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Population, Income Inequality and Economic Growth in Iran: A Co-integration Analysis

Seyyid Parviz Jalili Kamjo[1*], Tayebe Rahimi[2], Davoud Mahmoudinia[3]

[1]Ph.D. Student of Economics, Isfahan University, Iran
[2]MA Graduated of Economics, Isfahan University
[3]Ph.D. Student of Economics, Isfahan University, Iran

[*]***Corresponding Author Email:*** parviz.jalili@gmail.com

Abstract

During recent decades there has been an increasingly accurate awareness of a direct impact of population on the macro economy. Despite important studies that uphold positive effects of population on the economic growth, several studies argue that population have negative effect on the economic growth? The classical economists advanced the hypothesis that inequality of income distribution in the society is useful for both workers and investors. This paper examines the causal relationship of population, Income Inequality and Economic Growth in Iran. For this purpose, we use the Autoregressive Distributed Lag (ARDL)-bounds testing approach. Results indicate that, in the long run, population has a positive and significant effect on economic growth. On the other hand, the impact of population and economic growth on GINI coefficient is negative and statistically significant. Also, the results of Granger causality test show that there is a long run causality relationship from population to economic growth.

Keywords: Economic growth, Income inequality, Population, Autoregressive distributed lag.
JEL: O40, C32, D.

Introduction

During recent decades there has been an increasingly accurate awareness of a direct impact of population on the macro economy. The influence of the size and rate of growth of population and fertility rate on the development prospects of developing countries has continued to attract the attention of economists, demographers and social scientists in general. The role of population growth in economic development has become a controversial issue in recent years. Identification of the nature and direction of a causal relationship between population and economic growth have been the subjects of long-standing discussion among researchers and policy-makers. The relationship between population and economic growth was first explored by Malthus (Simon, 1988).

There are three schools of thought on the relationship between population growth and economic growth (Tiffen, 1994).

- The Malthusian position: Malthus launched the population and economic growth debate in 1798, with the proposition: 'Population, when without control, increases in geometric ratio. Subsistence increases only in arithmetical ratio' (Malthus, 1992).
- Transition theory: set population growth to be driven by the levels of income. Increases in income initially increase the population growth rate, but when higher income levels are attained, birth rates decrease, and population stabilizes (the curve similar to inverse U).
- The technological position is currently mainly associated with Simon (Simon, 1981). Technological progress counters the effects of diminishing returns and leads to income growth through the discovery of new resources, high efficiency with existing resources, and improvement of resources. More people creation the necessary new ideas.

The thought of fair distribution can be dated back to classical economists like David Ricardo and left-wing theoretical masters like Karl Marx. The political economy approach, developed by Alesian and Rodrik (1994) and Persson and Tabellini (1994), argues that inequality is harmful for economic development because inequality generates a pressure to adopt redistributive policies that have an adverse effect on economic growth. The modern theory suggests that income distribution plays an important role in the determination of aggregate economic activity and economic growth. Inequality is most often measured using the Gini coefficient, but there are also many other methods. The aim of this paper is to delineate both the short-run and long-run relationships between population, inequality and economic growth in the context of a dynamic model in Iran. Our approach has significant differences from others both theoretically and methodologically. What is the long run effect of population growth upon the standards of living in the more developed and developing countries? The answer which comes to rational mind is that there are no limits to economic growth upon which standards of living depend because there are no limits to technical progress, new idea generation and the growth of knowledge (Simon, 1988).

The paper is organized as follows. In section 2-1 review relationship between population and Economic Growth. In section 2-2 consider the question of whether the relationships between income inequality and economic growth. Section 3 briefly describes Empirical Studies. The model, methodology, empirical results and their interpretations are presented in Section 4. Summary and conclusions are given in the end.

