https://doi.org/10.52131/joe.2024.0602.0206

*i*RASD Journal of Economics

Volume 6, Number 2, 2024, Pages, Pages 257 – 268

Journal Home Page:
https://journals.internationalrasd.org/index.php/joe

Unveiling Inequality: Mapping Asset Disparities in Azad Jammu and Kashmir (Pakistan)

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ARTICLE INFO

Article History:
Received: January 17, 2023
Revised: May 08, 2024
Accepted: May 10, 2024
Available Online: May 12, 2024

Keywords:
Estimation of Asset Index
Azad Jammu and Kashmir
Factor Analysis
Principal Component Analysis
Item Response Theory
Palma Index
Gini-coefficient

JEL Classification Codes:
D31, D63, O15, P36

Funding:
This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

ABSTRACT

The main objectives of this study are to construct a valid and reliable asset index at the household level for 10 districts of Azad Jammu and Kashmir (AJK) by using Multiple Indicators Cluster Survey micro-data and to estimate economic disparities by calculating Gini-coefficient and Palma Ratio. The asset index is considered a better estimate than expenditures or current household income to gauge a household's living standard and its potential resilience to deal with economic shocks. The dimensional structure of assets is assessed by applying Exploratory Factor Analysis (EFA) and Tetrachoric Principal Component Analysis (PCA). Further, this paper has applied Classical Test Theory (CTT) and Item Response Theory (IRT) to ensure the reliability of the household-based asset index. Furthermore, the Gini-coefficient and Palma ratios are estimated by using the composite household-based asset index to estimate economic disparities in all 10 districts of AJK. The dimensional structure of assets, reliability, and validity analysis suggest to use 21 assets (out of 30 items) to construct the household-based asset index. The nine items (assets) are excluded from the analysis to avoid systematic errors and random errors. The results show that districts Bhimber and Mirpur have achieved the highest average asset scores, which are 0.62 and 0.64 respectively. The score of the Gini-coefficient index and the Palma ratio analyses shows that the asset distribution in the districts Neelum and Haveli are highly unequal. The Gini-coefficient is highly responsive to midpoint distribution while the Palma ratio concentrates more on top and bottom distribution, and it ignores the middle 50 percent from the analysis. Interestingly, both approaches have produced similar district rank ordering because we have adopted a systematic process for construct validity and reliability to minimize measurement errors.

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Citation: Naveed, T. A., Ullah, S., Mughal, S. A., & Rizvi, B. (2024). Unveiling Inequality: Mapping Asset Disparities in Azad Jammu and Kashmir (Pakistan). *IRASD Journal of Economics*, *6*(2), 257–268. https://doi.org/10.52131/joe.2024.0602.0206

1. Introduction

Economic disparities is a cluster term focusing on inequality and intersecting socioeconomic statuses. United Nations took multiple initiatives to address the issue of inequality globally. Sustainable development and "leave no one behind" agendas are efforts to reduce the severity of inequalities. Inequality or disparity is not derived by income measures only; however, there are other facets, including disability, sexual orientation, age, ethnicity, class, and religion which may expand inequality context (UN, 2023). The inequality of outcomes and inequality of opportunities are both distinct terms; thus, disparities exist not only due to income, wealth, and expenditure however inequalities also exist due to location of birth, ethnicity, gender, family, and other factors that are beyond the control of an individual. It is inevitable to separate effort from opportunity as these are intergenerational contexts such as the parental income will determine the chance of a child to obtain an education. Thus, it is essential to understand the nature of disparity. Disparity so far has not been considered a problem; however, income inequality leads to differences in human capital accumulation and economic growth. Inequalities have huge social costs. Inequality leads to mistrust of citizens in institutions, nepotism, corruption, resource misallocation, and adverse economic and social consequences. The social cohesion is eroded in this case (Dabla-Norris, Kochhar, Suphaphiphat, Ricka, & Tsounta, 2015).

The disparities between rich and poor leave a severe impact on harnessing economic growth. The statistics of disparities between rich and poor are monitored by WEF (World Economic Forum). (Tabassum, Kamboyo, Mangrio, & Siddiqui, 2021) shows the extent of wealth and income inequalities between and within countries. Covid 19 has contributed to widening disparities. Globally, the average income of an adult is $23,380; however, the richest 10 percent of the global population takes home 53 percent of the revenue, and the poorest half of the worldwide population takes 8 percent. The individuals from the top 10 percent earn $122,100, whereas the bottom half earn just $3,920. The gap is more expansive when it comes to wealth (valuable assets and items above income). The poorest half of the global population owns only 2 percent of the global total, whereas the richest 10 percent own 79 percent of the whole wealth (Tabassum et al., 2021).

