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Does the Impact of Gini Index on Growth Differ among GCC Countries ?

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Abstract

This paper tests whether inequality and economic growth in eleven Gulf Cooperation Council (GCC) countries are cointegrated, and estimates the impact of inequality on growth in each country separately in case cointegration exists. Assuming that each country has its own inequality-growth relationship, the paper uses time series data to estimate the impact of inequality on growth individually in each GCC country by making use of single equation cointegration techniques robust to small sample sizes such as dynamic ordinary least squares (DOLS), fully modified ordinary least squares (FMOLS) and canonical cointegration regression (CCR). Results show that the impact of inequality on growth differs among GCC countries. The paper is valuable to policy makers in GCC countries, especially the Arab Spring countries, who aim to achieve higher growth rates by improving income inequality. The paper shows whether measures aimed at ameliorating income distribution will positively or negatively affect economic growth.

Keywords: Gulf Cooperation Council countries (GCC), Economic growth; income inequality; Cointegration; Unit root tests

JEL Classification : O11, O15, O53, C23, C26

1. Introduction

This paper tests whether inequality and economic growth in eleven Gulf Cooperation Council (GCC) countries are statistically cointegrated. The paper uses time series data of each individual country to test the relationship. Lately panel cointegration techniques have been almost the norm in the prevalent literature discussing the impact of inequality on economic growth. Panel cointegration has the advantage upon time series cointegration in significantly enlarging the number of observations thereby making empirical results more trustworthy. However a major problem that has emerged from the empirical literature (discussed in the next section) is that findings of most research have appeared rather mixed or in other words inconclusive as to whether inequality has a positive or negative impact on growth. The failure to find a 'one rule fits all' theory has induced us into undergoing the current research that depends on individual countries, assuming that each country would have its own inequality-growth nexus. In addition to this, there is hardly any geographical region in the world that surpasses (GCC) countries in the amount of diversity that characterizes its countries concerning natural resources, GDPs, GDPs per capita, past and present economic systems, past colonization or even population densities, to cite only a few differences. From sparsely populated extremely oil-rich countries such as Qatar to densely populated lower middle income countries such as UAE, or from liberal economies such as Kuwait to historically socialist economies, it is extremely difficult to imagine that there can exist one relationship that governs how changes in the inequality of income distribution may affect economic growth. In contrast to the results from aggregate analysis, we find that controlling and identifying country individual characteristics may produce long run relationships that may also be in line with economic theory. The objective of this research is to attempt to grasp what unique relationship exists in each GCC country between inequality and growth and whether the two variables are cointegrated in a long run relationship. The research is of growing importance especially in the Arab Spring countries which one of the main reasons behind their revolutions was the large disparity in the incomes between the upper and lower classes. As a result of such disparity, these countries are now seeking to narrow the gap between the rich and the poor classes through policies aimed at decreasing income inequalities. The paper uses time series data on eleven GCC countries from 1964 to 2013 to examine whether a long term relationship exists between inequality and growth in each and every GCC country examined, making use of new single equation cointegration techniques such as the dynamic OLS (DOLS), the fully modified OLS (FMOLS) and the canonical cointegration regression

(CCR). The paper is organized as follows: after this introduction section two lays the theoretical foundation behind the inequality-growth nexus and reviews the empirical research conducted; section three expounds the data and methodologies used; section four states the main findings while sections five concludes and identifies the main limitations and avenues for future research.

2. Inequality and economic growth: theory and empirical evidence

As this study is not concerned with the impact of growth on equality, but rather the impact of inequality on growth, we will review the theoretical foundations that explain how inequality either positively or negatively affects growth, totally neglecting the inverse relationship detecting the impact of growth on inequality. The positive link between increasing inequality and enhancing economic growth is embedded deeply in the classical economic thought. Smith and the classical were clear to favor saving and capital accumulation as an engine for growth (Smith 1776). Higher saving leads to higher investment and eventually to faster growth (Kaldor 1961). Higher growth would in turn increase saving and the country enters a cycle of self sustained growth.

