EDUCATIONAL EXPANSION AND EDUCATIONAL INEQUALITY: PANEL DATA EVIDENCE FROM PAKISTAN

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ABSTRACT- This study investigates the relationship of educational expansion and educational inequality in Pakistan using panel data of 99 district. The study verifies the presence of inverted U-shaped relation of mean and dispersion of education that is known as Education Kuznets Curve in the literature. Findings of the study validate the inverted U-shaped relationship between educational inequality and educational expansion using standard deviation as measure of educational inequality.Education inequality rises at first and after a threshold it start declining. This threshold lies at matric level of education for polled data while it varies between matric and inter level of education if separate model is estimated for each year.

Keyword: Education, Educational Inequality, Inequality, Kuznets curve

I.   INTRODUCTION:

Education is anessential element for economic development and civilized society. As perceived by human capital theory education uplift productivity and human capital of individuals that in turn led to better employment and earnings opportunities for individuals (Mincer, 1974; Becker, 1962).
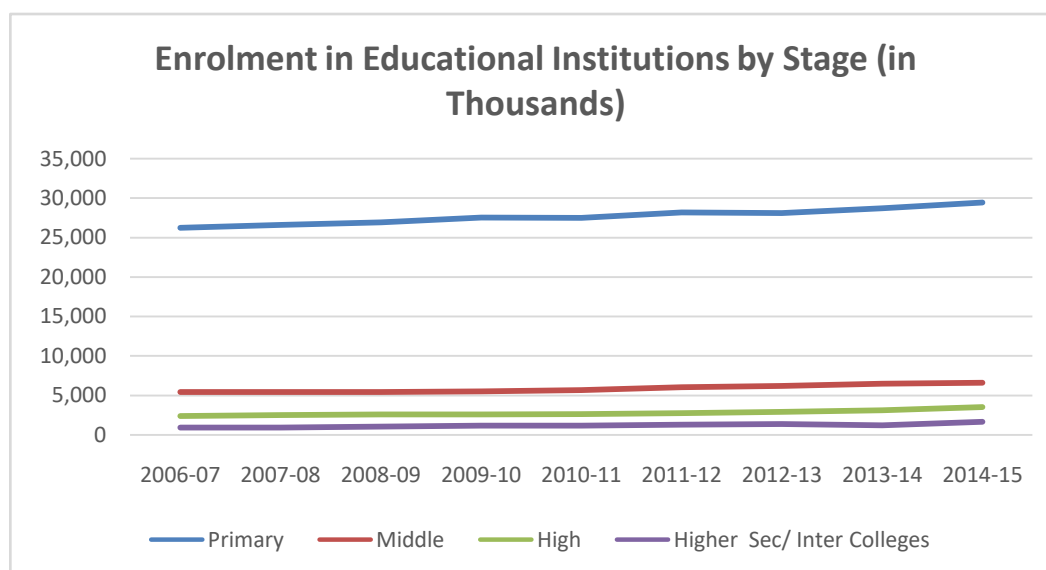

Figure 1 Enrolment in Educational Institutions by Stage

Source: PES 2016-17

However, expansion of educational opportunity cannot achieve desired objectives without fair distribution of equal access to education.As Fields (1980) pointed out thatregardless of the rapid educational expansion in developing countriesreduction in income inequality is not matching that pace.Therefore, distributional aspect of education should also be considered along with its expansion.Its significance can be accessed by the fact that SDG-4 that is "quality education"also focus on equitable access to education along with educational expansion. Pakistan is also signatory of these goals and devoted to improve education conditions in Pakistan as plannedby SDGs. As it can be seen in Figure

1,within the time period of theanalysis an improvement in expansion of educationis observed particularly at primary level in Pakistan.

