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Temporal and Spatial Variations in Human Development Across the Districts of Punjab, Pakistan

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The present study attempts to look into the temporal and spatial variations in human development across the districts of Punjab. The spatial variations in human development have been shown by calculating a district level Human Development Index (HDI) in Punjab for the year 2014. The temporal variation in human development for the districts of Punjab has been shown by comparing the HDI calculated in this paper with the HDI calculated for the same districts by Jamal and Khan (2007). However, the present work tries to correct some of the methodological issues in the work done by UNDP (2003) and Jamal and Khan (2007). Due to data constraints at the district level, UNDP (2003) and Jamal and Khan (2007) used health outcomes at the provincial level to calculate district health index in Pakistan. Similarly, they constructed income and education index by using some weak proxies. Income index was calculated by assuming equal share of services in gross domestic product (GDP) for all districts. For education index they considered adult literacy rate. Present study has used district level child survival rate for health index. Per capita income and mean years of schooling have been used for calculating for income and education index. The availability of data on child survival rate, income and mean years of schooling has been made possible by the Multiple Indicator Cluster Survey (MICS, 2014) conducted by the Punjab Bureau of Statistics with the collaboration of UNDP and UNICEF. The results confirm the common perception of regional disparities in Punjab. Moreover, the temporal comparison of HDI points towards the widening of development gap between the regions of Punjab.

*Keywords***:** human development index, regional development Gap, Punjab, Pakistan
JEL Classification: O15, O16

The issue of regional inequalities has important political economy implications. Inter-regional disparities can create distrust among regions and hence can be a source of deterioration of social cohesion in the society. Lack of social cohesion further works as a hindrance for the achievement of number of development goals including growth of income per capita (Pervaiz & Chaudhary, 2015). Thus studying the issue of regional inequalities is significant not only because it is an important issue in itself but also due to its vast implications for economy. Though the issue is

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important for all societies yet the societies which are more heterogeneous on the basis of their ethnic, racial, linguistic or religious composition should be more cautious about such inequalities because tolerance for inequality in such societies may be less as compared with homogenous societies (Hirschman & Rothschild, 1973).

Pakistan is a developing country of South Asian region. It is ethno-linguistically one of the most diverse countries of the world (Alesina et al., 2003). Regional inequalities have been important feature of Pakistan's economy (UNDP, 2003; Jamal & Khan, 2007; Akhtar, 2008; Jan & Chaudhary, 2011a, 2011b). These inequalities have worked to weaken social cohesion (Pervaiz & Chaudhary, 2010) and to create distrust among the regions of the country (Azfar, 1973). This study is an attempt to investigate human development disparities across different districts of Punjab province of Pakistan. Punjab is the most populous province of the country and more than half of population of the country lives in this province. Despite being considered as the most developed province of the country, inter-regional disparities are present in the province (UNDP, 2003; Jamal & Khan, 2007). By presenting spatial variations in human development of different districts of Punjab, this study has analyzed the current status of human development in different regions of the province. The study has also tried to explore that whether development gaps among districts of Punjab have narrowed or widened over time. For analyzing spatial variations in human development, we have calculated Human Development Index (HDI) for different districts for the year of 2014. For temporal analysis, we have compared the HDI calculated by this study with HDI calculated by Jamal and Khan (2007) because of its methodological closeness with the present paper. The study may be helpful for policy makers to adopt suitable policies to address the issue of human development disparities across district of Punjab. Remaining of the paper is structured as following. Next section is about the methodology of the construction of HDI used in this study. The third section is about data sources used for construction of HDI of different districts of Punjab. In fourth section, comparison of districts on the basis of their HDI value has been presented. Conclusion of the study has been given in section 5.

Construction of HDI

United Nations Development Program (UNDP) publishes annual reports on human development. These reports examine the status of human development across the countries and across the regions of the world. Occasionally, country-specific reports are also published by UNDP to study the regional differences of human development in a country. One such report by UNDP (2003) examined human development disparities among the provinces as well as among the districts of Pakistan. The report calculated HDI for the year 1998. HDI was calculated with the help of three sub-indices termed as income index, education index and health index. The report calculated GDP with the help of agricultural crop value and manufacturing value added to calculate income index. Literacy rate and primary enrollment rate was used for the construction of education index. The health index was constructed for provinces as well as for districts by using the indicators of infant survival rate and immunization rate. However, in the construction of health index for different districts, provincial level infant survival rates were used.