Methodology

Relationship between population and economic growth

Relationship between population and economic growth is important subject that many researches in economics have been done base it. Despite important studies that uphold positive effects of population on the economic growth, several studies deduction that population have negative effect on the economic growth; important earlier studies in this term could be traced back to Malthus (Ehrlich & Ehrlich, 1990; Malthus, 1992; Portner, 1996). Kelley and Schmidt (2003) believe that population growth lead to decrease whole store of capital and so have negative effect on economic growth; "When population growth is rapid, a large part of investment (typically in physical capital) is used to satisfy the needs of the growing population ''investment-diversion effect''. Todaro (1995) have more studies in this case, he offered that if an increase in population coincides with low rates of saving, the rate of development will slows down and per capita income will reduce because of population growth. The rapid population growth rate necessitates a higher rate of capital stock growth and thus a larger concomitant savings and investment rate just to maintain a constant level of per capita income.

However many of economists are agreeing on the positive effects of population on economic growth; Simon, in his influential book, showed that rapid population growth can actually lead to positive impacts on economic development (Simon, 1981). As an optimistic view, the population growth is fuels of economic growth. According to optimistic view, Tamura (2002, 2006), extend the Kremer's (1993) model by introducing mortality rate. In both models, fertility depends positively on the level of mortality. Jones (2002) showed that mortality and fertility falls because of rising levels of population consumption, nevertheless Tamura (2006) debates that something reduces mortality risk is the increase in the average level of human capital in the population. Moreover, in Jones (2003) acceleration of economic growth isn't caused by rising population (Kremer, 1993) but it is caused by an exogenous increase in the productivity of population in producing ideas. Tamura (2006) concluded that higher economic growth is ultimately driven by the larger level of human capital accumulation due to falling fertility also he presents a model of economic and population growth that able to generate endogenously a transition from a classical (agricultural) to an industrial mode of production. For low human capital, the classical method argues that industrial mod is first, but for high human capital the opposite is true. Once the transition to industry has occurred, the growth rate of per-capita income is positively related to the growth rate of population (Tamura, 2002).

Some economists believe that population growth actually boosting economic growth. This idea has been extension by Boserup (1981). Population growth by raising the returns to innovation induces technological change, Kuznets (1960, 1967), Simon (1981), Boserup (1989). Endogenous population growth and the emergence of new ideas are also treated in Kremer (1993) and especially in Jones (2002), also in the growth models based on the idea; idea accumulation determines economic growth and idea creation is related to population growth (Jones, 2002). More population generates more idea (Jones, 2003). Phelps (1968) has pointed out population has "Mozart effect". According to this viewpoint, larger population has more Mozarts. By this effect we can accept the assumption of increasing return to scale in endogenous growth. Engels pointed out that knowledge is direct function of population. It seems that Engels's viewpoint is the first specification of technology production function (Simon, 1998, xviii).

As Arrow et al (2003) have argued, population has a non-negative shadow price. In any dynamic model with positive growth rate for population, population should be one of the state variables of the model. In usual models of economic growth and population, population is exogenous and has constant returns to scale. According to this method for introducing population into the model, optimal policy is not affected by population.

Relationship between inequality and economic growth

Relationship between income distribution and economic growth has been significant subject in the two past centuries. So the classical economists advanced the hypothesis that inequality is beneficial for economic development; in Smith viewpoint, inequality of income distribution in the society is be useful for both workers and investors. Ricardo suggest that with the increase in population and with law of diminishing returns (with attention to the fixed of supply earth), real wage must be at least livelihood (iron law of wages). Marshal says that with progress in industry, productivity is increased and increases the wages. Income inequality has a negative quadratic effect on economic growth in addition positive direct effect. This viewpoint can be traced to Kuznets (1955)'s findings of the inverse U relationship between inequality and economic development (Galor et al., 2009).

Neoclassical economics also achieve theories and empirical evidence on the relationship between inequality and economic growth. They discover that inequality have a significant effect on the economic growth. Galor and Zeira (1988, 1993), have done basic study in this case. They analyzed the role of heterogeneity in the determination of macroeconomic activities. They advanced the Novel viewpoint that income distribution plays an important role in the determination of economic growth. Attention to the human capital formation with considering classical hypothesis is the basic trait of their work. Baseline estimation and sensitivity analysis prove that inequality of income distribution is positively and significantly, related to economic growth (Li & Zou, 1998) in sharp contrast Alesina and Rodric (1994), Persson and Tabellini (1994). In the modern theory relationship between inequality and economic development has very developed.

