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An Interaction Effect of Human Capital and Democracy on Income Inequality in South Asia: A Panel Data Analysis

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ABSTRACT

*The global rise in the disparity of income has been the subject of numerous political and public discussions in the wake of the most recent economic crises. The objective of the current study is to empirically investigate the impact of human capital and democracy on income inequality. This study analyzed the interaction between democracy and income inequality from 2000 to 2020. The balanced panel data is collected from South Asia and regressed by applying three different statistical techniques (Pooled OLS, Fixed Effect Model, and Random Effect Model). The Levin-Lin Chu test, the Hardri LM test, and the IM-Pesaran-Shin test have all been used to address the order of integration in the study. The White test, the Brush-Pagan test, the Brush-Pagan LM test, and the Hausman test were all used in this study to increase reliability. The outcomes of every diagnostic test support Fixed-Effect Model estimation (FEM). The results revealed that human capital and the interaction term (human capital*democracy), govt. health expenditures are negatively associated with income inequality whereas, population growth, trade openness, and infrastructure have been positively related to the income inequality in South Asian countries during the specified period. The study concludes that democracy plays an essential role in reducing income gaps, by enhancing human capital. The outcomes suggest that the role of democracy in reducing the income inequality gaps should not be overemphasized particularly in South Asian countries.*

1 Introduction

The idea that democracy encourages an equitable income distribution has been around since the late 18th century. Many academics contend that democracy expands participation options, enabling the underprivileged to call for more equal economic redistribution (Boix, 1998; Chan, 1997). By adopting redistributive policies like welfare expenditures, progressive taxation, minimum wage laws, price subsidies, and public employment rules, democratic governments frequently assist the lower and middle classes. On the other side, powerful and affluent individuals control the actions of autocratic authorities. They frequently adopt public measures that sustain or widen income inequality and favor this minority. Through the process of conflicting demands, democracy influences how money is distributed. Interest groups can exert pressure on the government. These organizations are more effective at influencing policy-making the more vital and well-organized they are. According to Lenski (1978), democracy results in policies that lessen inequality since political power is

redistributed in the majority's favor. Some authors go into detail on a few particular historical incidents, suggesting, for instance, that the suffrage movement expanded throughout the Western Europe in the early 1900s leading to a decrease in wealth disparity (Justman & Gradstein, 1999; Lindert, 1994). According to Muller (1988), these factors such as democracy and wealth inequality, influence one another, therefore the equilibrium result must be decided upon concurrently. In particular, if inequality and economic growth have an impact on democracy, then democracy itself has an impact on inequality and economic progress (Alesina, 1998; Alesina & Perotti, 1996).

This research evaluates the dynamics of democracy and inequality in South Asia based on the examination of survey data. The largest problem for policy makers in this region seems to be finding the correct balance between the numerous demands. The stark realities of the "reality" of inequality frequently put the "ideal" of democracy to the test. The intention of the state and its institutions is that they should ensure an element of sensitivity towards the desires of the people relating to their basic wants and well-being given the priority given to the welfare and justice elements of democracy. The development strategies adopted by the state to give meaning to this popular aspiration lies at the center of the democracy-inequality debate in the South Asia region.

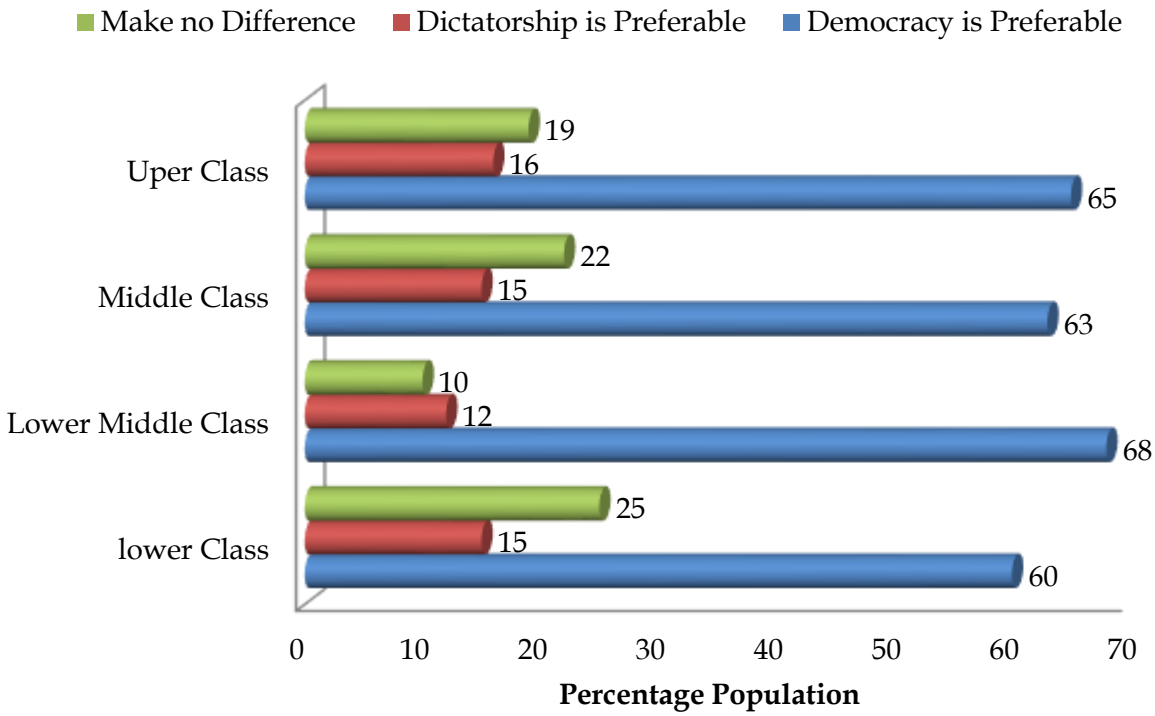

Figure 1
Percentage Support for Democracy in South Asian
Source: SDSA Data Set, Lokniti-CSDS.

Democracy, understood in a very general sense, refers to rule by the individuals. This appears to be a recurring theme throughout all of the word's uses and claims a long history dating back to the Classical era. The word also assumes sovereignty in all contexts. By comparing answers with respect to their intensity of satisfaction with the functioning of democracy in South Asia, a final analysis of support for democracy and its links to respondents' economic standing was attempted, as shown in Figure 1. From the perspective of economic class, respondents were divided into three groups: those who were happy with how democracy was operating, those who were dissatisfied, and those who were not at all happy. According to the analysis, South Asians' levels of satisfaction with the functioning of democracy varied only slightly across economic classes. Figure (1) shows that the

upper class had a little greater degree of extreme dissatisfaction with how democracy was operating, but the difference was only two percentage points.