Widened disparities curb GDP growth. The poor and middle class have suffered the most till now; IMF declares that income inequality matters for growth and sustainability. Income distribution leaves an impact on growth. More inequality (income share of the top 20 increases) declines the GDP growth eventually. The income share of the bottom 20 percent is also linked with higher GDP growth (Dabla-Norris et al., 2015).

Poor and middle class are the main engines of economic growth and the diverse group of countries is paying more focus on these groups. The reasons that contributed to inequality are technological progress and the decline in labor market institutions. The skill differences are associated with widening income disparities. The policies that focus on the poor and middle class can reduce inequality; however, the facts need to be understood that a one-size-fits-all approach is not effective in tackling inequality. The policies should focus on human capital enhancement skills, coupled with making tax systems effective. Inequality entrenches an environment of uncertainty and insecurity. The challenges to policymakers of modern times are to deal with high levels of inequality and disparities, social discord and violence, along with climate change, technology, and urbanization (UN, 2023). Rigorous research is present to identify the policies that can reduce inequality and enhance opportunity. The financial deepening is accompanied by creating incentives for lowering informality. Thus considering disparity is the primary concern of modern times. There exist persistent disadvantages for particular segments of the economy, and widening disparity may lead to growth and macroeconomic stability hurdles. The decision power of human resources and investments lies in a few hands, which leads to rising crisis risks.

Equality impacts economic growth and wellbeing. The various models of income inequality are linked to economic growth (Mdingi & Ho, 2021). Economic growth as an essential factor of economic development (Taqi, e Ali, Parveen, Babar, & Khan, 2021). Miscellaneous inequality measurements (Gini coefficient, Atkinson measure, and Theil's index of entropy) were being used to capture inequality, various studies have reviewed the contribution of HDI in finding the proper measures of economic performance and social progress (Dervis* & Klugman, 2011). The inequality between areas will rise due to online technologies. Thus, disparities and inequalities will continue to grow in the next twenty-five years, leading to further inequality and disparity. The high levels of inequality reduce the opportunity for skill accumulation, social mobility, and human development. This also depresses the economic growth. This is a need of time to dig down the issue of inequality to adopt suitable policies to trigger inequality.

Azad Jammu and Kashmir is administratively under the control of Pakistan. Severe gender, socioeconomic, and regional disparities exist across the districts AJK. Among the 10 districts, Mirpur and Bhimber have much better socioeconomic indicators while other districts are lagging. The main objectives of this study are to construct a valid and reliable asset index at the household level and to estimate the asset disparities across the 10 districts of Azad Jammu and Kashmir. This research has used Multiple Indicators Cluster Survey micro-data for its analysis, and further economic disparity is estimated by calculating the Gini-coefficient and Palma Ratio.

The first part of the paper explores the introduction followed by a literature review. Data and methodology will provide details of districts of AJ&K, MICS data understanding, and asset index construction. The fourth part of the paper discusses the results and the fifth part will be an enfolding discussion. The last part will be the conclusion and policy recommendations.

2. Literature review

Wealth of Nations explained the idea of the free market and the distribution of overall products among the population however the product is distributed not equally but proportionality. The modern economic literature addressed the issue of economic inequality, it was developed by Anand and Kanbur (1985). Kuznets describes the inverted U hypothesis which advocates that inequality tends to increase during early stages of economic development and decrease in later stages. Durlauf (1996) explained the theory of persistent income inequality in which locality effects inequality as children's education and sociological effects are noticeable in the locality. The wealthier families segregate into economically homogenous neighbors and the economic stratification transmits economic status across generations which leads to persistent inequality. Moreover, fourth industrial revolution widen income inequality gap between highly and lowly skilled labor. The 4IR is skill-biased and technological improvements are harmful to equality and lead to unemployment (Krueger, 1993).

Williams and Doessel (2006) explored that measuring inequality can be misleading because of the difficulty in obtaining a complete ranking of distributions. The multidimensionality of poverty complicates the aggregation necessary to perform analysis of policies. Conceptualizing poverty is complex due to the multidimensional nature of poverty as it ranges from income to consumption-based on lack of sustainable livelihood and lack of access to education, health, water, a safe environment, poor housing, and social exclusion are all part of life (D'Attoma & Matteucci, 2023).

