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The Dynamics Of Income Inequality In Pakistan: An Empirical Investigation On The Role Of Macroeconomic And Institutional Forces

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Abstract:

Turn down income inequality as a key component of green development, and the income inequality can have a negative impact on economic growth. The paper aims to assess the operators of income inequality in Pakistan using an Environmental Kuznets curve framework, which emphasizes the relationship between per capita income and inequality. We have explicitly examined the probability of the continuation of various income substantial states using the approach of nonlinear autoregressive distributed lags model (NARDL). Using time series data of Pakistan spanning the years 1981–2021. For inspecting the study, Gini coefficient is used as a dependent variable and income, employment, government spending and corruption are used as the independent variables. Our findings suggest that the coefficient of all independent variables have a positive relation with inequality in both long run and short run except income. In other words, the role of macroeconomic indicator like economic growth increases in Pakistan the income inequality decreases. Evidence suggested the attention of financial, and job related policies, corruption are tackled when income inequality reduced in Pakistan.

Keywords: Income inequality, Macroeconomic and institutional forces, ARDL, NARDL, Pakistan.

Introduction:

In order to attain goal of sustainable development, Pakistan has implemented a number of policy initiatives, which have been designed to promote economic growth and reduce poverty. These include the creation of the Ministry of Planning, Development and Reform, and the development of the Poverty Reduction Strategy Paper (PRSP). The PRSP is an important certificate that outlines the country's strategies for poverty reduction and economic growth, and addresses key issues such as poverty reduction and human development, access to basic services, and economic opportunity. Additionally, the Government of Pakistan has implemented a number of social protection schemes, such as the Benazir Income Support Program, the Ehsaas Program, and the BISP, which are targeted at providing economic assistance to the poor for reducing inequality. Furthermore, the Government of Pakistan has made efforts to improve the country's infrastructure, which is essential for economic development. This

includes investment in the energy sector, which is crucial for sustained economic growth, and the construction of roads, ports and railways. In addition, the country has also implemented a number of fiscal incentives, such as tax holidays and export promotion schemes, to attract foreign direct investment and create jobs. Overall, the Government of Pakistan has taken important steps to promote economic growth, reduce poverty and inequality.

The process of economic improvement and structural transformation is a well-established phenomenon, as pointed out by Kuznets (1973) and Lewis (1954). As economies grow, they tend to shift away from agriculture towards manufacturing and services, with a greater concentration of economic activity in downtown. The constitutional revolution is fueled by, including labor, and capital, and it underpins economic growth. However, income inequality can significantly slow down economic growth. This is because income inequality can limit, the economical and reasonable use of applicable assets, as noted by Boushey (2020, 2015), Alesina and Perotti (1996), Persson and Tabellini (1994). In other words, if a significant proportion of the population does not have access to the resources needed to participate in the growth process, then the overall pace of economic growth is likely to be slower, and poverty reduction will be slower as well. It is therefore important to address income inequality as part of any strategy for promoting economic growth and poverty reduction. This may involve policies to promote greater income equality, such as progressive taxation, minimum wage laws, and social safety nets. By assuring that, all representatives of community have connection to the capital, they right to cooperate in the growth process, and we can promote more economical and reasonable use of applicable assets, and thereby accelerate the measurement of economic expansion and poverty diminish, Boushey (2020), Bourguignon (2004), and Kakwani (1993).

The Kuznets curve framework suggests that income inequality initially increases as a country's economy develops, but then starts to decrease after a certain level of economic development is reached. The Environmental Kuznets curve posits that income inequality first increases with economic development as economies transition from agriculture to industry, and then decreases as economies mature and shift towards a service-based economy. Some studies have found support for the Kuznets curve (1955). Furthermore, even if the Kuznets curve holds true, it is important to note that reducing income inequality may still be an important policy goal, as high levels of inequality can have negative effects on social and economic outcomes, as discussed earlier. In the case of African countries, it is possible that lower levels of income inequality would have led to greater progress in economic growth and poverty reduction. However, it is also important to recognize that many factors, including political instability, lack of infrastructure, and limited access to credit and technology, have also contributed to the slow pace of economic development in many African countries. Addressing these factors will also be critical for promoting sustained economic expansion and poverty diminishing in the region.

Income is a key driving force of income inequality. However, the empirical evidence on the relationship between income and income inequality is mixed, and conflicting findings have been reported in the literature, Boushey and Price (2014). Some researchers have established a positive link between income and inequality, while others have found a negative or no relationship, Persson and Tabellini (1994), Alesina and Perotti (1994, 1996). Methodological shortcomings, such as the use of different datasets, sample sizes, and measures of income and inequality, may have contributed to these

conflicting findings. Despite these methodological challenges, it is widely acknowledged that income inequality can have significant negative effects on social and economic outcomes, including reduced economic growth, increased poverty, and social unrest. Therefore, policymakers should consider addressing income inequality as a critical component of their efforts to promote sustained economic growth and poverty reduction. Moreover, while income is a critical determinant of income inequality, other factors, such as access to education, healthcare, and social safety nets, can also play a crucial role. By promoting greater access to these resources, policymakers can help reduce income inequality and ensure that all members of society have the opportunity to participate in the growth process, Li and Zou (1998), Forbes (2000), Partridge (1997), Frank (2009), Muinelo-Gallo and Roca-Sagalés (2013), Cingano (2014), Nahum (2005), Rubin and Segal (2015), Saari et al. (2015).