1.1 Economic Linkage between Democracy and Human Capital in South Asian

Several concepts of human capital are used in the literature, but most of them place a strong emphasis on the financial gains from investing in human capital. To distinguish between raw (unskilled) labor and skilled labor, Schultz (1961) used the term "acquired skills and knowledge" to define human capital. People's participation in politics gives them more power, especially the very poor, and should encourage governments to be more responsive to their needs. If a autocratic system of government is continued for a longer period of time, citizens will benefit. Let us examine four possible causes that may be associated with human growth and democracy (McGuire, 2010; Ross, 2006). First, because elites compete with one another for the support of voters, elites should answer to public. As extreme human suffering is unpopular, leaders who are dramatically elected may care more about issues of human development than those who gained their seats by other ways (Lake and Baum, 2001). Second, democratic systems usually promote a strong civil society. This is because civil rights have a close relationship with politics, and over time, the presence of civil rights usually leads to the development of a complex web of deliberate links. These affiliations could be national or international, religious or secular, issue specific or broad (Parker, 1996).

Third, democracy might help to build an equitable society where marginalized groups have more power. When out-groups, such as lower standings and classes, rustics and radical, ethnic and religious subgroups, are granted formal citizenship rights, democracy may be fostered. These groups then perceive their rights and interests and take aggressive action to fulfill them in political, social and economic domains (Alvarez, Dagnino, & Escobar, 1998: Piven & Cloward, 1995: Rubin, 1997). A well institutionalized democracy has procedures that are functionally distinct, regularized, professionalized, rationalized and valuable, even though political institutionalization is challenging to express (Huntington, 1984: Levitsy, 1998: Polsby, 1968).

South Asia is currently dealing with a number of issues, including unemployment, population growth, poverty, and an economic crisis. However, one of the most significant problems and one of the main reasons why democracy in South Asia has grown slowly is illiteracy. Widespread discussion of this problem is required, and actionable efforts must be done to resolve it.

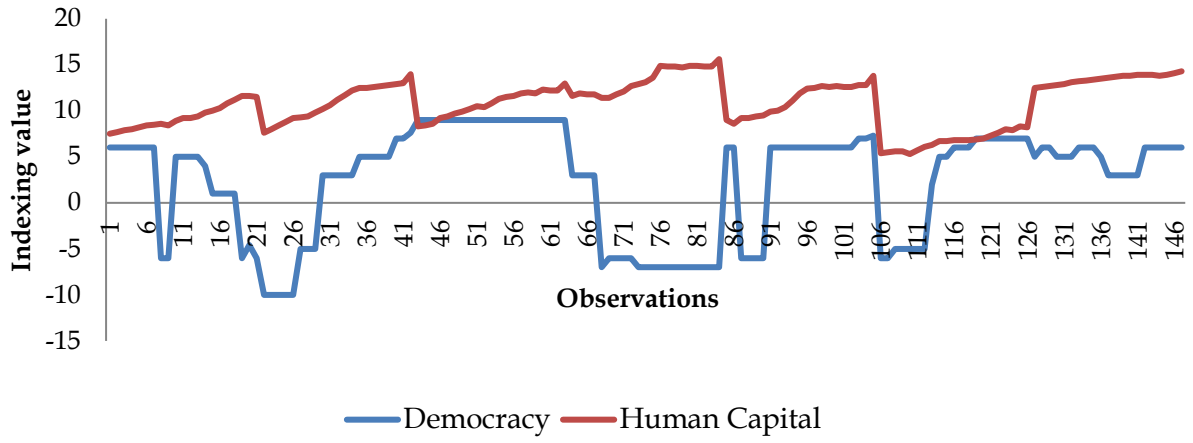

Figure 2
Relationship between the Human Capital and Democracy in South Asian

Figure 2 depicts the relationship between democracy and human capital in south Asian nations from 2000 to 2020. This graph's trends demonstrate a definite positive association between South Asian human capital and democracy. South Asian human capital increased as a result of the economy being managed by a democratic government. Democracy is a type of government in which the public' participation is crucial to its success because it is they who ultimately hold the reins of power, or popular sovereignty. The educational and intellectual capacities of individuals must be taken into consideration in such a system. When citizens are well-educated and literate, they are able to actively participate in political debates, learn from discussions on important governance issues, and even come up with creative solutions to the problems that arise in both government and the state as a whole.

1.2 Income Inequality in South Asia

Economic inequality is the disparity in standard of living between individuals, households, regions, and countries. Since there are numerous different interpretations of "standard of living," substitutes like income or wealth (most frequently the former) are employed to indicate an economic unit's living standard. As a result, one of the government's economic development planning projects has focused on diminishing income inequality and speed up rural-based progress. Income inequality is a hindrance to social and economic development in emerging nations.

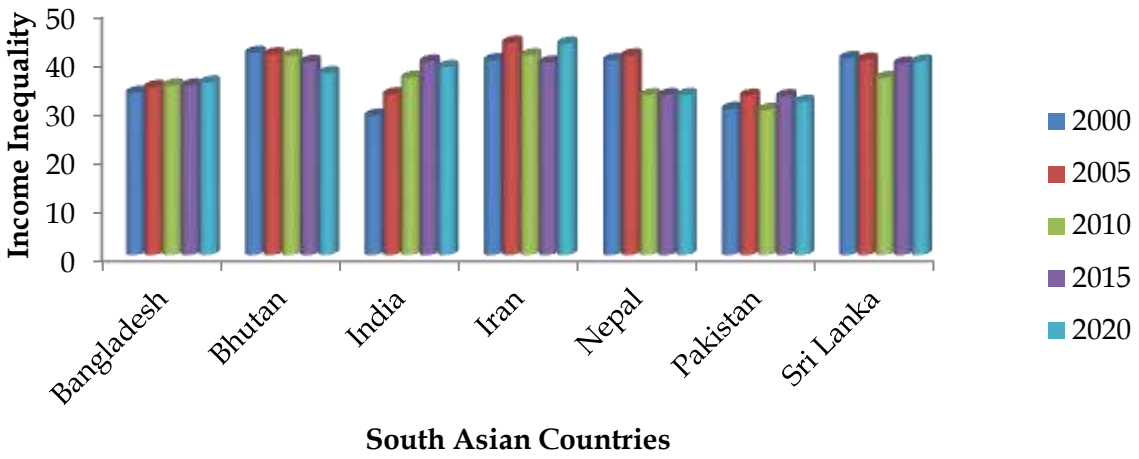

Figure 3
Income Inequality in South Asian 2000-2020

In this study, the Gini coefficient is used to quantify income inequality. Figure (3) demonstrates how the distribution of wealth has changed a little bit over time in South Asia. In Pakistan, the wealthiest 10% of the population earns 27.6% of the national income, while the bottom 10% only make 4.1%. Pakistan's poverty rate decreased from 64.3% in 2001 to 24.3% in 2015, according to the World Bank. At $1.90 per day, the poverty headcount ratio decreased from 6.2% in 2013 to 4% in 2015. Pakistan now has the second-lowest headcount poverty rate in South Asia because to significant reductions in poverty. According to the wealth distribution statistics, as of November 2016, 54% of India's wealth was held by the millionaires, the second highest share after Russia. 58% of India's wealth is seized by the richest 1% of Indians, while 80% is held by the top 10%. Between 2000 and 2020, the Gini coefficient of the south Asian region had an average value of 33.7. When compared to the other neighboring countries, this is a relatively high value.

