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Did the Saudi Economic Growth distributed equally

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Abstract. Based on the four available household surveys from 1999 to 2018, this paper answers the main reach question: did Saudi economic growth spread evenly?. The aforementioned question was answered using the nonlinear autoregressive distributed lag model (NARDL) to account for the possibility of nonlinear effects of the explanatory variables on the dependent variable. The Gini coefficient is the dependent variable explained by real per capita income, squared real per capita income to examine the Kuznets inverted U shape hypothesis, and lastly the inflation rate. The results demonstrate that exogenous variables account for 99 percent of the variation in the dependent variable. The estimated coefficients are highly significant including the squared per capita implying the validity of the Kuznets hypothesis. The results have policy implications in that the economic growth path that began in the 1950s has had an impact on income and consumption magnitude in the Kingdom of Saudi Arabia, where economic policies such as free education and health services, exemption from income tax, Zakat distribution, and regulation of charity societies support the average Saudi family and reduce inequality. Jazan and Najran will need to put in even more effort to catch up to the other districts.

Keywords. economic growth, household surveys, Gini coefficient Kuznets hypothesis

1. Introduction

According to Adam Smith, inequality promotes progress in three ways: more wealth eventually benefits the poor, increases competition, and stabilizes society. Another example of this idea is Kuznets' (1955) inverted U shape of per capita income. Others disagree with this viewpoint. The opposing viewpoints see inequality as a threat to economic growth by reducing the motivation to save and invest, as well as a negative impact on investment in education and health care by favoring the private sector and, finally, a reduction in human capital investment. Inequality has a negative impact on growth via underinvestment in human capital because of the high cost and access of the poor to the credit market (Ines et al (2022). The relationship between inequality and income has been studied in a lot of studies, including Abdulfattah, Abuzaid, and Albakl (2022), Ali (2021), Pajak and Keuangan (2021), Yameogo, and Dauda (2020), Alhawary (2017), Skaik. (2015), and Ibrahim (2013).

The discovery of vast oil reserves in 1938 marked a turning point in the Saudi economy in terms of new towns, infrastructure, housing, energy and water systems plants, and staff training in new fields. Before 1970 the focus of the government was on developing human

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resources, the transportation system, and other infrastructure. The first five-year plan 1970 - 1975 allocated 45 percent to capital projects, defense, education, transportation, and utilities were the main beneficiaries. The second five-year plan 1976-1980 introduced free medical services, free education, and vocational training, free-interest loans, subsidies for the purchase of homes, subsidized prices for essential commodities, interest-free credit for people with limited incomes, and extended social security benefits and support for the needy. The third-year plan 1980-1985 concentrated on unfinished projects. The fourth year 1985-1990 focused on economic and human resources development, and stimulation of the private sector (UNDP 2010). The fifth-year plan 1990-1995 was concerned with the growth of agricultural and manufacturing sectors. The sixth-year plan 1995-2001 adopted the privatization of public enterprises. Under the Seventh plan, 2001-2005 achieved good economic growth, as reflected in higher per capita income and greater employment opportunities, in addition to a larger volume of external trade and a higher trade surplus. The five-year plans continued economic and social progress. The eighth-year plan 2005-2009 constituted the first link in a strategic path for the national economy (MOF 2009), extending well into the next two decades and involving four successive five-year development plans. The ninth year plan 2010-2014 emphasized several priorities; key among which are: improving living standards and quality of life and providing job opportunities to all Saudi citizens; expansion of education, training, health, and social services. It also stressed keeping pace with the fast momentum of global economic and technological developments, diversification of the economic base, improving productivity, and boosting the competitiveness of the national economy. As a result, the Kingdom has made remarkable economic, industrial, and development progress, as well as ever-increasing hopes for ongoing improvement in Saudi people's living standards and quality of life in all parts of the kingdom.

Despite the Kingdom of Saudi Arabia's economic expansion, household spending differed significantly throughout the thirteen districts. The Gini coefficient is the most widely used method for assessing income disparity based on household spending. The kingdom's Gini coefficient rose steadily until reaching a peak in 2013, after which it began to fall slightly. The Gini coefficient is considered the key measure of the effect of economic policies on poverty, and income distribution of welfare among households, and individuals The mean, the minimum, and, the maximum of per capita income in million Riyal are 46296.46, 39678.94, 51469.68 respectively.

Except for a Ph.D. entitled "The impact of development on income distribution in the Kingdom of Saudi Arabia - an analytical research for the period (1999-2018) Alsuhaimi (2022)" there are no studies on inequality in Saudi Arabia that I am aware of. the current study overlaps with the Ph.D. described above in the period of research chosen based on the available Household Income Surveys, the dependent variable, and two explanatory variables, The key differences are the functional form, double logarithm vs. level, the usage of NARDL instead of ARDL, the construction of the Gini time-series means against interpolation, and the inflation rate in its place of government final consumption. We used the NARDL model to account for the possibility of nonlinear effects of the explanatory variables on the dependent variable, whether short-run or long-run, as well as to test for cointegration among model variables.

