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An Analysis of District Level Earnings Inequalities in Pakistan

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Abstract

Using the latest household survey data for Pakistan, this study analyzes the role of education in determining the extent of earning inequality. Gini indices of individuals' earnings are computed for each district and the resulting district level indices are regressed against the district level indicators of earners' education along with a set of other personal characteristics of earners and district attributes as control variables. The main finding of the study is that earning inequality is higher among the districts with higher levels of education and that higher degree of inequality in educational attainment is a significant factor contributing to earning inequality. The study concludes that provision of better quality education is important to raise living standards, while universal access to education is crucial to ensure equitable distribution of national income.

Key Words: Earnings, inequalities, education.

1. Introduction

Despite substantial increase in per capita income over the past 50 years, it is often claimed, both in academics and policy circles that Pakistan continues to face high incidence of poverty. While per capita income has increased by more than 250 percent between the years 1960 and 2010, headcount index of poverty still shows that more than 20 percent households remain below poverty line. The persistent incidence of poverty often instigates controversies regarding the objective reporting of poverty figures in official documents. Measures of household income inequality, on the other

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hand, is not subjected to similar controversy, probably because, income inequality does not provide direct information on the sensitive subject of poverty. The data show that the Gini index of inequality in Pakistan has remained almost persistently high, fluctuating between 0.33 and 0.42. This obviously means that not all segments of society could share the benefits of economic growth on equitable basis.

Analyzing the correlates of poverty or income inequality is not an easy task because of limited data availability. Poverty figures are questionable due to controversies on the definitions of poverty line, which can vary from year to year. Furthermore, time series of the relevant statistics are incomplete because the statistics are computed only for the survey years. However, the practice of constructing district level data recently adopted in Pakistan has made it possible to generate cross-section data at district level and then analyze correlates of poverty or income distribution.

In the light of the above observations and given data availability, the present study attempts to analyze the factors that can be attributed to differences in earning inequality using district as the unit of analysis. This area is quite unexplored in Pakistan, where only few studies have been conducted on the measurement and determinants of earning inequality in Pakistan [see, for example Nasir and Riaz (1998), Idrees (2007) and Athtar & Sadiq (2008)].[1] These studies have examined the earning differentials at Pakistan level, rural-urban division or at most incorporated the provincial divisions. The literature does not, however, provide sufficient insight into factors contributing to earning differentials. The district-level analysis to be undertaken here is expected to yield relatively better explanation of earning differentials.

Administratively each province of Pakistan is divided into districts that constitute third level of governance structure. There is substantial diversity

[1] However, quite a few studies can be found on the empirical analysis of household income or consumption inequality, among which Haq (1964), Bergan (1967), Khandker (1973), Azfar (1973), Naseem (1973), Alauddin (1975), Ayub (1977), Nasir (1984), Kurijk*et al.* (1985), Jehle (1990), Adams (1993), Jafri*et al.* (1995), Iqbal*et al.* (1999), Ahmad (2000), Jamal (2003), Anwar (2003), Idrees (2007) and Idrees and Ahmad (2010) are significant.

across different districts from economic, cultural and even social points of view. For example, average monthly earnings in the districts like Islamabad, Karachi, Lahore, Gujranwala, Faisalabad, Rawalpindi and Peshawar are more than twice the average monthly earnings in relatively poor districts like Muzaffargarh, LakkiMarwat, MirpurKhas, UmerKot and Khanewal. Apart from the inter-district earning differentials, it is also important to analyze intra-district differentials, which in certain districts are quite alarming. For example, in the district Rahim Yar Khan top 10 percent earners account for more than 52 percent of the total earnings. On the other hand, district UmerKot has least earning inequalities where the top 10 percent earners account for around 21 percent of the total earnings.[2]

As a first step, the study estimates Gini Coefficients to measure earning inequality within each district of Pakistan. At the second step the resulting cross section of earning inequalities is regressed on various potential attributes of earning inequality. These attributes include earners' personal characteristics and regional variables.

The paper is divided into four sections. Section 2 describes the analytical framework and methodological issues. Section 3 presents the empirical results. Finally, section 4 concludes the study.