The effect of income on inequality can vary depending on the level of economic development of a country. Some studies have found that earning adversely changes income inequality in growing countries, Barro (2000), while others have found a positive relationship in prosperous economies. In the context of Pakistan, it is important to understand the link between income and income inequality to develop effective policies aimed at reducing inequality and promoting inclusive growth. However, the literature on this topic in Pakistan has been relatively narrow in focus. Empirical examination of the relationship between income and income inequality in Pakistan could help to fill this gap in the literature. Additionally, exploring the determinants of income inequality in Pakistan, such as access to education and healthcare, could shed light on potential policy solutions for addressing this issue. It may be useful to investigate the distributional impact of economic expansion in Pakistan to determine whether it is contributing to reducing or exacerbating income inequality. Policies aimed at promoting more inclusive growth could help ensure that the benefits of economic growth are shared more equitably across society. Overall, understanding the relationship between income and income inequality in Pakistan is an important area of research that could inform policy decisions aimed at promoting more equitable and sustainable economic growth.

In Section 2, we can discuss the existing literature on income inequality in Pakistan, including previous empirical studies, theoretical frameworks, and policy recommendations. In Section 3, you can provide a detailed description of your econometric methodology and framework. This may include the data sources we used, the variables we included in the analysis, and any assumptions or limitations of the approach. In Section 4, we can present the empirical results, including any descriptive statistics, regression analyses, or other econometric techniques we used. Finally, in Section 5, we can summarize the main findings, draw conclusions, and offer policy recommendations based on the research.

Literature review:

Indeed, the link between income disparity and economic expansion was a complex and multi-faceting one, with various mechanisms and channels of influence at play. The income disparity could stimulate economic expansion over the investment - saving system, Kaldor (1957) and Pasinetti (1962), other scholars had argued that high levels of inequality could actually hinder growth by reducing the limiting access to investment and credit opportunities for those at the bottom of the income distribution, Galor and Zeira (1993), Milanovic (2016). Milanovic (2016) concept of "Kuznets waves" highlighted the idea that income inequality was not a static phenomenon, but rather a dynamic and evolving one that was shaping by a range of

economic, social, and political factors. According to this perspective, the current increase in inequality was driving by a combination of technological progress and globalization, which were transforming the nature of work and the distribution of income and wealth in society. However, Milanovic (2016) also suggested that these forces were likely to leading to a reduction in inequality over time, as the benefits of growth eventually trickle down to lower-income groups and a new equilibrium was establishing. Kuznets (1955), Atkinson and Harrison (1978), and Piketty (2014), studied of income disparity and link to economic expansion was an important and ongoing area of research, with implications for policy-makers, businesses, and individuals.

Simon Kuznets, a Nobel laureate in economics, hypothesized that there was an inverted U-shaped link between inequality and economic expansion. According to Kuznets, as an economy develops, income inequality initially raised, then plateaus, and eventually decreased as per capita income continues to grow. Kuznets argued that during the early stages of development, the market forces of industrialization and urbanization tend to increase income inequality. However, as economies develop further, government intervention, such as progressive taxation and social welfare programs, was help to reducing inequality. Some argued that the link between inequality and economic expansion was not as clear-cut as Kuznets proposed and that other factors, such as political institutions and globalization, play a significant role. While some studies suggested that government spending on social welfare programs was help reducing inequality, others argue that it was also creating disincentives to work and negatively affect economic growth. The effectiveness of government expenditure in reducing inequality may also depend on the specific policies.

Calderon and Serven (2004) found that public investment in infrastructure had a positive effect on economic growth and contribute to reduced income inequality in developing countries. It highlighted the complexity of the relationship between government expenditure and inequality, as different studies had found varying results depending on the country and time period studied. It was important to note that government expenditure could take many forms. Furthermore, the impact of government expenditure on inequality may depend on other factors, such as the level of corruption, the efficiency of public service delivery, and the structure of the economy. Therefore, it was important to consider these factors when assessing the effectiveness of government expenditure policies in reducing inequality.

Likewise, Maestri and Roventini (2012) found the relationship between government expenditure and income inequality was complex and could vary across different countries and time periods. The finding that government expenditure could increase income inequality in some European countries suggests that the effectiveness of government expenditure policies in reducing inequality may depend on the specific context in which they were implementing. Sarel (1997) proved the differing results on the impact of inflation on income disparity also highlight the need for careful analysis of the factors that contribute to income disparity excluding, Ademan and Fuwa (1992), Sarel (1997), and Blinder and Esaki (1978). While some studies had founded that inflation could contribute to cyclical changes in income distribution, other studies had not founded a significant relationship. This underscores the importance of considering multiple factors and using rigorous empirical methods to understand the drivers of inequality.

