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**THE CHANGING PROFILE OF
REGIONAL INEQUALITY**

SOCIAL POLICY AND DEVELOPMENT CENTRE

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There is a growing concern, in developing and transition economies that spatial and regional inequality, of economic activity, incomes and social indicators, is on the increase. Regional inequality is a dimension of overall inequality, but it has added significance when spatial and regional divisions align with political and ethnic tensions to undermine social and political stability. Despite these important popular and policy concerns, surprisingly there is little systematic and coherent documentation of the facts of what has happened to spatial and regional inequality over the past twenty years. This paper is an attempt to meet this gap and provides changing scenarios of multi-dimensional inter-temporal spatial inequality and level of development in Pakistan during early 1980's and late 1990's.

1. INTRODUCTION

The literature on the measurement of regional inequality has been largely concerned with singly dimensioned indicators of economic status. Yet there are many situations in which there are several dimensions to inequality and where these are not readily reduced to a single index. Therefore, in welfare analysis the basic notion that welfare should be measured on the basis of as large a number of components or attributes as is relevant and feasible has enjoyed widespread support. Further, the multivariate approach to empirical welfare analysis is becoming more popular due to significant advance in both theoretical and measurement areas.

Earlier research on multivariate regional development in Pakistan demonstrated the existence of significant variations in the quality of life of people living in different parts of the country. Attempts have also been made to observe inter-temporal changing of development levels. Pasha et al (1990) observed changes in development rank ordering of districts of Pakistan and demonstrated marked changes in development ranking of a number of districts from the early 1970s to the early 1980s, especially among districts at the intermediate level of development.

The last two decades have witnessed significant institutional, demographic, economic and social changes which are likely to have major spatial consequences. Factors which may have contributed to increased regional inequality include IMF/World Bank structural adjustment programs, lesser role of the public sector in economic development, and lack of integrated planning and policy making at federal and provincial levels due to political instability.

Thus, the primary objective of this paper is to highlight inter-temporal provincial inequalities in various economic and social dimensions. Further, there is a need for a more recent development profile of districts based on new 1998 population and housing census data and

other information of late 90s (1998). Comparison of this new development ranking with that of early 80s (1981) will help in identifying the major changes, at district levels that have taken place in the profile of regional development in the country. The paper also identifies regional clusters and describes the sectoral inequality levels in the country.

The research is organized as follows: Section 2 discusses the various dimensions and attributes chosen for the analysis. Section 3 briefly describes the methodology of multi-dimensional inequality as well as methodology for indexing or ranking of districts, based on selected development indicators. Section 4 is reserved for the discussion of empirical findings related to inequality and development levels at province and district levels, while concluding remarks are furnished in Section 5.

2. DIMENSIONS OF INEQUALITY

Attributes or indicators that have been included in this research relate to measures of economic potential and achieved levels of income and wealth; mechanization and modernization of agriculture; housing quality and access to basic residential services, development of transport and communications; and availability of health and education facilities. A brief description of individual welfare attributes is given below.

2.1 Income and Wealth

Household income and wealth is the most discussed welfare attribute in the literature. Direct income data at provincial or district levels are not available; therefore various proxies are used to estimate the income and wealth position of a district.

For the rural economy, cash value of agricultural produce per rural person (CROPS) and livestock per rural capita (LIVESTOCK) are used. All major and minor crops are considered to estimate the district's cash value from agriculture. This indicator is based on the aggregation of

43 crops, including fruits and vegetables. Different types of livestock have been aggregated by assigning weights as recommended by the FAO (Pasha and Hassan, 1982) to reflect the capital value of various animals and poultry.

For the urban part of a district, per capita value added in large-scale manufacturing (MANUFACTURING) is used to proxy the level of urban income. Value added by the small-scale component could not be included due to lack of data. On the assumption that there may be a direct link between the number of bank branches in a district and the volume of bank deposits, number of bank branches per capita (BANKS) is used as a crude measure of the district's wealth. Per capita car ownership is also used to proxy the district's income and wealth in the urban areas.