Economic growth has reciprocal and intricate relevance with inequality. Reciprocal relevance because of economic growth effect on the income distribution and income distribution effect on the economic growth too. Intricate relevance for this reason that affected extra parameters on these relations such as economics, politics, and so on.

Review of empirical studies

Musai et al (2011) in his article titled “Income Distribution and Economic Growth in Iran” has analyzed mutual impact of economic growth and income distribution. Testing Kuznets hypothesis, based on available statistical data from 1968-2003, he rejects Kuznets hypothesis in Iran. According to his idea one of the major factors of inequality of income distribution in Iran is the presence of sectoral duality. Results show that to reduce the level of economic inequality in Iran, economic policies must be directed to the agricultural growth. The empirical observations imply that in the development process, the industrial sector has a pioneer role and the role of agriculture is reduced.

Hasan (2010) using multivariate vector autoregressive model, he investigates the relationship between population and per capita income according to the neoclassical growth and endogenous growth models in mainland China. Results show that in the neoclassical growth model population growth has positive effect on per capita income growth while the modified endogenous growth model shows a negative relationship between these two variables. In the other study Bakhshi and Khaki (2009) using Genetic algorithms, shows that population has a positive effect on per capita income, per capita saving and per capita capital stock for Iran economy during 1961-2006. Also these results were predicted for the next 30 years.

The causal relationship between population and per capita economic growth in the Central Asian Economies (CAEs) has been investigated by Savaş (2008). The results show that there are the long run and positive relationship between economic growth and population. This results provide strong support for the hypothesis that population is driving growth. The relationship between economic growth and income inequality for USA has been investigated by Panizza (2002). He uses panel data model by both fixed effect and GMM estimation. His results implies that the negative relationship between growth and inequality exist in USA. In the other study, Barro (2000) using three stages least square, founds a negative relationship between growth and income inequality in developing countries and positive relationship between these two variables in developed countries.

Darrat and Al-Yousif (1999) investigate the relationship between population and GDP for 20 developing countries using annual data over the period 1950-1996. They have found that population has stimulated economic growth in more than half of the countries. Fougere and Merette (1999) have investigated the impact of population ageing on economic growth for seven industrialized countries using an OLG model. They have used modified endogenous growth model, which is generated by the accumulation of both physical and human capital. The result shows population ageing could stimulate economic growth via creating more opportunities for future generation to invest in human capital formation. Bloom and Freeman (1988) had investigated the relationship between population growth and economic growth in developing countries from 1965-1985. Their results show that population growth is important element in the process of economic development and income growth is related to the time path of population growth and that population growth is associated with slower income growth due to high birth and death rates.

The long run and cointegration relationship between population and per capita GDP in India have been studied by Dawson and Tiffin (1998). Their results show that population and per capita income have no long run relationship with together. Also they indicate that population and per capita income is casually independent and population growth neither stimulates per capita income growth nor detracts from it. Parvin (1996) in her article titled “Income Distribution and Growth Continuation” has analyzed mutual impact of economic growth and income distribution in Iran’s economy. Allowing for restrictions of the statistics and data, she shows that, in Iran, revenues from petroleum sector have caused the possibility of creation of a development process with no regards for unequal income distribution and its consequences. At the same time, unequal income distribution creates restrictions on qualitative and quantitative structure of the market, and stresses on duality of economy. Also Persson, and Tabellini (1994) shows that there is significantly negative relationship between growth and inequality in democratic countries.

