of development. This is accomplished through the use of the augmented human development index. Tbe human development index is composed of three components: education, health, and household welfare. Each of sub-indices is further composed of five indicators.

The study's findings concluded that the hypothesis regarding the convergence of all districts to a single equilibrium state is rejected. Instead, for the human development index, we discovered evidence for seven convergence clubs and one non-convergent group. The study also shows that the education index has five convergence clubs and one non-convergent group, the health index has four convergence clubs and one non-convergent group, and the household welfare index has five convergence clubs and one non-convergent group.

Findings of the study clearly show that human development is distributed unevenly across districts of Pakistan. For sub-indices, that there is more convergence in health index than education and household welfare index. For health index, Out of 97 districts 90 districts converged to two clubs. After health, there is more convergence in education index than household welfare index. Although the number of clubs is same in both cases, but the leading two clubs comprises 82 districts in case of education index, while in case of household welfare index, the leading two clubs encompasses 62 districts.

Overall, the results of the study support the view that human development is not uniformly distributed across districts of Pakistan. Therefore, there is need to design policies that could reduce spatial disparities in human development across districts of Pakistan.

c) Fiscal Decentralization and Spatial Disparities

Over the years, researchers have been interested in the effects of fiscal decentralization on spatial disparities across countries or regions. Increasing the delegation of authority and resources to lower-level governments may result in regional convergence because lower-level governments are expected to meet the needs of the general public more efficiently. Conversely, devolution may also broaden spatial inequalities because the redistributive response or capacity of the federal authority is reduced. Accordingly, in the contest for fiscal resources, relatively better-off regions will tend to overpass poorer ones. Another justification, why fiscal decentralization may not result in convergence of regions is the low quality of government in lower levels.

By using data on pre and post decentralization periods, the study investigated the effects of fiscal decentralization on human development index and sub-indices across districts of Pakistan. Findings of the study revealed that independently fiscal decentralization may harm human development index and sub-indices at the district level; distance from capital city can serve as outstanding moderator in turning over the insignificant or adverse impacts into useful. Therefore, the more a district is close to the capital city, the more the fiscal decentralization is effective in putting useful impacts on development level, educational level and household welfare level. On the

other hand, fiscal decentralization is insignificant for health index both independently and jointly with "distance from capital city". Overall, the study's findings indicate that the useful effects of fiscal decentralization on development level are conditional on distance from capital cities.

6.2. Policy Recommendations

The difference in the success rate of development is related to the variation in both natural resources and geographical location. Furthermore, variations in a region's ability to manage its potential and resources are factors that influence development progress in each region. The study's findings have important implications for current efforts in Pakistan to reduce spatial disparities at the district level. Important policy Implications of the study are given as under;

- Findings of the study revealed the dualistic structure of Pakistan's economic geography, as explained by previous literature. The findings of the study show spatial autocorrelation among districts as well as spatial heterogeneity. These findings demonstrate how 'neighborhoods' matter' for improving local human development conditions, because a district's development levels in Pakistan are dependent on the development levels in its neighbouring districts.
- • In terms of policy, this means that policies aimed at reducing spatial inequality in Pakistan should distinguish between the specific patterns of different types of districts and take into account the districts' unique characteristics.
- Understanding the spatial distribution of clubs can help policymakers reduce disparities in human development. According to the study's findings, the

majority of districts in Balochistan and interior Sindh are clusters of low development level districts. As a result, the government should prioritize the improvement of social and economic conditions in Balochistan and interior Sindh.

- In recent years, human development has emerged as an important concept and a viable alternative to GDP per capita as a measure of life quality. As a result, the study's findings can be used to benchmark and profile district positions in terms of human development.

- Decentralization has the advantage that it involves citizens in decision-making process and makes local representative more responsible. Therefore, there is a need for transfer of the authority to lower-level government at district level as it can enhance the efficiency and service delivery at lower level.
- The study's findings revealed that the usefulness of fiscal decentralization is conditional on distance from the capital city. As a result, districts that are too far from capitals must be provided with improved infrastructure and linked to capital cities. Improved connectivity has the potential to accelerate development and reduce disparities.
- The lack of reasonable official figures may lead to wild guesses and dubious estimates as the basis of the argument. Therefore, it is important for government to produce a reliable data on socio-economic indicators at district level.