1.3 Democracy and Income Inequality

It has long been understood that political issues can have a significant impact on how income is distributed within an economy. More specifically, it stands to reason that a more equitable wealth

distribution should go hand in hand with a more egalitarian allocation of political rights in the form of a political democracy. Indeed, the social sciences have a long history of using this theory (Lipset, 1959; Lenski, 1978; Meltzer and Richard, 1981). Arguments over whether or not the hypothesis is true have involved political scientists, economists, and sociologists. Many academics contend that democracy expands participation options, enabling the underprivileged to call for more equal economic redistribution (Boix, 1998; Chan, 1997).

1.4 Human Capital and Income Inequality

Growing disparity income has come under scrutiny in South Asia in recent decades. Along with income growth, income inequality has expanded in many countries (Piketty and Saez, 2014). The "miracle" of "growth with equity" has been realized in many East Asian economies, but this progress has also been accompanied by a worsening of income inequality (Zhuang, Kanbur,and Rhee, 2014; Jain-Chandra, Kinda, Kochhar, Piao and Schauer, 2019). From the perspective of social justice, a significant degree of income discrepancy is undesirable, especially when it stems from a widespread inequality of opportunity within a society. In addition, unequal income distribution might be adverse to long-term economic growth. Additionally, unequal income distribution might be unfavorable for continued economic growth. Growing inequality restricts investment by making society more unstable and hinders the potential for bright but poor people to advance their studies.

Research generally highlights human capital as one of the primary elements determining the extent of income inequality. A worker's lifetime earnings are largely determined by their human capital, which is based on their level of education. Parents feel that one of the most important measures to increase their children's future wages to capitalize in their education.

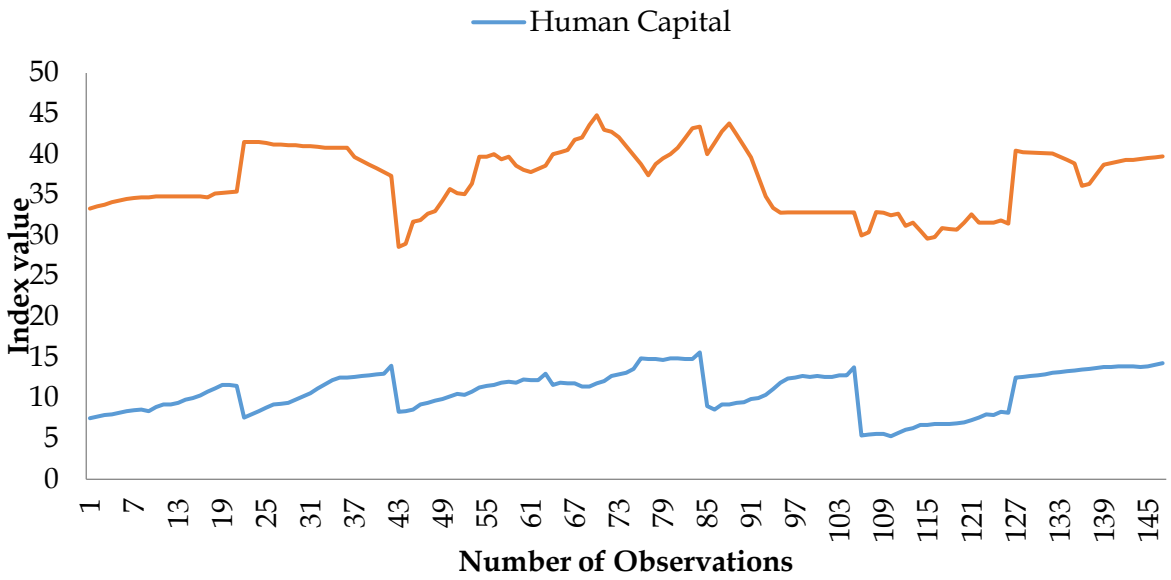

Figure 4
Human Capital and Income Inequality Trends from 2000-2020

The association between human capital and income inequality in south Asian nations is depicted in Figure (4). According to studies, the relationship between this region's human capital and income inequality is nonlinear. Between 2000 and 2020, Pakistan's human capital value climbed from 5.4 to 8.2 and the Gini coefficient value increased from 30 to 31.47. In India, the human capital value climbed from 8.3 to 12.9 and the Gini coefficient value increased from 28.6 to 38.6 between 2000 and 2020, respectively. In Pakistan, India, Bangladesh, and Iran, there is a positive association between human

capital and income inequality, which implies that as human capital expanded, the Gini coefficient's value rose and the income gap widened as well.

On the other hand, income inequality and human capital are negatively allied in Bhutan, Nepal, and Sri Lanka. The findings indicate that income inequality and human capital in south Asia are negatively correlated.

1.5 Relationship among Income Inequality and Some other Economic Variables in South Asia

Figure (5) show the association between income inequality and some other economic variable like trade openness, population, infrastructure, and Govt. health expenditures.