Jamal and khan (2007) calculated HDI for the provinces as well as for the districts of the provinces of Pakistan. The study used different variables for the construction of three sub-indices of income index, education index and health index which were further used to develop HDI. Adult literacy rate and combined (primary, secondary and tertiary) enrollment rate was used for developing education index whereas age and sex specific death rates and immunization rates were used for the construction of health index. The income index for districts was constructed by calculating GDP with

the help of agricultural crop value and manufacturing value added. Like UNDP (2003), instead of using district level health indicators, Jamal and Khan (2007) have also used provincial level age and sex specific death rates in the construction of health index for different districts. The study analyzed inter-temporal change in human development across the provinces and districts of Pakistan by calculating HDI for the years 1998 and 2005. The findings of the study reveal that HDI values of provinces and districts improved significantly but some provinces and districts improved more as compared to other provinces and districts. Punjab had high HDI value as compared to other provinces but growth in HDI from 1998 to 2005 of Khyber Pakhtunkhwa was the highest. There was no significant reduction in human development disparities across the provinces as well as across the districts of Pakistan from 1998 to 2005.

Studies by UNDP (2003) Jamal and Khan (2007) share a common flaw in the construction of district level HDI. Provincial level health indicators have been used by these studies to reflect district specific health outcomes. The use of provincial level health indicators for the construction of district level HDI seems to be based upon an implicit assumption that health indicators remain same across the districts. But this assumption seems to be unrealistic. Similarly, both studies calculated GDP with the help of agricultural crop value and manufacturing value added by assuming equal share of services sector in GDP in all districts. It is fairly possible that services may a primary source of income in some districts. In that case, their GDP might have been underestimated because services were given equal share for all districts in the calculation of GDP. We have tried to correct this flaw by using district level health indicators instead of provincial level health indicators. Further, MICS (2014) has information on per capita income at the household and thus district levels, so we have used per capita income in the construction of district income index instead of taking some proxy variables like agricultural and manufacturing value added. Besides, mean years of schooling is considered a better proxy variable for education and MICS (2014) provides information on this important variable so we have also incorporated this proxy variable with combined enrollment to construct district education index.

The present study constructs HDI on the basis of three dimensions, that is, average achievements by the districts in health, education and living standard. The average achievements are measured through three sub-indices i.e. health index, education index and income index. HDI is a composite index which combines these three indices with equal weights. This study has constructed health index by using district specific health indicators instead of provincial indicators as proxy for district health achievements. Child survival rate and immunization rates have been used for the construction of health index. We have used mean years of schooling and combined enrollment rate for construction of district education index. Income index is constructed by using district level per capita incomes. HDI has been constructed by taking the geometric mean of income index, education index and health index.

The first step in the construction of HDI is to create sub-indices for each dimension. Minimum and maximum values (goalposts) need to be set in order to transform the indicators into indices between 0 and 1. Geometric mean for aggregation, the maximum value does not affect the relative comparison (in percentage terms) between any two regions or periods of time. The minimum values can affect comparisons, so values that can be appropriately conceived of as subsistence values or “natural” zeros can be used. These goalposts act as the ‘natural zeros’ and ‘aspiration goals’, respectively (UNDP, 2015). Present study uses goal posts in the construction of HDI proposed by UNDP. In this way all constructed indices are comparable among the districts of Punjab and globally as well. Equation 1 describes the construction of HDI with the help of its three sub-indices.

$$HDI = (\text{Income Index} . \text{Education Index} . \text{Health Index})^{1/3} \quad (1)$$

A brief description of the construction of three sub-indices i.e. income index, education index and health index is given below.

Income Index

For the construction of income index, we have calculated per capita income for all districts of Punjab by using household data from Multiple Indicator Cluster Survey (MICS) (2014). The calculated per capita income has been converted into purchasing power parity (PPP$). The income of all members of a household is given in MICS (2014). First, we have calculated per capita income for households then for all districts. According to UNDP (2015) the low minimum value for per capita income, $100, is justified by the considerable amount of unmeasured subsistence and nonmarket production in economies close to the minimum. There is virtually no gain in human development and well-being for a region from annual income beyond $75,000. Similarly, Kahneman and Deaton (2010) have shown that there is effectively no gain in human development and human well-being for a region from annual income beyond $75,000. Present study has set $100 as a minimum value and the maximum is set at $75,000 per capita for income index. In this way constructed income index is not only comparable across the districts of Punjab, it is also comparable at global level. Because each dimension index is a proxy for capabilities in the corresponding dimension, the transformation function from income to capabilities is likely to be concave (Annand and Sen, 2000). Thus, for income the natural logarithm of the actual minimum and maximum values is used.