Paliova, McNown, and Nülle (2019) investigated the role of human development in recognizing well-being. Faisal (2022) investigated the interconnectedness of income inequality, economic growth, and human development. Elistia and Syahzuni (2018) found a causal relation

between HDI and economic growth, value of HDI positively influences GDP and economic growth. The impact of HDI on economic development in ten different ASEAN economies has been analyzed. Economic growth ensures a high level of human development. There exists a causal relationship between economic growth and human development, and this can be an indicator of welfare in an economy. Sajith and Malathi (2020) investigated that the gross domestic product is the measure of wellbeing. Tracking GDP is not an accessible channel as it does not capture exact inequality. The economist Mehbub ul Haq's human development project is a composite matrix that captures the life expectancy and education per capita indicators. Empirical results show that income inequality and the human development index are negatively correlated, which means high-income inequality will lead to low HDI. However, health variable does not establish a valid relationship with the Gini coefficient.

The inequality is much higher in urban areas in comparison to rural areas. The highest inequality was observed in Sindh in 1992-93, whereas it was the highest in Punjab from 1993-94 to 1998-99. Punjab followed the same trend in inequality as it was followed in the whole of Pakistan (CHEEMA & SIAL, 2013). Inequality of opportunity is severe in Pakistan and gender is the highest contributor, followed by the region of household, the father's education, and the father's occupation (Shaheen, Awan, & Cheema, 2016). The incidence of poverty has increased. The expenditure approach is hardly used in any study to know the inequality. The household income and expenditure survey showed that there was less inequality in terms of food expenditure, whereas higher inequality is found in non-durable items, whereas durable items inequality is even higher (ul Mustafa, Abro, & Awan, 2021).

McKenzie (2005) explored that data on household infrastructure, ownership of durable assets and building materials can be used to measure the inequality in living standards. Naveed, Gordon, Ullah, and Zhang (2021) constructed an asset index at house household level, and 36 districts in Punjab were analyzed using MICS data. The asset index is an exceptional measure to measure the current income and the potential of households to buy long-run household goods and services.

Wittenberg and Leibbrandt (2017) measured inequality using asset indices for South Africa. The use of an asset index can guide the order of magnitude of rich and poor differentials. Asset indices are used towards many different ends i.e. identifying the poor and deprived personnel and measuring the gap between rich and poor.

The debate of literature comes upon that typically income data is used to estimate household wellbeing or economic prosperity. Nevertheless, income data is questioned for its data collection reliability. This is because head of family are reluctant to share true information related to their household incomes and its sources. The expenditure data is also considered a good proxy to measure household living standards. High measurement errors are expected while using expenditure approach, because it is very difficult to recall exact number of expenditures in previous month or couple for weeks earlier for a particular goods or services. Further, at a household level, only the head of the family does not spend but there are numbers of persons at household level who do spending. So, handling all of information regarding expenditures is not easy task. Asset ownership gives information about households' permanent income. Moreover, data on assets is easily available in various country-level surveys and data collection reliability for assets is very high. Thus, this research has chosen to measure household-based asset index. Further adopted various steps to ensure the reliability and validity of the construct.

3. Data and Methodology

Multiple indicator cluster surveys (MICS) are household surveys that are rendered globally by the United Nations Children's Fund to provide a better understanding of the

situation of children and women and compare the data rigorously. This survey provides benchmarks for several indicators at the district level for all districts of AJ&K. The quality of the housing depends on the construction material used for it. Consumer durables include a large range of technological and electrical products including vehicles, mobile phones, bicycles and motorcycles, radio and television, washing machines, air conditioning, and much more. The MICS data does provide information about housing, consumer durables, and ownership of other assets in binary form i.e. yes/no.

This research has followed certain steps to ensure construct validity and reliability. Naveed and Shah (2024) have explicitly stressed on validity of an index. They have estimated child health disparities by introducing a step-by-step approach to ensure the validity of the outcomes. This paper has adopted procedural guidelines provided by Naveed et al. (2021) and (Ullah & Chishti, 2023). At first, we checked the dimensional structure of assets by applying EFA and PCA. Secondly, we applied Cronbach's Alpha statistics and Item Response Theory to check the reliability of the index. Once we have finalized the assets that are important to add to the final analysis and which assets must be dropped (as given in Table 1, 2, and Figure 1), we used equations 1 and 2 to construct a household-based asset index.