There are considerable differences in education attainment across and within districts in Pakistan due to difference in access to education. For instance, see Figure 2 which shows disparity in the number of schools in the districts of Pakistan based on recent Alif Ailaan 2016 data. Here bar graph clearly shows that number of schools is unevenly distributed among districts. Educational access imbalance leads to educational heterogeneity.
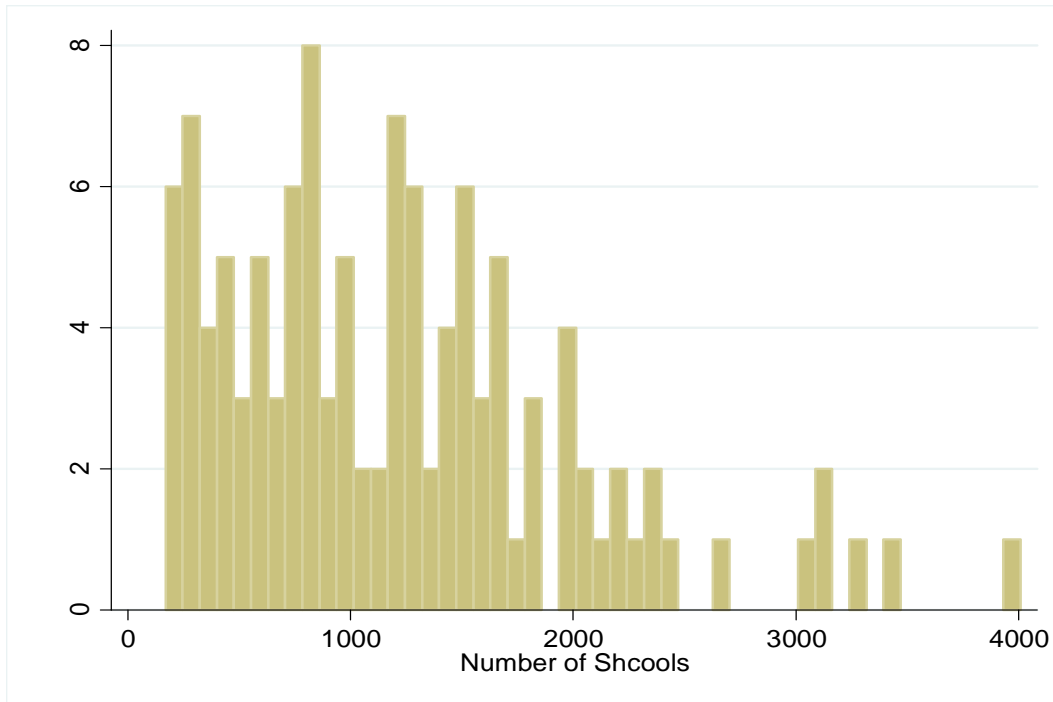

Figure 2: Distribution of the Number of School in 116 Districts of Pakistan

Source: Based on Alif Ailaan 2016

Major trend in empirical literaturefocused on expansion of education rather than distributional aspect of educationbefore the seminal study of Ram (1990). Inequality in education was not analyzed extensively as inequality in income before 90s. Ram (1990) traced Kuznets curve between educational expansion and educational inequality by using cross section data. Results reveals educational inequality responds to educational expansion in a way as income inequality respond to income growth. As the mean level of education increases inequality of education increases and then declines in later phases of educational expansion. Hereafter, development in the empirical literature can categories in subsequent strands. First strand of literature mainly focused on relationship between educational expansion and educational inequality [Park, 1996; Thomas, Wang, Fan, 2001; De Gregorio and Lee, 2002; Hertz, Jayasundera, Piraino, Selcuk, Smith, and Verashchagina, 2008; Morrison and Murtin, 2010] and explored the underlying dimension of this relationship. [Rong and Shi, 2001; Gradstein and Nikitin, 2004; Kim, 2004; Lin, 2007; Ziesemer, 2016; Balcázar, Narayan and Tiwari, 2015]. Among them a series of literature relate income distribution with educational inequality [Chu, 2000; Machin and Vignoles, 2004; Blanden and Machin, 2004]. Meanwhile, another strand of literature emerged that used educational outcome to explore inequality of opportunity [Haim, Shavit and Ayalon, 2007;Buis, 2010;Haim andShavit 2013; Ferreira and Gignoux, 2014].