However, the majority of studies detecting the impact of inequality on growth seem to support theories that advocate the negative impact inequality has on growth. There are several channels how lowering inequality (or improving equality) can enhance growth; first, improving health and education improves the human capital accumulation of the poor classes and increases their productivity (Dasgupta et al 1987). Second, enhancing equality improves political stability which boosts production (Alesina et al 1994). Third, higher crime rates and other rent seeking activities aggravate social unrest and decrease investments ((Benabou, 1996; Merton, 1938). Fourth, higher inequality causes the wealthy to manipulate politicians to decrease taxes leading to corrupted governments and increasing the prices of licenses thereby decreasing investments (Murphy et al 1993) In addition, decreasing inequality and poverty increases demand for locally produced goods thereby increasing local production and growth (Hicks 1979).

Resting on the previously reviewed theories, most empirical research seem to support either the positive or the negative influence on inequality on growth or fail to prove any significant link between them pending the results on the data selected to represent inequality, the econometric methodology used or whether inequality exists in the upper or lower end of the distribution. As it is practically impossible to review all studies conducted on this topic, we confine our literature review to studies carried out during the last decade. Some of the major recent studies on the impact of inequality on economic growth are summarized in table (1) which highlights the countries examined, periods and variables selected, methodologies employed and findings reached.

Insert table 1

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3. Empirical Model, Data and Methodology

3.1 The model

Our basic model takes the form of:

$\text{Log}(\text{income}_{it}) = \alpha_i + \zeta_{it} + \xi_{1i}\log(\text{invest}_{it}) + \xi_{2i}\log(\text{Inequality}_{it}) + \varepsilon_{it}$ (1)

Where α_i is the country specific effects and ζ_{it} is the country specific time trends, introduced in the model to control for any country specific omitted variables that may change very slowly over time or are constant over the time period.

3.2 Definition of the Variables and Data Sources

Log (Income) is the natural log of real per capita income over time periods t = 1, 2,…..T and countries i = 1, 2,…N. Log (Invest) is the natural log of the percentage investment share of real GDP per capita while Log (Inequality) is the natural log of the estimated household inequality (EHII) in Gini form measured in percentage points. Following Herzer and Vollmer (2011) we only include the investment share of GDP in the equation (since it is unrealistic to attribute growth only to inequality) but exclude other variables usually incorporated on other studies so as not to eliminate the impact of inequality on growth which operates through human capital variable. Gini coefficient data are taken from the University of Texas Inequality Project. Real per capita GDP and the percentage investment share of real GDP are obtained from Penn World Tables online. The University of Texas Income Inequality Data set (EHII) is 'derived from the econometric relationship between UTIP-UNIDO, other conditioning variables, World Income Inequality Database (WIID), the World Bank database and Deininger and Squire data set (University of Texas Inequality Project online). The period examined starts from 1964 and ends in 2013.

3.3 Method of Estimation

Before estimating our model and examining whether inequality affects growth in each of the eleven selected countries in our sample, the stationarity of the time series variables should be tested since conventional regression methods can produce spurious results if the variables are non-stationary or integrated of order I(1). The concept of cointegration, first introduced by

Granger (1981) is that even if two variables are integrated of order I(1), there is a stationary cointegration vector that gives the linear combination of the two variables. The first step is to examine the order of integration of the individual time series variables making use of some tests such most common of which is the ADF test. If the series are I(1) in levels then we test whether stationarity is achieved by first differencing; if not then by second differencing and so on. Each time we difference the variables the residuals from OLS estimation are tested to determine their stationarity. If the residuals are stationary we reject the null hypothesis of the existence of a unit root and therefore deduce that the model can be cointegrated and that a long term relationship can exist between the variables.

Estimating the differenced model however suffers from various shortcomings due to the dynamic effects of the model; in addition estimating a model which includes more than two variables may result in the existence of more than one cointegrating vector. To solve these difficulties Johansen (1991) developed a new method in which he did not assume in advance the existence of one cointegrating relationship but developed a procedure to test it.

In this study we employ an alternative method, the Stock Watson dynamic ordinary least squares (DOLS) (Saikkonen 1992, Stock and Watson 1993) to estimate a single equation cointegrating relation between per capita income growth and income inequality.