3.1. Dimensional Structure of Assets

Table 1
Results of Exploratory Factor Analysis and Tetrachoric Principal Component Analysis

Loadings of EFA rotations				Loadings of Tet-PCA with oblique		
Factors	**Assets**	**Factor Score**	**Alpha Score**	**Sr.no**	**Assets**	**Factor1 Score**
Factor 1	Wall	0.70	0.87	1	Refrigerator	0.89
	Washing	0.70		2	Washing	0.86
	Floor	0.69		3	Internet	-0.84
	Refrigerator	0.68		4	Cabinet	0.82
	Television	0.63		5	Computer	0.79
	Roof	0.63		6	CF	0.79
	Cabinet	0.62		7	AC	0.79
	CF	-0.57		8	Wall	0.76
	Chair	0.56		9	Camera	0.75
	Electricity	0.54		10	Television	0.75
	SM	0.50		11	Chair	0.71
	Mobile	0.40		12	Floor	0.71
	Pump	0.42		13	Bank	0.68
Factor 2	RC	0.40	0.78	14	Electricity	0.66
	Internet	-0.73		15	RC	0.65
	Computer	0.69		16	Roof	0.65
	AC	0.67		17	Cars	-0.63
	Car	-0.63		18	SM	0.60
	Telephone	0.60		19	Pump	0.56
	Camera	0.60		20	Telephone	0.54
	Bank	0.46		21	Mobile	0.51
Factor 3	Land	0.78	0.54	22	Watch	0.38
	Animals	0.69		23	Motorcycle	0.34
Factor 4	Motorcycle	0.59	0.39	24	Animals	0.31
	ADC	0.48		25	Tractor	0.06
	Tractor	0.43		26	Land	-0.09
Factor 5	Radio	0.61	0.20	27	ADC	-0.23
	Watch	0.58		28	Boat	0.14
Factor 6	Boat	0.73	0.08	29	Radio	0.01
	Rickshaw	0.64		30	Rickshaw	-0.02

The reliability and validity of indices are important to construct deprivation indices thus classical test theory and item response theory are applied. The classical test theory measures the internal consistency of the scale i.e. how aligned the set of assets is. This is also known as Cronbach's Alpha statistic.

The item response theory is complementary reliability analysis (Omega Analysis is reported for this). Dimension, reliability, and validity are three important steps of asset index construction. United Nations Economic Commission for Europe stressed the importance of the validity and reliability of indicators whereas the World Bank Commission on Global Poverty has also argued for the statistical validity of indicators. Thus, the analytical framework is aligned with the internationally recommended best practices.

The paper has applied various steps to estimate household-based asset index for AJK. Firstly, Exploratory Factor Analysis is applied that suggests six factors. Alpha test is applied to these six factors that recommend that items in the first two factors are reliable to include in the construction of the asset index. Out of 30, the alpha test suggests 21 assets may construct a reliable index. Further, Tetrachoric Principal Component Analysis (PCA) with oblique rotation is applied to verify the results given by EPA. The cut value for Tet-PCA is 0.4, interestingly similar assets are suggested by PCA to finalize the index.

Table2
IRT results for 30 indicators of Asset index

		IRT Results[1]		
Sr.no.	**Item Name**	**Difficulty**	**Discrimination**	**Correlation**
1.	Radio	-134.20	-0.15	-0.08
2.	Rickshaw	-171.2	-0.22	-0.12
3.	Animals	-22.05	-0.18	-0.09
4.	Land	-0.35	-1.49	-0.07
5.	Cooking Fuel	0.29	1.91	0.54
6.	Bank	2.25	1.14	0.63
7.	Electricity	1.83	2.50	0.80
8.	Car	-1.53	1.57	0.65
9.	Air	1.42	2.65	0.82
10.	Wall	0.72	2.23	0.77
11.	Floor	0.59	1.88	0.71
12.	Computer	-1.09	2.55	0.81
13.	Internet	-1.10	3.17	0.86
14.	Television	0.42	1.94	0.73
15.	Sewing	0.29	1.31	0.58
16.	Washing	0.25	3.2	0.86
17.	Refrigerator	0.18	3.50	0.88
18.	Watch	0.74	-0.68	-0.35
19.	Telephone	-2.13	1.44	0.62
20.	Motorcycle	-0.24	-0.71	-0.36
21.	Roof	1.10	1.58	0.65
22.	Pump	-1.15	2.34	0.53
23.	Mobile	2.63	1.30	0.68
24.	Cabinet	0.36	2.42	0.80
25.	Chair	0.16	1.74	0.69
26.	Room Cooler	-1.44	1.52	0.64
27.	Camera	-1.80	2.35	0.79
28.	ADC	6.60	0.46	0.24
29.	Boat	20.84	-0.31	-0.16
30.	Tractor	-22.05	-0.16	0.09

[1] IRT 2pl is applied, sorted by difficulty, discrimination, and run the transformation: $\{a\left|\sqrt{(3.29 + \mathrm{a2}}\right\}$ for correlation range -1 to +1 and exclusion rule for difficulty is ≥ 3 or ≤ -3 & for correlation is ≤0.4.