Model, data and methodology

Bounds test approach to cointegration

In this study we employ the Autoregressive Distributed Lag (ARDL)-bounds testing approach that suggested by Pesaran et al. (2001) to investigate the long-run relationship among per capita GDP, Population and income inequality. Monte Carlo evidence shows that the bound test has several important advantages over other conventional tests (Emran et al., 2007). These benefits can be summarize as follows: 1 - the ARDL approach can be suitable irrespective of the order of integration whether the variables under consideration are purely [I (1)], purely [I (0)] or fractionally integrated. 2-The short-run and long-run parameters of the model are estimated simultaneously. 3- Inability to test hypotheses on the estimated coefficients in the long-run associated with the Engle-Granger method is avoided. 4- It can be applied to studies that have a small sample size (Narayan, 2005). 5- The appropriate lags in the ARDL model are corrected for both serial correlation and endogeneity problems (Pesaran & Shin, 1999). The ARDL model used in this study can be expressed as follows:

MODEL1:

$$\Delta LGDP_t = \alpha_0 + \sum_{i=1}^{n} \alpha_{1i} \Delta LGDP_{t-i} + \sum_{i=0}^{n} \alpha_{2i} \Delta LGIN_{t-i} + \alpha_3 LGDP_{t-1} + \alpha_4 LGIN_{t-1} + \mu_t \quad (1)$$

$$\Delta LGIN_t = \beta_0 + \sum_{i=1}^{n} \beta_{1i} \Delta LGIN_{t-i} + \sum_{i=0}^{n} \beta_{2i} \Delta LGDP_{t-i} + \beta_3 LGIN_{t-1} + \beta_4 LGDP_{t-1} + \mu_t \quad (2)$$

MODEL2

$$\Delta LGDP_t = \gamma_0 + \sum_{i=1}^{n} \gamma_{1i} \Delta LGDP_{t-i} + \sum_{i=0}^{n} \gamma_{2i} \Delta LPOP_{t-i} + \gamma_3 LGDP_{t-1} + \gamma_4 LPOP_{t-1} + \mu_t \quad (3)$$

$$\Delta LPOP_t = \lambda_0 + \sum_{i=1}^{n} \lambda_{1i} \Delta LPOP_{t-i} + \sum_{i=0}^{n} \lambda_{2i} \Delta LGDP_{t-i} + \lambda_3 LPOP_{t-1} + \lambda_4 LGDP_{t-1} + \mu_t \quad (4)$$

MODEL3:

$$\Delta LGIN_t = \phi_0 + \sum_{i=1}^{n} \phi_{1i} \Delta LGIN_{t-i} + \sum_{i=0}^{n} \phi_{2i} \Delta LPOP_{t-i} + \phi_3 LGIN_{t-1} + \phi_4 LPOP_{t-1} + \mu_t \quad (5)$$

$$\Delta LPOP_t = \theta_0 + \sum_{i=1}^{n} \theta_{1i} \Delta LPOP_{t-i} + \sum_{i=0}^{n} \theta_{2i} \Delta LGIN_{t-i} + \theta_3 LPOP_{t-1} + \theta_4 LGIN_{t-1} + \mu_t \quad (6)$$

Here, $LGDP$ denote to log real per capita GDP; $LPOP$ is the log population and $LGINI$ is the log of Gini coefficient. Also Δ is the first difference operator and μ is the white noise error term.

The long-term relationship between the variables is tested by means of bounds testing procedure of Pesaran et al (2001). The bounds testing procedure is based on the F-statistics (Wald-statistics) and is the first stage of the ARDL cointegration method. The null hypothesis of no cointegration (H_0) and alternative hypothesis of coitegration (H_1) in three models and six equations have been shown in follow:

MODEL1.

	null hypothesis(H_0)	alternative hypothesis(H_1)	Function
Equation (1)	$\alpha_3 = \alpha_4$	$\alpha_3 \neq \alpha_4$	$LGDP(LGIN)$
Equation (2)	$\beta_3 = \beta_4$	$\beta_3 \neq \beta_4$	$LGIN(LGDP)$

MODEL 2.