Income Index (INI) = (ln (actual) – ln (minimum)/ ln (maximum) – ln (minimum) (2)

Education Index

Education index has been constructed with the help of two of its sub-indices termed as mean years of schooling index and combined enrollment index. Education index is the summation of these indices whereby two third of the weight has been assigned to mean years of schooling index and one third weight has been assigned to combined enrollment index. For the construction of mean years of schooling index, mean years of schooling of population aged 15 years and above have been used. Combined enrollment index has been constructed by using combined (primary, secondary and territory) enrollment rate of age cohort 5 to 24 years. 100 percent is considered as maximum and 0 percent as minimum goal post for the construction of combined enrollment index. For mean years of schooling, 0 is used as minimum and 15 is considered as maximum which is proposed by UNDP (2015) as the projected maximum for a society by 2025. Education index has been obtained by combining these two indices by assigning two-third weight to mean years of schooling index and one-third weight to combine enrollment index. Equation (6), equation (7) and equation (8) explain the mechanism involved in the construction of education index.

Mean Years of Schooling Index (MYSI) = actual – minimum/maximum – minimum (3)

Combined Enrollment Index (EI) = actual – minimum /maximum–minimum (4)

Education Index (EDI) = 2/3 (MYSI) + 1/3 (CEI) (5)

Health Index

Anand and Sen (1994) suggest that child mortality (i.e. additive inverse of child survival rate) and life expectancy are suitable proxies for health because both present a comprehensive picture of health in any society. Because of unavailability of district specific data for life expectancy, we used under five survival rate and immunization rate in construction of health index. Immunization is a

method of making a person immune to diseases by injecting certain substances into the body, which stimulate the production of disease-fighting antibodies. Fully immunization means injection for eleven diseases. In the past, immunization for children comprises a series of vaccinations e.g., BCG (anti-TB); DPT, anti-polio (drops), given by mouth not by injection and Measles. A few years back, government of Pakistan has also introduced COMBO (1, 2, and 3) combination of DPT and Hepatitis. But from 2010 onwards government have introduced PENTA (Diphtheria, Pertussis, Tetanus, Hemophilus Influenza B and Hepatitis B); along with COMBO, Measles 2, BCG, and anti-polio drops have also been introduced (Pakistan Social and Living Standard Measurement Survey (PSLM), 2014). Under five survival rates is calculated from under five mortality rate which is probability of dying between birth and exactly five years of age expressed per 1,000 live births (MICS, 2014).

Two sub-indices termed as child survival index (CSI) and immunization index (IMI) have been constructed which have been used for the construction of health index (HI). In the construction of CSI and IMI, 100 percent is considered as maximum goal post and 0 percent as minimum goal post. HI has been constructed by combining IMI and CSI. 70 percent weight has been to CSI and 30 percent weight to IMI because child survival rate is more representative measure of health condition of a society as compared to immunization rates. It is an outcome of different health related activities and facilities. Equation (9), equation (10) and equation (11) explain the methodology of calculating health index.

Child Survival Index (CSI) = actual – minimum / maximum – minimum (6)

Immunization Index (IMI) = actual – minimum / maximum – minimum (7)

Health Index (HI) = 0.7 (CSI) + 0.3 (IMI) (8)

Data Source

We have used data for all districts of Punjab for the year 2014. The data has been collected from different sources. The data of immunization rate and combined enrollment rate for all districts has taken from Pakistan Social and Living Standard Measurements Survey (PSLM, 2014) conducted by Pakistan Bureau of Statistics (PBS) at district level from entire country. This survey covered 14,549 enumeration blocks and 25,875 villages from Punjab. Calculation of child survival rate, per capita income and mean years of schooling for the districts of Punjab, Multiple Indicator Cluster Survey (MICS, 2014) has been used, which is conducted by Punjab Bureau of Statistics with the collaboration of UNDP and United Nations International Children's Emergency Fund (UNICEF). The survey covered 6,368 clusters and 91,280 households in urban and rural areas throughout the province.