3.2. Reliability Analysis: Item Response Theory (IRT)

Reliability analysis is imperative to avoid systematic error while estimating a household-based asset index. Table 2 presents the results of the Item Response Theory (on application of IRT readers may read [2]). The correlation coefficient is generated through the transformation given in footnote. The cut value for the coefficient is 0.4. it suggests that any asset that owes correlation value below this cut value will not be included in the final index. IRT models suggest similar 21 items to be included for estimation of asset index.

Figure 1 presents Item characteristic curve. The criteria for the selection of items are +3 and -3 theta values. Assets with theta values greater than 3 or less than -3 are excluded from the final construction of the asset index. This curve also suggests that 21 assets may create a reliable asset index. If these criteria are violated, there will arise systematic error in constructing the index.

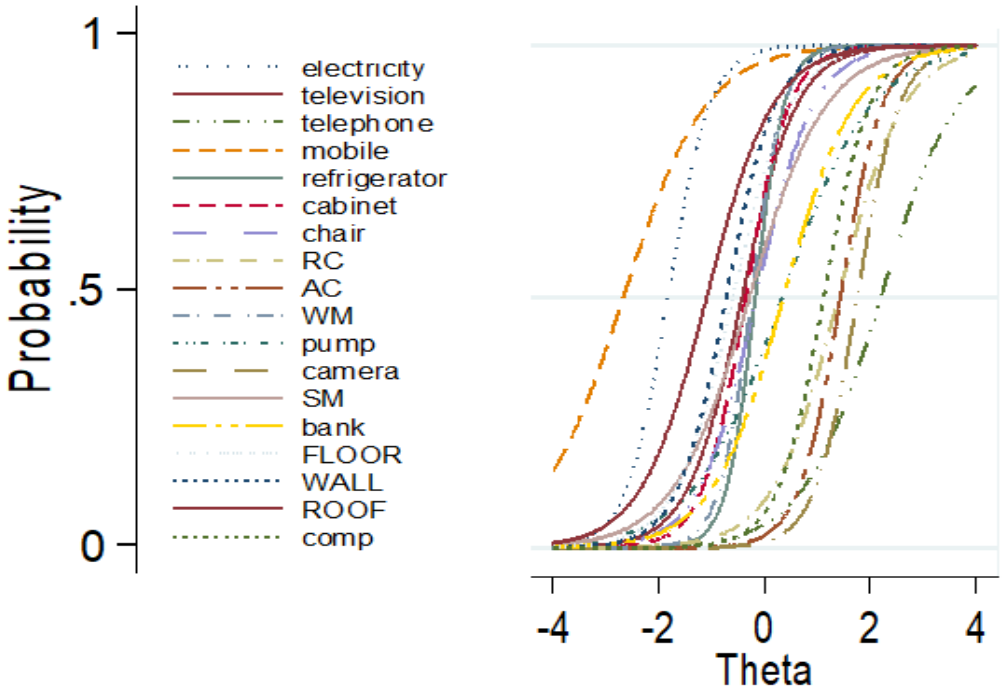


Figure 1: Item Characteristic Curve

3.3. Asset index construction

The formal equation for the asset index is mentioned below:

$$A^h = y_1^{\wedge} a_{i1} + \cdots + y_n^{\wedge} a_{in} \quad (1)$$

$y_1^{\wedge}$ signifies the particular weights which are given to each asset owned by households, each item has assigned equal weights to increase reliability. a_{in} is the respective asset of the i^{th} households recorded as dichotomous variable in AJK data sets. The second step of the household specific asset index is normalized using the formula given below:

$$Y^h = \frac{A^h - (\min A^h)}{Max\ A^h - (\min A^h)} \text{h=1, 2, …, K} \quad (2)$$