	null hypothesis(H_0)	alternative hypothesis(H_1)	Function
Equation (3)	$\gamma_3 = \gamma_4$	$\gamma_3 \neq \gamma_4$	$LGDP(LPOP)$
Equation (4)	$\lambda_3 = \lambda_4$	$\lambda_3 \neq \lambda_4$	$LPOP(LGDP)$

MODEL 3.

	null hypothesis(H_0)	alternative hypothesis(H_1)	Function
Equation (5)	$\phi_3 = \phi_4$	$\phi_3 \neq \phi_4$	$LGIN(LPOP)$
Equation (6)	$\theta_3 = \theta_4$	$\theta_3 \neq \theta_4$	$LPOP(LGIN)$

Two sets of critical *F*-values have been provided by Pesaran et al (2001) for large samples and by Narayan (2005) for sample size ranging from 30 observations to 80 observations. One set assumes that all variables are I(0) and the other set assumes they are all I(1). According to Pesaran et al (1999, 2001) if the computed F-statistic exceeds the upper critical bounds value, then the null hypothesis of no cointegration(H_0)is rejected, that implies to cointegration. If the F-statistic is below the lower critical bounds value, the alternative hypothesis of cointegration (H_1) is rejected that implies to no cointegration. Lastly if the computed F- statistic falls between the critical lower and upper bounds values, then no conclusion can be reached about cointegration status. Although cointegration implies the presence of Granger causality, it does not identify the direction of causality. A time series (X) is said to

Granger-cause another time series (Y) if the prediction error of current Y decline by using past values of X in addition to past values of Y. Causality from Y to X can also be defied in the same way. As Odhiambo (2010), Narayan and Smyth (2005), Narayan and Singh (2007) were shown, the direction of causality can be determined through the lagged Error Correction term for long-run casuality effects. Also the coefficient of the ECM shows the speed of the adjustment back to the long run equilibrium after short run shock. In our study, tests for Granger causality can be done through following equations:

MODEL1:

$$\Delta LGDP_t = \alpha_0 + \sum_{i=1}^{n} \alpha_{1i} \Delta LGDP_{t-i} + \sum_{i=0}^{n} \alpha_{2i} \Delta LGIN_{t-i} + \alpha_3 ECM_{t-1} + \xi_t \quad (7)$$

$$\Delta LGIN_t = \beta_0 + \sum_{i=1}^{n} \beta_{1i} \Delta LGIN_{t-i} + \sum_{i=0}^{n} \beta_{2i} \Delta LGDP_{t-i} + \beta_3 ECM_{t-1} + \xi_t \quad (8)$$

MODEL2

$$\Delta LGDP_t = \gamma_0 + \sum_{i=1}^{n} \gamma_{1i} \Delta LGDP_{t-i} + \sum_{i=0}^{n} \gamma_{2i} \Delta LPOP_{t-i} + \gamma_3 ECM_{t-1} + \xi_t \quad (9)$$

$$\Delta LPOP_t = \lambda_0 + \sum_{i=1}^{n} \lambda_{1i} \Delta LPOP_{t-i} + \sum_{i=0}^{n} \lambda_{2i} \Delta LGDP_{t-i} + \lambda_3 ECM_{t-1} + \xi_t \quad (10)$$

MODEL3:

$$\Delta LGIN_t = \phi_0 + \sum_{i=1}^{n} \phi_{1i} \Delta LGIN_{t-i} + \sum_{i=0}^{n} \phi_{2i} \Delta LPOP_{t-i} + \phi_3 ECM_{t-1} + \xi_t \quad (11)$$

$$\Delta LPOP_t = \theta_0 + \sum_{i=1}^{n} \theta_{1i} \Delta LPOP_{t-i} + \sum_{i=0}^{n} \theta_{2i} \Delta LGIN_{t-i} + \theta_3 ECM_{t-1} + \xi_t \quad (12)$$

In these equations ξ_t's are the serially uncorrelated error terms and ECM_{t-1} is the lagged error-correction term obtained from the long-run equilibrium relationship and indicates the speed of adjustment back to long run equilibrium after a short run shock. The long run causality can be tested by looking at the significant of the coefficient of the error correction term in each equation.