Easterly and Fischer (2001) suggested that there was complex relationships between inflation, inequality, and the well-being of the poor. While some studies had founded a negative correlation between inflation and the well-being of the poor,

others Beetsma and Van der Ploeg (1996) and Romer (1986), and Bulìrˇ and Gulde (1995) had founded a positive correlation between inflation and inequality. Furthermore, the persistence of inequality in countries with adverse domestic conditions highlights the importance of addressing the underlying structural factors that contribute to inequality. These may include political instability, small levels of investment, macroeconomic instability, and weak financial institutions. Galor and Zeira (1993), Fishman and Simhon (2002), diminished inequality and increasing access to resources and opportunities, policies aimed at promoting human capital development could help to diminish the gap of poverty period and promote more equitable and sustainable economic growth.

Barro (2000) found that investment, particularly physical capital investment, was the most significant determinant of economic expansion across 70 nations. The investment and financial development were important factors to promoting economic growth and reducing inequality. The finding that income inequality could hinder investment highlights the importance of addressing inequality as a means of promoting economic development. Furthermore, the concept of financial inclusion, which goes beyond financial depth to also consider broader access to financial services, had also emerged as an important factor to reducing poverty and inequality. According to Alesina and Perotti (1996), while there was existing empirical evidence of the impact of fiscal improvement on poverty and inequality diminish, there was need for more cross-country empirical studies that considering the broader concept of financial inclusion. Dabla-Norris et al. (2015), Han and Melecky (2013), Mehrotra and Yetman (2015), Sahay et al. (2015), overall, these studies underscore the importance of addressing inequality as a means of promoting economic growth and development, and suggested that investment and financial development could play important roles to achieving these goals.

According to Ricardo (1821), the theory of comparative advantage suggested that countries should specialize in producing goods and services in which they had a comparative advantage, and trade with other countries to maximize their gains from trade. The empirical studies you mentioned suggest that the consequences of trade on income disparity depend on a variety of factors, including factor endowments, skills, and the level of development. Some studied find that trade openness could lead to increased income inequality in high-income, Jaumotte et al. (2013) and capital-abundant countries, while reducing inequality in low-income countries. Other studies, Spilimbergo et al. (1999) found mix results, with trade openness having differing effects on income inequality in different countries. These results propose that the link between trade and income disparity was complex and depends on a variety of factors. While Yang and Greaney (2017) highlighted the importance of considering the impact of trade policies on income distribution, and suggested that trade policies should be designed to promote inclusive growth and reduce inequality.

However, some studies challenged the notion that democracy and good institutions necessarily lead to reduced income inequality. For example, argued that democracy could lead to increased redistribution, but also increased rent-seeking and inefficiencies, which could harm economic growth and ultimately exacerbate income inequality. Similarly, Persson and Tabellini (1994) found that while democracy could lead to more equal distribution of income, the effect was weak and depended on other factors such as education and technology. They also established that the effect of democracy on income disparity was more significant in developing nations than in developed ones. Overall, the relationship between democracy, good institutions, and

income inequality was complex and depends on various factors.

Data and Econometric Methodology:

Data source:

Using data from a single country may limit the generalizability of the findings to other contexts or populations. However, it's important to be transparent about the limitations of the data and acknowledge that the findings may not be applicable to other countries or regions. When merging different data sources, it's important to ensure that the data is compatible and can be merged in a way that maintains the integrity of the original sources. Due to data feasibility, the data wrap only Pakistan. The analysis focuses on the period 1981–2021. Data on the GINI index was compiled from source, comprising the World Development Indicators (World Bank). We collected GDP per capita data from World Bank. The other volatiles both dominating and analytical are gathered from the World Bank. Table 1 summarizes data sources and measurement level. Therefore, we estimate our models using ARDL and nonlinear ARDL.

Table 1: Variables definition, Measurement and Data source

Variables	Definition	Measurement level/Unit	Data source
Dependent variable			
Inequality	Estimate of Gini index of inequality	Percentage	World Bank
Independent variables			
Income	GDP per capita	constant 2015 US$	World Bank
Employment	Labor force participation rate, total	% of total population ages 15+ (national estimate)	World Bank
Government spending	General Government final consumption expenditure (% GDP)	% of GDP	World Bank
Corruption	Corruption Perceptions Index	0 = High levels of corruption, 100 = Low levels of corruption	Transparency International, World Economics

Materials and Methods:

Autoregressive Distributive Lag under Co integration Modeling:

This empirical analysis uses income, employment, government spending and corruption to evaluate the impact of income, employment, government spending and corruption on income inequality in terms of GINI index in Pakistan. Previous studies that have used a similar empirical analysis framework to the one being used in the study that are discussing**,** Hao et al. (2016), Baek and Gweisah (2013). To establish the impact of income, employment, government spending and corruption, on income inequality influencing factors. More, we evaluated the following empirical equation:

$$GINI_t = \beta_0 + \beta_1 INC_t + \beta_2 EMP_t + \beta_3 GOVTS_t + \beta_4 CRUPT_t + \epsilon_t \quad \textbf{(1)}$$

Where, GINI represents the income inequality, INC represents GDP per capita; GOVTS represents the government spending on final consumption expenditures, and CRUPT represents corruption. Using yearly data from 1981 to 2021 and collecting the data from WDI is a common approach to analyzing long-term trends in various economic, social, and environmental indicators. However, using linear imputation (LI) to fill in missing data is a method that should be used with caution. Table 1 likely provides a more detailed description of the variables used in the analysis, including their units of measurement and definitions. Table 2 should provide summary statistics for each variable, including measures of central tendency (e.g., mean, median) and measures of variability (e.g., standard deviation, range). These statistics can help researchers understand the distribution of each variable and identify any outliers or unusual values that may impact the analysis.