2. Framework of Analysis

This section covers the methodological issues like data selection, choice of earning unit, selection of inequality measure, construction of variables and econometric models.

3. Data

3.1 Data

The study uses micro level data from *Household Integrated Economic*

[2]The calculations are based on *Household Integrated Economic Survey* (*HIES*), 2010-11.

Survey (*HIES*) for the year 2010-11, which is the latest available issue. *HIES* is conducted by The Federal Bureau of Statistics, Government of Pakistan. This is a country-wide survey based on 16,341 households covering detailed information of almost 110,000 individuals including more than 28,000 employed persons.

The unit of analysis is an employed earner. In our data set almost 20% of the earners are categorized as unpaid family workers. We have not considered such employed persons in our analysis because although apparently their earnings are zero but their efforts are reflected in the earnings of household head or other household member with whom they work. So inclusion of unpaid family workers will create upward bias in the measurement of inequalities as their recorded earnings are zero, while in reality they also contribute to household earnings.

Since earning inequality is to be estimated for each district, all the 132 districts of Pakistan form the population of districts. However, the *Universe* in *HIES* (2010-11) does not cover any of the districts in Gilgit-Baltistan, Federally Administrated Tribal Areas (FATA), Azad Jammu and Kashmir and military restricted areas. There are 21 districts/agencies in these excluded areas. Moreover, the data for Baluchistan are available with the code of administrative divisions only, which are six in number. Therefore, to include the province of Baluchistan in the analysis, the administrative divisions are considered in place of districts. Although some information is lost due to aggregation, it may be noted that due to scattered population in Baluchistan the sample size in each of its divisions remain comparable to most of the small and medium sized districts of the other provinces. Hence, the study is based on all districts of Punjab, Sindh and Khyber Pakhtunkhwa, Islamabad district (the federal capital) and all the administrative divisions of Baluchistan. This makes a restricted universe of 90 regions (84 districts and 6 divisions), which account for more than 90 percent of the total population.

3.2 Measurement of Earning Inequality

The first obvious step for the measurement of earning inequality is the

selection of inequality measure. Although several alternative measures of inequality are available in literature, Gini coefficient, attributed to Gini (1912) is still considered the most popular measure due to its theoretical appeal and easy interpretation. Therefore the study employs Gini coefficient to measure earning inequality.[3] It is defined as the ratio of the area between the line of absolute equality and the Lorenz curve to the total area below the line of absolute equality. Rao (1969) has given the following formula to calculate Gini coefficient:

$$G = \sum_{i=1}^{n-1} \left(P_i q_{i+1} - P_{i+1} q_i \right)$$

where P_i is the cumulative population share and q_i is the cumulative earning share corresponding to the income unit i when all earners are arranged in ascending order of earnings. Gini coefficient lies between zero and one; zero representing perfect equality and one representing perfect inequality.

3.3 Determinants of Earning Inequality

The next step is to investigate the role of different factors in earning inequalities. In this regard we consider the following variables.

Earner's Education

Education of an earner is one of the crucial factors in determining his/her earnings. Education increases the productive capacity of an earner and hence his/her earning potential. In this respect education can play a key role in the determination of earning inequality. Education is treated as a qualitative variable because an additional year of education has varying effect on earning potential depending on the stage of education. For example the effect

[3]Gini coefficient satisfies Pigou-Dalton transfer principle, income scale independence, population principle and symmetric principle. It also has defined and interpretable lower and upper limits.

of 2 years of schooling rather than none is expected to be negligible, while the effect of 16 years of schooling (Master's degree) rather than 14 (Bachelor's degree) would be substantial. Thus, education of an earner is measured as a categorical variable consisting of four education groups: less than 5 years of education, 5 or more but less than 10 years of education, 10 or more but less than 14 years of education and 14 or more years of education. The proportion of the sampled earners in a district falling into each educational category is considered as an explanatory variable in the regression of earning inequality on its potential determinants. For the obvious reason of singularity problem, one of the educational categories has to be excluded as the reference category and we select the first category for this purpose.