The study put together six sections starting with an introduction, literature review, methodology, results, discussion, and conclusion.

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2. Literature Review

In the following empirical research, the Gini coefficient and the Human Development Index (HDI) are two of the most commonly used indices of income inequality. In some studies, the Gini coefficient is merely employed to evaluate inequality, whereas, in others, Gini and HDI are used as dependent variables and/or explanatory factors.

Abdulfattah, et al (2022) employed the ARDL technique to assess the relationship between income distribution and sustainable development as evaluated by the (HDI) in Egypt between 1990 and 2018. Their main motive was the United Nations' tenth Sustainable Development Goal, which stated that in each member country run, income distribution is the only factor that matters; but, in the long run, government spending and environmental factors (carbon dioxide emissions) play a significant role.

Affan (2021) studied economic growth and income inequality in Egypt from 1991 to 2018 using a vector autoregressive model (VAR). She estimated the VAR model by taking into account economic growth and six channels: capital formation, credit, human capital, redistributive income policy, corruption, and foreign direct investment. She concludes that inequality is a factor influencing growth.

Ali (2021) used a dynamic ARDL model to examine the role of politics (structural program implementation) in the relationship between the environment and inequality for Egyptian data from 1975 to 2017, refuting the short-run trade-off between carbon dioxide emissions and inequality (the Gini coefficient) because the latter affects the environment in the long run. In other words, the study looked at how politics affects the enforcement of structural programs that benefit the rich at the cost of the poor. Carbon dioxide emissions, income inequality, economic growth, urbanization, primary energy use, and trade openness were all included in the model.

Pajak and Keuangan (2021) used fixed and random effect models with the Gini coefficient as a dependent variable explained by GDP, tax, and employment for panel data from fifty nations from 2000 to 2018. They conclude that per capita has less impact on increasing inequality as assessed by the Gini coefficient in high-income nations than in upper-middle and lower-income countries.

Obinna (2020) used ordinary least squares to examine the effects of the inflation rate, interest rate, and government consumption on Nigerian final consumption from 1981 to 2018, concluding that the explanatory variables explain only 48% of the variations in the dependent variable. Inflation and government consumption both have a positive effect on the dependent variable indicating more spending during the rise of prices and expansion of government consumption, while interest rate has a negative sign.

Using an ARDL model supplemented by income growth, government, and poverty, Yameogo, and Dauda (2020) explored the relationship between income inequality, environment, and economic growth in Burkina Faso and Nigeria from 1980 to 2016. Inequality, poverty, and government spending all contribute to long-term environmental damage in Nigeria. In the short run, the effects in Nigeria and Burkina Faso are opposed: wealth inequality reduces CO_2 emissions in Nigeria while increasing CO_2 emissions in Burkina Faso.

Goblan et al. (2020) used an error correction model to assess the role of value-added tax reform and the effect of income and wealth in determining Saudi household consumption from 1970 to 2017. The data supported the live-cycle hypothesis in terms of the effect of income and wealth and the consistency of the short-term effects of prices and real interest rates.

Bergstrom (2020) used data from thirty-five countries provided by the World Bank to calculate the elasticity of poverty inequality and growth employment for each country from

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1974 to 2018. she compared absolute growth elasticity to lagged per capita income. To answer the crucial question, he decomposed changes in per capita and changes in inequality. In comparison to the (absolute) growth elasticity of poverty reduction, she discovered that the inequality elasticity of poverty reduction is greater on average. Furthermore, as a country's initial level of inequality rises, the (absolute) growth elasticity falls sharply.

Alhawary (2017) developed two econometric models to investigate the relationship between income inequality, using official data on poverty and socioeconomic poverty as dependent variables explained by the Gini coefficient, unemployment rate, inflation rate, and Algerian economic growth. He used a vector error correction model (VECM) and fully modified ordinary least squares (FMOLS). He discovered a link between the Gini coefficient and the official poverty index.

Skaik (2015) identified four factors that affect the income distribution expressed by the Gini coefficient in Palestine: per capita GDP, per capita disposable income, government final consumption, and a dummy variable representing political division. He calculated the Gini coefficient using household budget surveys and averages to bridge the gap. He used multiple regression to reach contradictory conclusions about the positive effects of per capita GDP on income inequality and the negative effects of per capita disposable income on income inequality.

According to Ibrahim (2014), real income proxied by real GDP, real accumulated financial wealth proxied by real financial assets of the banking sector, and real interest rate computed as nominal interest rate minus inflation rate were the determinants of private consumption in Saudi Arabia from 1986 to 2008. The analysis tool was the dynamic ordinary least squares.