Results and Discussion

The following table (Table 1) shows values of HDI for all the districts of Punjab and their relative positions accordingly.

Table 1

Ranking of the Districts based on HDI

Districts	HDI		Districts	HDI	
	Value	Rank		Value	Rank
Rawalpindi	0.6292	1	Okara	0.5275	19
Lahore	0.6131	2	Kasur	0.5262	20
Chakwal	0.6125	3	Khushab	0.5186	21
Jhelum	0.6115	4	Vehari	0.5175	22
Gujrat	0.5890	5	Layyah	0.5169	23

Sialkot	0.5849	6	Hafizabad	0.5164	24
Gujranwala	0.5635	7	Khanewal	0.4966	25
Faisalabad	0.5625	8	Chiniot	0.4958	26
Mandi Bahauddin	0.5515	9	Bhakkar	0.4952	27
Attock	0.5502	10	Pakpattan	0.4951	28
TT Singh	0.5501	11	Jhang	0.4894	29
Narowal	0.5492	12	Bahawalnagar	0.4752	30
Nankana Sahib	0.5447	13	DG Khan	0.4596	31
Sahiwal	0.5427	14	Lodhran	0.4581	32
Sargodha	0.5383	15	Bahawalpur	0.4569	33
Mianwali	0.5359	16	RY Khan	0.4562	34
Sheikhupura	0.5353	17	Muzzafargarh	0.4441	35
Multan	0.5288	18	Rajanpur	0.4421	36

Source: Author's Calculation

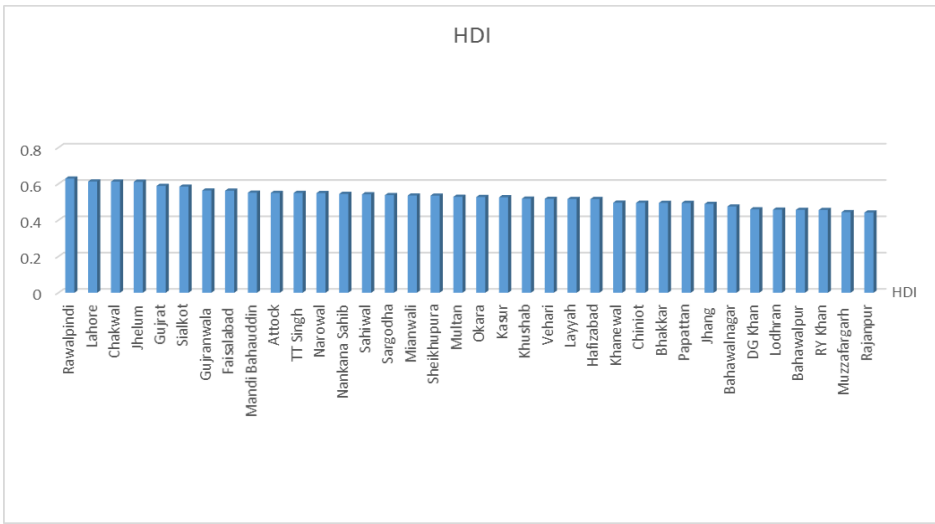

Fig1: HDI Value in Districts of Punjab

The HDI value for Punjab is 0.5300 which is far below the HDI value for the developed nations. Punjab lies in the lower category of human development as specified by UNDP (2015). UNDP (2015) has categorized those nations in the medium human development for whom the value of HDI lies within the range of 0.5480 to 0.6980 and categorized those nation in the lower human development for whom the value of HDI is lower than 0.5480. On the basis of this criterion, twelve districts fall in the category of medium human development, whereas, twenty four districts of the province fall in the category of low human development. These results also reveal some interesting facts about the inter- and intra-regional disparities in Punjab. Southern Punjab is usually considered the most underdeveloped region of the province and our results confirm that perception about the region. The HDI values for the districts of Southern Punjab indicate comparatively lower performance. No any single district in Southern Punjab lies in the medium category of human development. On contrary, eight out of seventeen districts in Central Punjab lie in the medium category of human development.