If the earning differentials vary with the level of education, it would mean that it is the unequal levels of education that cause earning inequality. Therefore, the role of education on earning differentials can also be analyzed by estimating the effect of educational inequality on earning inequality. For this purpose, we compute concentration ratio of education level, arranging the education level in the ascending order of earnings. Obviously, for this calculation, education has to be measured in terms of the completed years of schooling. This part of the analysis will indicate how inequality in education is reflected in earnings inequalities.

Earner's Age

Age is another key determinant of the earnings of an individual. Age affects the efficiency and skill of an earner. It is generally believed that middle-aged earners have higher earnings as compared to young earners, having less experience, and the old ones, having less physical and mental efficiency. Like education the role of age is also analyzed by classifying age into four groups: 16-29 years, 30-44 years, 45-59 years and 60 years and above. Taking the first age group as the reference category, the proportion of the sampled earners in a district falling into each of the remaining three age

category is considered as an explanatory variables in the regression equation.

As in the case of education, if the effect of age groups on earning inequality is found to be significantly different from zero, the age variables will be replaced by the concentration ratio of age in the regression equation. The coefficient of the concentration ratio of age will indicate how age distribution is reflected in earning inequalities.

Earner's Gender

Gender of the earner is another potential determinant of earning differentials. There are certain professions where almost no women can be found such as construction work, cab driving, etc. Likewise, some professions are mostly adopted by women such as health workers, bank tellers, etc. Earning inequality can vary with the proportion of females in the labor force due to earning differential between men and women and the different degrees of earning differentials within each gender category. Therefore, to analyze this potential source of earning inequality, the proportion of female earners in the district is considered as a determining variable.

Level of Earning

To explore whether the degree of earnings inequality is higher or lower among the districts where average earnings are higher, we include natural log of earnings as an additional variable determining earnings inequality. The results in this respect will indicate how the extent of earning varies over various segments of earning profile.

District Size

Larger cities in terms of population are considered to offer more and better employment opportunities than the smaller cities. Thus, minimum

wages paid in larger cities are expected to be higher. Such expectations are likely to attract labor force to larger cities. However, only the selected few are able to secure well-paying jobs, while the rest may be relegated to informal labor market with much lower wages. All-in-all it is not possible to anticipate the effect of city size on earning differentials and it may better be left as an empirical question. In any case, to quantify the market size effect, the population of each district normalized by the total population of all the districts is considered as a potential determinant of earnings inequality.

Province of Residence

There are substantial differences among the four provinces of Pakistan in terms of geography, population density, rural-urban mix and economic structure. To capture the effect of province on earning inequality three provincial dummies are used for the provinces of Sindh, Khyber Pakhtunkhwa and Baluchistan, taking Punjab as the reference province.

3.4 Econometric Models

In the light of above discussion, the following variables are constructed for econometric analysis.

$GINI_i$ = Gini coefficient of earning inequality in district i

EDU_i^j = Proportion of earners falling in education category j (= 1, 2, 3, 4) in district i,

CR_i^{EDU} = Concentration ratio of the education of earners in district i,

AGE_i^j = Proportion of earners falling in age group j (= 1, 2, 3, 4) in district i,

CR_i^{AGE} = Concentration ratio of the age of earners in district i,

FEM_i = Proportion of female earners in district i,

$EARN_i$ = Natural log of average earning in district i,

$SIZE_i$ = District size, measured by the population share of district i,

PP_i = Dummy variable, one if district i lies in the province of Punjab,

PS_i = Dummy variable, one if district i lies in the Province of Sindh,

PK_i = Dummy variable, one if district i lies in theprovince of Khyber Pakhtunkhwa,

PB_i = Dummy variable, one if district i lies in the province of Baluchistan.