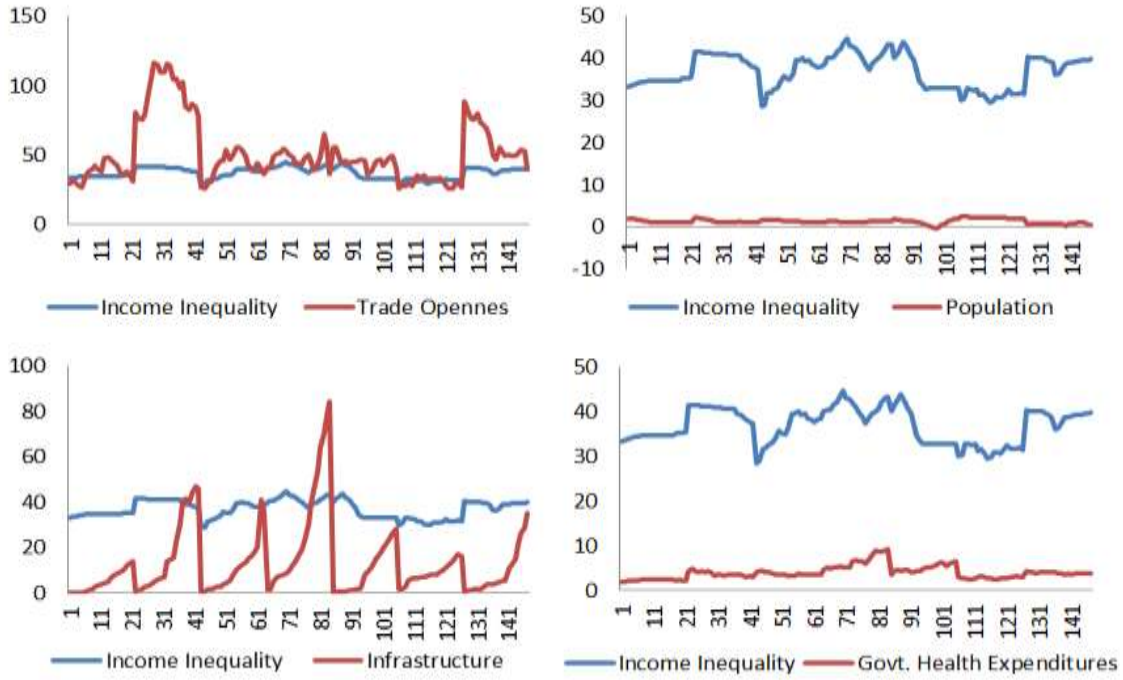

Figure 5
Income Inequality and other Economic Variables

1.6 Research Question

- Whether in the presence of democracy the human capital positively affects the income distribution in South Asian countries?
- What is the impact of human capital on income inequality in South Asia?

1.7 Scope of the Research Work

This study can expand the existing knowledge about the role of democracy and human capital in enhancing the equal distribution of income and it helps the policymakers and economic agents. There are several socioeconomic indicators such as corruption, money laundering weak financial system, education, and others that may affect the distribution of income. This research seeks to the role of the interaction effect of human capital in a democracy especially in South Asian countries.

1.8 Hypothesis

For the above study, we can build up the following hypotheses.

Hypothesis: Human capital has a negative impact on income inequality in South Asian countries.

Hypothesis: There is an interaction effect of human capital and democracy on income inequality in South Asian Countries.

The remaining part of the paper will proceed as: section 2 will describe the review of literature, section 3 will be based on the statistical and econometrics techniques, and section 4 will analyze the results and discussions for the investigation. Finally, section 5 will deliver the conclusion and policy implications.

2 Literature Review

The impacts of economic openness and democracy on income inequality were examined by Reuneny and Li in 2003. The study used a pooled time-series, cross-sectional data set from 1960 to 1996; a country decade served as the analysis unit, and 69 different nations made up the sample. According to the study, income inequality is not impacted by financial capital, but it is decreased by democracy and trade, increased by foreign direct investments, and unchanged by foreign direct investment.

Arslan and Okten (2010) used Johansen's (1988) cointegration and Error Correction Model (ECM) tests to investigate the affiliation between foreign direct investment (FDI) and democracy in Turkey, covering the period 1970-2010. The outcomes of the cointegration study revealed that foreign direct investments (FDI) and democracy had a long-term association. A unidirectional fundamental relationship between democracies and foreign direct investment was also suggested by the Error Correction Model.

Islam (2016) put forth a theory of the relationship between political freedom and income inequality with redistribution serving as a conduit via which freedom influences inequality. The data from 83 different nations were evaluated by using GMM methodology. The findings showed that freedom and inequality had a nonlinear, inverted U-shaped connection. According to the study's findings, only democracies experienced a decrease in inequality. Inter-country income inequalities were a result of institutional, cultural, and economic growth. Secondary education had little impact, while primary education reduces inequality.

Amir-ud-Din and Khan (2017) looked into how democracy, income inequality, and economic growth were related in Pakistan. The time series data were gathered from 1963 to 2016, and 3SLS and other estimation methods were used. The study's findings indicated that economic growth, income inequality, and democracy were endogenously interlinked in Pakistan. Economic growth was adversely affected by the degree of inequality, whereas the rate of economic growth had a major negative impact on democracy and had little effect on inequality. Inequality was decreased by democracy and public spending on public, social, and community services.

Saha and Zhang (2017) used cross-national panel data spanning more than 20 years that included the effect of the democratization process to evaluate the democracy growth tie and its interaction effect on human development. Over 170 nations participated in the panel data study from 1980 to 2010. The findings show that the democracy growth nexus interacted positively with human development. The study's findings suggested that because economic growth is so important in emerging nations, the function of democracy in promoting human development shouldn't be overemphasized.

Dahlum and Knutsen (2017) looked into whether democracy improved citizens' abilities and knowledge by raising the standard of education. The study used a current dataset that compared international student assessments for 128 nations starting in 1965. Studies did not consistently uncovered evidence that democracies provided higher-quality education. The study provided fresh information about the relationship between democracy and other educational outcomes that were not directly related to educational quality. It also informed literature that links democracy to development outcomes like growth through effects on human capital.

Annaka and Higashijima (2017) looked at how democracy affected human growth. The study applied Error Correction Models (ECM) with Instrumental Variables (IV) estimate and employed freshly gathered panel data on infant mortality spanning from 1800 to 2015. The findings showed that

democratization only reduced infant mortality in the long run. This study came to the conclusion that shortly following a regime change, democratization pushed the government to raise health spending.

Hovhannisyan, Castillo-Ponce and Valdez (2019) reported evidence regarding the significance of education in determining income inequality. By examining this link for a sample of developing and wealthy nations from 1990 to 2014, this study illuminated the controversy. This study was controlled for country-specific factors such as trade openness, unemployment, foreign direct investment, and the proportion of the senior population. Robust panel data calculations clearly demonstrated a negative and substantial affiliation between education and income disparity. The study concluded that in order to provide a more equal distribution of income and growth with equality, a more educated population benefit.

Trinugroho, Achsanta, Pamungkas, Saputro and Yuniarti (2023) empirically examined the impact of democracy on economic growth and income inequality at the regional level by studying provinces in Indonesia. A panel data estimation was employed with 335 province-year observations to test the empirical model covering 34 provinces. The study found that overall democracy was a detrimental factor to regional economic growth as higher level of democracy needed substantial cost to finance. However, the study revealed that democracy helped to reduce inequality across provinces as it might open up the possibilities to get more education for marginalized people which then implied for higher income for those people.

Vo, Vo and Ho (2024) investigated the effect of human capital on income inequality in both the short and long-term using the mean group, pooled mean group, and threshold regressions for the ASEAN-7 (including Indonesia, Laos, Malaysia, the Philippines, Singapore, Thailand, and Vietnam) from 1992 to 2018. Findings indicated that human capital reduced income inequality in the short run in the ASEAN countries. However, the effect was reverted in the long run.