2.2 Modernization of Agriculture

Modernization of agriculture is another area of development which has direct or indirect effects on the prosperity and standard of living of the rural population. To capture the process of mechanization in agriculture, tractors per 1000 acres of cropped area (TRACTORS) has been used in the study. The extent of the use of fertilizer, estimated as the consumption of fertilizer per 100 acres of cropped area (FERTILIZER) is also used as the indicator of modernization in agriculture. In addition, irrigated area per 100 acres of cropped area (IRRIGATION) is used to capture the access to canal irrigation systems and tube-wells.

2.3 Housing Quality and Housing Services

It is of interest to compare inequality in means and standards of living directly provided by government and those that are acquired by the household. It is argued that access of services provided publicly must have more equal distribution. Shelter is one of the basic needs, and housing conditions are one of the key determinants of the quality of life. To observe the inequality in housing facilities, three indicators are used viz., proportion of households using

electricity (ELECTRICITY), gas (GAS) and inside piped water connections (WATER). The quality of housing stock is represented by the proportion of houses with cemented outer walls (WALLS) and RCC/RBC roofing (ROOF). Rooms per persons (PERSONS) is used to proxy adequate housing in a district.

2.4 *Transport and Communications*

Three indicators have been included to portray the level of development of the transport and communication sector in a district. Roads and transportation network have a significant impact on socialization and modernization. Therefore, metalled road mileage (ROADS) per 100 square miles of geographical area of a district is included in the study. With regard to the availability of transport vehicles, a summary measure, viz., passenger load carrying capacity (PASSENGER) is included. Different vehicles are aggregated assigning weights recommended in Pasha and Hassan (1982). Number of telephone connections per 1000 persons (TELEPHONE) is also used in the study to observe the unequal distribution of this important indicator of the standard of living.

2.5 *Health*

Welfare and inequality, in the health sector, may be examined with a number of welfare indicators e.g. calories and protein intake, life expectancy at birth, infant mortality rates etc. However, availability of data has restricted the choice to only two indicators, viz., the number of hospital beds and number of doctors (DOCTORS) per 10,000 population.

2.6 *Education*

Both, stock and flow measures to represent the education level of a district's population are included in the study. The stock measure is the literacy rate (LITERATE) whereas enrollment rates with respect to population of relevant age at different levels are the flow measures. Gross

enrolment at primary level (PRIMARY), middle level (MIDDLE), higher secondary level (MATRIC), and at collage and degree level (TERTIARY) are considered as a proportion of population in the relevant age group (Jamal and Malik, 1988). To measure the extent of gender equality, female to male literacy ratio (FMLITERACY) is included.

2.7 Labor Force

The share of the industrial sector in the urban labor force (ILABOR) of a district is a key labor force indicator. This variable reflects the extent of employment absorption, especially in small-scale manufacturing. Further, female to male labor force ratio (FMLABOR) is also included to observe the correlation between changes in the role of women and level of development.

3. METHODOLOGY AND DATA SOURCES

No single attribute can be expected to provide complete representation of welfare. As Kolm (1977) suggested that greater the number of attributes considered, the better is the assumption of 'anonymity' and 'impartiality' in welfare analysis. Atkinson and Bourguignon (1982) and Maasomi (1986) also emphasized the need of a multi-dimensional approach to the analysis of welfare and inequality. Therefore, this research uses two approaches – multi-dimensional Gini Index and Factor Analysis for measuring inter-provincial and inter-district inequality. These are briefly described below.

3.1 Multi-dimensional Gini Index

Traditional Gini index is used to measure inequality in a singly welfare attribute such as income or per capita GNP. It is essentially a rank order weighted index with the weights being determined by the order position of the person or region in the ranking by the level of the attribute. An appealing characteristic of Gini is that it is a very direct measure of welfare and captures the differences between every pair in the distribution.

Following the approach adopted by Maasoumi (1989) and Hirschberg et al. (1991), the multivariate Gini index is computed as follows.

$$G = 1 + (1/n) - [(2/n) \sum r_i \rho_i]$$

where;

$$\begin{aligned} S_i &= X_i / \sum X_i && \text{(Share of a region in an attribute)} \\ \rho_i &= S_i / \sum S_i && \text{(Distribution of aggregate attributes)} \\ r_i &= \text{Rank of } \rho_i \end{aligned}$$