As explained earlier, education and age of earners are considered in two alternative ways; by dividing earners into different education and age categories and by calculating concentration ratios of education and age. The two corresponding econometric models are given as below.

$$GINI_i = \alpha_1 + \sum_{j=2}^{4} \alpha_j EDU_i^j + \sum_{j=2}^{4} \beta_j AGE_i^j + \delta_1 FEM_i + \delta_2 SIZE_i + \delta_3 PS_i + \delta_4 PK_i + \delta_5 PB_i + U_i \quad (1)$$

$$GINI_i = \alpha + \beta\ CR_i^{EDU} + \delta\ CR_i^{AGE} + \phi\ FEM_i + \gamma\ SIZE_i + \lambda\ PS_i + \pi\ PK_i + \theta\ PB_i + V_i \quad (2)$$

4. Results and Discussion

To begin with, Gini indices of earnings inequality are computed for each district. The results are reported in Table 1, wherein districts are classified into three categories with respect to the extent of earnings inequality. It is apparent from the results that there are substantial variations in earnings inequalities across districts. The lowest degree of earnings inequality is observed in some less developed districts in Baluchistan and Rural Sindh, Jhelum being an exception. On the other extreme, the highest degree of earning inequality is found mostly in South, South Punjab and Central Punjab.

For the province wise distribution of earnings inequality, the three categories of districts with respect to the level of earnings inequality are further classified into provinces. The results are reported in Table 2. Chi-square statistic computed for the independence between the level of inequality and province is highly significant, indicating that the extent of earning inequality varies significantly across the four provinces. The results further show that the highest degree of earning inequality prevails in Punjab, while the lowest degree of inequality is found in Baluchistan and Sindh. Notably 90 percent of the districts of Punjab lie in the category of 'highest inequality' whereas all the six divisions of Baluchistan lie in the category of 'lowest inequality'.

Turning now to the econometric results, both the regression equations (1) and (2) were initially estimated by OLS technique in the form specified above. Standard Wald tests on significance of the individual regression coefficients and equality of similar parameters resulted in a slightly restricted final specification. The parameter estimates under OLS technique for the finally selected equations are presented in Table 3.

Table 1
Earning Inequality by Districts

Districts with Highest Inequality		Districts with Moderate Inequality		District with Lowest Inequality	
District	Gini Coefficient	District	Gini Coefficient	District	Gini Coefficient
UmerKot	0.273	Narowal	0.373	D.G. Khan	0.457
Kalat	0.277	Bonair	0.374	Mandi Bahauddin	0.458
Jamshoro	0.287	Charsadda	0.377	Peshawar	0.464
Jhelum	0.292	Khushab	0.377	Karachi	0.469
Nasirabad	0.299	Tando M. Khan	0.381	Tobatek Singh	0.475
Sibbi	0.299	Mansehra	0.381	Rawalpindi	0.477
Mekran	0.304	Larkana	0.383	Lodhran	0.480
Zhob	0.305	Jaccoabad	0.383	Rajanpur	0.481
Malakand	0.308	Mianwali	0.385	Islamabad	0.482
Kohistan	0.309	Mardan	0.389	Faisalabad	0.491
TharParker	0.310	Karak	0.391	Vehari	0.492
Hangu	0.310	Attock	0.393	Hafizabad	0.492
Quetta	0.315	Lower Dir	0.396	Dear Ismail Khan	0.494
Kohat	0.328	Tank	0.399	Nankana Sahab	0.500
Nowshera	0.334	Swat	0.400	Chiniot	0.501
TandoAllahYar	0.335	Abbotabad	0.401	Sargodha	0.506
Kashmore	0.341	Haripur	0.403	Pak Pattan	0.508
Badin	0.344	Hyderabad	0.409	Sahiwal	0.516
Dadu	0.345	Sialkot	0.411	Layyah	0.524
Nawab Shah	0.346	Ghotki	0.412	Multan	0.524
Matiari	0.347	Shangla	0.414	Muzzafargarh	0.526
Nowshero Feroze	0.350	Chakwal	0.416	Jhang	0.528
Mirpur Khas	0.351	Shikarpur	0.421	Gujranwala	0.537
Chitral	0.352	Lakki Marwat	0.426	Okara	0.544
Gujrat	0.355	Bannu	0.431	Lahore	0.553
Upper Dir	0.357	Khairpur	0.432	Khanewal	0.558
Batgram	0.359	Sukkhur	0.434	Kasur	0.583
Sanghar	0.366	Sheikhupura	0.439	Bhawalpur	0.593
Thatta	0.369	Bhakkar	0.452	Bahawal Nagar	0.615
ShahdadKot	0.371	Swabi	0.453	RahimYarKhan	0.669

Table 2
Bivariate Distribution of Districts by earning Inequality and Province

Provinces	Levels of Inequality			
	Highest inequality	Moderate inequality	Lowest inequality	Row Totals
Punjab	27	8	2	37
Sindh	1	8	14	23
KPK	2	14	8	24
Baluchistan	0	0	6	6
Column Totals	30	30	30	
Chi-Square	56.67*			

Note: The federal capital, Islamabad, is included in Punjab. The Chi-square statistic is significantly different from zero at 1% level.