Theoretical Framework

The majority of work examined the relationship between income inequality and economic variables (growth, foreign direct investment, capital inflow and human capital). Hsieh and Klenow's (2010) theory explain how variations in human capital between nations impact disparities in wealth. Benhabib and Speiegel (1994), however, contend that total factor productivity plays a role in the indirect relationship between human capital and income inequality within nations.

The most usual approach to gauge inequality is the Gini coefficient. Figure (6) illustrates how the Lorenz curve framework, on which the Gini coefficient built, is normalized. It is a perfect distribution line denotes a Gini coefficient for income inequality of 0, which indicates that everyone earns same income. The degree of wealth inequality in the population increases with the distance the Lorenz curve line deviates from this 45-degre line. In the extreme case, one person would earn all the income in a population, to which the maximum Gini value of 100 % would be attributed. The Gini coefficient is chosen as the dependent variable to quantify income inequality because it satisfies all four inequality principles (Ray, 1998). Furthermore, it is by far the most widely used measure if inequality and thus has many rich datasets.

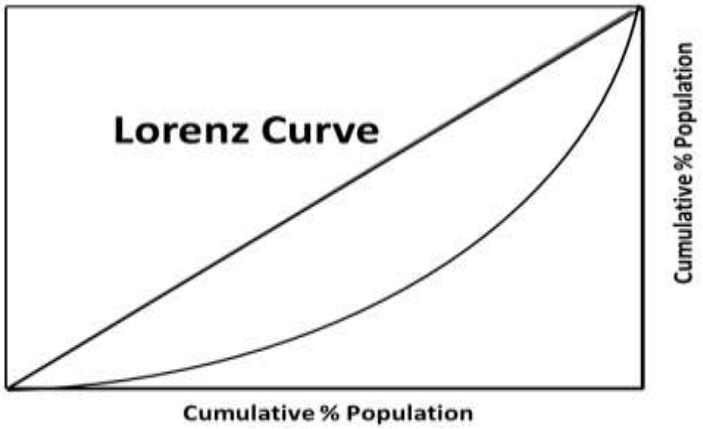

Figure 6
Lorenz Curve

The largest collection of datasets for the Gini cofficient is the Estimated Household Income Inequality Dataset (EHII), The World Income'Inequality Database (WIID), and finally, the Standardized World Income Inequality Database (SWIID) (Galbraith, Halbach, Malinowska, Shams & Zhang, 2015; World Bank, 2016; UNU-WIDER, 2015; Solt, 2020).

2.1 Research Gap

Through the previous literature, it seems that no one found the interactive effect between democracy and human capital on income inequality in South Asian countries. This study will observe the role of human capital, democracy, and their interaction effect on income inequality. It is also worth mentioning that the current study also applies multiple methodologies like POLS, FEM and REM.

3 Data and Methodology

Estimating the interactions between democracy, income inequality, and human capital is empirically difficult. The interaction effect of democracy and human capital on income inequality was examined by the study using panel data analysis. Seven South Asian nations are included in the panel data study, which spans the years 2000 to 2020. This study applied the pooled least square (POLS), fixed effect model (FEM), and random effect model (REM) to estimate the panel. The empirical analysis evaluates the interaction effect of democracy and human capital on income inequality.

In this research paper income inequality (Gini index) is the endogenous variable on the other hand human capital (education index), and democracy (polity V), and their interaction term is treated as exogenous variables. The study has collected data from different sources like human capital (UNESCO, 2022), Gini coefficient (World Bank, 2020), Polity V (INSCR, 2020), and govt. health expenditures (World Bank, 2020) etc.

Table 1
Measurement and Source of Data

Short form	Measurement	Source
GINI	Gini disposable income	World Inequality Database
HC	Education index	UNESCO Institute for Statistics (2022)
POP	Population growth (annual %)	World Bank
TROP	Trade (% of GDP)	World Bank
INF	Individuals using the Internet (% of population)	World Bank
GHE	Current health expenditure (% of GDP)	World Bank
DEMO	Polity V	Integrated Network for Social Conflict Research (INSCR)

Interaction Term	Multiple of polity V and education index	Author Calculations

The table (1) explains the variables, their measurements, and their sources. It is given that % population growth, trade % to GDP, infrastructure, and Govt. health expenditure data collected from the World Bank (WB). The Gini coefficient data is collected from the World Inequality Database (WID), Human capital is measured by the education index and data collected from the UNESCO Institute for Statistics (2022), and last democracy data is collected from the Integrated Network for Social Conflict Research (INSCR).

3.1 Unit Root Tests

The order of integration of the variables (ADF) was ascertained by the study using three-panel unit root tests Levin Lin and Chu (LLC 2002), IM Pesaran and Shin (IPS 2003), and Augmented Dicy-Fuller. To do this, the Levin-Lin Chu (LLC, 2002) regression standard equation can be calculated as follows.:

$$\Delta y_{i,t} = \propto_t + \theta_t + \delta_t t + \rho_i y_{i,t-1} + \sum \alpha_t \Delta y_{t-i} + u_{i,t} \dots\dots\dots\dots\dots (6)$$

t = 1,2,3,4,……, T: I = 1,2,3,4,…..…..N: where 'i' and 't' show the countries and time period respectively. The model is very general since it permits for both entity-specific and time-specific through α_t and θ_t respectively.

The regression standard equation can be estimated for the Augmented Dicky Fuller (ADF) test:

$$\Delta Y_t = \gamma Y_{t-1} + \sum_{i=2}^{p} \beta_i \Delta Y_{t-i-1} + u_t \dots\dots\dots\dots\dots (7)$$

$$\Delta Y_t = a_0 + a_2 t + \gamma Y_{t-1} + \sum_{i=2}^{p} \beta_i \Delta Y_{t-i-1} + u_t \dots\dots (8)$$

3.2 Specification of the Model

On the basis of literature review and theoretical framework the study concludes some determinants of income inequality such as democracy, education, population, trade openness, infrastructure and government health expenditure. To estimate the role of human capital, democracy and their interaction effect on income inequality, the study has devised the following economic model.

$GINI = f\ (\ HC, POP, TROP, INF, GHE)$ ……... (1)

$GINI = f\ (\ interaction, POP, TROP, INF, GHE)$ …… (2)

Models (1) and (2) are structured by incorporating the Gini coefficient (GINI) as a dependent variable and on the right-hand side population (POP), trade openness (TROP), infrastructure (INF), government expenditures (GEDU), and interaction of human capital and democracy (HC*DEMO) as explanatory variables.