Ncube et al (2013) examined cross-section data from the Middle East and North African countries from 1985 to 2009 to assess the effects of inequality on economic growth and poverty, concluding that inequality reduces income and increases poverty.

Birehi and Radhi (2013) computed the Gini coefficient based on household spending rather than income from a household budget survey conducted in 2012, revealing that there was an inequality in expenditure amongst Iraqi provinces. They attribute the inequality to family size, inflation, and lack of legal legislation to reduce unfair salaries and wage distribution.

Abdulbagi (2011) sought to answer two questions: can Islamic Economics provide a cohesive framework that can be used to eliminate poverty and income inequality? The second question is whether Bahraini government policies and processes are consistent with the Islamic approach to eradicating poverty and inequality. The government uses the wage minimum level and unemployment as criteria to categorize Bahraini individuals as impoverished. The major conclusion is that Zakat is the most effective way to eliminate poverty and inequality. The Bahraini government's policies are in line with Islamic principles.

The study of Ahmed and Shihab (1988) rejected the Kuznets hypothesis in Iraq due to the increasing inequality during the study period from 1971 to 1988. Their main tool of analysis was the Gini coefficient calculated from Iraqi household budget surveys.

Our study is similar to some of the above studies in many ways, such as the use of household surveys to compute the Gini coefficient, the functional form, the choice of Gini coefficient as a dependent variable, and the explanatory variable selection, but it differs in the analysis method (NARDL).

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3. Methodology

3.1 Factors that Affect Consumption

Income (per capital GDP), tax policy, government final consumption, and the inflation rate are all factors that influence private consumption (Goblan et al. (2020)). The variation in consumption in the thirteen Saudi districts serves as the foundation for computing the Gini coefficient. The use of household consumption expenditure due to the availability of data.

Income: The real income affects directly the pattern and magnitude of private consumption as mentioned in early economic theory by Keynes in absolute income hypothesis based on the fundamental psychological law, the budget study (USA time series 1929-1944) by Kuznets, relative income hypothesis by Duesenberry 1949, and permanent income hypothesis by Milton Friedman 1957. The demand for consumer goods depends on a constant and disposable income (Dadkhah 2009).

Simon Kuznets wandered about whether the increase in income increase or decreases inequality, and what factors determine the level of inequality. He used data from the United Kingdom, USA, and Germany to conclude that tax and government assistance should be taken into account, and an increase in real income stabilizes or even reduces inequality. Income is less vulnerable to temporary fluctuations as a result of technological advancements and economic progress. Despite the accumulation of savings in the upper-income brackets, and the high level of service income, the number of employees moving from lower-income to higher-income groups grows less than the less privileged, and because of the freedom of options as a feature of a dynamic economy. Inequality is divided into three stages. The long swing inequality is caused by the swift, stable, and narrow shift from pre-industrial to industrial civilization, as represented by the inverted U-shape of the Kuznets curve (Kuznets 1955).

Tax Policy: The increase in government spending through taxes lowers household permanent income. This negative wealth effect decreases household consumption. In the case of the proportional tax rate to income low-income group favors high taxes (Ines 2022). Income subject to tax is gross income and includes income, profits, gains of any type, and any form of payment arising from carrying out the activity. Gross income includes capital gains and incidental income but excludes certain exempt income.

However, the Tax Law provides that income derived from certain types of activities and sources is considered taxable in Saudi Arabia while exempting the others from income tax if income is derived only from employment (Ines 2022)

Government Expenditure: Government spending on education, health care, subsidies, and transfers, as well as equitable service distribution, raises the standard of living (Abdulfattah et al 2022).

The Inflation Rate: According to Keynes there is an Inflationary gap defined as the excess of planned expenditure over output available at full employment (Obinna 2020). Floyd (2021) states that inflation erodes purchasing power or how much of something can be purchased with currency. Because inflation erodes the value of cash, it encourages consumers to spend and stock up on items that are slower to lose value. It lowers the cost of borrowing and reduces unemployment.

3.2 The Proposed Model

Autoregressive distributed lag (ARDL), and nonlinear autoregressive distributed lag (NARDL) were the tools of analysis (Abderrazak 2021).

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$$\Delta y_t = \mu - \rho y_{t-1} + \theta^+ x_{t-1}^+ + \theta^- x_{t-1}^- + \sum_{j=1}^{p-1} \alpha_j \Delta y_{t-j}$$
$$+ \sum_{j=0}^{q-1} \left(\pi_j^+ + \Delta x_{t-j}^+ + \pi_j^- \Delta x_{t-j}^-\right) + \varepsilon_t \quad (1)$$

Where y is the dependent variable and x is the vector of explanatory variables.

The proposed models include the Gini as a dependent variable to be explained by per capita income in real terms (Q), the squared real per capita income (Q^2), and the inflation rate (inf).