It should be noted that only the cointegration vectors in the before step will be estimated with an error-correction term (Narayan & Singh, 2007; Odhiambo, 2010).

Results

Data and unit root tests

Annual time series data used in this paper which cover the period 1969-2007 are obtained from Central Bank of Iran. Annual time series data are include: per capita real GDP, Gini coefficient and total population. Notice that Logarithmic forms of all the variables are used in the empirical analysis. In the first step before cointegration analysis, it is necessary to investigate the unit root properties of the data series. According to Pesaran (1999 2001) the ARDL bound testing procedure can be applied irrespective of whether the variables are I(0), I(1) or fractionally cointegrated. Hence we use the Phillips and Perron (1988) and Kwiatkowski et al (1991) unit root tests to ensure that variables are not integrated of order 2[I (2)]. It should be noted that the null hypothesis in the PP and KPSS unit root tests are non-stationary and stationary respectively. The results PP and KPSS unit root tests are reported in table – and --. As the results show all variables are stationary in level or first difference and therefore none of the variables in this study are not I (2).

Table 1. Phillips Perron test.

	PP test statistic		PP test statistic
$LGDP$	-2.564	$\Delta LGDP$	-4.383
$LPOP$	-2.893	$\Delta LPOP$	-0.855
$LGIN$	-2.033	$\Delta LGIN$	-11.781
Critical values:			
1%	-3.615		-3.621
5%	-2.941		-2.943
10%	-2.609		-2.610

Note: (1) the truncation lag is based on Newey and West (1987) bandwidth.

Table 2. KPSS test.

	KPSS test statistic		KPSS test statistic
$LGDP$	0.320	$\Delta LGDP$	0.265
$LPOP$	0.743	$\Delta LPOP$	0.493
$LGIN$	0.546	$\Delta LGIN$	0.500
Critical values:			
1%	0.739	0.739	
5%	0.463	0.463	
10%	0.347	0.347	

Cointegration analysis

In the second step we investigate the long run relationship between variables in three equations. We have two steps in this process: In the first step, the optimal order of lags is selected based on Schwarz-Bayesian criterion (SBC) and/or Akaike information criterion (AIC) (the optimal lag is 3). In the second step, we estimate six equations through OLS procedure and compute the F-statistic (Wald-test) for the joint significant of the lagged levels of variables to compare the critical values provide by Narayan (2005). The results of the bound test for cointegration are reported in table 3. The result indicates that in the equations 2 [$LGIN(LGDP)$], 3 [$LGDP(LPOP)$], 4 [$LPOP(LGDP)$], 5[$LGIN(LPOP)$] and 6 [$LPOP(LGIN)$] F-statistics are higher than the upper bound critical values at the 5% and 10% level and the null hypothesis of no cointegration are rejected. But in the equation 1[$LGDP(LGIN)$] F – statistic is lower than the lower bound critical value at the 10% level and the null hypothesis of no cointegration is not rejected.

Table 3. Bounds F-test for cointegration.

Dependent variable	Function	F- test statistic
Model1		
$LGDP$	$LGDP(LGIN)$	2.552
$LGINI$	$LGIN(LGDP)$	4.355***
Model2		
$LGDP$	$LGDP(LPOP)$	5.460**
$LPOP$	$LPOP(LGDP)$	3.850***
Model3		
$LGINI$	$LGIN(LPOP)$	3.966***
$LPOP$	$LPOP(LGIN)$	4.752**

Asymptotic critical values: Narayan, (2005). P,1987	I(0)	I(1)
5%	3.937	4.523
10%	3.210	3.730

**and ***denote significance at 5% and 10%, respectively.

Long run coefficients

Having found a cointegration relationships at the all equations (expect in the equation 1) in this section we present the estimated long run coefficient, using the ARDL approach. The results are reported in Table 4. As the results show, in equation 2 the impact of per capita GDP on Gini coefficient is negative and statistically significant. As 1% increases in per capita GDP lead to a 0.18% decrease in income inequality. In the equation 3, 4 the impact of population on per capita GDP and inverse are positive and statistically significant. In these equations 1% increases in population causes a 1.6% increase in Per capita GDP and also 1% increase in Per capita GDP lead to 0.36% increase in population. On the other hand in the equation 5 when LGINI is dependent variable, the impact of population on income inequality is negative. In this equation 1% increase in population lead to 0.37% decrease in income inequality. But in the equation 6 the impact of Gini on population is positive but statistically is not significant.