Econometrics transformation of the model (1) and (2) is given as below:

$Gini = \alpha + \beta_1 HC + \beta_2\ POP + \beta_3 INF + \beta_4 GHE + Ui$ ……... (3)

$Gini = \alpha + \beta_1 Interaction + \beta_2\ POP + \beta_3 INF + \beta_4 GHE + Ui$ ……. (4)

3.3 Panel Analysis

Panel data models have grown to be quite popular because they can reduce biases resulting from time-constant omitted variables. Panel data are multidimensional data that offer information about spanning several time periods and among different people (countries). The above equations (3) and

(4) can be transformed in their generalized econometrics model form for the panel data analysis as under:

$Y_{it} = \alpha + \beta_1 X_{it} + \beta_2 X_{it} + \beta_3 X_{it} + \beta_4 X_{it} + \mu_{it}$ ..... (5)

Y_{it} = Dependent Variable

α = Intercept of the Model

X_{it} = Respective Independent Variables

β_i= Respective Slope

μ_i = Error Term of Model

3.4 Estimation Techniques

Panel data offer information on individual behavior within individuals as well as over time. They have cross-sectional and time-series dimensions. The model (9) represents the Fixed Effect Model within the group in which the "u_t" represents the error term and "ε_{it}" represent the idiosyncratic error term.

$$Y_{it} = \propto_1 + \sum_{k=2}^{k} \beta_j X_{kit} + u_t + \varepsilon_{it} \dots\dots\dots\dots\dots (9)$$

Slope coefficients are constant, and the intercept varies over individuals:

$$y_{it} = \alpha_i^* + \sum_{k=1}^{k} \beta_k x_{kit} + u_{it} \dots\dots\dots\dots\dots\dots (10)$$

Slope coefficients are constant, and the intercept varies over individual and time:

$$y_{it} = \alpha_{it}^* + \sum_{k=1}^{k} \beta_k x_{kit} + u_{it} \dots\dots\dots\dots\dots\dots (11)$$

All coefficients vary over individuals:

$$y_{it} = \alpha_i^* + \sum_{k=1}^{k} \beta_{ki} x_{kit} + u_{it} \dots\dots\dots\dots\dots\dots (12)$$

All coefficients vary over time and individuals:

$y_{it} = \alpha_i^* + \sum_{k=1}^{k} \beta_{kit} x_{kit} + u_{it} \dots\dots\dots\dots\dots (13)$.

In the above equations the "i" represents the number of individuals and "t" represents the number of the time.

4 Results and Discussion

We begin with the panel unit root test and use the Levin Lin Chu (LLC), Hadri LM (HLM), and IM, Pesaran, and Shin tests in order to evaluate the influence of democracy and human capital on income inequality.

Table 2
Results of Unit Root Tests

Variables	LLC	(HLM)	(IPS)	Summary
Gini coefficient	I(0)	I(0)	I(1)	I(0)
Democracy	I(1)	I(0)	I(1)	I(1)
Human capital	I(0)	I(0)	I(1)	I(0)

Population growth	I(0)	I(0)	I(0)	I(0)
Trade openness	I(0)	I(0)	I(0)	I(0)
Infrastructure	I(0)	I(0)	I(1)	I(0)
Govt. health Expenditures	I(0)	I(0)	I(1)	I(0)

According to the outcomes in Table (2), the majority of the variables are stationary at level, although some are stationary at level I(0) and some are stationary at the first difference I(1). The table's summary indicates that democracy is stationary at the first difference, and the Gini coefficient is stationary at the level, and all other variables are likewise stationary at the level

4.1 Descriptive Statistics

A specific data set is summarized by concise informative coefficients in descriptive statistics. In this study, the dataset consists of a balanced panel set of Seven South Asian countries. The period of the analysis is 2000 to 2020. The results of descriptive statistics are given in the following table.

Table 3
Descriptive Statistics

Variables	Mean	Standard deviation	Minima	Maxima	Observation
Income inequality	36.95925	3.974559	28.6	44.8	147
Democracy	2.45102	5.961697	-10	9	147
Human capital	10.82005	2.567285	5.3	15.61684	147
Population	1.32569	.5415625	-.2684863	2.647399	147
Trade openness	51.40606	22.30051	25.30623	116.5498	147
Infrastructure	12.83055	15.7027	.071039	84.11087	147
Govt. health expenditures	3.993597	1.502811	1.986744	9.329763	147
Human capital *Democracy	26.93382	65.78215	-109.3179	116.7726	147

The above table (3) described the variable's mean values, standard deviation, minimum values, maximum values, and the total number of observations used in this study. Income inequality shows a mean value of 38 and the mean value of democracy is 2.45102. The minimum value of the Gini coefficient is 28.6 which is observed in India in 2000 and the maximum values is 44.8 which is observed in Iran in 2006. Every variable takes equal 147 observations in the balanced panel data.

4.2 Pair-Wise Correlation

The Pair-Wise correlation is used to quantify the linear relationship between two variables. A perfect positive correlation has a value of +1, whereas a perfect negative correlation has a value of -1.

Table 4
Pair-Wise Correlation

	GINI	DEMO	HC	POP	TROP	INF	GHE	HC*DEMO
GINI	1.0000							
DEMO	0.3943	1.0000						
HC	0.5501	0.0272	1.0000					
POP	0.3722	-0.1763	-0.7457	1.0000				
TROP	0.6048	-0.1157	0.3132	-0.2790	1.0000			
INF	0.2418	-0.1212	0.5715	-0.1262	0.1132	1.0000		
GHE	0.4175	-0.3662	0.6077	-0.2509	0.0936	0.5626	1.0000	
HC*DEMO	-0.3414	0.9697	0.0450	-0.2221	-0.0357	-0.1616	-0.4048	1.0000

Table (4) shows the pair-wise correlations matrix for the overall seven variables which describe the summary statistics for panel data. In the above table, we see that the Gini coefficient is extremely

linked with human capital, democracy, and trade openness. The correlation value among Gini coefficient and democracy is 0.39 and between the Gini and human capital, it is 0.550 which means that human capital and democracy highly affect the Gini coefficient. Trade openness is also highly correlated with the Gini coefficient. The correlation coefficient value between these two variables is 0.6.

4.3 Diagnostic Tests

Diagnostic tests are performed as a part of the basic analysis in econometrics. These tests are used to diagnose heteroskedasticity, autocorrelation, misspecification of the functional form, etc.