The results show that overall significance of the regression results as indicated by the values of R-square and F-statistic indicate that the proposed models fit quite well on the given data. The application of White's test indicates absence of significant heteroscedasticity in the regression residuals of both the equations. All the regression coefficients have signs and magnitudes that are consistent with economic theory or are at least plausible in the given empirical context. Furthermore, almost all the regression coefficients are statistically significant.

The results show that earnings inequality is higher among the districts with higher average levels of education. For example, as the proportion of earners with primary education increases (while the proportion of base category, illiterate, decreases) by one percentage point, the Gini index of earning inequality increases by 0.221 percentage points. Likewise, the earning inequality also increases, though by a smaller margin, as the proportion of earners with secondary or higher education increases (while the proportion of base category, illiterate, decreases). This result can be explained as follows. Education provides a platform for securing certain

Table 3
Regression Results for Earning Inequality Equations

Variable	Description	Equation (1)	Equation (2)
C	Intercept	0.232	-0.07
		(0.50)	(-0.29)
EDU_i^j	Proportion of earners with primary education	0.221	
		(2.95*)	
$EDU_i^3 + EDU_i^4$	Proportion of earners with secondary & higher education	0.182	
		(2.04**)	
CR_i^{EDU}	Concentration ratio of years of education		0.185
			(3.5*)
AGE_i^2	Proportion of earners aged 16 to 29	-0.623	
		(-1.53)	
AGE_i^3	Proportion of earners aged 30 to 44	-0.934	
		(-2.25**)	
AGE_i^4	Proportion of earners aged 45 to 59	(-0.844)	
		(-1.98**)	
CR_i^{AGE}	Concentration ratio of years of education		0.636
			(3.09*)
FEM_i	Proportion of female earners	0.422	0.311
		(4.15*)	(3.05*)
$EARN_i$	Monthly wage earnings	0.091	0.045
		(3.34*)	(1.71***)
$SIZE_i$	Population share of the district	1.105	1.556
		(2.89*)	(3.51*)
PS_i	Provincial dummy for Sindh	-0.086	(-0.106)
		(-4.64*)	(-6.87*)
PK_i	Provincial dummy for Khyber Pakhtunkhwa	-0.051	-0.043
		(-2.62*)	(-2.83*)
PB_i		-0.139	-0.151
		(-5.48*)	(-8.94*)
R-squared		0.801	0.736
F-statistic		28.61*	28.19*

Note: The t-statistics are computed using White's Heteroskedasticity consistent standard errors. The statistics significant at 1%, 5% and 10% levels are indicated by *, ** and *** respectively.

categories of jobs in which fixed wages are paid and for which literacy is the basic requirement. Thus, a sizable number of earners with some level of education are expected to be engaged with more-or-less similar wages, thereby resulting in lower level of inequality. On the other hand, earnings of illiterate earners depend mostly on personal characteristics, like hard work

and intelligence, which can vary greatly across earners. Thus, the absence of education as an equalizing factor results in higher degree of earning inequality among these workers.

Since the earning differentials are found to vary with the level of education, it means that it is the unequal level of education that causes earning inequality. Thus, as explained earlier, the role of education on earning differentials is also analyzed through equation (2) to estimate the effect of educational inequality on earning inequality. The regression results in the last column Table 3 show that in response to, say,10 percentage point increases in concentration ratio of education years, Gini index of earnings increases on average by 1.85 percentage points.

Age of the earners is another variable that is found to have significant relationship with earning inequality. The results show that the earning inequality is relatively lower in those districts in which the proportion of older earners is higher, especially in the categories of 30 to 44 years and 45 year and above. Thus, the earning differentials at early ages tend to decline with experience. A possible interpretation is that the reward to experience is on average relatively less unequal as compared to the earnings at the beginning of jobs. Another interpretation is that the earners who entered in earning activities a few decades in the past did not face as diversified earning potentials as faced by the younger earners. This may be the case with increased access to global markets and addition of new professions where wages vary much more on the basis of productivity.