Table 2: Descriptive statistics

Measures	GINI	INC	EMP	GOVTS	CRUPT
Mean	0.3673	1032.398	50.1773	11.1364	73.6098
Median	0.3550	952.7479	50.4500	10.8236	75.0000
Maximum	0.7630	1473.865	54.0300	16.7849	84.0000
Minimum	0.2360	693.0760	32.2000	7.3467	63.0000
N	41	41	41	41	41

Unit Root Test:

The passage describes a preliminary data analysis process for the bounds testing procedure. The procedure requires that the time series involved should not have integrated of order 2 (I(2)) variables. To check for the integrated order of each variable, the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests are accomplished on each variable. Both tests include constant and trend terms, and the Schwarz Information Criterion (SIC) is used to determine the optimal lag order in the ADF test. The results of the tests are given in Table 3. The tests show that inequality, income, investment, external debt, trade, education, and corruption measures are integrated of order 1, which means they have a unit root. However, the ADF and PP tests differ on whether inequality is stationary in level or becomes stationary at level. This difference could be due to the different asymptotic distributions of the two tests. The procedure involves estimating an ECM and then testing the restrictions on the coefficients of the ECM using the Wald test. If the null hypothesis of no long-run relationship is rejected, it implies the presence of a co integrating link between the two variables.

Table 3: Unit root tests

	Level		First difference		Conclusion
Variable	**ADF**	**PP**	**ADF**	**PP**	
GINI	-1.7105	-1.3080	-4.1342***	-4.0872***	I(1)
INC	-2.9693	-3.3312	-7.9519***	-7.9395***	I(1)
INC^2	-2.3954	-1.6830	-4.2118***	-4.2129***	I(1)

EMP	-6.0284***	-6.0331***	-9.9945***	-32.6161***	I(0)
GOVTS	-1.8562	-2.0681	-5.1657***	-5.1695***	I(1)
CRUP	-1.8659	-1.8467	-6.3805***	-6.3791***	I(1)

Notes: *** denote significance at 1% level.

Table 4: Optimal lag selection criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-935.3850	NA	1.33e+14	49.54658	49.80515	49.63858
1	-728.9954	336.7410	1.74e+10	40.57870	42.38867*	41.22268*
2	-694.0732	45.95023	2.13e+10	40.63543	43.99679	41.83138
3	-642.7664	51.30679*	1.45e+10*	39.82981*	44.74257	41.57773

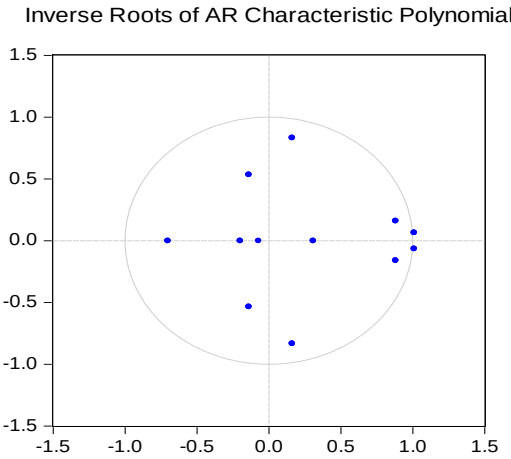
* indicates lag order selected by the criterion

Lag Selection Criteria Test

The process of selecting the optimal lag length for the analysis of co integration, which is an essential step in the analysis of long-run dynamics in an equation. Table 4 shows the findings of various lag selection criteria tests, including the, Akaike information criterion, final prediction error, and Schwarz information criterion, and sequential modified likelihood ratio, Hannan-Quinn information criterion. All the tests suggest a lag length of 3 for the evaluation of co integration. In addition to these lag selection criteria tests, Figure 1 shows the results of the VAR model-based, which also suggest a lag length of 3. The suitability of this lag selection is confirmed by the small dots inside the circle of the polynomial graph.

The passage then discusses different empirical modeling techniques for co integration analysis, including the fully modified ordinary least squares, univariate co integration analysis, and full information maximum likelihood method, the autoregressive distributive lag (ARDL) model. While the Johansen techniques of co integration analysis are commonly used and can provide multiple co integration linkages and accommodate small and biased samples. The ARDL model is an alternative approach that can be used to overcome the issue.

Figure 1: Polynomial graph for optimal lags selection



The maximum lag order considered is 3, which suggests that the model may be a time-series model that includes lagged variables. Table 5 appears to report some type of F-statistics that are used to evaluate the goodness of fit of the different model specifications tested. Table 6 presents the results of the final model estimation, which likely includes estimates of the model parameters (such as coefficients for each variable in the model) and some measure of goodness of fit (such as R-squared or adjusted R-squared). Overall, this text appears to be describing a fairly

standard statistical modeling procedure that is used in many different fields to analyze data and test hypotheses.