3.2 Factor Analysis

Another popular method for indexing multidimensional phenomena is the Factor Analysis (FA) technique (for detailed discussion, see Adelman and Morris, 1972). This technique reduces the number of relationships by grouping or clustering together all those variables which are highly correlated with each other into one factor or component. Thus, the FA model can be described as follows:

$$X_i = a_{i1}F_1 + a_{i2}F_2 + \dots + a_{ij}F_j$$

Where;

$$\begin{aligned} X_i &= \text{Indicator} \\ a_{ij} &= \text{Represents the proportion of the variation in } X_i \text{ which is} \\ &\quad \text{accounted for by the } j\text{th factor (factor loading)} \\ \sum a_{ij} &= \text{It is equivalent to the multiple regression coefficient in} \\ &\quad \text{regression analysis (communality)} \\ F_j &= \text{Represents the } j\text{th factor or component} \end{aligned}$$

Factor Analysis produces components in descending order of importance, that is, the first component explains the maximum amount of variation in the data, and the last component the minimum. It is often found that the first few components, called principal components, account

for a sizeable part of the variation and subsequent components contribute very little. Using factor loading (sum of the square of correlation coefficients) of these principal components, factor score for each region or geographic unit is computed as follows:

$$WFS_i = \sum [e_i * (\sum e_{ij} * Z_j)]$$

where;

WFS _i	=	Weighted Factor Score of <i>ith</i> unit
e _i	=	Factor Loading of <i>ith</i> Factor (weight assigned)
e _{ij}	=	Factor Loading of <i>ith</i> Factor and <i>jth</i> indicator
Z _j	=	Standardized value of <i>ith</i> indicator or attribute

3.3 Data Sources

As the primary objective of this research is to observe inter-temporal changes in inequality and development levels, exactly the same methodology is used for constructing indicators for early 1980s (Pasha et al, 1990) and for late 1990s. Diverse sources have been used for obtaining data on the indicators or attributes, mentioned earlier. For the early 1980s these include:

- Districts Census Report, 1981
- Pakistan Census of Agriculture, 1980
- Census of Manufacturing Industries, 1980
- Provincial Development Statistics, 1980-81
- Agriculture Statistics of Pakistan, 1980-81
- Banking Statistics, State Bank of Pakistan, 1982

Data for the late 1990s are obtained from the following documents:

- District Census Reports, 1998
- Provincial Census Reports, 1998
- Agriculture Statistics of Pakistan, 1998-99
- Provincial Development Statistics, ranging from 1998-99 to 1999-2000
- Crop Area production (by Districts), 1997-98
- District Profiles, Government of Balochistan, 1997
- Half-Decade Review, Bureau of Statistics, NWFP, 2000
- District-wise Socio-Economic Indicators of NWFP, 1999-2000
- Quick Look at Education Sector, Sindh Bureau of Statistics, 1998-99
- Health Profile of Sindh, Sindh Bureau of Statistics, 1998-99
- Census of Manufacturing Industries, 1995-96

Further, to fulfill the missing gaps or for updating various information, unpublished data are obtained from provincial bureaus of statistics, State Bank of Pakistan, Ministry of Agriculture, and Pakistan Medical and Dental Association.

For some districts of Punjab and Sindh, data on district-wise telephone connections were missing, therefore these numbers are estimated on the basis of provincial total connections and urban population shares. Similarly, district-wise doctors data was not available for the province of Punjab. These numbers are projected on the basis of changes in urban population during 1981 and 1998, provincial total doctors, and 1981 district-wise doctors data.

4. MULTI-DIMENSIONAL INEQUALITY AND DEVELOPMENT

As discussed in the section on methodology, two diverse approaches are used to estimate inter-provincial inequality and development level. The Gini Index is used to estimate inter-provincial inequality levels, while Factor Analysis is employed for indexing or ranking of districts on the basis of development indicators, discussed above.

4.1 Inter-Provincial Inequality

Based on the dimensions of inequality discussed, multidimensional Gini coefficients for 1981 and for 1998 are presented in **Table 1**. As of 1981, regional inequality appears to be the highest in Balochistan followed by NWFP and Sindh. It is the lowest in Punjab. The table also confirms that no change has occurred in the ranking of provinces by the late 1990s. However, except for the Punjab, inequality has increased in all provinces. The highest increase is observed in Balochistan. Overall, about 30 percent increase (0.39 to 0.50) in inequality is estimated during 1981-1998, as evident from the Gini coefficients for both periods.