Our basic model takes the form

$$\text{Log}(\text{income}_{it}) = \alpha_i + \zeta_{it} + \xi_{1i}\log(\text{invest}_{it}) + \xi_{2i}\log(\text{Inequality}_{it}) + \sum_{j=-q}^{r} \S_{1i}\,\Delta\log(\text{invest}_{it+j})$$

$$+ \sum_{j=-q}^{r} \S_{2i}\,\Delta\log(\text{Inequality}_{it+j}) + \varepsilon_{it} \qquad (2)$$

Under the assumption that if q lags and r leads of the differenced regressors are added, this absorbs the long run correlation between ε_{1t} and $\varepsilon_{2t.}$ We choose the coefficient covariance matrix rescaled OLS which rescales OLS coefficient covariance using an estimator of the long run variance of the DOLS residuals. Our choice of the number of leads and lags depends on the number of leads and lags that bring the highest R^2 and the DW statistic that is closer to 2 to avoid serial correlation.

DOLS is more advantageous to Johansen's in that, being a robust single equation method, it is not influenced by any misspecification in other equations. It addresses the problem of endogeneity by including leads and lags of the first differences of regressors in addition to coping with small sample sizes (Stock and Watson 1993). Another main advantage is that

DOLS does not entail that all regressors should be integrated of order (1). DOLS regresses one of the I(1) variables on other I(1) variables, I(0) variables and lags and leads of the first differences of the I(1) variables. Endogeneity therefore has no influence on the robustness of the estimates.

In order to check the robustness of the estimated coefficients, two other cointegrating methods are used namely the fully modified OLS (FMOLS) by Phillips and Hansen (1990) and the canonical cointegration regression (CCR) by Park (1992). The FMOLS uses a standard triangular representation and asserts the existence of a single cointegrating vector. It is worth mentioning that the FMOLS method applies a correction which is semi parametric in nature to evade estimation problems caused by long run correlation between the cointegrating equation and the stochastic regresses innovations. On the other hand, the CCR estimation procedure is closely related to FMOLS but removes long run correlation between the cointegrating equation and regresses innovations by using stationary transformations to the data. The mathematical derivation of the two procedures can be found in Phillips and Hansen (1990) and Park (1992) but we do not include them here for reasons of parsimony.

4. Empirical results

4.1. Unit root tests

We test for unit roots in our variables in table (2) where per capita income is henceforth referred to by LNPCGDP, the share of investment in real GDP is referred to by LNINV, while the gini index is referred to by GINI1. (Appendix table A.1 cites codes of countries selected). Testing for unit roots in time series of the different variables employed using the Augmented Dickey Fuller (ADF) test showed that all series in levels contained unit roots with the exception of the Gini time series of Saudi Arabia and Jordan which did not contain unit roots (table 2). However, when these variables are tested again after dropping the intercept from the test equation (not shown in table), the results show evidence that the variables are I(1).

All series that contained unit roots turned stationary when first differenced, with the exception of the time series of investment in Saudi Arabia which turned stationary when second differenced.

Insert table 2

4.2. Cointegration tests

We start by testing for the long run relationships using equation (2). We employ four tests, Engle-Granger (1987) and Phillips Ouliaris (1990) residual based tests, Hansen instability test (Hansen 1992) and Park's H(p, q) added variable test (Park 1992) assuming a single equation cointegration setting. The Hansen test assumes a null hypothesis of cointegration against the alternative of no cointegration. In the case of no cointegration there is evidence of parameter instability which it tests. Park's added variable test is computed by testing the significance of spurious time trends in the cointegrating equation. The test assumes that the cointegrating equation consists of powers of trend up to order p. Then it estimates the spurious regression by including from p+1 to q spurious powers of trend, and test the joint significance of the coefficients.

Insert table 3

Results of the tests (table 3) were inconclusive concerning the cointegration between growth and inequality in the different countries. All four tests supported cointegration in Saudi Arabia at the 5% significance level; two out of the four tests supported cointegration in UAE and Kuwait, one test only supported cointegration while three tests supported no cointegration in Bahrain and Oman.