Below is given the descriptive statistics of HDI and its dimensional indices for the districts of Punjab (Table 2). This table shows the values for the mean, maximum, minimum, and standard deviation of HDI (human development index), EI (education index), HI (health index), and INCI (income index).

Table 2

Descriptive Statistics of HDI and Its Dimensional Indices for the Districts of Punjab

	HDI	EI	HI	INCI
Mean	0.527277	0.350747	0.849475	0.496296
Maximum	0.629263	0.501364	0.931200	0.558535
Minimum	0.442198	0.240040	0.740700	0.445761
Std. Dev.	0.050001	0.068175	0.051211	0.028266
Observations	36	36	36	36

Source: Author's Calculation

The highest mean values for health index and income index show that the HDI values for the districts of Punjab are mainly driven by improved health and income status of the people in this province. The low value of education index acts as a drag on the higher values of HDI for the districts of Punjab. It is also observed from UNDP (2015) that Pakistan has very low value of education index as compared to other two indices. It also supports the assertion that educational outcomes in an underdeveloped region required special intervention of government. The values for the standard deviation point towards the inter-district gap in Punjab vis-à-vis HDI and its dimensional indices. These values show that HDI gap between the districts is driven by the inter-district gap in all three dimensions. But gap in education and health is higher as compared to income. The evolution of the inter-district HDI gap can be judged by comparing the standard deviation of HDI calculated in this paper with the standard deviations of HDI calculated by Jamal and Khan (2007) for the districts of Punjab. The values for standard deviation of HDI in Punjab are 0.037 and 0.033 in 1998 and 2005 respectively as compared to '0.0500', which is the value of standard deviation of HDI in Punjab during 2014. This shows an increase of inter-districts gap of human development in Punjab during 1998-2014. This can also be seen in the following given table 3. The present study considers '1998' for rank comparison with '2014' because of enough time for HDI to change. Moreover, this paper considers the study conducted by Jamal and Khan (2007) as more relevant for rank comparison because of its methodological closeness with the present paper. Both the studies have used combined school enrollment instead of primary school enrolment used by UNDP (2003) in the construction of education index. However, the results show an approximate picture of the temporal variation of districts' ranking and should be interpreted with caution.

Table 3

Change in Ranking of the Districts of Punjab Based on 'HDI' Values in 1998 and 2014

Districts	HDI Rank, 1998 by Jamal and Khan (2007)	HDI Rank, 2014 (This paper's calculation)
Jehlum	1	4 ⇩
Sheikhupura	2	17 ⇩
Rawalpindi	3	1 ⇧
Lahore	4	2 ⇧
Faisalabad	5	8 ⇩
T.T.Singh	6	11 ⇩
Mandi Bahuddin	7	9 ⇩
Kasur	8	20 ⇩
Khushab	9	21 ⇩

Chakwal	10	3	⇧
Bhakhar	11	27	⇩
Sialkot	12	6	⇧
Mianwali	13	16	⇩
Rahim Yar Khan	14	34	⇩
Layyah	15	23	⇩
Sahiwal	16	14	⇧
Gujranwala	17	7	⇧
Sargodha	18	15	⇧
Attock	19	10	⇧
Hafizabad	20	24	⇩
Gujrat	21	5	⇧
Jhang	22	29	⇩
Narowal	23	12	⇧
Bahawalnager	24	30	⇩
Okara	25	19	⇧
Khanewal	26	25	⇧
Vehari	27	22	⇧
Bahawalpur	28	33	⇩
Multan	29	18	⇧
Pakpatten	30	28	⇧
D.G.khan	31	31	
Lodhran	32	32	
Muzaffar Garh	33	35	⇩
Rajanpur	34	36	⇩
Nankana Sahib		13	
Chiniot		26	

Source: Author's Calculation

The above table shows the change in the relative position of the districts of Punjab on the basis of HDI values calculated for the year1998 by Jamal and Khan (2007) and for the year 2014 in this paper. By comparing the HDI ranking of districts in 1998 and 2014, a total of 15 districts managed to improve their relative position in 2014 as compared to 1998 while the relative position of 17 districts deteriorated. Ten out of Seventeen districts in central Punjab moved up the HDI ladder. It means that around 60 % of the districts which are situated in this part of the province could improve their human development. On the other hand, only Two out of Nine districts in Southern Punjab moved up the HDI ladder i.e. around 23 % of the districts which are situated in this already underdeveloped region of the province could improve their relative position. On contrary, Seven out of Seventeen districts in Central Punjab and Seven out of Nine districts in Southern Punjab moved down the HDI ladder. In other words, around 40 % and 70 % of the districts in Central and Southern Punjab respectively moved down the HDI ladder. This is a clear indication of the widening of development gap between different regions of Punjab.