To estimate the model using the ARDL bounds testing approach, we need to follow these steps: Test the stationarity of the variables in the model using appropriate tests such as the Augmented Dickey-Fuller test, Phillips-Perron test, or Kwiatkowski-Phillips-Schmidt-Shin test. Determine the order of integration of the variables. Estimate the ARDL model using the appropriate number of lags and the selected order of integration. Test for the significance of the coefficients using appropriate tests such as the t-test or F-test. Check for the stability of the model over time using appropriate tests such as the CUSUM and CUSUMSQ tests. Finally, interpret the results and draw conclusions based on the estimated coefficients and the overall model fit.

The ARDL equation is stated as follows:

$$\Delta GINI_t = \beta_0 + \sum_{i=1}^{p} \beta_1 \Delta GINI_{t-1} + \sum_{i=1}^{p} \beta_2 \Delta INC_{t-1} + \sum_{i=1}^{p} \beta_3 \Delta EMP_{t-1} + \sum_{i=1}^{p} \beta_4 \Delta GOVTS_{t-1} + \sum_{i=1}^{p} \beta_5 \Delta CRUPT_{t-1} + \gamma_1 GINI_{t-1} + \gamma_2 INC_{t-1} + \gamma_3 EMP_{t-1} + \gamma_4 GOVTS_{t-1} + \gamma_5 CRUPT_{t-1} + \epsilon_t \quad (2)$$

Equation 2 is indeed the ARDL bounds testing approach, which allows for the evaluation of short- and long-run dynamics in the model. The long-run coefficients, denoted by $\gamma_1, \gamma_2, \gamma_3, \gamma_4, and\ \gamma_5$, while the short-run coefficients, denoted by , $\beta_2, \beta_3, \beta_4,\ and\ \beta_5$. To estimate the model using the ARDL bounds testing approach, we need to first determine the optimal number of lags to include in the model, which is denoted by p in Equation 2. Using information criteria such as Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), or Hannan-Quinn Information Criterion (HQIC). Once we have determined the optimal number of lags, we can estimate the model using least squares method or maximum likelihood method. We can then test for the joint significance of the long-run coefficients using the F-statistic or Wald test. If the joint significance test indicates a long-run link between the variables, the long-run coefficients using the estimated short-run coefficients and the error correction term, as shown in Equation 2. Finally, Equation 3 explains the short-run dynamics of the model, where ϑi represents the speed of adjustment. To test for the stability of the model, you can use diagnostic tests such as the Breusch-Godfrey test or the ARCH test.

$$\Delta GINI_t = \beta_0 + \sum_{i=1}^{p} \beta_1 \Delta \mathrm{GINI}_{t-1} + \sum_{i=1}^{p} \beta_2 \Delta \mathrm{INC}_{t-1} + \sum_{i=1}^{p} \beta_3 \Delta \mathrm{EMP}_{t-1} + \sum_{i=1}^{p} \beta_4 \Delta \mathrm{GOVTS}_{t-1} + \sum_{i=1}^{p} \beta_5 \Delta \mathrm{CRUPT}_{t-1} + \theta_i \mathrm{ECT}_{t-1} + \epsilon_t \quad (3)$$

NARDL Methodology:

The standard time series approach such as co integration, error-correction modeling, and Granger causality are commonly used to examine the relationship between inequality and macroeconomic factors. However, these techniques assume symmetric relationships between the variables, which may not be appropriate in all cases. Asymmetric relationships can occur when the response of a variable to positive and negative shocks is not the same. In such cases, standard time series techniques may not be able to capture the full extent of the relationship between the variables. To address this issue, Shin et al. (2011) proposed a nonlinear ARDL co-integration approach as an asymmetric extension of the standard ARDL model. The NARDL model can capture both long-run and short-run asymmetries in a variable of interest. The asymmetric long-run equation of inequality we specified is a good starting point for the analysis. I would suggest that, carefully select the variables to include in the model, and consider their theoretical and empirical relevance. We should also pay attention to the choice of lag

length. Overall, the NARDL model is a useful tool for examining asymmetric relationships between variables, Schorderet (2003) and Shin et al. (2011).

$$\Delta GINI_t = \beta_\circ + \beta_1 \Delta INC_t^+ + \beta_2 \Delta INC_t^- + \beta_3 \Delta EMP_t^+ + \beta_4 \Delta EMP_t^- + \beta_6 \Delta GOVTS_t^+ + \beta_7 \Delta GOVTS_t^- + \beta_8 \Delta CRUPT_t^+ + \beta_9 CRUPT_t^- + e_t \quad (4)$$

Where GINI is Gini index of inequality, INC is income GDP per capita, EMP is employment, GOVTS is government spending, and CRUPT is the corruption index, and $\beta = (\beta_0, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8, \beta_9)$ is a co integrating vector.