4.3. Estimating cointegration coefficients using DOLS

Estimating cointegration coefficients using DOLS (table 4) demonstrated that the inequality coefficient proved to be significant in only five out of the eleven countries in the sample. In three out of the five, the inequality coefficient held a positive sign while in two countries the inequality coefficient was negative. The countries which demonstrated the negative relationship were Saudi Arabia where a 1% increase in the gini index would decrease per capita income by about 0.7%. On the other hand, an increase in the Gini index increases - rather than decreases - per capita income by nearly 5% in UAE and nearly 3% in Kuwait. It is worth mentioning that the results in table (4) do not include the lags and leads.

Insert table 4

4.4. Other Robustness checks

4.4.1. Estimating cointegration coefficients using FMOLS

As a robustness check we employ the FMOLS technique explained earlier. Again the negative impact of inequality was traced in Saudi Arabia; while the positive impact of inequality was confirmed in Kuwait besides Bahrain which was not traced in DOLS.

Insert table 5

4.4.2. Estimating cointegration coefficients using CCR

As mentioned earlier the CCR estimation procedure is closely related to FMOLS but removes long run correlation between the cointegrating equation and regresses innovations by using stationary transformations to the data. Results from CCR estimation appear in table (6). As with FMOLS, the impact of inequality on growth was negative in Saudi Arabia and positive in Kuwait.

Insert table 6

4.4.3. Comparing results of FMOLS and CCR with DOLS

Results from FMOLS and CCR confirm the negative relationship between inequality and growth in Saudi Arabia. With respect to Saudi Arabia the results are robust as the coefficients of inequality are significant in all three tests. However, the results show that the estimated inequality coefficient is somewhat lower when FMOLS and CCR were used compared to the estimates from DOLS. As evident from tables (4), (5) and (6) the elasticity of inequality in Saudi Arabia ranged from -0.364 (FMOLS), -0.396 (CCR) and -0.648 (DOLS). On the other hand the positive relation between inequality and per capita income evident by the DOLS estimation method in UAE and Kuwait was confirmed only for Kuwait (but not for UAE) when the FMOLS and CCR estimators were employed. In fact, results for Kuwait were robust as the coefficient for inequality ranged between 3 in DOLS and 3.8 in FMOLS and CCR. Finally, it is worth mentioning that the coefficient of inequality proved significant in the case of Bahrain when FMOLS and CCR, as a 1% increase in the gini index would increase per capita income by nearly 1.3% in Bahrain. While the estimates for Bahrain were close to those obtained by DOLS (although as mentioned earlier the estimated coefficient was insignificant).

5. Conclusion

As the impact of inequality on growth remains inconclusive, cointegration between inequality and growth was studied separately in six selected Gulf Cooperation Council countries to identify whether a long term relationship exists between the two variables. Three different methods (DOLS, FMOLS and CCR) were employed to determine the long term estimates. These techniques have proven to provide robust and reliable estimates to small samples - which is the case with our time series data - in addition to successfully tackling the problem of endogeneity. However, results were robust in only three countries, Saudi Arabia and Kuwait as the two estimators were consistent in producing close results for each individual country; despite demonstrating a negative impact of inequality on growth in Saudi Arabia and a positive impact in the other two countries. The impact of inequality was also positive in UAE. The results clearly demonstrate that there is no one rule that fits the GCC countries concerning whether inequality should be fostered or hampered. The results send an important message especially to the Arab Spring countries like UAE which - as a response to public pressure - maybe induced to tackle chronic inequality resulting from long decades of authoritarian rule by harsh redistribution measures. Finally it should be noted that the results should be taken with caution since the time series of the Gini index used seem to somewhat overstate the official levels of the Gini estimates. This is quite evident if we compare for example UAE's Gini index recorded in UAE Human Development Reports at 31.6 and 29.3 in 1995 and 2000 respectively with estimates of Texas University Inequality Project used in this study amounting to 45.8 in 1995 and 50.08 in 2013 (UAE Human Development Reports 2001 online and 2004). However, the unavailability of continuous Gini indexes (or other inequality indexes) in the respective GCC countries makes the use of official inequality statistics hardly possible. The hope is that GCC countries produce such regular and continuous inequality indexes in the future knowing the vital importance of the inequality-growth nexus.