Park (1996) analyzed impact of educational expansion and inequality in education on income inequality in a sample of 59 countries. Results revealed that educational inequality led to income inequality and also validate Kuznets inverted U curve between educational expansion and educational inequality. Same as De Gregorio and Lee (2002) also investigated the relationship between distribution of education and income distribution in a panel sample. Results indicated that educational expansion and low educational inequality lead to minimize income inequality. The results also verified Kuznets curve for education level and its distribution. Hertz et al. (2008) validate this hypothesis by tracing the inverted U relationship between mean level of education and standard deviation of education in a sample of 42 countries.

Morrison and Murtin (2010) also analyzed Kuznets pattern between educational expansion and educational inequality in a panel sample of 32 countries.

It can be observed that previous literature in case of Pakistan focused on different aspect of educational expansion by giving less importance to distributional aspect of education. However, few studies try to express educational disparity by comparing educational attainment in different groups and segment of the society with the help different measures.One strand among them focus on gender disparity in education.Afzal, Butt, Akbar and Roshi(2013) analysis gender disparity in Punjab at middle level and high level of education with help of net enrolment ratio. They also examine gender disparity in education due to level of income of household and profession of house hold.Hamid, Akram and Shafiq (2013)analysis educational attainment differences between provinces and within provinces at district level in Pakistan by using net enrolment rates and literacy rate. They explore gender and rural/urban aspect educational attainment.Chaudhry (2007) analyzed impact of gender biased educational disparityin labor force on economic growth and employment by using male to female literacy ratio. Same as Chaudhry and Rehman (2009) analyze impact on poverty due to gender biased of education by using male to female literacy ratio at different educational level.Jamal and Khan (2005) computed Index of district education and then he used that index to calculate Gini Index, maximum-minimum ratio and Coefficient of Variation at provinces level,rural urban region wise andgender wise. Sabir (2002) used gross enrolment ratios to explain gender disparities in education.However, all these studies related to Pakistan as discussed above used traditional method of measuring educational expansion to compare disparity in education in different segment of society. Meanwhile, Saeed and Fatima (2015) fill this gap by using inequality indicator to quantify educational disparity in Sindh.The objective of this study to investigate the relationship of educational expansion and educational inequality by usingpanel data of 99 districts of Pakistan.

II. Empirical Framework

As previous literature(Psacharopoulos&Arriagada, 1986; Ram, 1990; Thomas et al., 2001; Lin, 2007)suggests that educational inequality is expected to increase, decrease or stay constant as educational expansion increases. Therefore, it is appropriate to specify the empiricalmodel as a quadratic function of the form

$$y_{it} = \alpha_0 + \beta_1 x_{it} + \beta_2 x_{it}^2 + \varepsilon_{it}$$

Where,i represents district, t indicate time,$y$is educational inequality which is measured in term ofstandard deviation of years of schooling of individuals in each district and independent variables x and x^2represent respectively educational expansion and square of educational expansion to verify quadratic pattern. Meanyears of schoolingof individualsat district level is used as a proxy for educational expansionfor each district. ε is error term. Since the levels of education are non-negative values, it is expected that as mean of the level of schooling is zero, inequality that is measured as standard deviation of level of education must be zero. Considering this constant, α_0 should be restricted to zero. Therefore, we can rewrite above equation as:

$$y_{it} = \beta_1 x_{it} + \beta_2 x_{it}^2 + \varepsilon_{it}$$

In order to verify inverted U-shaped relationship of educational expansion and educational inequality, it is requiredthat β1> 0 and β2< 0.The above model measures the presence of"Education Kuznets curve" without including any other factor that may affect educational inequality.That is, it assumes that all the governing factors of the school system do not directly influence the degree of educational inequality, but that they simply affect the educational expansion. Therefore,the educational inequalityautomatically declines asmean years of schooling rises after a certain level.