Conclusion

The empirical results of this study indicate that the province of Punjab and its twenty-four districts fall in the category of low human development as specified by the UNDP. Twelve districts of the province fall in the category of medium human development. This study also arrives at some interesting findings about the temporal and spatial variations across the districts of Punjab. Southern Punjab is usually considered as underdeveloped and ignored region of the province and our findings confirm that perception about the region. Moreover, the development gap between different regions of the province has been widened during 1998-2014. This state of affairs may cause distrust among the regions that may lead to political instability, conflict, and thus underdevelopment in the country. Therefore, the need arises for a judicious public policy to address the issue of inter-regional

development gap. There may be different criteria for allocating the development budget among different regions. Underdevelopment may also be considered as one of the criteria for allocating the development budget among different regions in the country as well as in the provinces. The provincial governments may increase the development budget of those districts which have low levels of human development.

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APPENDIX

Table A-1: Data

District	Mean Years of Schooling	Per Capita Income (RS)	Per Capita Income (PPP$)	Child Survival Rate	Immunization Rate (Complete)	Combined Enrolment Rate (Net)
Attock	5.2694	52195.36	2609.768	92.4	83	43
Bahawalnagar	3.9196	47348	2367.4	86.1	71	30.33333
Bahawalpur	3.9633	46935.84	2346.792	89.4	53	23.66667
Bhakkar	4.4137	43189.44	2159.472	91.7	72	32.66667
Chakwal	6.4584	66206.56	3310.328	95.6	85	55
Chiniot	3.9392	56829.92	2841.496	91.6	66	33.66667
DG Khan	3.7623	40312.16	2015.608	87.3	60	31
Faisalabad	5.9069	68956.16	3447.808	92	58	43.33333
Gujranwala	5.6628	68541.76	3427.088	92.7	74	40
Gujrat	6.5112	53256	2662.8	93.6	92	46
Hafizabad	4.7725	53109.28	2655.464	87.6	71	37.33333
Jhang	4.4658	53043.2	2652.16	89.2	45	34
Jhelum	6.3925	65646.56	3282.328	92.6	94	54.66667
Kasur	4.6738	58042.88	2902.144	88	86	36
Khanewal	4.5303	51624.16	2581.208	88	57	34.66667
Khushab	5.0007	46697.28	2334.864	92.5	66	37.33333
Lahore	6.8506	78226.4	3911.32	94.8	79	47.33333
Layyah	4.2436	42032.48	2101.624	90.7	82	45.66667
Lodhran	3.5352	47608.96	2380.448	88	55	30
Mandi Bahauddin	5.2431	64686.72	3234.336	85.5	81	44
Mianwali	5.3515	48796.16	2439.808	93.3	74	38
Multan	4.9902	66623.2	3331.16	92.4	65	33
Muzzafargarh	3.7386	38440.64	1922.032	88.8	47	27.33333
Nankana Sahib	5.0003	56863.52	2843.176	89	93	39.66667
Narowal	5.4245	41287.68	2064.384	94.1	85	46.66667
Okara	4.6397	53575.2	2678.76	89.3	79	41
Papattan	4.2119	45274.88	2263.744	87.2	74	36.66667
Rajanpur	3.2759	38249.12	1912.456	86.3	68	28.33333
Rawalpindi	7.2807	80696	4034.8	92.4	81	53.33333
RY Khan	3.8726	55426.56	2771.328	89.1	39	25

Sahiwal	5.3397	50585.92	2529.296	89.3	89	39
Sargodha	5.2751	56219.52	2810.976	89.3	68	41.66667
Sheikhupura	5.4015	52774.4	2638.72	90.1	78	35.66667
Sialkot	6.3641	52840.48	2642.024	91.7	93	47
TT Singh	5.6675	61187.84	3059.392	87.9	69	42
Vehari	4.7065	54118.4	2705.92	92.8	73	33.33333