TABLE 1		
OVERALL PROVINCIAL INEQUALITY		
	Multi-Dimensional Gini Coefficient	
	1981	1998
Pakistan	0.39	0.50
Punjab	0.21	0.19
Sindh	0.28	0.38
NWFP	0.37	0.51
Balochistan	0.50	0.74

It was believed that one of the major sources of inequality within each province is the difference in the magnitude of indicators between the district with the provincial capital and other districts. This difference is particularly large in Balochistan (between Quetta district and the rest of the province) and Sindh (between Karachi division and the rest of the province). **Table 2** encapsulates this phenomenon. The difference in inequality between two scenarios is sharper as of 1981 than for 1998. The Gini coefficient, for instance has decreased from 0.5 to 0.37 in the case of Balochistan. Similar phenomenon is observed in Sindh. However, despite increase in the number of districts and the consequent changes in district boundaries, the inequality coefficients (with and without capital) do not show sharp changes as of 1998. In two provinces, NWFP and Balochistan, inequality has slightly increased excluding districts with capital cities. This phenomenon indicates the existence of developing pockets other than provincial capital (for instance, Haripur and Abottabad in NWFP, and Sibi and Ziarat in Balochistan).

TABLE 2 OVERALL PROVINCIAL INEQUALITY [EXCLUDING DISTRICTS WITH CAPITAL CITIES]		
	Multi-Dimensional Gini Coefficient	
	1981	1998
Pakistan	0.35	0.49
Punjab	0.17	0.17
Sindh	0.20	0.36
NWFP	0.34	0.51
Balochistan	0.37	0.76

Table 3 and **Table 4** portray sectoral inequality coefficients. Few observations emerge. The inequality coefficients for Communication and Income sectors are relatively high throughout Pakistan. All provinces experienced a decline in inequality with respect to education facilities, and housing quality and services. This phenomenon indicates a relatively equitable distribution of public services during the period. Except for NWFP, a similar situation exists in the health sector. Inequality has decreased in the communication sector as well, except in NWFP, where it shows an upward trend. Equality with respect to modernization of agriculture has worsened during the period in Sindh and Balochistan.

TABLE 3 SECTORAL INEQUALITY – MULTI-DIMENSIONAL GINI COEFFICIENTS										
Sectors	Pakistan		Punjab		Sindh		NWFP		Balochistan	
	81	98	81	98	81	98	81	98	81	98
Agriculture	0.36	0.45	0.22	0.23	0.15	0.35	0.40	0.39	0.35	0.66
Communication	0.60	0.59	0.49	0.38	0.64	0.60	0.46	0.63	0.71	0.64
Education	0.36	0.22	0.21	0.15	0.20	0.13	0.22	0.24	0.42	0.22
Health	0.44	0.43	0.38	0.36	0.39	0.32	0.35	0.39	0.55	0.48
Housing	0.51	0.34	0.41	0.24	0.46	0.28	0.40	0.30	0.59	0.37
Income	0.40	0.52	0.18	0.28	0.23	0.27	0.46	0.51	0.66	0.72
Labor Force	0.33	0.34	0.12	0.24	0.22	0.22	0.40	0.29	0.32	0.37

TABLE 4 SECTORAL INEQUALITY – MULTI-DIMENSIONAL GINI COEFFICIENTS [EXCLUDING DISTRICTS WITH CAPITAL CITIES]										
	Pakistan		Punjab		Sindh		NWFP		Balochistan	
Sectors	81	98	81	98	81	98	81	98	81	98
Agriculture	0.37	0.40	0.22	0.23	0.15	0.30	0.35	0.39	0.37	0.47
Communication	0.49	0.56	0.35	0.37	0.51	0.57	0.40	0.61	0.60	0.52
Education	0.34	0.23	0.19	0.15	0.13	0.14	0.23	0.25	0.25	0.21
Health	0.33	0.39	0.30	0.29	0.28	0.31	0.27	0.35	0.33	0.35
Housing	0.42	0.32	0.34	0.22	0.30	0.22	0.36	0.29	0.34	0.28
Income	0.41	0.53	0.19	0.28	0.21	0.27	0.48	0.53	0.66	0.74
Labor Force	0.34	0.34	0.13	0.24	0.19	0.17	0.42	0.29	0.32	0.37

Thus, the sectoral profile indicates that inequality has increased due to unequal development of indicators related to agriculture, manufacturing, labor force, bank branches and number of cars. Overall inequality has remained stagnant regarding health facilities. An improvement in education and housing equalities is recorded during the period 1981-1998. A similar phenomenon is observed in inequality coefficients estimated after excluding districts with capital cities. Overall, the magnitudes of Gini are lower with the exception of ‘income and wealth’ sector.