Estimation Methods

Complex error structure of panel data often arises some methodological drawbacks in commonly used panel model estimation techniques. Non-spherical errors lead to inefficient parameters and standards errors became biased if not handled carefully. Serial correlation and cross-sectional dependence being a potential problem more or less exist in almost all panel data (Jonsson, 2005). Major drawback of FE as well as RE estimator is that these techniques cannot handle both theseproblems simultaneously.

Spherical errors should satisfy mainly two condition; Firstly, constant variance of error structure and secondly, presence of independent error structure. Second condition can be subdivided in to further two

conditions; error structure of a unit is not correlated across the time that is there is no serial correlation and error structure is not correlated across units at one point of time that is there is no spatial correlation. In the presence of non-spherical errors, SEs become incorrect either SEs become high or low than actual SEs. Therefore, our significance of the estimated coefficients becomes doubted. If the above mention conditions satisfy usual panel model estimation techniques performs well in estimating panel model. If these assumptions failed to satisfy than Panel corrected standard error model proposed by Beck and Katz (1995) is alternative way to estimate panel model. This is also known as inefficient OLS modified estimator. Therefore, this study estimates empirical model using "PCSE" method along pooled OLS.

III. THE DATA

This study uses district as a unit of observation for measuring inequality at local level due to its potential benefits. Districts indicate social subgroups of national and provincial level that vary in term of development and social preferences. As provinces are comprised of districts thus this allows analyzing political and institutional factors of provinces. Further, it enables to measure income inequality at local level. Measuring income inequality at district level provides more precision. This provides a fair enough sample as this study includes all possible districts for which data is available. As districts are observed at three points of time so this allows constructing a panel of districts. Data collection method is more homogenous among all districts than in the cross-national studies, so this enhances comparability. Cross national studies may lack in comparability due to difference in data collection method.

Pakistan Bureau of Statistics conducts Pakistan Social and Living Standards Measurement (PSLM) survey that provides information on social and economic indicators at provincial and district levels. As a matter of fact, objective of this study is to analyze regional educational inequality. Therefore, study uses district level Individual survey for years 2006-07, 2010-11 and 2014-15 that fulfill the requirement of our study. PSLM survey consists of four provinces of Pakistan excluding military restricted areas and FATA. These excluded areas constitute 2% of the total population. Table 1 shows mean and standard deviation for variables used in empirical model.

Table 1: Mean and Standard Deviation

Variables	Pooled		2006-07		2010-11		2014-15	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Educational Inequality	3.53	0.31	3.55	0.32	3.49	0.29	3.55	0.31
Educational Expansion	7.80	0.85	7.67	0.87	7.80	0.85	7.93	0.84

IV. EMPIRICAL RESULTS

This study investigates presence of inverted U-shaped relationship of educational expansion and educational inequality this relationship is known as "Education Kuznets Curve". Table 2 shows the empirical results obtained from panel corrected standard error (PCSE) and Pooled OLS models. OLS standard error and panel corrected standard errors are reported in parenthesis. As expected standard error of pooled OLS model are slightly low than PCSE. However, both standard errors predominately predict the significance of parameter estimates.

Table 2: Regression of Educational Inequality on Educational Expansion

	Pooled OLS	PCSE
X	0.75*	0.75*
	(0.019)	(0.023)
x^2	- 0.04*	- 0.04*

	(0.002)	(0.003)
R²	0.89	0.88
N	297	297
Turning Point	9.38	9.38

Note: Standard errors are in parenthesis. * shows significance of the estimates at 1%.