Table 4. Estimated long run coefficients.

	Constant	$LGDP$	$LPOP$	$LGIN$
Dependent variable				
Model1				
$LGIN$	0.503 (0.639)	-0.184*** (-1.761)		
Model2				
$LGDP$	-10.94** (-2.394)		1.611* (3.991)	
$LPOP$	8.714* (13.584)	0.366* (4.178)		
Model3				
$LGIN$	3.325* (2.992)		-0.375* (-3.876)	
$LPOP$	47.63 (0.172)			35.86 (0.130)

*,**and ***denote significance at 1% , 5% and 10%, respectively.

Analysis of causality test based on error-correction model

The results of the long run granger causality tests and the short run elasticity's are shown in table 5. As the table has shown, the impact of population on Per capita GDP in the short run is positive and statistically significant. Also the coefficient of ECM in equation 3 is negative and statistically significant that implies the long run causality exist from LPOP to LGDP. On the other hand in equation 4 the statistically significant positive coefficient of LGDP confirms that an increase in Per capita GDP leads to an increase in population in the short run and the ECM for the equation 4 is -0.01 and was found to be statistically significant at the 1% level that implies that 1% of the disequilibria in LPOP of the previous year's shock adjust back to the long run equilibrium in the current year.

Also in the short run when LGINI is dependent variable, the impact of population and per capita GDP on LGINI are negative and positive respectively but the coefficient of Per capita GDP is not statistically significant. Also the coefficients of ECM for 2 equations are statistically significant and have the correct signs. In the equation 2 and 5 the coefficient of ECM implies that 23% and 47% of the disequilibria in income inequality of the previous year's shock adjust back to the long run equilibrium in the current year respectively.

Table 5. Causality test and short run coefficients.

Dependent variable	c	$\Delta LGDP_t$	$\Delta LGDP_{t-1}$	$\Delta LPOP_t$	$\Delta LPOP_{t-1}$	$\Delta LGIN_t$	$\Delta LGIN_{t-1}$	$\Delta LGIN_{t-2}$	ECM
Model- 1									
$\Delta LGIN_t$	0.11 (0.77)	0.05 (0.14)					-0.51* (-3.65)		-0.23** (-2.16)
Model- 2									
$\Delta LGDP_t$	-4.77*** (-1.78)		0.32** (2.13)	21.02* (2.73)					-0.43* (-3.84)
$\Delta LPOP_t$	0.12 (3.67)	0.05* (2.70)			0.57* (4.90)				-0.01* (-3.72)
Model- 3									
$\Delta LGIN_t$	1.57 (2.96)			-2.87* (-2.62)			-0.40* (-2.57)		-0.47* (-2.54)
$\Delta LPOP_t$	0.03 (0.74)				0.80* (9.44)		-0.01 (-1.04)	-0.03* (-2.65)	-0.007 (-0.14)

*,**and ***denote significance at 1% , 5% and 10%, respectively.