6.3. Limitations of the study

Club Convergence studies mainly focus on two aspects i.e. identification of clubs and determinants of club formation. This study only focuses on identification of clubs and determinants of club formation are not analyzed due to non-availability of data at district level in Pakistan.

6.4. Future Research Possibilities

In light of the spatial nature of the above study, additional research can be done on the factors responsible for non convergence of development and other indices across the districts of Pakistan. Furthermore, these spatial econometrics techniques could be extended to other economic, social and environmental issues for Pakistan and developing world as portrayed by the literature on developed countries. Spatial studies could be conducted on different areas such as public expenditures allocation, poverty, carbon emissions etc.

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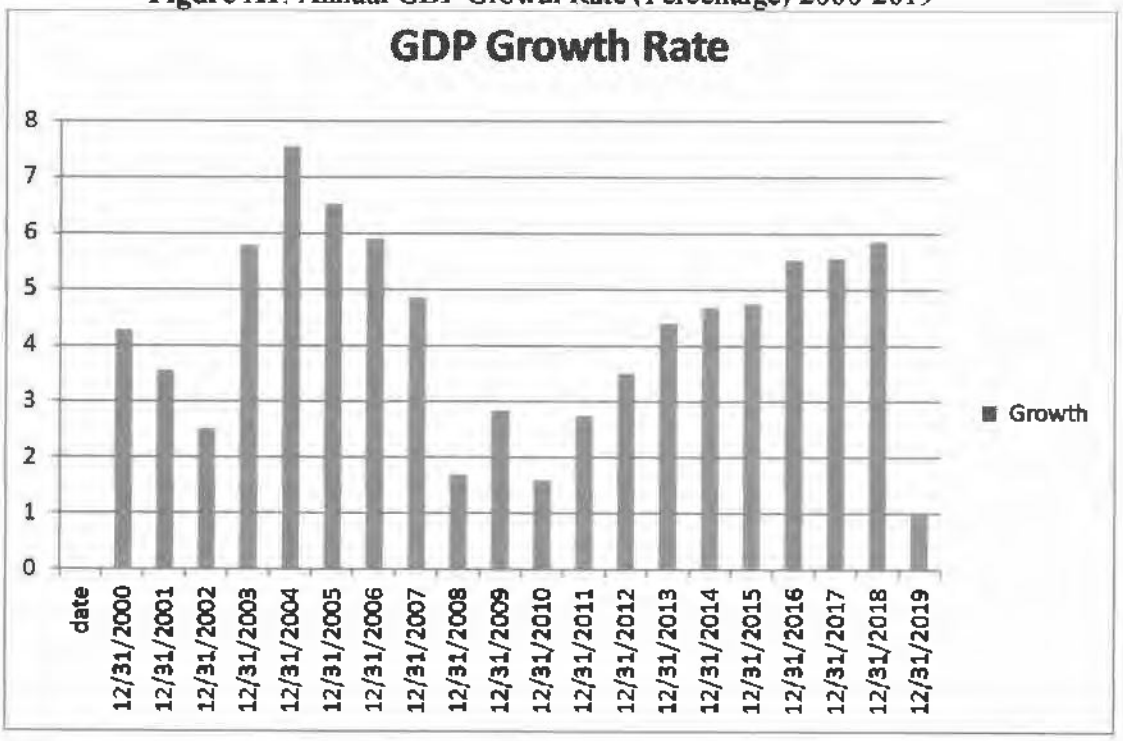
APPENDIX