GINI = C(1)*GINI(-1) + C(2)*Q_POS + C(3)*Q_POS(-1) + C(4)*Q_NEG + C(5)*Q_NEG(-1) + C(6)*ZZ_POS + C(7)*ZZ_POS(-1) + C(8)*ZZ_NEG + C(9)*ZZ_NEG(-1) + C(10)*INF_POS + C(11)*INF_POS(-1) + C(12)*INF_NEG

3.3 Measure of Inequality

The Lorenz curve, Gini coefficient, coefficient of variation, and Theil Index are among the most often used metrics of inequality. Depending on data availability, inequality can be measured in terms of consumption or income, however, consumption inequality is more appropriate for developing countries. The unit of measurement is a crucial consideration (Trapezinkova 25/4/2022).

For all conceivable values of x, the Lorenz curve depicts the cumulative percentage of income obtained by the poorest x percent of the population. When wealth is shared evenly among all persons, the 45-degree line signifies equality. The "Gini coefficient," which is closely linked to the Lorenz curve, is the most often used summary indicator of economic inequality.

By dividing the entire area (A) under the equality line by the area between the Lorenz curve and the equality line (A+B), the Gini coefficient is determined. This inequality index accepts values ranging from 0 (which represents "perfect equality") to 1 (the greatest value) and is calculated using the formula A/(A+B) (when one person earns all the income). The Gini coefficient is a measure of a society's equality. The lower the Gini coefficient, the more equitably distributed the population is.

We adopt the Gini coefficient calculating formula used by Birehi and Radhi (2012):

$$G = 1 - \frac{1}{1000} \sum_{i}^{n} (S_i + S_{i-1}) N_i \quad (2)$$

Where: S_i = Ascending accumulated frequencies, N_t = Percentage of units in the class, n = number of classes.

The standard deviation to average income ratio is equivalent to the coefficient of variation (CV). It is unaffected by income level because it measures variability relative to the mean.

Percentile ratios and share ratios are two types of ratios: The 90-10 ratio, also known as the "Interdecile ratio," is a regularly used percentile ratio that compares the income levels of people at the top of the income distribution (top 10%) to those at the bottom of the distribution (bottom 10%). (bottom 10 percent).

Theil index is one of a series of general entropy (GE) statistic that is based on income-to-mean ratios. The Theil index is a metric for measuring economic disparity. The Theil index

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devices the population's entropic "distance" from the "ideal" equal condition in which everyone has the same income. The numerical result is expressed in terms of negative entropy, with a greater number denoting more order and a distance from the "ideal" of maximum disorder. Because the index is based on negative entropy rather than entropy, it can be used to assess inequality rather than equality (United States Census 27/4/2022).

3.4 Data

The dependent variable is the Gini coefficient constructed based on four household budget surveys that are 1999, 2007, 2013, and 2018. Interpolation was the primary tool for creating time series of household expenditure, the percentile of the population was calculated at 0.05. Three independent variables explained the variation in the dependent variable. They are the real per capita income (Q) per month of Saudi Riyal, the squared real per capita income (Q^2) per month in Saudi Riyal to characterize the inverted U shape Kuznets hypothesis, and the consumer price inflation (INF). The Kuznets Hypothesis states that income inequality increases in the early stages of development and gradually decreases in the later stages, taking the shape of an inverted U. Data were collected from Saudi Arabian Statistics Authority and the Saudi Arabian Monetary Authority.

4. Results

Table (1) Descriptive Statistics

	GINI	Q	Q^2	INF
Mean	0.35	46296.46	2150000000.00	1.73
Median	0.34	46277.32	2140000000.00	1.96
Maximum	0.41	51469.68	2650000000.00	5.91
Minimum	0.30	39678.94	1570000000.00	-2.10
Std. Dev.	0.04	3293.39	303000000.00	2.20
Skewness	0.20	-0.21	-0.09	0.04
Kurtosis	1.45	2.13	2.05	2.12
CV	11%	7%	14%	127%
Jarque-Bera	2.12	0.76	0.77	0.65
Probability	0.35	0.68	0.68	0.72
Observations	20	20	20	20

Because the mean and median of all variables are near to each other, the Jarque-Bera test for normality accepts the hypothesis that all variables have a normal distribution. The inflation rate runs from -2.1 to 5.91 percent, with a mean of 1.73 percent, indicating mild price rises. In comparison to the other three variables, inflation has the highest coefficient of variation.