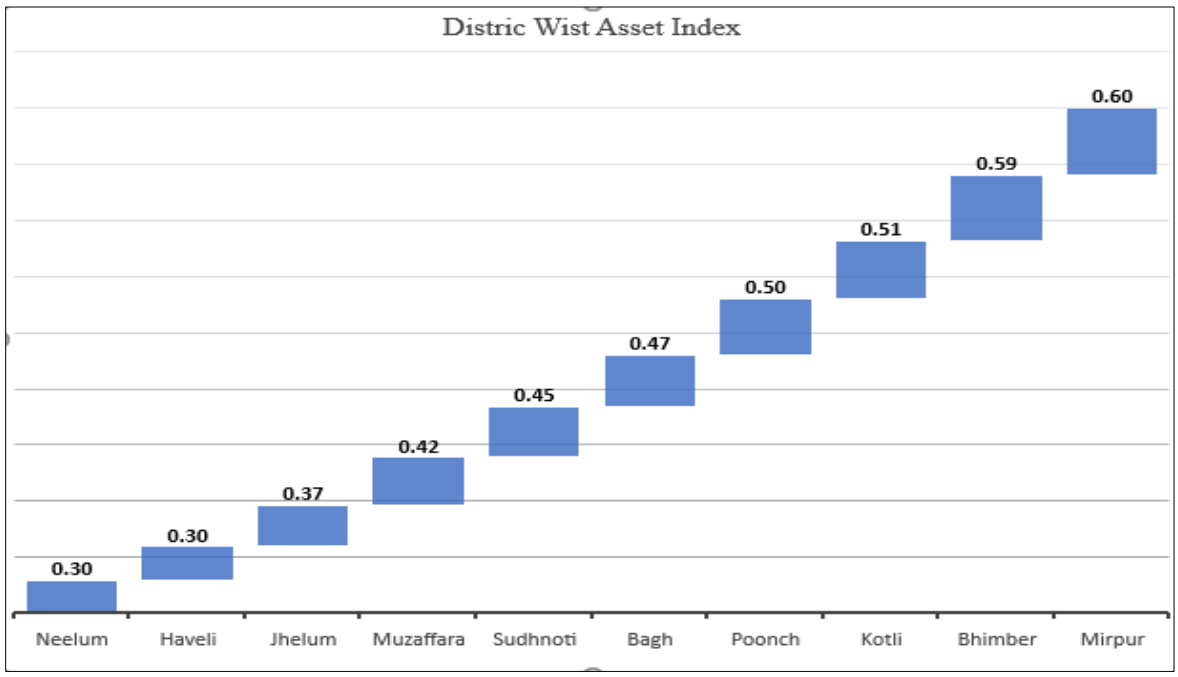
Where Y^h is the normalized asset index and A^h is the household-specific asset index. We have followed the methodology used by Naveed et al. (2021).

3.4. Measurement of inequality: Gini coefficient and Palma Ratio

Hundreds of econometric tests are present for analyzing the inequalities however one has to provide the reason for deciding the one to choose. Gini coefficient is the most cited measure. Gini coefficient represents income inequality, wealth inequality or consumption inequality within a nation. The Palma ratio is used for the measurement of asset disparities in Punjab. Palma ratio is the share of all income received by the 10 percent people with the highest disposable income divided by the share of all income received by the 40 percent people with the lowest disposable income.

4. Results and Discussion

This section explicates the outcomes of the asset index at the household level for unveiling inequality and mapping asset disparities in 10 districts of AJK, Pakistan. Figure 2 clarifies that out of 10 districts of AJK, the people of district Mirpur, on average, have the highest living standard. District Bhimber stands second, and Kotli at third. On the other hand, people of districts Neelum and Haveli are facing the highest deprivation of asset accumulation.



Authors' calculations

Figure 2: Asset Index: District-Level Disaggregated Analysis

Azad Jammu and Kashmir (AJ&K) is mostly comprised of mountains with the majority of the population living in rural areas. The per capita income of AJK is US 1512$ WDI (2023), with 25 percent of people living below the poverty line. According to the Pakistan Poverty Alleviation Fund Report 2022, the district Muzafarad and Bagh hosts the highest number of poor population while people residing in Mirpur and Bhimber have with highest quality of living. The rich districts mostly rely on international remittances while the poor districts have agriculture as a major source of earnings. The results of our study coincide with the PPAF report and other empirical studies. Figure 3 illustrates rural-urban asset disparities. The highest asset rural-urban disparities are depicted in district Muzaffarabad while least observed in district Mirpur.