Table A-2
Ranking of the Districts based on EI

Districts	EI		Districts	EI	
	Value	RANK		Value	RANK
Rawalpindi	0.501364	1	**Okara**	0.342876	19
Chakwal	0.470373	2	**Layyah**	0.340827	20
Jhelum	0.466333	3	**Hafizabad**	0.336556	21
Lahore	0.462249	4	**Multan**	0.331787	22
Gujrat	0.44272	5	**Kasur**	0.327724	23
Sialkot	0.439516	6	**Vehari**	0.320289	24
Faisalabad	0.406973	7	**Khanewal**	0.316902	25
Narowal	0.396644	8	**Jhang**	0.311813	26
TT Singh	0.391889	9	**Papattan**	0.309418	27
Gujranwala	0.385013	10	**Bhakkar**	0.305053	28
Mandi Bahauddin	0.379693	11	**Chiniot**	0.287298	29
Attock	0.377529	12	**Bahawalnagar**	0.275316	30
Sargodha	0.373338	13	**DG Khan**	0.270547	31
Sahiwal	0.36732	14	**Muzzafargarh**	0.257271	32
Mianwali	0.364511	15	**Lodhran**	0.25712	33
Sheikhupura	0.358956	16	**RY Khan**	0.255449	34
Nankana Sahib	0.354458	17	**Bahawalpur**	0.255036	35
Khushab	0.346698	18	**Rajanpur**	0.24004	36

Source: Author's Calculation

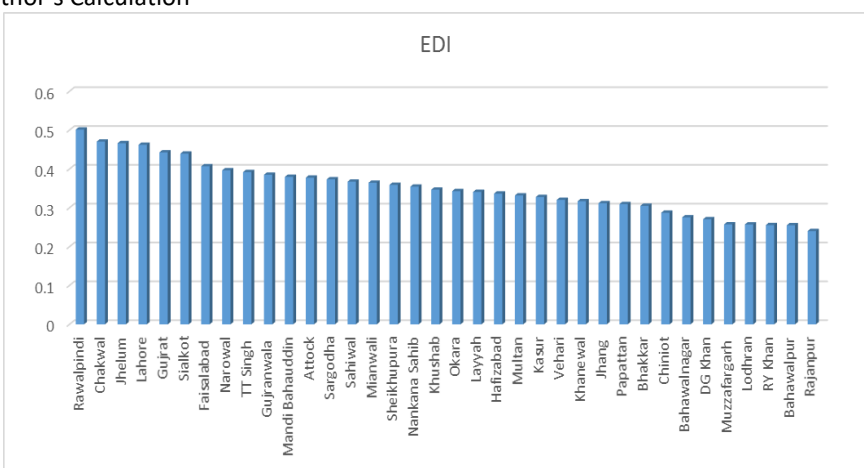

Fig: A-1

Table A-3
Ranking of the Districts based on HI

Districts	HI		Districts	HI	
	Value	RANK		Value	RANK
Gujrat	0.9312	1	**Khushab**	0.8455	19
Jhelum	0.9302	2	**Multan**	0.8418	20
Chakwal	0.9242	3	**Mandi Bahauddin**	0.8415	21
Sialkot	0.9209	4	**Chiniot**	0.8392	22
Narowal	0.9137	5	**Papattan**	0.8324	23
Nankana Sahib	0.902	6	**Sargodha**	0.8291	24
Lahore	0.9006	7	**Hafizabad**	0.8262	25
Attock	0.8958	8	**TT Singh**	0.8223	26
Sahiwal	0.8921	9	**Faisalabad**	0.818	27
Rawalpindi	0.8898	10	**Bahawalnagar**	0.8157	28
Layyah	0.8809	11	**Rajanpur**	0.8081	29
Mianwali	0.8751	12	**DG Khan**	0.7911	30
Kasur	0.874	13	**Khanewal**	0.787	31
Gujranwala	0.8709	14	**Bahawalpur**	0.7848	32
Vehari	0.8686	15	**Lodhran**	0.781	33
Sheikhupura	0.8647	16	**Muzzafargarh**	0.7626	34
Okara	0.8621	17	**Jhang**	0.7594	35
Bhakkar	0.8579	18	**RY Khan**	0.7407	36