The role of age differentials in determining the earning differentials is also verified with the significant positive regression coefficient of the concentration ratio of age, which shows that in response to 10 percentage point increase in the concentration ratio of age the Gini index of earning inequality increases by as much as 6.36 percentage points. This effect is quite sizable, indicating that age differentials are the major cause of earning differentials.

The next variable under consideration is the gender composition of

earners. The results indicate that earning inequality is higher among female earners. In particular, the districts where the proportion of female earners is higher by 10 percentage points, the Gini index of earning inequality is higher by 0.91 and 0.45 percentage points according to the estimates of equation (1) and (2) respectively and the relationship is quite significant in the first equation and marginally significant in the second equation. It may be noted, however, that despite somewhat significant relationship between gender and earning inequality, the magnitude of the relationship is not much sizable. In any case, the higher degree of earning inequality indicates relatively less competitive labor market for female workers.

The table shows that earning inequality significantly increases with the average earnings of the district. For example, 10 percentage points increase in average earnings across districts results in 0.9 and 0.45 percentage points increase in Gini index of earning inequality according to the estimates of equations (1) and (2) respectively. Thus, the earning differentials are found to be higher at upper tail of earnings distribution as compared to the lower tail.

This completes the discussion on the role of personal characteristics of earners in determining earning differentials. We now turn to aggregate attributes of districts. First, the degree of earning inequality is found to be positively associated with the size of district in terms of its population share. For example, on average a district with one percentage point higher share in population is expected to have 1.105 and 1.556 percentage points higher values of Gini index of earning inequality according to the estimates of equations (1) and (2) respectively and the relationship is statistically significant in both the cases.

Finally, the regression results show that the extent of earning inequality is not the same across the four provinces. Compared to the province of Punjab, the extent of earning inequality is significantly lower in the other three provinces. The magnitudes of regression coefficients show that earning inequality is the highest in Punjab, followed by Khyber Pakhtunkhwa and Sindh, while Baluchistan has the lowest degree of inequality. The Gini index of earning inequality in Baluchistan is estimated to be lower than that in

Punjab by 13.9 percentage points. This result has the same interpretation as of the district size. Earning opportunities available in smaller provinces are not as wide and diverse as available in the large province, thus resulting in relatively less unequal distribution of earnings in the smaller provinces.

5. Concluding Remarks

Using the latest household survey data for Pakistan from *Household Integrated Economic Survey* (*HIES*) 2010-11, this study analyzes the role of education in determining the extent of earning inequality. Gini indices of individuals' earnings are computed for each district and the resulting district level indices are regressed against district level indicators of earners' education along with a set of other personal characteristics of earners and district attributes as control variables. The main finding of the study is that earning inequality is higher among the districts with higher levels of education and high degree of inequality in educational attainment is a significant factor contributing to earning inequality.

The results further show that earning inequality is lower in the districts where the average age of earners is relatively higher and age differentials contribute significantly to earning differentials. Furthermore, the study also analyzes the role of gender composition of earners and finds that earning inequality is relatively higher among the districts where the proportion of female earners is higher. The study also finds that the earning differentials are relatively higher at upper tail of earnings distribution as compared to the lower tail.

Another finding of the study is that the extent of earnings inequality is lower in smaller districts and in the districts located in smaller provinces. Among the one third districts with the highest degree of earnings inequality, 90 percent belong to Punjab and none belongs to Baluchistan. On the other hand, all the six regions of Baluchistan considered in the analysis belong to the category of one third provinces with the lowest degree of earnings inequality.

The study concludes that the provision of better quality education is important to raise living standards, while universal access to education is crucial to reduce earnings differentials and, hence, to ensure equitable distribution of national income. Another conclusion is that specific efforts are needed to reduce earning inequality in larger cities, especially considering that the housing and other costs of living are expected to be higher in large cities. These efforts may include better access to educational and health facilities and establishment of welfare center for provision of shelter and meals.

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