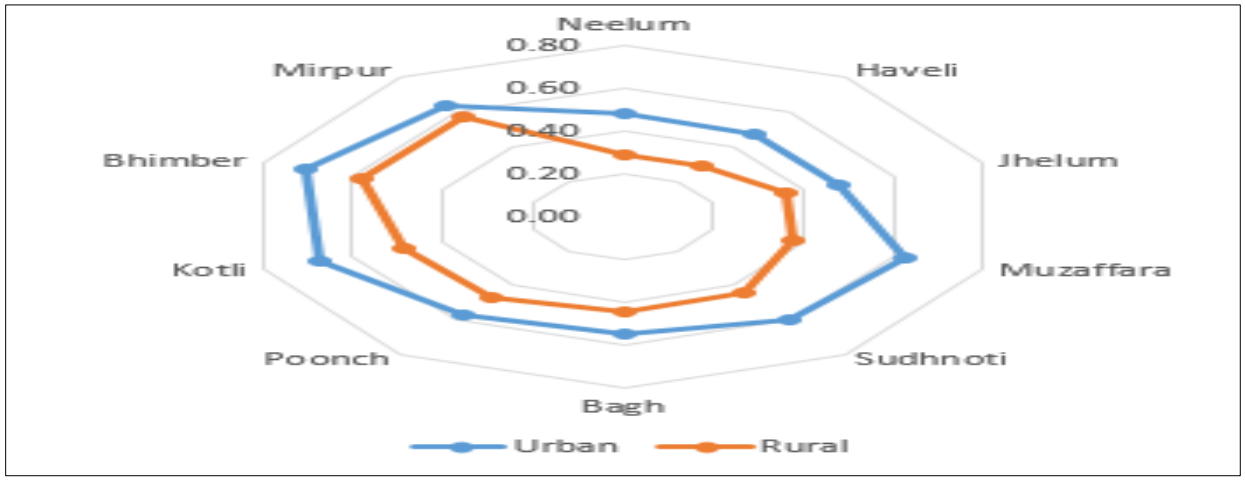


Figure 3: Asset Index: Rural-Urban Disparities

4.1. Mapping of Asset Disparities: Gini-Coefficient and Palma Ratio

The Gini coefficient is considered the most sophisticated method to measure inequalities because it satisfies most of the assumptions required to estimate inequalities. This technique is based on the Lorenz Curve framework, where Gini can range between 0 and 1. A lower Gini means lower inequality, the higher the value higher the level of inequality. While the Palma Ratio is the top 10 percent to bottom 40 percent ratio. According to Palma, the middle 50 percent is the most stable class better to compare top and bottom populations to measure inequalities. Figure 4 describes the top 10 percent, middle 50 percent, and bottom 40 percent asset share. The figure clarifies that in the districts where the top 10 percent have a higher share; there is a lower share for the bottom 40 percent. The more just society is only where the top 10 percent receive less share; there is another conclusion that the middle 50 percent population is more stable, and that is true in the case of Palma.

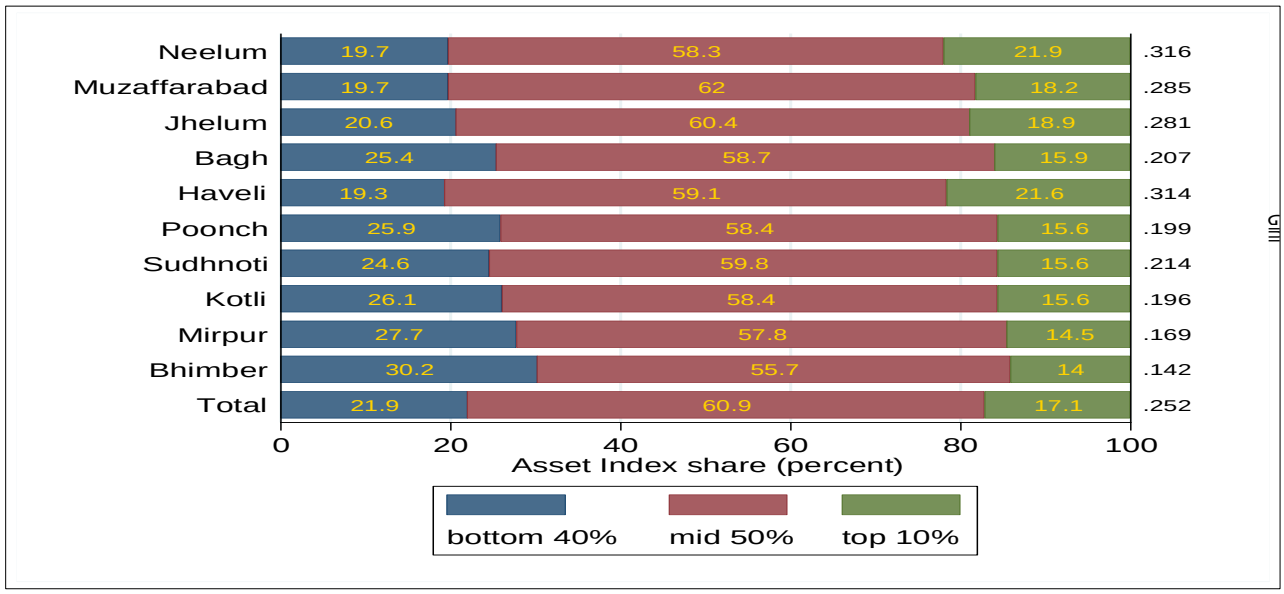


Figure 4: District Level Analysis: Top 10%, Middle 50% and Bottom 40% Asset Shares