References

Alesina, A. and R. Perotti, [1996]. "Income distribution, political instability, and investment". *European Economic Review*, 40: 1203-1228.

Alesina, A. and Rodrik., [1994]. "Distributive, politics and economic growth". *European Economic Review*, 55: 345-367

Atkinson. T[2002]«La distribution des revenus dans les pays de l'OCDE au vingtième siècle » *Revue française d'économie*. Volume 17 N°1, 2002. pp. 3-31.

Atkinson, M. Glaude et L. Olier [2001] « Inégalités économiques », Conseil d'analyse économique, *La Documentation française*.

Barro, R., [2000]. "Inequality and growth in a panel of countries". Journal of Economic Growth, 5: 5-32.

Benhabib, J. and M. Spiegel, [1994]. "The role of human capital in economic development: Evidence from aggregate cross-country data". *Journal of Monetary Economics*, 34: 143-173.

Bourguignon., [2003]. "The difficult task of expanding the income poverty paradigm". Paper prepared for the conference on "Conceptual challenges in poverty and inequality analysis", *Cornell University*, 16-17 April 2002.

Chambers, D. and Krause, A. (2010) Is the relationship between inequality and growth affected by physical and human capital accumulation? *Journal of Economic Inequality* 8: 153-172.

Engle, R. and Granger, C. (1987) Cointegration and error correction: representation, estimation and testing. *Econometrica* 55: 251-276.

Galor, O. (2011) Inequality, human capital formation and the process of development. *NBER Working Paper* 17058, May

Granger, C.W. (1981) Some properties of time series data and their use in econometric model specification. *Journal of Econometrics* 16: 121-30.

Hansen, B. (1992) Tests for parameter instability in regressions with I(1) processes. *Journal of Business and Economics Statistics* 10: 321-335.

Deininger, K., Squire, L. [1996], "Measuring Income Inequality: a New Data-base", World *Bank economic Review*, vol. 10(3), pp. 565–591.

Deininger, K., Squire, L. [1998], "New Ways of Looking at Old Issues: Inequality and Growth", *Journal of Development Economics*, vol. 57(2), pp. 259-287.

Forbes. K.J. [2000] "*A* Reassessment of the Relationship Between Inequality and Growth" *American Economic Review*, vol 90 : pp. 869-887.

Gastil, R.D., *Freedom in the World*, (various years).

Galor, Oded and Zeira, Joseph, [1993], "Income Distribution and Macroeconomics," *Review of Economic Studies*, 60 35-52.

Hall.R.E. et Jones.C.I. (1999), "Why do some countries produce some much more output per worker than others?", *The Quarterly Journal of Economics*, MIT Press , Vol. 114, No. 1, pp.83-116, February 1999.

Kaldor, N.[1956], "Alternative Theories of Distribution," *Review of Economic Studies*, 23, 83-100.

Kuznet, S., [1955], "Economic Growth and Income Inequality," *American Economic Review*, 45, 1-28.

Levine, R. and Renelt, D. (1992) «Sensitivity Analysis of Cross Country Growth Regressions" *American Economic Review*, 82: 942-63.

Mankiw, N., D. Romer and D. Weil, [1992]. "A contribution to the empirics of economic growth". *Quarterly Journal of Economics* 152: 407-437.

Milanovic, B. 2002, "True World Income Distribution, 1988 and 1993: First Calculation Based on Household Surveys Alone", *Economic Journal*, vol. 112, pp. 51-92.

Mo, Pak Hung, [2000]: "Income Inequality and Economic Growth," *Kyklos*, 53, 293-316.
Phillips, P. and Hansen, B. (1990) Statistical inference in instrumental variables regressions with I(1) Processes. *Review of Economic Studies* 57: 99-125.