The NARDL approach is a powerful tool that can be used to examine both short- and long-run dynamics between variables in a time series. Before applying the NARDL approach, it is important to test the order of integration of the variables. This is because the NARDL approach assumes that the variables are either stationary or integrated of order one (I(0) or I(1)). To test for the order of integration, we can use commonly used unit root tests such as the ADF and PP tests. If any of the variables are found to be integrated (I(2)), then the NARDL approach cannot be used since it relies on the assumption that the variables are either stationary or integrated of order one. In this case, alternative approaches such as FMOLS or DOLS can be used. The NARDL approach allows for the possibility of asymmetric effects in the short and long run, which can be particularly useful in analyzing the relationship between variables that are expected to have nonlinear effects on each other.

In Equation 4, $\beta_1 \Delta INC_t^+$, $\beta_3 \Delta EMP_t^+$, $\beta_5 \Delta GOVTS_t^+$, $\beta_7 \Delta CRUPT_t^+$ analyze the positive change in income, employment, government spending and corruption respectively. While, $\beta_2 \Delta INC_t^-$, $\beta_4 \Delta EMP_t^-$, $\beta_6 \Delta GOVTS_t^-$, $\beta_8 \Delta CRUPT_t^-$ represent the negative change in income, employment, government spending, and corruption respectively.

This is an important prerequisite for conducting a reliable analysis using the NARDL model. In addition, the selection of the lag order is also crucial for obtaining accurate estimates and making reliable predictions. It is good to know that we have used LOSC (lag order selection criteria) to determine the appropriate lag length, and that we have found a lag of 3 is applicable for the NARDL. We have determined the appropriate lag length and confirmed that the variables are stationarity. This will allow that to capture both long-run and short-run asymmetries in the relationship between inequality and macroeconomic factors. When using the NARDL model, it is important to pay attention to the interpretation of the results. Specifically, we should examine the coefficients of the positive and negative shocks separately, as they may have different effects on the dependent variable.

Results Estimation of ARDL Model:

It is important to conduct a bounds co-integration testing approach to determine whether the variables in your study are co-integrated in the long-run. The joint-F significance test is commonly used for this purpose, and it is good to see that we have applied the approach to the study. In table 5, it is encouraging to see that the computed F-values are higher than the fixed critical values, indicating that the variables in your study are co-integrated in the long-run. Moreover, the significance levels are high, even at the 5% level, which suggests that the co-integration results are reliable, Narayan (2005). It is important to note that co-integration implies a long-run relationship between the variables, which means that changes in one variable will eventually be reflected in the other variables in the system. The above-stated scheme proved that, there is a long run linkages of income (INC), employment, government spending, and corruption, and income inequality. The

autoregressive distributed lag (ARDL) approach is a commonly used econometric technique for analyzing the long-run and short-run link between variables. We are using it to investigate the relationships between GDP per capita (income), employment (labor force participation rate), government spending, and income inequality (Gini index) for Pakistan.

Table 5: Bounds test for ARDL co-integration:

Bound Test	**H0: No co-integration**				**Decision**
		Sig.	Level: I(0)	1_{st} Difference: I(1)	
F-stat	4.1125**	10%	2.26	3.35	
K	5	5%	2.62	3.79	
		2.5%	2.96	4.18	
		1%	3.41	4.68	Co-integration

Notes: the critical values are from Narayan (2005), given the small sample size. ** represent the level of significance at 5%, respectively.

The results of a statistical analysis of several variables related to inequality, income, government spending, employment, and corruption. Co-movement of variables in the long run suggests that there is a stable link between them. Positive and negative changes in income affecting the relationship between inequality and the other variables could indicate that changes in income have a significant impact on the level of inequality in Pakistan. However, it is important to keep in mind that statistical analyses are just one tool for understanding complex phenomena, and that the results should always be interpreted with caution and in light of other evidence and theory.

Table 6: Estimation of long-run ARDL with diagnostic test.

Variable	**Coefficient**	**p-value**
INC	-0.0003	0.5562
INC^2	-0.0000	0.8177
EMP	0.0128	0.0036
GOVTS	0.0147	0.0017
CRUPT	0.0004	0.0197
Constant	-0.0816	0.7807
Statistics		
R^2	0.9264	
Adjusted R^2	0.6219	
F-stat.	3.0418	0.0655
Diagnostic tests		
Normality test		
Jarque–Bera test	0.9418	0.6244
Heteroscedacity		

Breusch–Pagan test	1.1925	0.4353
ARCH	0.7758	0.3846

Notes: J-B is the Jarque-Bera test for error normally, LM is the LM test for error autocorrelation up to the lag order given in the parenthesis, and ARCH is the ARCH test for autoregressive conditional heteroskedasticity up to the lag order given in the parenthesis.

In table 6, 7, the increasing income per capita is associated with a decrease in income inequality in Pakistan. It could suggest that policies aimed at increasing economic growth and income could also help reduce income inequality. However, it's also important to note that there may be other factors that affect income inequality in Pakistan, such as differences in access to education, healthcare, and other resources. It's encouraging that the study highlights the need for serious steps to be taken to alleviate income inequality in Pakistan. These findings will help inform policy decisions and lead to positive changes in the country.

Table 7: Short-run estimation of ARDL model.

