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The Changing Profile of Regional Inequality

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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. It provides changing scenarios of multi-dimensional inter-temporal spatial inequality and level of development in Pakistan during early 1980s and late 1990s.

1. INTRODUCTION

The literature on the measurement of regional inequality has been largely concerned with single dimension indictors 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 on account of significant advances 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 the 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.

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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 the IMF/World Bank structural adjustment programmes, 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 the new 1998 Population and Housing Census data and other information of late 1990s (1998). A comparison of this new development ranking with that of early 1980s (1981) will help identify the major changes, at district level, 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 organised 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 the 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; mechanisation and modernisation 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 fruit and vegetables. Different types of livestock have been aggregated by assigning weights, as recommended by the FAO [Pasha and Hasan (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, the 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. Modernisation of Agriculture

Modernisation 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 mechanisation in agriculture, tractors per 1000 acres of cropped area (TRACTORS) has been used as a measure. The extent of the use of fertiliser, estimated as the consumption of fertiliser per 100 acres of cropped area (FERTILISER), is also used as the indicator of modernisation in agriculture. In addition, irrigated area per 100 acres of cropped area (IRRIGATION) is used to capture the access to canal irrigation systems and tubewells.

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 reinforced cement concrete/reinforced brick concrete 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 networks have a significant impact on socialisation and modernisation. 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 Hasan (1982). The 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 the number of doctors (DOCTORS) per 10,000 population.

2.6. Education

Both stock and flow measures are included in the study to represent the educational level of a district's population. The stock measure is the literacy rate (LITERATE) whereas enrolment 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 college 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. Labour Force

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

3. METHODOLOGY AND DATA SOURCES

No single attribute can be expected to provide a complete representation of welfare. As Kolm (1977) suggests, the greater the number of attributes considered, the better is the assumption of 'anonymity' and 'impartiality' in welfare analysis. Atkinson and Bourguignon (1982) and Maasoumi (1986) also emphasise 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.

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

where;

$S_i = X_i / \Sigma X_i$ (Share of a region in an attribute)
$\rho_i = S_i / \Sigma\ S_i$ (Distribution of aggregate attributes)
r_i = Rank of ρ_i

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:

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

where;

X_i = Indicator
a_{ij} = Represents the proportion of the variation in X_i which is accounted for by the jth factor (factor loading)
Σa_{ij} = It is equivalent to the multiple regression coefficient in regression analysis (communality)
F_j = Represents the jth factor or component.

Factor Analysis produces components in a 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 geographical unit is computed as follows:

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

where;

WFS_i = Weighted Factor Score of *ith* unit
e_i = Factor Loading of *ith* Factor (weight assigned)

e_{ij} = Factor Loading of *ith* Factor and *jth* indicator
Z_j = Standardised value of *ith* 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, as mentioned earlier. For the early 1980s these include:

District 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 Report, 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 District), 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 fulfil the missing gaps or to update various information, unpublished data are obtained from provincial bureaus of statistics, the State Bank of Pakistan, the Ministry of Agriculture, and the 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 were 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 the 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 the 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 is evident from the Gini coefficients for both periods.

It was believed that one of the major sources of inequality within each province was 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. A similar phenomenon is observed in Sindh. However, despite the 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, the NWFP and Balochistan, inequality has slightly increased, excluding districts with capital cities. This phenomenon indicates the existence of developing pockets other than the provincial capital (for instance, Haripur and Abottabad in the NWFP, and Sibi and Ziarat in Balochistan).

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

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 educational facilities, and housing quality and services. This phenomenon indicates a relatively equitable distribution of public services during the period. Except for the NWFP, a similar situation exists in the health sector. Inequality has decreased in the communication sector as well, except in the NWFP, where it shows an upward trend. Equality with respect to modernisation of agriculture has worsened during the period in Sindh and Balochistan.

Thus, the sectoral profile indicates that inequality has increased due to unequal development of indicators related to agriculture, manufacturing, labour force, bank branches, and the 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.

Table 3

Sectoral Inequality—Multi-dimensional Gini Coefficients

	Pakistan		Punjab		Sindh		NWFP		Balochistan	
Sectors	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
Labour 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
Labour Force	0.34	0.34	0.13	0.24	0.19	0.17	0.42	0.29	0.32	0.37

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.

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 Toba Tek Singh.

Table 5

Provincial Population Shares in Development Levels (Percentage)

	Development Level		
	High	Middle	Low
Late 1990s (1998)			
Punjab	35	40	25
Sindh	42	21	37
NWFP	12	39	49
Balochistan	11	1	88
Early 1980s (1981)			
Punjab	28	40	32
Sindh	45	25	30
NWFP	21	39	40
Balochistan	9	3	88

From Sindh province, Karachi, Hyderabad, and Sukkur were in the top category in 1981, comprising 45 percent of the province's 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 in a decrease in the province's 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 Punjab's population lived in the 'Low' development level as compared with 32 percent in 1988. The shares of Sindh and the NWFP provinces have increased, while the share of Balochistan is stagnant—88 percent of the population still lives at 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 at the lowest development level, while 15 out of 24 districts of the NWFP are in this category. Further, about one-third of the districts of Punjab also fall in the category of low development level.

Table 6

Distribution of Districts in Development Levels—1998 (Numbers)

	Development Level			
	High	Middle	Low	Total
Late 1990s (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 an 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 the 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 over time inequality has increased in three provinces, namely, Sindh, the NWFP, and the Balochistan. So 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 utilisation 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 at the lowest development level in 1981 have moved up. The situation in the NWFP in not so disturbing, and it seems that the province is acquiring the characteristics of an emerging economy.

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