Table 5
Diagnostic Tests

Test Statistics	Null Hypothesis (H_0)	Prob.	Decision
Breusch-Pagan Test	H_0: Homoscedasticity	0.9302	Accept H_0
White Test	H_0: Heteroscedasticity	0.0000	Reject H_0
Breusch-Pagan LM Test	H_0: Fixed-Effect-Model is Appropriate	1.0000	Accept H_0
Hausman Test	H_0: Fixed-Effect-Model is not Appropriate	0.0000	Reject H_0

The table (5) shows the result of diagnostic tests which are applied to diagnose the data and model applied in this paper. To verify the heteroskedasticity and robustness, the White test and Breusch-Pagan test are used. The findings demonstrate that the model's heteroskedasticity is not problematic. The Hausman test and the Breusch-Pagan LM validate whether the fixed effect model or the random effect model is appropriate. The 0.000 p-value of the Hausman test, which demonstrates how the null hypothesis was rejected, suggests that the fixed effect model is inadequate. Finally, according to the study's findings, the fixed effect model makes more sense than the random effect model.

4.5 Results of Fixed Effect Model (FEM)

In this section, the regression analysis results are presented and discussed. The Stata 14 is used to regress the balanced panel data of South Asia. First, the regression results using the fixed effect model are presented. Secondly, it follows the pooled OLS and random effect model. Finally, the study will compare these models. For each model a Hausman test is conducted to indicate whether the fixed effects model or random effects model is appropriate (Hill , Griffiths, and Lim, 2012).

Table 6
Panel Fixed Effect Model

Dependent Variable		Income inequality		
Method Used		Fixed Effect Model		
Sample Adjustment		2000 to 2020		
	Regression 1 FEM		**Regression 2 FEM (interaction term)**	
Variables	**Coefficient**	**Prob.**	**Coefficient**	**Prob.**
HC & HC*DEMO	-0.7316131	0.004	-0.0272692	0.000
POP	0.5376795	0.408	1.131943	0.017
TROP	0.102707	0.000	0.1060429	0.000
INF	0.0889374	0.000	0.0707814	0.000
GHE	-1.245454	0.000	-2.003013	0.000
Constant term	42.71551	0.000	37.83292	0.000
R-Square		0.5810		
Adjusted R-Square		0.5661		
Prob (F-Statistics)		0.000		
Rho		0.86784552		

In table (6) regression 1. (FEM) includes income inequality as an endogenous variable and human capital, population trade openness, infrastructure, and Govt. health expenditures as exogenous

variables. The result of the fixed effect model shows how these variables affect income inequality in South Asian Countries. The first independent, human capital is statistically significant and negatively related to income inequality. It means that when the education level of society increased the income gap between people will be decreased. Hence, increases in human capital over time lead to a decrease in the income gap among the people in South Asia. The estimated coefficient (-0.7316) suggests that on average when one percent increases in the human capital it will decrease the income gap (-0.7316) percent. This result is supported by Lee and Lee (2018) and Hovhannisyan, Castillo-Ponce and Valdez, (2019) who also confirmed that human capital and income inequality are negatively associated with each other. In this model population is the second independent variable which is positively related to income inequality it means that when the population increase in south Asia the income gap will also increase but this relation is statistically insignificant. The third variable, trade openness is statistically substantial and positively related to the dependent variable it means that when trade between the countries increases the income gap will also increase. In this model, the infrastructure is the fourth explanatory variable which is statistically significant and positively connected to the explained variable. In the first model, the value of the infrastructure is (0.088). It means that a one percent change in the infrastructure will lead to an (0.088) increase in the income gap. Govt. health expenditure is the last independent variable which is negatively and statistically significantly related to the income inequality whose value is (-0.1245). When the govt. health expenditures increased the income gap among the people will decrease in south Asia. The value of the constant term is (42.715).

In the second model the study used the interaction term to investigate the second hypothesis (There is an interaction effect of human capital and democracy on income inequality in South Asian Countries). In the above table (6) regression 2. representing the result of interaction term (human capital*democracy). In this model study will conclude whether human capital is negatively or positively related with the income inequality and the relation statistically significant or insignificant. There is one dependent variable and five independent variables including the interaction term. The first independent variable is the interaction term which is negatively and statistically significant related with the income inequality. It's value is (-0.027) which means that when one percent increase in the interaction term it will lead to (-0.027) decrease in the income inequality in the South Asian Society. This result is in line with the results derived by many studies (Reuveny and Li 2003; Pan-Long 1998; Islam 2016; Amir-ud-Din and Khan 2017) has reported negative impact of the democracy on income inequality. The study accepts the hypothesis that there is an interaction effect of human capital and democracy on income inequality in South Asian Countries. By adding the interaction term we see that the population is also providing the statistically significant and positive results. In the regression 1. FEM population is statistically insignificant. In this model it's value is (1.131) it means that when the one percent population increase the income gap will also increase by (1.131) percent. The trade openness and infrastructure are also positively and statistically significant related with the income inequality. The last variable Govt. health expenditure is negatively related with the income inequality. The constant term is decrease from regression 1. FEM (42.71) to regression 2. FEM (37.83) which show that with the interaction term model explaining better than the previous model.

At last the R-square value show the explanatory power of the model. It explains that how much explanatory variable explaining to the model. The value of R-square is (0.58) it's means that the taken exogenous variables 58 percent explaining to the model. The adjusted R-square is the modified shape of the R-square whose value only increases when the model explanatory power increases in real term. The value of adjusted R-square is (0.56) which means that dependent variables can explain 58 percent to the dependent variable in real term. Prob. (F-Statistics) shows the overall significant of the mode. The value of F-statistics is (0.00) which show that model is best fitted. The Rho value shows the overall association between the variables. In this model the Rho value is (0.867) it means there is strong relationship among the selected variables.

4.6 Regression Results of Pooled OLS, FEM, and REM with and without Interaction Term

Three alternative approaches, including Pooled OLS, fixed effect models, and random effect models, were used in the study's construction of a panel data econometric model. Ordinary least squares (OLS) regression with no cross-sectional or time effects is what is used in the pooled regression. Because the fixed effect model controls the unobserved time-invariant within the panel and the random effect model captures the effects of unobserved factors that may induce heterogeneity across the nations, the study mentioned the fixed effect model in the previous section. The Pooled OLS is poorer than the others according to the statistical significance of the F-test and Breusch-Pagan Lagrangian test. However, none of the FEM and REM coefficients are statistically significant when examining the significance of regression coefficients. Table (7) study compares the outcomes of Pooled OLS, random effect model, and fixed effect model.