	Coefficient	**p-value**
ΔINC	-0.0371	0.0099
ΔINC^2	0.0002	0.0077
ΔEMP	0.0107	0.1258
ΔGOVTS	0.0414	0.1123
ΔCRUPT	-0.0029	0.7361
Coint. Eq.	-7.9805	0.000

The Kuznet Curve is a well-known economic theory, Simon Kuznet (1955) that describes the link between economic development and inequality. According to the theory, income inequality tends to increase during the early stages of economic development, as people move from rural to urban areas and new industries emerge. However, as the economy continues to develop and modernize, income inequality tends to decrease, as more people gain access to education, job opportunities, and social services. The Kuznet Curve is often represented as an inverted U-shaped curve, with income inequality rising at the early stages of development, peaking at some point, and then declining as development continues. The shape and timing of the curve can vary depending on a range of factors, including the country's level of economic development, its political and social institutions, and the specific policies that are implemented to address income inequality. The Kuznet Curve can be a helpful tool for policymakers looking to design effective interventions to address inequality.

Based on the analysis, Dhrifi et al. (2020), Masron and Subramaniam (2019) conducted in developing countries, and in Asian nations, Lu (2017), we have concluded that our results differ from the perspective of Kuznet, and are consistent with other studies. However, we also note that, our results differ from some other studies conducted in African nations, Abid (2016), in LDCs, Koçak et al. (2019), in Sub-Saharan Africa, Zaidi et al. (2019), which may have different economic dynamics from Pakistan. We suggest that the method used in the study may have contributed to these differences.

In table 6, 7, the link between employment and income inequality in Pakistan that employment can have a positive and significant impact on reducing inequality. It suggests that as employment increases, income inequality also tends to increase. The types of jobs and industries that are available in a country can have a significant impact on income inequality. Some jobs may be highly skilled and high-paying, while others may be low-skilled and low-paying. In addition, certain industries may be more likely to create opportunities for upward mobility and economic growth, while others may perpetuate poverty and inequality, Banerjee (2005). Understanding the relationship between employment, occupational structure, and income inequality can be important for policymakers looking to design interventions to reduce inequality and promote inclusive economic growth. By promoting job creation in industries that are more likely to reduce income inequality and support upward mobility, policymakers can help create a more equitable society.

We have found that the results of the study are adverse to the work of Boyce (1994), who suggested that higher inequality creates a dynamic difference between social classes and worsens the quality of employment. Instead, the study is dependable with the findings of several other studies conducted in G7 countries, Uddin et al. (2020), in china, Wang and Ye (2017), in European nations, Kounetas (2018), in third world nations, Grunewald et al. (2017), in Turkey, Demir et al. (2019), which suggest that the relationship between income inequality and employment quality may differ and research methods used. It is important to note that research findings are often context-specific and may depend on a range of factors, including the methods used, the population studied, and the specific variables measured. The study highlights the importance of understanding the unique economic and social dynamics of Pakistan.

The government spending has a direct and statistically significant link with inequality in Pakistan, both in the long and short-runs. This suggests that government spending policies may play a role in exacerbating income inequality in the country. The way that government spending is allocated and distributed can have a significant impact on income inequality, both within and between regions, Henderson (2002). It's important for policymakers to consider the potential impact of their spending decisions on income inequality and to design policies that promote more equitable outcomes. Our findings are consistent with previous studies in some cases, Bakhsh et al. (2017), Islam and Ghani (2018) but differ in others, Munir and Khan (2014), Hao et al. (2016). It highlights the complexity of the link between government spending and inequality and suggests that the specific context of each country or region may play a significant role in shaping this relationship.

Table 6, 7, conducted a regression analysis using the ARDL methodology and found a positive and statistically significant relationship between corruption and income inequality in Pakistan. The results suggest that corruption contributes to income inequality in the short and long-run. The results of the analysis are consistent with the work of several other studies conducted in different countries, including BRICS economies, Nigeria, ASEAN countries, developing countries, upper middle-income countries, and China. The study suggests that while economic expansion and activity in developing nation like Pakistan may share to the reduction of corruption, this may come at a high cost in terms of income inequality. It is important to note that the results of the study may be specific to the context of Pakistan and may not be generalizable to other countries or regions.

Diagnostic Tests:

Diagnostic Tests of ARDL Model Regarding model diagnostic, presented in Table 6. The study

conducted two tests to ensure the validity of the data. The first test was the Jarque-Bera (JB) test for normality, which checks whether the data follows a normal distribution. The result of the study indicated that the data is normally distributed, which is a positive result since many statistical models assume normality of the data. The second test was the Breusch-Pagan (BP) test for heteroscedasticity, which checks whether the variance of the data is constant. The study also incorporated the ARCH test, which is another test for heteroscedasticity that checks whether the variance of the data changes over time. The results of both tests indicated that the data is homoscedastic, which means that the variance of the data is constant over time. This is also a positive result, as many statistical models assume homoscedasticity of the data.