Quintana, D., and Vicente M. (2012) Agglomeration, inequality and economic growth: cross section and panel data analysis. AQR-AREA - Universidad de Barcelona 690 08034 BCN.
Perotti, Roberto, [1994]: "Income Distribution and Investment," *European Economic Review*, 38, 827-35.

Piketty. T and Saez. E [2003] "Income Inequality in the United States, 1913- 1998", *Quarterly Journal of Economics*, 118(1): 1-39.

Renelt, David Ross Levine;"A Sensitivity Analysis of Cross-Country Growth Regressions" *The American Economic Review*, Vol. 82, No. 4. (Sep., 1992), pp. 942-963.

Appendices

Table A.1 Country Codes

Saoudi Arabia	SAB
United Arab Emirates	UAE
Bahrain	BHN
Kuwait	KEW
Oman	OMN
QATAR	QTR

Table (1): The impact of inequality on growth: A survey of the literature

Study	Country Or Countries Examined	Period estimated	Variables estimated	Method-ology used	Main finding
Odedokun, M. and Round, J., (2004)	Sample of 35 African Countries	Various periods in the last four decades	Level of economic development – regional factors – government budget – subsidies and transfers – income inequality	Various techniques including quasi panel data	Inequality hinders growth through reducing primary, secondary and tertiary education, decreasing political stability and raising fertility rates
Knowles, S. (2005)	Various Time Series Samples	Averages over the years 1960-1990	GDP growth per capita – average years of male secondary schooling – average years of female schooling in the base year – inflation deflator – income inequality	OLS	Negative correlation between inequality and growth
Voitchovsky, S. (2005)	Sample of 21 Countries	Two 5-year consecutive periods or all years between 1975-1990	GDP per capita – inequality measures at the top and bottom ends – average years of schooling – average investment rate	OLS - GMM	Inequality raises growth if it exists in the upper end of the distribution and slows growth if it exists in the lower end. The impact of inequality also depends on the econometric technique used
Malinen, T. (2009)	Sample of 53 Countries	1970-1999	Real GDP per capita – inequality (gini index) – share of investment to GDP – average years of schooling	Panel cointegration	The effect of inequality on growth is negative for the majority of countries. However, the for less developed countries there

					seems some evidence of a positive relation
Benjamin, D., Brandt, L. and Giles, J. (2010)	Longitudinal survey in rural China	1987 - 2002	Average growth rate of per capita income in villages – distribution of resources across other households in the village- level of inequality – initial levels of household and village covariates	Various techniques including OLS, IV-2, IV-3 and others	Higher inequality villages seem to experience less economic growth. The channel includes the village institutions that are associated with households access to higher income activities
Chambers, D. and Krause, A. (2010)	Sample of 54 Countries	Eight 5-year time periods starting 1960 and ending 2000	Growth rate of real per capita income – gini coefficient – average years of secondary education – per capita capital stock	Local Linear Least Square (LLLS), semiparametric FGLS estimators	Generally income inequality negatively affects economic growth over the next 5-year span; however, as the returns to human capital rise relative to physical capital, the harmful effect of inequality on growth increases.
Galor, O. (2011)	Various Country Cases Studies	Various periods in history	Examined the main variables tackled in empirical research	Theoretical and historical analyses	In the early stages of industrialization when physical capital is vital for growth, higher inequality might enhance growth; whereas lower inequality may be better in high income countries when human rather than physical capital is needed
Jalles, J. (2011)	10 Common wealth of Independent states (CIS)	1991-2006	Real GDP – secondary school attainment – trade openness – employment rate population – fertility rate - others	OLS – FE - GMM	No statistically significant relationship exists between inequality and growth
Herzer, D. and Volmer, S. (2011)	Sample of 46 Countries	1970-1995	Per capita income – investment share of GDP - inequality	Heterogeneous panel cointegration	Inequality has a negative long term effect on income. The effect of inequality on income amounts to nearly half the effect of investment on it.
Malinen, T. (2013)	Sample of 70 countries	1965 - 2000	Real GDP per capita – change in real GDP per capita – share of investment in real GDP per capita – average years of schooling – inequality	FE-OLS - GMM	Although results reveal a negative effect of inequality on growth there is some evidence of non-linearities in the relationship