4.2 Changing Profile of Development

Districts have been ranked according to the development score (Weighted Factor Score). Classifying districts in terms of high, medium, and low development on the basis of one-third of the national population in each of the categories provides a useful basis of analysis. The share of the four provinces in each development category is presented in **Table 5** for both periods.

TABLE – 5			
PROVINCIAL POPULATION SHARES IN DEVELOPMENT LEVELS			
[Percentage]			
	Development Level		
	High	Middle	Low
Late 90's [1998]			
Punjab	35	40	25
Sindh	42	21	37
NWFP	12	39	49
Balochistan	11	1	88
Early 80's [1981]			
Punjab	28	40	32
Sindh	45	25	30
NWFP	21	39	40
Balochistan	9	3	88

It is interesting to note the significant changes that have occurred in the provincial shares during the period of the study. As of 1981, 28 percent of the population (Lahore, Rawalpindi, Faisalabad and Gujranwala) lived in the relatively high development areas. The share of Punjab has increased to 35 percent as of 1998, and the districts that emerged in the high development category are Lahore, Rawalpindi, Sialkot, Jhelum, Gujranwala, Faisalabad, Gujrat and T.T. Singh. From Sindh province, Karachi, Hyderabad and Sukkur were in the top category in 1981, comprising 45 percent of the province population. In 1998, Sukkur is no longer in the high development category. Similarly, Peshawar (including Charsadda and Nowshera districts) was in the top quartile in 1981 and now Charsadda and Nowshera are in the middle level of development; resulting a decrease in the province share from 21 to 12 percent in the high development category.

At the bottom, the share of Punjab has decreased over time. In 1988, about 25 percent of the Punjab's population lived in the 'Low' development level as compared with 32 percent in

1988. The shares of Sindh and NWFP provinces have increased, while the share of Balochistan is stagnant – 88 percent of the population still lives in the lowest development level.

The current profile of backwardness is portrayed in **Table 6**. It is evident from the table that the situation is the worst in Balochistan province; 24 out of 26 districts are at the low level of development. About more than half of the districts of Sindh are in the lowest development level, while 15 out of 24 districts of NWFP are in this category. Further, about one-third of the districts of Punjab are also fall in the category of low development level.

TABLE 6				
DISTRIBUTION OF DISTRICTS IN DEVELOPMENT LEVELS – 1998				
[Numbers]				
	Development Level			Total
	High	Middle	Low	
Late 90's [1998]				
Punjab	8	16	10	34
Sindh	2	5	9	16
NWFP	1	8	15	24
Balochistan	1	1	24	26

5. CONCLUDING REMARKS

Spatial inequality is a dimension of overall inequality, but it has added significance when spatial and regional divisions align with political and ethnic tensions to undermine social and political stability. Despite important policy concerns, surprisingly, there is little systematic and coherent documentation of the facts of what has happened to spatial and regional inequality over the past twenty years. This paper is an attempt to provide changing scenarios of multi-dimensional inter-temporal spatial inequality and level of development in Pakistan during early 1980s and late 1990s. The paper also identifies current regional clusters and describes the latest profile of backwardness in the country.

The research indicates that overtime inequality has increased in three provinces namely Sindh, NWFP and Balochistan. As far as the province of Balochistan is concerned, there is evidence that it has continued to fall behind the rest of the country during the last 20 years. This, despite the substantially higher development allocations per capita, is perhaps due to leakages in the utilization of funds or higher unit costs of serving a sparsely populated area. The situation in Sindh is also discouraging. Except Karachi and Hyderabad, all districts are at low or middle levels of development. Districts of Punjab have generally moved up and improved their position in the development rank ordering. Out of 12 districts in the high development category, 8 districts are from Punjab. Similarly most of the districts of Punjab, which were in the lowest development level in 1981 have moved up. The situation in NWFP is not so disturbing and it seems that the province is acquiring the characteristics of an emerging economy.

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