Estimation of NARDL Model:

The NARDL model has been estimated using data on GINI, INC_POS, INC_NEG, EMP_POS, EMP_NEG, GOVTS_POS, GOVTS_NEG, CRUPT_POS, and CRUPT_NEG. The results indicate the existence of a long-run relationship among these variables, which suggests that changes in these variables can affect each other in the long run. The coefficients of the NARDL model are statistically significant and have positive and negative signs, which indicates that the link between income and inequality is both direct and asymmetric. Additionally, the results suggest that a decrease in income has a statistically significant impact on income inequality. The NARDL model appears to provide a useful framework for analyzing the relationships between income and income inequality over time. However, the specific data and methodology used to estimate the model, it is difficult to provide a more detailed interpretation of the results.

Table 8: NARDL co integration bound test.

Bound Test	**H0: No co-integration**				**Decision**
		Sig.	Level: I(0)	1_{st} Difference: I(1)	
F-stat	4.8798****	10%	1.95	3.06	
K	8	5%	2.22	3.39	
		2.5%	2.48	3.70	
		1%	2.79	4.10	Co-integration

*, **, ***, and **** represent the level of significance at 10, 5, 2.5, and 1%, respectively.

Table 9: NARDL long-run estimation with diagnostic tests.

Variable	**Coefficient**	**p-value**
INC_POS	0.0002	0.0566
INC_NEG	-0.0076	0.0077
EMP_POS	-0.0308	0.1895
EMP_NEG	-0.0525	0.0623
GOVTS_POS	-0.0143	0.4986
GOVTS_NEG	0.0035	0.9049
CRUPT_POS	-0.0323	0.0189

CRUPT_NEG	-0.0036	0.6976
Constant	0.4054	0.0000
Statistics		
R^2	0.8338	
Adjusted R^2	0.5901	
F-stat.	3.4208	0.0087
Diagnostic tests		
Normality test		
Jarque–Bera test	361.2489	0.0000
Heteroscedacity		
Breusch–Pagan test	0.7417	0.6907
ARCH	0.1501	0.7007

Table 10: Short-run estimations of NARDL.

	Coefficient	**p-value**
ΔINC_POS	-0.0007	0.9650
ΔINC_NEG	0.0008	0.9981
ΔEMP_POS	0.0699	0.0369
ΔEMP_NEG	-0.0024	0.7054
ΔGOVTS_POS	0.0258	0.0465
ΔGOVTS_NEG	-0.0513	0.0234
ΔCRUPT_POS	-0.0412	0.0730
ΔCRUPT_NEG	N/A	N/A
Coint. Eq.	-0.9193	0.0636

Similarly, the NARDL model suggests that positive shocks to employment have a positive impact on income inequality in the long-run but a negative impact in the short-run. The model suggests that employment changes may have different effects on income inequality depending on the time horizon being considered. Government spending, on the other hand, appears to have a consistently negative impact on income inequality, although the impact is statistically insignificant. Finally, the link between corruption and inequality appears to be asymmetric, with increases in corruption (positive shocks) increasing income inequality, while reductions in corruption (negative shocks) do not appear to have a significant impact. The result suggests that addressing corruption may be important for reducing income inequality, but that simply reducing corruption may not be enough to have a significant impact. In table 9, the diagnostic tests of the model suggest that the model is well-described, as the null hypothesis of normality and heteroscedasticity is not rejected. However, it is important to note that the specific data and methodology used to estimate the model, it is difficult to assess the validity of the results.

Conclusion:

The paper focuses on investigating the relationship between macroeconomic and institutional factors and income inequality in Pakistan. The aim to reassess the validity of the Kuznets curve hypothesis in the context, which suggests an inverted-U shaped link between

inequality and per capita income. The econometric strategy that includes autoregressive distributed lag (ARDL) and nonlinear ARDL models to examine the relationship. This approach is particularly relevant for low-income economies like Pakistan, where the Kuznets curve hypothesis may not hold. By examining the relationship between macroeconomic and institutional factors and inequality in Pakistan, the paper aims to share to an exceptional understanding of the determinants of income inequality and provide insights into how policies can be designed to reduce it. The results of the study could be useful for policymakers and researchers interested in understanding the relationship between macroeconomic and institutional factors and inequality in other developing countries.

The study suggested that the link between income and inequality in Pakistan is complex and not consistent across different economies. Additionally, the study finds that inequality may be boost in high-income nation in Pakistan, while decline in low-income economies. Furthermore, the study finds that factors such as employment, government spending, and corruption have a significant impact on income inequality in the country. The results are consistent and robust, highlighting the importance of these aspects in understanding inequality in Pakistan. Overall, the study's findings provide insights into the complex relationship between macroeconomic and institutional factors and income inequality in Pakistan, and suggest that policies aimed at reducing income inequality in the country should take into account the heterogeneous nature of the relationship across different economies and the role of other macroeconomic and institutional factors.

Overall, the use of advanced econometric techniques and the inclusion of institutional variables provide valuable insights into the complex dynamics of income inequality in Pakistan. The statement highlights the issue of limited access to finance for the poor population in many countries. The finding suggests that, only a small percentage of the poor population, has access to credit, which can be a major impediment to reducing income inequality. To address the issue, it can be achieved through various means, such as microfinance programs, peer-to-peer lending platforms, and government-led initiatives to promote financial inclusion. By expanding access to credit, the poor can start and grow their own businesses, which can generate income and create employment opportunities, ultimately contributing to reducing income inequality.

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