Estimated results show that educational expansion (mean education) is associated positively with educational inequality while its square is associated negatively with educational inequality. Both of estimates are significant, this validates the presence of Education Kuznets curve in the case of Pakistan. This affirms that when education expands at early stage, educational inequality tends to rise than starts falling after reaching its turning point. The results indicate this turning point at 9.38 years of education. This finding is consistent with Ram (1990), De Gregorio and Lee (2002), Lin(2007), Limand Tang (2008), Meschi and Scervini (2014) and Shukla and Mishra (2019).

Figure 3 shows a scattered plot that indicates relationship between educational inequality (standard deviation) and educational expansion (mean education). Here a vertical line indicates the turning point of Education Kuznets Curve. This point is above middle and slightly below matric level of education as per defined level of education in our analysis. This threshold levels lies above the average and median level of dependent variable that are 7.80 and 7.79 respectively.
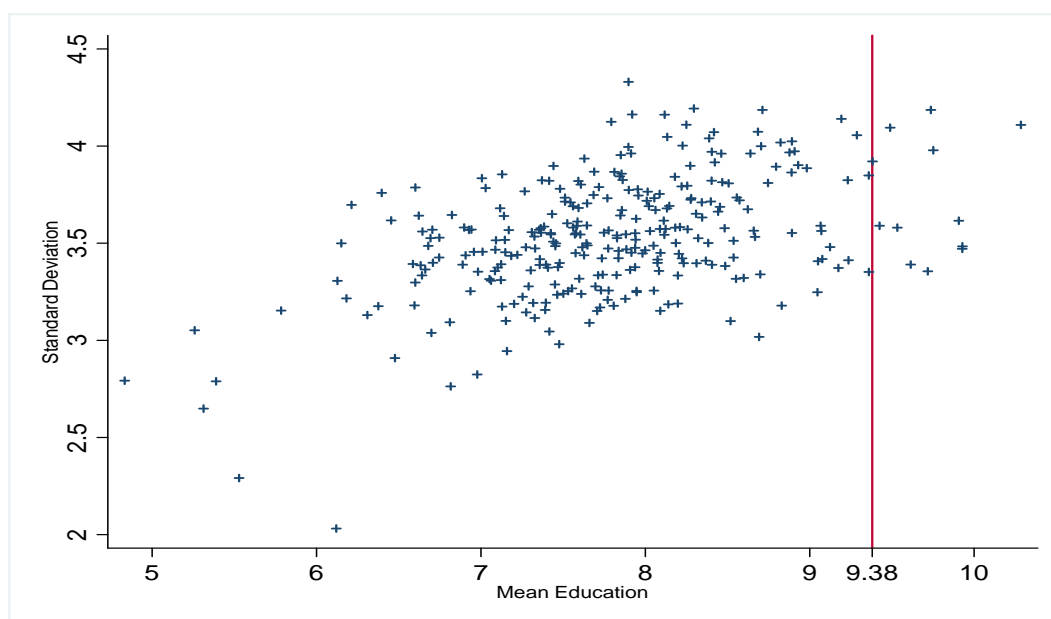

Figure 3: Educational Inequality and Educational Expansion Nexus

Moreover, the study estimates empirical model for each year using cross-sectional data of districts. The results are presented in Table 3, estimated model for three point of time also validates the presence of Educational Kuznets curve.

Table 3: Regression of Educational Inequality on Educational Expansion:

A Cross-sectional Analysis

	2006-07	2010-11	2014-15
X	0.76*	0.70*	0.77*
	(0.032)	(0.03)	(0.04)
x^2	- 0.04*	- 0.03*	- 0.04*

	(0.004)	(0.003)	(0.004)
R^2	0.95	0.94	0.94
N	99	99	99
Turning Point	9.5	11.67	9.6

Note: Standard errors are in parenthesis. * shows significance of the estimates at 1%.