Table (2) Breakpoint Unit Root Test

Variable	Level	Year	Ist Diff.	Year
GINI	0.03**	2007		
Q	0.74	2002	0.045**	2009
Q^2	0.76	2010	0.054*	2009
INF	0.87	2005	0.01***	2008

The Gini series is stationary at a 95% confidence level, the per capita income has a unit root at 5%, the squared per capita income has one unit root at 10%, and the inflation rate has one unit root at 1%. As a result, all variables are constrained between I(0) and I(1) satisfying the main condition for using the ARDL model. The financial crises that occurred in 2008 led to structural

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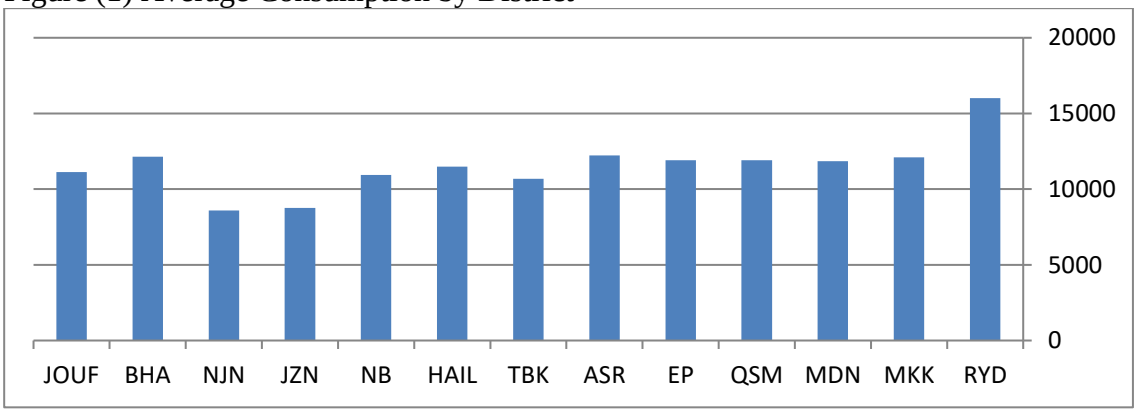
breaks in the model variables. However, the existence of two cointegration equations, as mentioned in Annex (2), when paired with the breakpoint unit root test, renders the variables eligible to be estimated by NARDL. The years of global economic instability from 2007 to 2009 were breakpoints for the model variables.

Table (3) The Coefficient of Variation

RYD	MKK	MDN	QSM	EP	ASR	TBK	HAIL	NB	JZN	NJN	BHA
0.10	0.11	0.24	0.12	0.12	0.14	0.17	0.14	0.16	0.40	0.10	0.18

Riyadh and Najran had the lowest coefficient of variation, followed by Makah and the Eastern Province, while Jazan had the highest, followed by Medina. Jazan's monthly income increased by 2.6 percent from 4351 Riyal in 1999 to 14395 Riyal in 2018, a twenty-year period in which the survey was conducted. Medina's spending has been growing at a pace of 0.1 percent per year. The aggregate coefficient of variation is 0.11.

Figure (1) Average Consumption by District



Riyadh has the highest average monthly consumption in Saudi Riyal, followed by Makkah, Asir, and AlBaha, the lowest averages are in Jazan and Najran.

The per capita GDP (income) has been rising steadily during the study period. The inflation rate as a key determinant of consumption was negative for the first three years of the study period then continued to rise steadily to a high in 2008, then showed a downward trend to the lowest point in 2017.

Table (4) Estimation Results

ARDL			Short-run		
Variable	Coefficient	Prob.*	Variable	Coefficient	Prob.*
GINI(-1)	0.946722000	0.0000	D(Q_POS)	0.0000594000	0.0013
Q_POS	0.000059400	0.0536	D(Q_NEG)	-0.000048300	0.0012
Q_POS(-1)	-0.000047200	0.0672	D(Q^2_POS)	-0.000000000	0.0016
Q_NEG	-0.000048300	0.0464	D(Q^2_NEG)	0.0000000005	0.0023
Q_NEG(-1)	0.000149000	0.0055	D(INF_POS)	-0.005024000	0.0002
Q^2_POS	-0.000000001	0.0547	CointEq(-1)*	-0.053278000	0.0000
Q^2_POS(-1)	0.000000001	0.0647			
Q^2_NEG	0.000000000	0.0641			
Q^2_NEG(-1)	-0.000000002	0.0049			
INF_POS	-0.005024000	0.0031			
INF_POS(-1)	0.006033000	0.0005			
INF_NEG	0.013942000	0.0009			
R^2	0.995908		R^2	0.940319	

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$\overline{R}^2$	0.988407		$\overline{R}^2$	0.915452	

Contemporary and pervious positive changes in per capita, as well as present squared positive changes are significant at 10% while all other estimates are either significant at 5% or 1%. As can be seen in Table(4), all calculated coefficients are very modest where the current positive change in per capita, negative changes lagged once of squared per capita, and inflation worsen inequality. Other positive and negative trends worsen inequality. The explanatory factors account for 99 percent of the variation in the inequality index. In the short run, the term for error correction is negative (-00.053), and the coefficient of determination is 94 percent.