Figure A1: Annual GDP Growth Rate (Percentage) 2000-2019



Source: Pakistan Economic Survey

Figure A2: Provincial Administrative Map of Pakistan

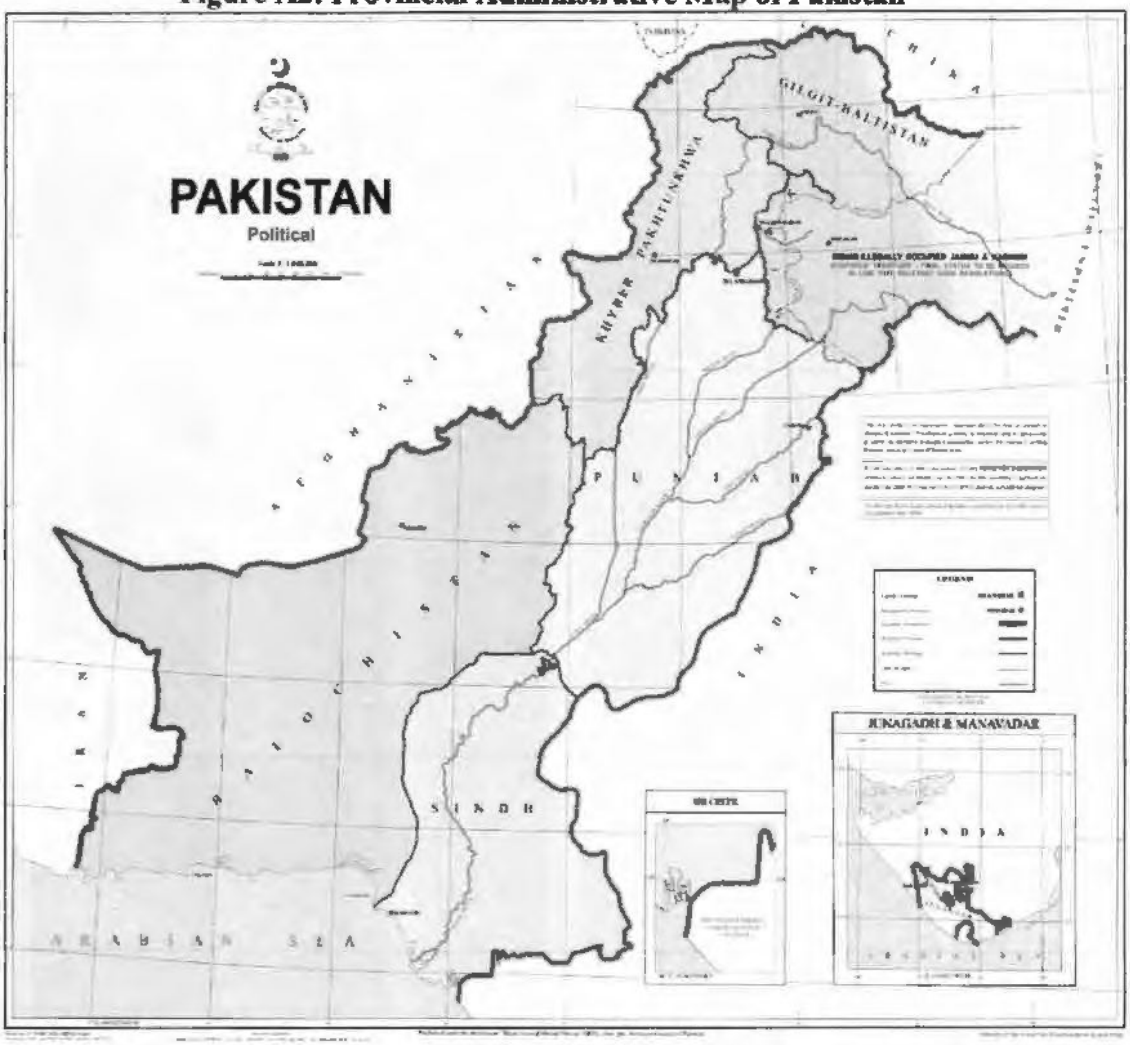


Figure A3: District Administrative Map of Pakistan

Figure A4: Local Moran statistics for Education Index 2004

Figure A5: Local Moran statistics for Education Index 2015

Figure A6: Local Moran statistics for Health Index 2004

Figure A7: Local Moran statistics for Health Index 2015

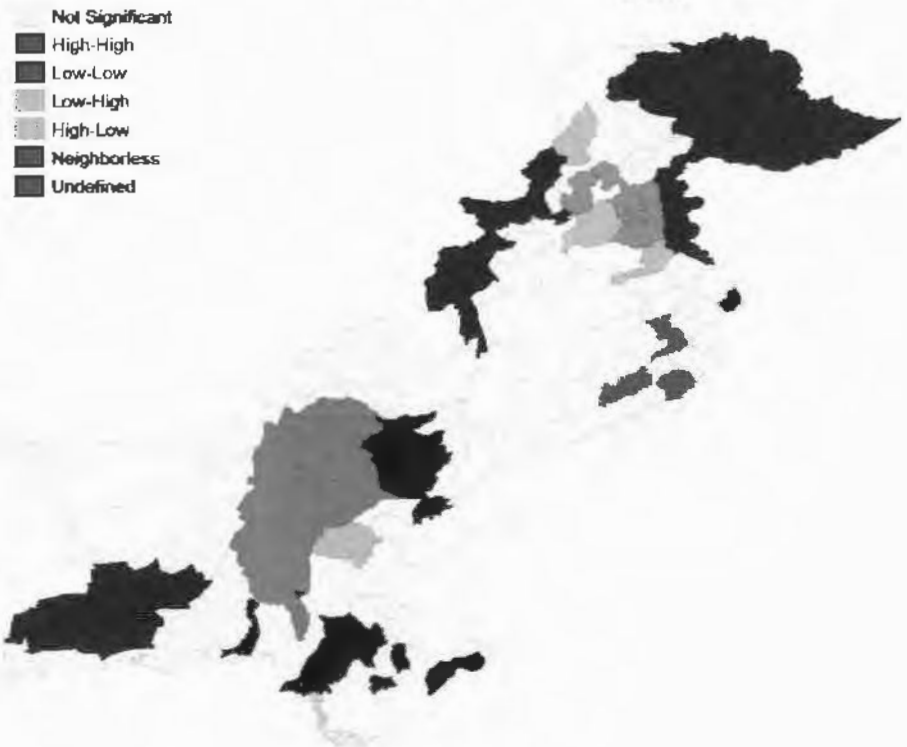


Figure A8: Local Moran statistics for Household Welfare Index 2004

Figure A9: Local Moran statistics for Household Welfare Index 2015

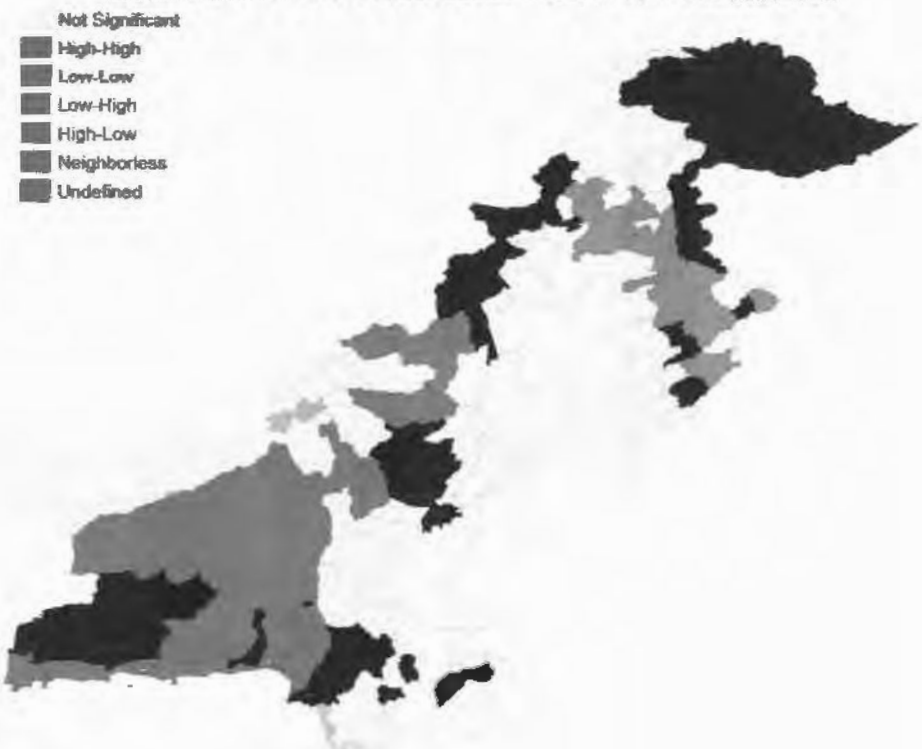


Table A1: Sample Binary Contiguity Weight Matrix

	Attock	Chakwal	Gujranwala	Gujrat	Hafizabad	Jhelum	M.Bahuddin	Rawalpindi	Sialkot
Attock	0	1	0	0	0	0	0	1	0
Chakwal	1	0	0	0	0	1	0	1	0
Gujranwala	0	0	0	1	1	0	1	0	1
Gujrat	0	0	1	0	0	1	1	0	1
Hafizabad	0	0	1	0	0	0	1	0	0
Jhelum	0	1	0	1	0	0	1	1	0
M.Bahuddin	0	0	1	1	1	1	0	0	0
Rawalpindi	1	1	0	0	0	1	0	0	0
Sialkot	0	0	1	1	0	0	0	0	0