These findings appear instructive for educational policy options. Government should adopt policies to expand mean level of education above the threshold level of education to reduce educational inequality at district level. Mean level of education expansion from low mean toward threshold level can be achieved in two ways. If government polices focus on lower than estimated threshold educational levels than educational inequality will increase at first stage and eventually tend to decrease after surpassing threshold level. However, this increase of educational inequality in early stage is not that acute as it is normally considered in growth and inequality relationship. Therefore, government efforts in this direction can help to surpass mean educational level above estimated threshold level. On the other hand, mean educational level expansion can increase inequality if government polices focus on higher than estimated threshold educational levels.

V. CONCLUSION

This study selects 99 districtsfrom four provinces of Pakistanto analyzepatron of educational inequality over the time period of 2006-07 to 2014-15. This study applied pooled OLS method andalternatively applied panel corrected standard error method to incorporate complex error structure of panel data. Estimated models validate the presence of Kuznets curve for educational inequality in selected districtsboth in pooled and separated model for each year. This affirms that when education expands at early stage, educational inequality tends to rise than start falling after reaching its threshold. This threshold point achievesat matric mean level of education for pooled data. Moreover, estimated threshold first increases form matric to intermediate mean level of education from 2006-07 to 2010-11 than decreases form intermediate to matric mean level of education from 2010-11 to 2014-15. Given the findings of study government should adopt policies to uplift mean level of education at least above matric level of education to reduce educational inequality at district level.

REFERENCE

1. Afzal, M., Butt, A. R., Akbar, R. A., & Roshi, S. (2013). Gender disparity in Pakistan: a case of middle and secondary education in Punjab. *Journal of Research and Reflections in Education*, *7*(2), 113-124.
2. Balcázar, C. F., Narayan, A., & Tiwari, S. (2015). Born with a silver spoon: inequality in educational achievement across the world. *World Bank Policy Research Working Paper* (7152).
3. Beck, N., & Katz, J. N. (1995). What to do (and not to do) with time-series cross-section data. *American political science review*, *89*(3), 634-647.
4. Becker, G. S. (1962). Investment in human capital: A theoretical analysis. *Journal of political economy*, *70*(5, Part 2), 9-49.
5. Blanden, J., & Machin, S. (2004). Educational inequality and the expansion of UK higher education. *Scottish Journal of Political Economy, 51*(2), 230-249.
6. Buis, M. L. (2010). Not all transitions are equal: The relationship between inequality of educational opportunities and inequality of educational outcomes. *M. Buis, Inequality of Educational outcome and inequality of educational opportunity in the Netherlands during the 20th century. PhD thesis*.
7. Chaudhry, I. S. (2007). Gender inequality in education and economic growth: case study of Pakistan. *Pakistan Horizon*, *60*(4), 81-91.
8. Chaudhry, I. S., & Rahman, S. (2009). The impact of gender inequality in education on rural poverty in Pakistan: an empirical analysis. *European Journal of Economics, Finance and Administrative Sciences*, *15*(1), 174-188.
9. Chu, H.-Y. (2000). The impacts of educational expansion and schooling inequality on income distribution. *Quarterly Journal of Business and Economics*, 39(2), 39-49.