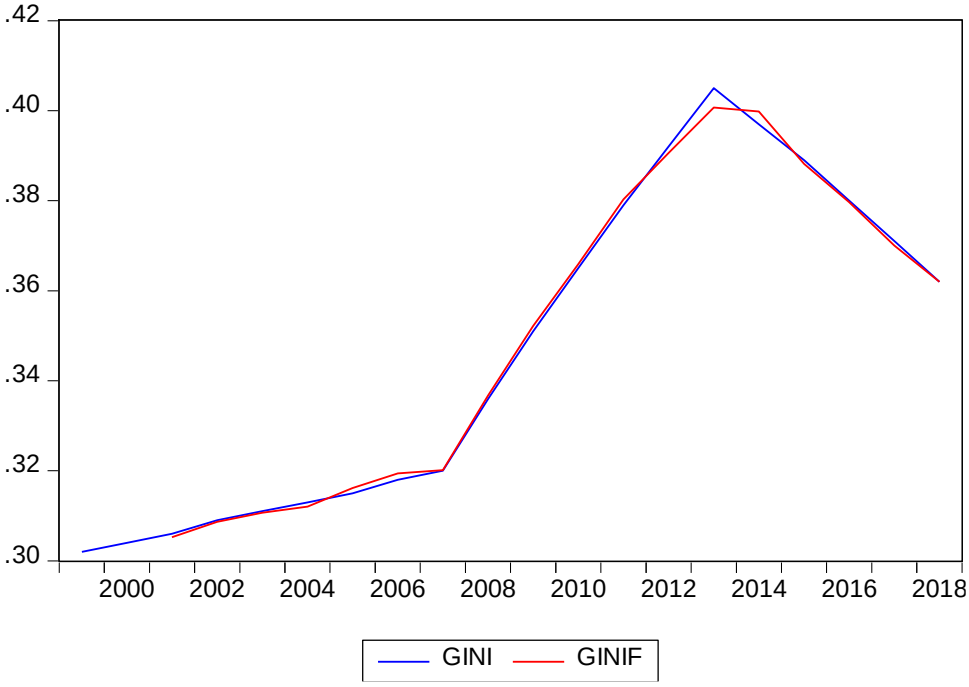
The model passed all standard tests, including heteroscedasticity (F = 0.754, Prob = 0.68), and the Breusch-Godfrey Serial Correlation LM Test (F = 3.125, Prob = 0.15). The presence of the ARCH is rejected at 5% (F = 1.59, Prob. 0.23).

The Bound test is six times more than the maximum limit of 4.05 at 1%, showing that the NARDL model is acceptable. For per capita (F = 2.90, Prob. = 0.14), squared per capita (F = -1.75, Prob. = 0.13), and inflation (F = 2.01, Prob. = 0.0.9), the asymmetry test was used showing significant long-run asymmetries for per capita income is (F =1.70, Prob. = 0.14); the squared per capita income (F = -1.75 ,Prob. = 0.13), and the inflation rate (F = 2.01 , Prob = 0.09). The short-run asymmetries for per capita income (F = -2.64, Prob. = 0.04) has been rejected but accept for squared per capita income (F = 1.74, Prob. = 0.13), A one percent standard deviation shock on inflation and per capita income associate the negative changes to with a downward asymmetry in contrast to that on squared per capita

Ramsey rest test accepts that the model has enough variables and that no additional variables should be added (F = 1.12, Prob. = 0.31).

Forecasting is another diagnostic test with a Theil inequality coefficient of 0.002, a bias proportion of 0.0004, a variance proportion of 0.03, and a covariance proportion of 0.97. As demonstrated in Figure (2), the simulated values of the dependent variable are nearly identical to the actual, and the turning points ensure the model's adequacy.