Table 3
District Level Analysis: Gini-coefficient and Palma Ratio

Districts	Bottom 40%	Middle 50%	90-100	Gini	Palma Ratio
Neelum	0.20	0.58	0.22	0.31	1.11
Haveli	0.19	0.59	0.22	0.31	1.12
Muzaffara	0.20	0.62	0.18	0.29	0.92
Jhelum	0.21	0.60	0.19	0.28	0.92
Sudhnoti	0.25	0.60	0.16	0.21	0.64
Bagh	0.25	0.59	0.16	0.21	0.63
Poonch	0.26	0.58	0.16	0.20	0.60
Kotli	0.26	0.58	0.16	0.20	0.60
Mirpur	0.28	0.58	0.15	0.17	0.52
Bhimber	0.30	0.56	0.14	0.14	0.46
AJK	**0.22**	**0.61**	**0.17**	**0.25**	**0.78**

Gini-coefficient concentrates more on the middle distribution while Palma focuses on top and bottom distributions by ignoring middle distributions. Both methods have produced similar asset disparities in district rank ordering for AJK. We have produced the results of Palma ration to verify the result of Gini. The results of Table 3 show that districts Neelum and Haveli stand with the highest Palma ratio and Gini values, while district Bhimber with lowest asset disparities. More explicitly, district Mirpur has the highest living standard (with the highest value of asset index) while district Bhimber is at second. Bhimber is more society as far as asset distribution is concerned while district Mirpur stands second on the pedestal of asset disparities' ranking shown by Palma and Gini.

5. Conclusions

Addressing the disparities is the top agenda of Sustainable Development Goals (SDGs) with a slogan of "no one left behind. Income inequality at the household level is one of the leading reasons for slow growth, low capacity for resilience to shocks, and inefficient human resources. Many of the researchers have used income data to assess the disparities in developing countries. However, the data on income is mostly questioned for its reliability and validity. Some studies have used the expenditure approach as an alternative but expenditure data has also its limitations; e.g., recalling spending in the past and counting expenditures by multiple family members. Formation of an asset index at the household level is a superior solution because the accumulation of assets gives a better picture of long-term household income. It is also better estimate because of its easy computation and availability of high-quality data on assets' ownership in various surveys. The study aim to estimate household based asset index ensuring minimization of systematic or/and random errors (validity and reliability of the index) for all districts of AJK by using MICS data. Further, to investigate the household based asset disparities by utilising Palma Index and Gini-coefficient approaches.

Out of 30 only 21 assets have passed the validity and reliability criteria of formation of a composite index of assets at household level. Later, this index is used to estimate Palma and Gini coefficient. The AJK is facing severe levels of across the districts and rural-urban asset disparities within the districts of the province. District Mirpur and Bhimber have the highest standard of living and are considered the most just societies in AJK. While districts Neelum and Haveli remain at the bottom of the distribution. Out of 10 districts of AJK, the people of district Mirpur, on average, have the highest living standard. District Bhimber stands second, and Kotli at third. On the other hand, people of districts Neelum and Haveli are facing the highest deprivation of asset accumulation. The highest asset rural-urban disparities are depicted in district Muzaffarabad while least observed in district Mirpur.

Ensuring socioeconomic inequality and fostering inclusive development across the districts in AJK, this research recommends improving access to basic amenities like water, electricity, and road networks. Strengthening social protection measures and introduction to social welfare programs would also reduce the inequalities.

Author's Contribution:
Tanveer Ahmed Naveed: Data collection, data screening, measurement of asset index and disparities.
Sami Ullah: Conceptual framework and literature review.
Sundus Aijaz Mughal: Discussion and analysis of empirical work followed by suggestions.
Badar Rizvi: Introduction and socio-economic profile of AJK

Conflict of interest/ Disclosures:
The authors declared no potential conflicts of interest w.r.t the research, authorship and/or publication of this article.

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