10. De Gregorio, J., & Lee, J.-W. (2002). Education and income inequality: New evidence from cross-country data. *Review of income and wealth, 48*, 395-416.
11. Ferreira, F. H., & Gignoux, J. (2014). The measurement of educational inequality: Achievement and opportunity. *The World Bank Economic Review, 28*(2), 210-246.
12. Fields, G. S. (1980). *Poverty, inequality, and development*: CUP Archive.
13. Gradstein, M., & Nikitin, D. (2004). *Educational Expansion Evidence and Interpretation* (Vol. 3245): World Bank Publications.
14. Haim, E. B., & Shavit, Y. (2013). Expansion and inequality of educational opportunity: A comparative study. *Research in Social Stratification and Mobility*, *31*, 22-31.
15. Haim, E. B., Shavit, Y., & Ayalon, H. (2007). Expansion and inequality of educational opportunity: A comparative multi-level analysis. In *Tel Aviv University, presentation at the Montreal Meeting of RC28, August* (pp. 14-17).
16. Hamid, A., Akram, N., & Shafiq, M. (2013). Inter and Intra Provincial Educational Disparities in Pakistan. *Pakistan Journal of Social Sciences*, *33*(2), 447-462.
17. Hertz, T., Jayasundera, T., Piraino, P., Selcuk, S., Smith, N., & Verashchagina, A. (2008). The inheritance of educational inequality: International comparisons and fifty-year trends. *The BE Journal of Economic Analysis & Policy, 7*(2).
18. Jamal, H., Khan, A.J. (2005). The knowledge divide: Education inequality in Pakistan. *The Lahore Journal of Economics*, *10*(1), 83-104.
19. Jonsson, K. (2005). Cross-sectional dependency and size distortion in a small-sample homogeneous panel data unit root test. *Oxford Bulletin of Economics and Statistics*, *67*(3), 369-392.
20. Kim, K. H. (2004). *Expanded opportunity, persistent inequality: social class and gender differentials in school transitions in Korea.* Paper presented at the Association Coreenne d'Etudes Politiques Francaise's International Conference. Japan: Center for the Study of Social Stratification and Inequality.
21. Lim, A. S. K., & Tang, K. K. (2008). Human capital inequality and the KuznetsCurve. *The DevelopingEconomies, 46*(1), 26–51.
22. Lin, C.-H. A. (2007). Education expansion, educational inequality, and income inequality: evidence from Taiwan, 1976–2003. *Social indicators research, 80*(3), 601-615.
23. Machin, S., & Vignoles, A. (2004). Educational inequality: the widening socio-economic gap. *Fiscal Studies, 25*(2), 107-128.
24. Meschi, E., & Scervini, F. (2014). Expansion of schooling and educational inequality in Europe: the educational Kuznets curve revisited. *Oxford Economic Papers*, *66*(3), 660-680.
25. Mincer, J. (1974). Schooling, Experience, and Earnings. Human Behavior & Social Institutions. *National Bureau of Economic Research*. 1(2), 1–2.
26. Morrison, C., & Murtin, F. (2010). *The Kuznets curve of education: a global perspective on education inequalities*. Centre for the Economics of Education, London School of Economics.
27. Park, K. H. (1996). Educational expansion and educational inequality on income distribution. *Economics of education review, 15*(1), 51-58.
28. Parks, R. W. (1967). Efficient estimation of a system of regression equations when disturbances are both serially and contemporaneously correlated. *Journal of the American Statistical Association*, *62*(318), 500-509.
29. Psacharopoulos, G., & Arriagada, A. M. (1986). *The educational attainment of the labor force: an international comparison*. Washington, DC: World Bank.
30. Ram, R. (1990). Educational expansion and schooling inequality: International evidence and some implications. *The Review of Economics and Statistics*, *72*(2),266-274.
31. Rong, X. L., & Shi, T. (2001). Inequality in Chinese education. *Journal of Contemporary China, 10*(26), 107-124.
32. Sabir, M. (2002). Gender and Public Spending on Education in Pakistan: A Case Study of Disaggregated Benefit Incidence. *The Pakistan Development Review, 41*(4), 477-493.
33. Saeed, N., & Fatima, A. (2015). Educational Inequality in Rural and Urban Sindh. *The Pakistan Development Review, 54*(4), 767-777.
34. Shukla, V., & Mishra, U. S. (2019). Educational expansion and schooling inequality: testing educational Kuznets Curve for India. *Social Indicators Research*, *141*(3), 1265-1283.
35. Thomas, V., Wang, Y., & Fan, X. (2001). *Measuring education inequality: Gini coefficients of education* (Vol. 2525): World Bank Publications.
36. Ziesemer, T. (2016). Gini coefficients of education for 146 countries, 1950-2010. *Bulletin of Applied Economics*, *3*(2), 1-8.