Figure (2) The Actual and Simulated Gini Coefficient



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5. Discussion

The Saudi development process began in the early 1950s of the twentieth century in terms of five-year development plans. The outcome is tremendous growth in the economy accompanied by huge development in infrastructure, free education, and free health care, as well as a large increase in the per capita income, and consumption has taken pace. Consumption patterns and magnitudes of Saudi citizens fluctuated across the thirteen districts, as evidenced by household budget surveys, particularly during the study period, which spanned twenty years from 1999 to 2018, with an estimated Gini coefficient ranging from 0.302 to 0.405, with an average of 0.364 and a median of 0.344. The NARDL was chosen as the primary analysis tool because it met the requirement that the model variables be stationary and/ or integrated of order one, and its results passed the bound test for model adequacy, and test for any nonlinear effects of the explanatory variables. The NARDL findings reveal that current positive changes in per capita income and squared per capita are increasing the inequality contrary to the current negative changes. The opposite is true for the effect of the previous period Inflation, a one percent rise in squared per capita income, and inflation reduces inequality. These findings, combined with the trend of inequality, suggest that Kuznets' inverted U hypothesis can be adopted. The policy implications of these findings are that an increase in current per capita income leads to increased inequality to the peak of the inverted U shape, then a downward trend, implying that steps must be taken to achieve more equitable income distribution while maintaining the economy's development path and continuing to provide free education and health care. In addition, the rate of inflation is a crucial predictor of inequality and should be reduced. The role of Zakat is obvious in income distribution whereas the first Zakat collecting system was established in the Kingdom by Royal decree No. 17/2/28/8634 on June 29, 1370, under which citizens were exempted from paying income tax, and the Sharia Zakat had to be paid following Sharia regulations. A monthly sum is paid to the poor and low-income individuals, to enhance their quality of life through a complementary assistance program and the introduction of programs for those who can work. Despite Social Security's efforts to eliminate poverty, they still require a lot of help and growth, as well as the spread of Takaful awareness (Bokhaisar 2020). However, many charity societies are working in the Kingdom offering support to the needy and poor people.

6. Conclusion

The Gini coefficient was estimated as the dependent variable explained by per capita income, squared per capita income, and inflation to provide an answer to the study question about the relationship between economic growth and inequality. The Gini series for the thirteen districts was created using data from four household surveys and interpolation with EViews 10 utilizing consumption data from all Saudi districts from 1999 to 2018. Only Saudi citizens' consumption was taken into account when the Gini coefficient was calculated. The explanatory variable squared per capita income was utilized as a proxy for Kuznets inverted U shape to achieve relevant results. All of the usual tests were passed by the estimated NARDL model. Saudi Arabia ("KSA") has historically been a tax-free country. However, in recent years, the country has begun to implement various forms of taxation to diversify its economy and reduce its reliance on oil earnings. This new legislation will help to further align the country with the government's Vision 2030 national reform initiative (Doglas 27/4/ 2022). So it is recommended in upcoming studies to take into account the effect of taxes on the disparity of consumption.

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Annex

Annex (1)

Dependent Variable: GINI
Method: ARDL
Date: 04/28/22 Time: 22:19
Sample (adjusted): 2001 2018
Included observations: 18 after adjustments
Maximum dependent lags: 2 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (1 lag, automatic): Q_POS Q_NEG Q^2_POS Q^2_NEG INF_POS INF_NEG
Fixed regressors:
Number of models evaluated: 128
Selected Model: ARDL(1, 1, 1, 1, 1, 1, 0)
No d.f. adjustment for standard errors & covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
GINI(-1)	0.946722000	0.017705	53.47353	0.0000
Q_POS	0.000059400	2.48E-05	2.396008	0.0536
Q_POS(-1)	-0.000047200	2.11E-05	-2.23112	0.0672
Q_NEG	-0.000048300	1.93E-05	-2.50143	0.0464
Q_NEG(-1)	0.000149000	3.52E-05	4.230547	0.0055
Q^2_POS	-0.000000001	2.68E-10	-2.38152	0.0547
Q^2_POS(-1)	0.000000001	2.43E-10	2.257939	0.0647
Q^2_NEG	0.000000000	2.05E-10	2.265003	0.0641
Q^2_NEG(-1)	-0.000000002	3.82E-10	-4.32889	0.0049
INF_POS	-0.005024000	1.06E-03	-4.75311	0.0031
INF_POS(-1)	0.006033000	8.75E-04	6.894333	0.0005
INF_NEG	0.013942000	2.27E-03	6.143898	0.0009
R-squared	0.995908	Mean dependent var		0.351056
Adjusted R-squared	0.988407	S.D. dependent var		0.035065
S.E. of regression	0.003776	Akaike info criterion		-8.08581
Sum squared resid	8.55E-05	Schwarz criterion		-7.49223
Log-likelihood	84.77227	Hannan-Quinn criterion.		-8.00396
Durbin-Watson stat	2.989537			

Annex (2) Short-run Estimates

ARDL Error Correction Regression
Dependent Variable: D(GINI)
Selected Model: ARDL(1, 1, 1, 1, 1, 1, 0)
Case 1: No Constant and No Trend
Date: 04/28/22 Time: 22:20

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Sample: 1999 2018
Included observations: 18
ECM Regression
Case 1: No Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(Q_POS)	0.0000594000	1.04E-05	5.694174	0.0013
D(Q_NEG)	-0.0000483000	8.35E-06	-5.78527	0.0012
D(Q^2_POS)	-0.0000000006	1.18E-10	-5.43181	0.0016
D(Q^2_NEG)	0.0000000005	9.18E-11	5.066208	0.0023
D(INF_POS)	-0.0050240000	6.52E-04	-7.71029	0.0002
CointEq(-1)*	-0.0532780000	0.004524	-11.7774	0.0000
R-squared	0.940319	Mean dependent var		0.003222
Adjusted R-squared	0.915452	S.D. dependent var		0.009182
S.E. of regression	0.00267	Akaike info criterion		-8.75248
Sum squared resid	8.55E-05	Schwarz criterion		-8.45568
Log-likelihood	84.77227	Hannan-Quinn criter.		-8.71155
Durbin-Watson stat	2.989537			