*Full matrix is accessible in *GWT file* design

Table A2: List of Districts Included in the Data

	Provinces			
	Punjab (35)	**Sindh (16)**	**KP (24)**	**Balochistan (21)**
Districts	Kasur Islamabad Jehlum Rahim Yar Khan Khushab Chakwal Faisalabad Bahawalnager T.T.Singh Jhang Hafizabad Vehari Sahiwal Okara Gujrat Muzaffar Gar Narowal Multan Lahore D.G.khan Pakpatten Bahawalpur Khanewal Mianwali Bhakhar Rawalpindi Sheikhupura Lodhran Gujranwala Rajanpur Attock Sialkot Layyah Mandi Bahuddin	Jaccobabad Shikarpur Nowshero Feroze Ghotki Khairpur Sukkur Shaheed Benazirabad Sanghar Mir Pur Khas Tharparkar Karachi Badin Thatta Larkana Dadu Hyderabad	Swat Upper Dir Lower Dir Peshawar Charsada D.I.Khan Bonair Tank Mansehra Nowshera Abbottabad Batagram LakkiMarwat Mardan Shangla Malakand Haripur Bannu Kohat Karak Hangu Swabi Chitral Kohistan	Quetta Sibbi Qilla Abdullah Chaghi Pashin Kharan Lasbilla Gwadar Zhob Loralai Khuzdar Awaran Musa Khel Ziarat Kalat Jafarabad Jhal Magsi Barkhan Qilla Saifullah Mastung

Table A3: List of Districts dropped from Data due to missing Observation

	Provinces			