Table (2) Unit root tests

Variables	ADF					
	At Levels	Test critical values	At 1st difference	Test critical values	At 2nd difference	Test critical values
LNPCGDP SAB	-1.571430	-4.226815	-8.673380***	-4.226815		
(Intercept, trend)		-3.536601		-3.536601		
		-3.200320		-3.200320		
LNINV_SAB	- 1.687681	-3.632900	-2.601760	-3.632900	-9.330640***	-3.632900
(Intercept)		-2.948404		-2.948404		-2.948404
		-2.612874		-2.612874		-2.612874
LNGINI1_SAB	-3.47633**	-4.004425				
(Intercept)		-3.098896				
		-2.690439				
LNPCGDP_UAE	-2.242683	-4.219126	-4.759827***	-4.226815		
(Intercept, trend)		-3.533083		-3.536601		
		-3.198312		-3.200320		
LNINV_UAE	-1.129932	-3.615588	-4.515624***	-3.621023		
(Intercept)		-2.941145		-2.943427		
		-2.609066		-2.610263		
LNGINI1_UAE	-3.030737**	-3.639407	-10.30702***	-3.646342		
(Intercept)		-2.951125		-2.954021		
		-2.614300		-2.615817		
LNPCGDP_BHN	-1.751909	-3.621023	-4.037943***	-3.621023		
(Intercept)		-2.943427		-2.943427		
		-2.609066		-2.610263		
LNINV_BHN	-3.157605**	-3.621023	-5.356945***	-3.626784		
(Intercept)		-2.943427		-2.945842		
		-2.610263		-2.611531		
LNGINI1_BHN	-2.246449	-3.632900	-6.205921***	-3.632900		
(Intercept)		-2.945842		-2.948404		
		-2.611531		-2.612874		
LNPCGDP_KWE	-1.731691	-4.219126	-4.769274***	-4.234972		
(Intercept, trend)		-3.533083		-3.540328		
		-3.198312		-3.202445		
LNINV KWE	-2.228440	-3.615588	-4.951899***	-3.621023		
(Intercept)		-2.941145		-2.943427		
		-2.609066		-2.610263		
LNGINI1_KWE	-1.093270	-4.243644	-6.143729***	-4.243644		
(Intercept, trend)		-3.544284		-3.544284		
		-3.204699		3.204699		
LNPCGDP_OMN	-1.581231	-3.615588	-6.229464***	-3.621023		
(Intercept)		-2.941145		-2.943427		
		-2.609066		-2.610263		
LNINV_OMN	-2.193231	-3.615588	-7.104442***	-3.621023		
(Intercept)		-2.941145		-2.943427		
		-2.609066		-2.610263		
LNGINI1_OMN	-	-3.646342				
(Intercept)	5.099689***	-2.954021				
		-2.615817				
LNPCGDP_OMN	-2.033649	-4.219126	-6.952666***	-4.226815		
(Intercept, trend)		-3.533083		-3.536601		
		-3.198312		-3.200320		
LNINV_OMN	-2.010803	-3.653730	-2.706808*	-3.646342	-6.545619***	-3.646342
(Intercept)		-2.957110		-2.954021		-2.954021
		-2.617434		-2.615817		-2.615817
LNGINI1_OMN	-	-3.769597				
(Intercept)	4.309683***	-3.004861				
		-2.642242				
LNPCGDP_QTR	-0.527222	-4.219126	-7.218418***	-4.226815		
(Intercept, trend)		-3.533083		-3.536601		
		-3.198312		-3.200320		
LNINV_QTR	-3.095320	-4.219126	-3.348940*	-4.273277	-3.942626**	-4.273277
(intercept, trend)		-3.533083		-3.557759		-3.557759
		-3.198312		-3.212361		-3.212361
LNGINI1_QTR	-3.230245*	-3.699871	-4.880729***	-3.711457		
(Intercept)		-2.976263		-2.981038		
		-2.627420		-2.629906		

Lag length: automatic based on SIC

Whether the test included an intercept, or both an intercept and trend depended on the graphical representation of the variable's time series.