Source: Author's Calculation

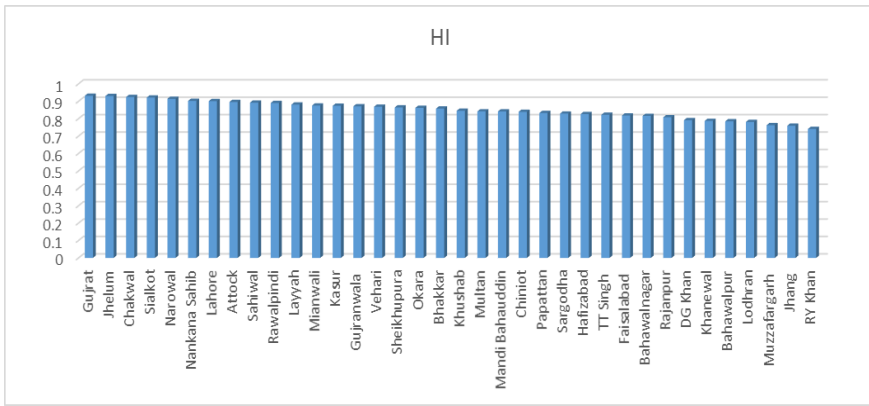

Fig: A-2

Table A-4
Ranking of the Districts based on INI

Districts	INI		Districts	INI	
	Value	RANK		Value	RANK
Rawalpindi	0.55853489	1	**Jhang**	0.49515457	19
Lahore	0.5538398	2	**Sialkot**	0.49457616	20
Faisalabad	0.53478619	3	**Sheikhupura**	0.49438714	21
Gujranwala	0.53387567	4	**Attock**	0.4927206	22
Multan	0.52958715	5	**Khanewal**	0.49105841	23
Chakwal	0.52863953	6	**Sahiwal**	0.48798948	24
Jhelum	0.52735641	7	**Mianwali**	0.4825482	25

Mandi Bahauddin	0.52513147	8	**Lodhran**	0.4788276	26
TT Singh	0.51673164	9	**Bahawalnagar**	0.47799734	27
Kasur	0.50876097	10	**Bahawalpur**	0.47667666	28
Nankana Sahib	0.50566009	11	**Khushab**	0.47590693	29
Chiniot	0.50557081	12	**Papattan**	0.47123424	30
Sargodha	0.50393957	13	**Bhakkar**	0.46411101	31
RY Khan	0.5017938	14	**Layyah**	0.46000933	32
Vehari	0.49818589	15	**Narowal**	0.45730868	33
Okara	0.49666204	16	**DG Khan**	0.45369679	34
Gujrat	0.49575937	17	**Muzzafargarh**	0.44651592	35
Hafizabad	0.49534263	18	**Rajanpur**	0.44576144	36

Source: Author's Calculation

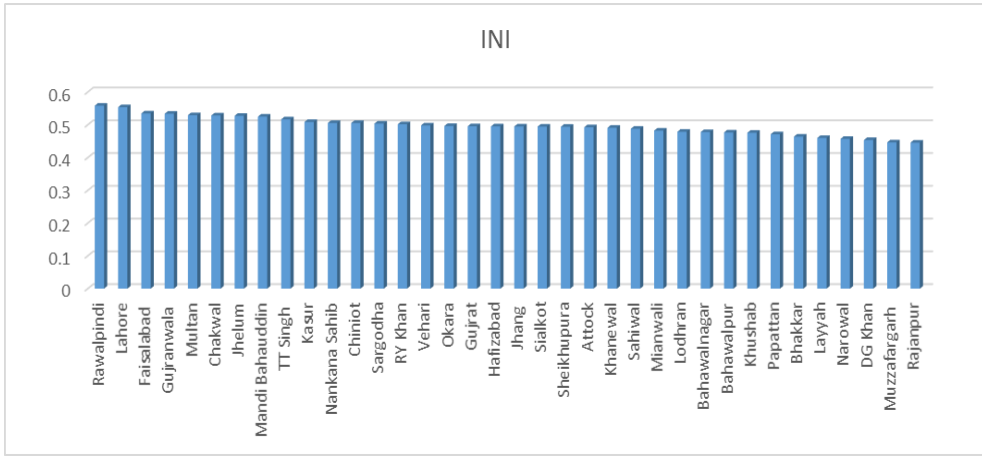

Fig: A-3