	Punjab	**Sindh**	**KP**	**Balochistan**
Districts	Nankana Sahib, Chiniot	Sujawal, Umerkot, Shahdadkot, Tando Allah Yar, Tando Muhammad Khan, Kashmore, Jamshoro, Matiari	Tor-Ghar	Washuk, Nushki, Sheerani, Ketch, Panjgur, harnai, Kohlu, Dera-Bugti

Table A4: List of Districts of Punjab included in the study

Districts of Punjab			
Attock	Gujrat	Mandi Bahuddin	Rajanpur
Bahawalnager	Hafizabad	Toba Tek Singh	Mianwali
Bahawalpur	Jhang	Sialkot	Multan
Bhakhar	Jhelum	Sargodha	Muzaffar Garh
Chakwal	Kasur	Sheikhupura	Narowal
Dera Ghazi khan	Khanewal	Sahiwal	Narowal
Faisalabad	Khushab	Rawalpindi	Pakpatten
Gujranwala	Lahore	Rahim Yar Khan	Layyah
Lodhran			

Table A5: Abbreviations of the Variables used in the Model

S.NO	Variables	Abbreviations
1	fd	Fiscal Decentralization
2	dev	Development Index
3	edu	Education Index
4	hh	Household welfare Index
5	dstcp	Distance from capital city
6	popdens	Population density
7	devdfd	Development index divided by Fiscal decentralization
8	edudfd	Education index divided by Fiscal decentralization
9	hhdfd	Household welfare index divided by Fiscal decentralization