Table (3): Cointegration tests

Country	Cointegration test			
	Hansen Lc statistic	Park added var. Chi-squared	Engle-Granger	Phillips-Ouliaris
Saoudi Arabia	0.139 (>0.2)	1.767 (0.4133)	Tau - 4.691 (0.0425) Z-stat - 23.992 (0.0411)	Tau -4.686 (0.0429) Z-stat -23.188 (0.0533)
UAE	0.035 (>0.2)	3.828 (0.1475)	Tau -2.564 (0.6874) Z-stat -10.790 (0.7201)	Tau -2.592 (0.6745) Z-stat -11.107 (0.6990)
Bahrain	0.022 (>0.2)	136.936 (0.0000)	Tau -2.484 (0.8748) Z-stat -10.481 (0.897)	Tau -2.499 (0.8704) Z-stat -10.643 (0.8908)
Oman	0.0281 (>0.2)	4.108 (0.1281)	Tau -3.554 (0.1141) Z-stat -21.625 (0.0497)	Tau -3.124 (0.2303) Z-stat-12.161 (0.3968)
Qatar	0.048 (>0.2)	7.881 (0.0194)	Tau -2.245 (0.8190) Z-stat -6.768 (0.9292)	Tau -2.364 (0.7740) Z-stat -8.216 (0.8687)

1) Hansen stability: Null assumes series are cointegrated
2) Park added variables: Null assumes series are cointegrated
3) Engle Granger: Null assumes series are not cointegrated. Automatic lag selection based on Schwartz
4) Phillips-Ouliaris: Null assumes series are not cointegrated
P-values are in parenthesis

Table (4): Cointegration estimation of the inequality coefficients in some GCC countries using DOLS

Country	Dependent Variable real per capita GDP in natural logs				
	LNGINI1	LNINV	OBS	R^2	DW
Saoudi Arabia	-0.648** (0.023)	0.191*** (0.006)	22	0.849	2.4
UAE	5.736*** (0.005)	0.430** (0.015)	26	0.998	2.1
Bahrain	1.496 (0.563)	-3.838 (0.501)	28	0.950	1.5
Kuwait	3.068*** (0.000)	0.557*** (0.0001)	29	0.980	1.3
Oman	0.520 (0.5360)	-0.639 (0.1392)	22	0.967	2.2
Qatar	-0.398 (0.5213)	-0.606** (0.024)	25	0.998	1.8

*** Significant at the 1% level
**Significant at the 5% level
*Significant at the10% level

Table (5): Cointegration estimation of the inequality coefficients in some GCC countries using FMOLS

Country	Dependent Variable real per capita GDP in natural logs			
	LNGINI1	LNINV	OBS	R^2
Saudi Arabia	-0.364*** (0.010)	0.175*** (0.001)	26	0.734
UAE	0.289 (0.1260)	-0.043* (0.1160)	34	0.963
Bahrain	1.350** (0.041)	-0.457* (0.096)	36	0.247
Kuwait	3.783*** (0.000)	0.595*** (0.000)	37	0.788
Oman	-	-	-	-
Qatar	-1.310*** (0.000)	-0.022 (0.7243)	31	0.985

*** Significant at the 1% level
**Significant at the 5% level
*Significant at the10% level

Table (6): Cointegration estimation of the inequality coefficients in some GCC countries using CCR

Country	Dependent Variable real per capita GDP in natural logs			
	LNGINI1	LNINV	OBS	R^2
Saudi Arabia	-0.396*** (0.013)	0.180*** (0.000)	26	0.729
UAE	0.171 (0.4410)	-0.050* (0.0867)	34	0.961
Bahrain	1.349** (0.045)	-0.473 (0.1286)	36	0.247
Kuwait	3.792*** (0.000)	0.602*** (0.000)	37	0.788
Oman	-	-	-	-
Qatar	-1.340*** (0.000)	-0.010 (0.9065)	31	0.985

*** Significant at the 1% level
**Significant at the 5% level
*Significant at the10%