Table 7
A Comparative Analysis between POLS, FEM, and REM

Variables	POLS	POLS with (HC*DEMO)	FEM	FEM with (HC*DEMO)	REM	REM with (HC*DEMO)
HC & HC*DEMO	0.78895 (0.000)	-0.01845 (0.000)	-0.73161 (0.004)	-0.02726 (0.000)	0.78895 (0.000)	0.02049 (0.000)
POP	1.29255 (0.092)	-1.85574 (0.000)	0.53767 (0.408)	1.13194 (0.017)	1.29255 (0.042)	-1.05289 (0.037)
TROP	0.08859 (0.000)	0.09021 (0.000)	0.10270 (0.000)	0.10604 (0.000)	0.08859 (0.000)	0.09449 (0.000)
INF	-0.05290 (0.013)	0.00007 (0.997)	0.08893 (0.000)	0.07078 (0.000)	-0.05290 (0.023)	0.01186 (0.472)
GHE	0.590114 (0.005)	0.483833 (0.018)	-1.24545 (0.000)	-2.00301 (0.000)	0.59011 (0.005)	-0.01108 (0.964)
Constant term	20.47688 (0.000)	33.3456 (0.000)	42.71551 (0.000)	0.78895 (0.000)	20.47688 (0.000)	33.94113 (0.000)
R-Square	0.5810					
Adjusted R-Square	0.5661					
Prob. (F-Statistics)	0.0000					
Rho	0.86784552					

Model 1 to 6 of the table (7) represents the Pooled OLS, REM, and FEM regression results. The first two models show the Pooled OLS results. In the first model (POLS) income inequality is the dependent variable and human capital, population, trade openness, infrastructure, and Govt. health expenditure are independent variables. The results show that all variables have a statistically significant effect on income inequality. Expect in infrastructure all other variables have a positive effect on income inequality. Human capital is the first independent variable the coefficient value of this variable is (0.7889) which shows that when human capital increased by one percent the income gap among the South Asian people increased by (0.7889) percent. The second variable (population 1.292) fourth variable (trade openness 0.0885) and fifth variable (Govt. health expenditure 0.529) are positively related to income inequality.

In the second model POLS with interaction term (HC*DEMO) is used to find out the relationship between the dependent variable and independent variable in the presence of democracy. As mansion above that, the interaction term is the multiple of human capital and democracy. The model shows that the interaction term negatively impacts income inequality. It means that in the presence of democracy human capital is negatively related to income inequality the value of the interaction term

is (-0.0184) which means that when the interaction term increase by one percent the income inequality decreases by (-0.0184) percent these results are also statistically significant and in line with the (Reuveny & Li 2003); (Pan-Long, 1998); (Islam, 2016); and (Amir-ud-Din & Khan 2017). In this model, the population is negatively related to income inequality and all other variables are positively related to income inequality. As compared to the first POLS model this model is given better results and all variables are statistically significant.

The third (FEM) and fourth (FEM with interaction term) models are already explained in table (6). The results of these models show that there is a negative relationship between the Gini coefficient and human capital the interaction term is also negatively related to the Gini coefficient. The results of these two models all variables are statistically significant.

At the end of this research, this study applied the random effect model. Model fifth (REM) and model sixth (REM interaction) also show the relationship between the same variable which are used in the previous model. The result of the first random effect (REM) shows a positive and significant relationship between income inequality and human capital, that is when human capital increased by one percent the income gap will be increased by (0.7889) percent. The result of the first random effect model (REM) and the first pooled OLS (POLS) model are the same and statistically significant. But the result of the second pooled OLS (POLS with interaction term) and second random effect model (REM with interaction term) are not the same.

In the above table (7) the last model (REM with interaction term) also shows the relationship between income inequality and the interaction term. The value of the interaction term is (0.0204917) and P-value is (0.000) which shows that there is a positive and statistically significant relationship between the interaction term and income inequality. This model shows that in the democratic economy when the human capital increase by one percent the income gap increases by (0.020491) percent. In this model two variables (population and Govt. health expenditures) shows a negative relation with income inequality other variable (human capital*democracy, trade openness, and infrastructure) are positively related to the income inequality.

In this table, the results of the R-square and adjusted R-square show that the model is best fitted. The value of F-statistics shows the overall significance of the model and the value of F-statistics is 0.0000 which is less than one percent and it authenticates that overall, the model is significant at a one percent significant level. Rho indicates the variance in the model due to the randomness of the sample and the estimated value of the Rho of the model is (0.8678) which shows that the sample is heterogeneous across the countries and implies that the Fixed Effect Model is suitable which further authenticates application of the Fixed Effect Model (FEM).

From the above discussion, we conclude that Human capital negative impact on income inequality, and there is an interaction effect of human capital and democracy on income inequality in South Asia. When the literacy rate increase it will decrease the income gap between poor and rich people. The results of the study support democracy because the results are statistically significant and in favor of democracy.

Democracy always has a negative impact, which suggests that it lowers the level of income inequality. By using more accurate income inequality data (in comparison to previous studies of the effect of democracy on inequality), including economic openness in the model, and correcting for the Kuznets (1955) curve and prior income inequality, the results support the hypothesis that democracies reduce income inequality within nations.

Finally, the study concludes that fixed effect model is preferable than the random effect model because numerous research have validated the conclusions of the fixed effect model (Reuveny and Li, 2003; Pan-Lang, 1998; Islam, 2016; Amir-ud-Din and Khan, 2017). The FE estimation is the best choice and gives you the best consistent estimates.

4.7 Multicollinearity

Multiple independent variables in a model can be correlated with one another, a phenomenon known as multicollinearity in statistics. To address the problem of multicollinearity in the model, VIF and TOI tests are applied. The Results of these tests are given as under:

Table 8
Multicollinearity

Variables	VIF	TOl	Conclusion
Human capital	6.22	0.160784	No Multicollinearity
Population growth	3.46	0.288878	No Multicollinearity
Govt. health expenditures	2.44	0.410237	No Multicollinearity
Infrastructure	2.18	0.458531	No Multicollinearity
Democracy	1.38	0.725599	No Multicollinearity
Trade openness	1.19	0.841133	
Mean VIF	2.81		

The Variance Inflationary Factor (VIF) and Tolerance (TOI) test results are shown in Table (8), which guarantees that there is no multicollinearity in the model because the VIF's mean value is 2.81 and its value is less than 10.

5 Conclusion and Policy Implications

In the wake of the most recent economic crises the global increase in income inequality has been the subject of numerous political and public discussions. This study offers proof that the distribution of income is significantly influenced by human capital, as determined by the educational index. For the years 2000 to 2020, this analysis employed balanced panel data from seven South Asian nations. According to the study's three main approaches (pooled OLS, random effect, and fixed effect model), education has greatly reduced income inequality. A higher level of education contributes to lessening income inequality. The study shows support for the claim that human capital has a bad relationship with income inequality in South Asia by employing three different techniques. In the next step, the effect of the interaction term (democracy*human capital) on income inequality is empirically assessed by this study. The findings support the hypothesis that there is a negative link between interaction terms and income inequality, suggesting that democratic and educational levels are key factors in influencing the income distribution. Democracies are essential for raising human capital and reducing income inequities. The findings support the hypothesis that population has a causal relationship with income inequality. The differences in income inequality widened as the population grew. The results show that the contribution of democracy to the reduction of income inequality gaps should not be overemphasized, particularly in South Asian nations.

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