Table A6: Results by using Health Index (2008-2009)

devindex	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval
fd	-0.038	0.370	-0.10	0.918	-0.796	0.720
dstcp	-0.011	0.006	-1.64	0.111	-0.025	0.002
popdens	-0.001	0.001	-0.88	0.384	-0.003	0.001
_cons	160.521	35.138	4.57	0.000	88.654	232.388

Table A7: Results by using Health Index & interaction of FD & DSTCP (2008-2009)

devindex	Coef.	Std. Err.	t	P>|t|	95% Conf.	Interval
fd	0.730	0.690	1.06	0.299	-0.683	2.144
dstcp	0.189	0.177	1.07	0.294	-0.173	0.552
popdens	0.001	0.002	0.57	0.571	-0.003	0.005
fddstcp	-0.002	0.001	-1.12	0.270	-0.005	0.001
_cons	86.715	65.97	1.31	0.199	-48.430	221.860

Table A8: Results by using Health Index (2014-2015)

devindex	Coef.	Std. Err.	t	P>|t|	95% Conf.	Interval
fd	-0.266	0.263	-1.01	0.321	-0.805	0.272
dstcp	0.002	0.005	0.36	0.723	-0.009	0.013
popdens	-1.65	0.0007	-0.00	0.998	-.0014	0.001
_cons	177.951	24.496	7.26	0.000	127.851	228.051

Table A9: Results by using Health Index & interaction of FD & DSTCP (2014-2015)

devindex	Coef.	Std. Err.	t	P>|t|	95% Conf.	Interval
fd	0.374	0.898	0.42	0.680	-1.465	2.214
dstcp	0.167	0.2183	0.77	0.450	-0.280	0.614
popdens	0.001	0.002	0.67	0.508	-0.003	0.006
fddstcp	-0.001	0.002	-0.76	0.454	-0.006	0.002
_cons	116.803	85.870	1.36	0.185	-59.093	292.700

Table A10: Summary Statistics (2008-2009)

Variable	Obs	Mean	Std.Dev.	Min	Max
devindex	33	213.224	31.533	141.870	281.322
eduindex	33	98.973	24.603	39.648	143.525
hindex	33	153.181	5.814	139.860	165.526
hhindex	33	124.368	27.036	67.082	192.93
fd	33	92.839	4.966	76.4	97.7
dstcp	33	262.039	144.150	0	587.4
popdens	33	805.030	1053.074	148	6279

Table A11: Summary Statistics (2014-2015)

Variable	Obs	Mean	Std.Dev.	Min	Max
devindex	33	223.206	30.674	173.569	289.325
eduindex	33	107.777	23.921	65.110	153.216
hindex	33	153.773	4.104	147.351	163.946
hhindex	33	131.366	27.413	90.967	197.015
fd	33	92.839	4.966	76.4	98.6
dstcp	33	262.039	144.150	0	587.4
popdens	33	805.030	1053.074	148	6279

Table A12: Correlation Matrix (2008-2009)

	devindex	eduindex	hindex	hhindex	fd	dstcp	popdens
devindex	1.000						
eduindex	0.975	1.000					
hindex	0.351	0.400	1.000				
hhindex	0.955	0.876	0.128	1.000			
fd	-0.614	-0.505	0.017	-0.715	1.000		
dstcp	-0.600	-0.573	-0.198	-0.587	0.307	1.000	
popdens	0.574	0.4834	-0.027	0.660	-0.724	-0.485	1.000

Table A13: Correlation Matrix (2014-2015)

	devindex	eduindex	hindex	hhindex	fd	dstcp	popdens
devindex	1.000						
eduindex	0.957	1.000					
hindex	0.268	0.266	1.000				
hhindex	0.959	0.844	0.136	1.000			
fd	-0.691	-0.560	-0.290	-0.739	1.000		
dstcp	-0.597	-0.564	-0.037	-0.594	0.346	1.000	
popdens	0.590	0.468	0.178	0.649	0.678	-0.485	1.000