Annex (3) Long-run Estimates
ARDL Long Run Form and Bounds Test
Dependent Variable: D(GINI)
Selected Model: ARDL(1, 1, 1, 1, 1, 1, 0)
Case 1: No Constant and No Trend
Date: 04/28/22 Time: 22:34
Sample: 1999 2018
Included observations: 18
Conditional Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GINI(-1)*	-0.05328	0.030665	-1.73741	0.133
Q_POS(-1)	1.23E-05	1.46E-05	0.840619	0.4328
Q_NEG(-1)	0.000101	3.74E-05	2.691176	0.036
Q^2_POS(-1)	-8.97E-11	1.51E-10	-0.59359	0.5745
Q^2_NEG(-1)	-1.19E-09	4.22E-10	-2.81449	0.0306
INF_POS(-1)	0.001009	0.001157	0.871905	0.4168
INF_NEG**	0.013942	0.00393	3.547181	0.0121
D(Q_POS)	5.94E-05	4.30E-05	1.383336	0.2158
D(Q_NEG)	-4.83E-05	3.35E-05	-1.4442	0.1988
D(Q^2_POS)	-6.38E-10	4.64E-10	-1.37497	0.2183
D(Q^2_NEG)	4.65E-10	3.56E-10	1.3077	0.2388
D(INF_POS)	-0.00502	0.001831	-2.74421	0.0335

Annex (4) Bound Test
Levels Equation
Case 1: No Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.

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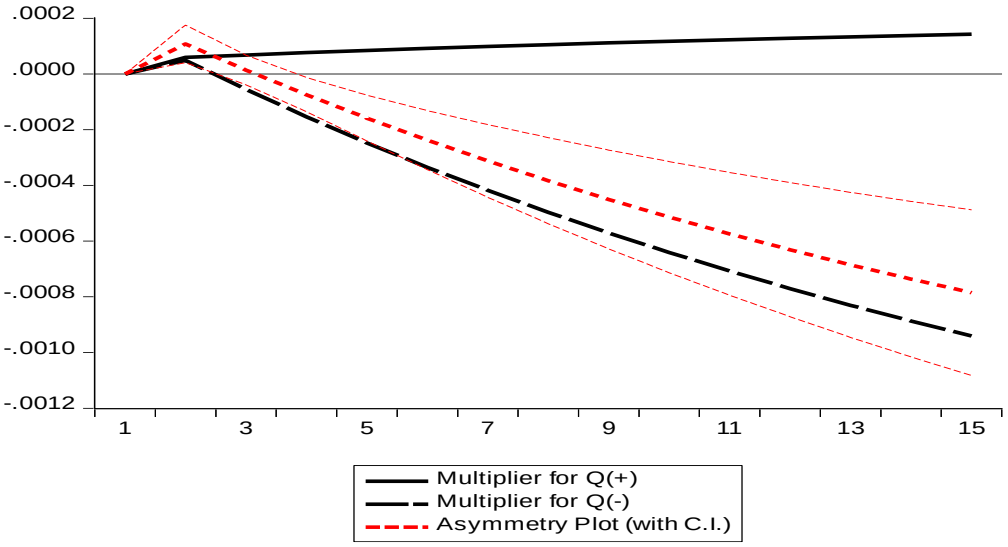
Q_POS	0.00023	0.000141	1.629945	0.1542
Q_NEG	0.001891	0.000566	3.340332	0.0156
Q^2_POS	-1.68E-09	1.54E-09	-1.09328	0.3162
Q^2_NEG	-2.23E-08	6.64E-09	-3.36001	0.0152
INF_POS	0.018942	0.016206	1.168844	0.2868
INF_NEG	0.261676	0.076212	3.43352	0.0139

EC = GINI - (0.0002*Q_POS + 0.0019*Q_NEG -0.0000*ZZ_POS -0.0000 *Q^2_NEG + 0.0189*INF_POS + 0.2617*INF_NEG)

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	9.907637	10%	1.75	2.87
k	6	5%	2.04	3.24
		2.50%	2.32	3.59
		1%	2.66	4.05
Actual Sample Size	18		Finite Sample: n=35	
		10%	-1	-1
		5%	-1	-1
		1%	-1	-1
			Finite Sample: n=30	
		10%	-1	-1
		5%	-1	-1

t-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
t-statistic	-1.73741	10%	-1.62	-3.7
		5%	-1.95	-4.04
		2.50%	-2.24	-4.34
		1%	-2.58	-4.67



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