Conclusion

In this current study, we investigated the casual and long run relationship among population, income inequality and economic growth, in Iran economy during 1969-2007. We use the Autoregressive Distributed Lag (ARDL)-bounds testing approach that suggested by Pesaran et al (2001). Our main findings were as follow: firs, we found that there were cointegration relationship between 5 equations from 6 equations and only in equation 1 $LGDP(LGIN)$; we not found any long run relationship between two variables. In the other step, we survived the long run relationship between variables in 5 equations. The results show that in the long run the effect of GDP and POP on Gini is negative and statistically significant. On the other hand, when GDP is dependent variable, the effect of population on GDP is positive and statistically significant. Also the effect of Gini on POP statistically is not significant. In the last step, we investigated the short run coefficient and long run causality between equations. We found that the impact of population on Per capita GDP in the short run is positive and statistically significant. Also the coefficient of ECM implies that the long run causality exist from LPOP to LGDP. When LGINI is dependent variable, in the short run the impact of population on LGINI is negative and positive and also the long run causality relationship from economic growth and population to gini coefficient have been accepted.

References

Alesina A, Rodrik D, 1994. Distributive Politics and Economic Growth. The Quarterly Journal of Economics. 109(2): 465-490.

Arrow KJ, Dasgupta P, Maler KG, 2003. The genuine savings criterion and the value of population. Economic Theory. 21: 217-225.

Bakhshi R, Khaki N, 2009. Effect of population on economic growth in optimal growth model in Iran economy (1961-2006) application of Genetic algorithms. Journal of Economic researches.

Barro RJ, 2000. Inequity and growth in a panel of countries. Journal of Economic Growth. 5: 5-32.

Bloom D, Freeman R, 1998. Economic development and the timing and components of population growth. Journal of Policy Modeling. 10(1): 57-81.

Boserup E, 1981. Population and technological change: a study of long-term trends. Chicago: University of Chicago Publications.

Boserup E, 1989. Women's role in economic development. London: Earthscan Publications.

Darrat AF, Al- Yousif YK, 1999. On the long-run relationship between population and economic growth: some time series evidence for developing countries. Eastern Economic Journal. 25(3): 302-311.

Dawson PJ, Tiffin R, 1998. Is there a long-run relationship between population growth and living standards?. The case of India. The Journal of Development Studies. 34: 149-156.

Ehrlich PR, Ehrlich AH, 1990. The population explosion. NY: Simon & Schuster Publications.

Emran MS, Shilpi F, Alam I, 2007. Economic Lib eralization and price resp onse of aggregate private investment: time series evidence from india. Canadian Journal of Economics. 40(3).

Fougere M, Merette M, 1999. Population ageing and economic growth in seven OECD countries. Economic Modeling. 16: 411-427.

Galor O, 1988. The Long-run implications of a hicks-neutral technical progress. International Economic Review, Department of Economics, University of Pennsylvania and Osaka University Institute of Social and Economic Research Association. 29(1): 177-183.

Galor O, 1993. Income distribution and macroeconomics. Review of Economic Studies. 60(1): 35-52.

Galor O, Moav O, Vollrath D, 2009. inequality in landownership, the emergence of human-capital promoting institutions, and the great divergence. Review of Economic Studies. 76(1): 143-179.

Galor O, Zeira J, 1993. Income distribution and macroeconomics. Review of Economic Studies. 60(1): 35-52.

Hasan M, 2010. The long-run relationship between population and per capita income growth in China. Journal of Policy Modeling. 23: 337-355.

Jones C, 2002. Sources of U.S. economic growth in a world of ideas. American Economic Review. 92(1): 220-239.

Jones C, 2003. Population and ideas: a theory of endogenous growth. In: Aghion F, Stieglitz M, Woodford B. (Edn.), Knowledge, Information, and Expectations in Modern Macroeconomics. Princeton: Princeton University Publications.

Kelley AC, Schmidt R, 2001. Economic and demographic change: a synthesis of models, findings, and perspectives. In: Birdsall N, Kelley AC, Sinding SW. (Edn.), Population Matters: Demographic Change, Economic Growth, and Poverty in the Developing World. Oxford: Oxford University Publications.

Kremer M, 1993. The O-Ring theory of economic development. The Quarterly Journal of Economics. 108: 551-575.

Kuznets S, 1960. Economic Growth of Small Nations. In The Economic Consequences of the Size of Nations. Proceedings of a Conference Held by the International Economic Associations. MacMillan, Toronto.

Kuznets S, 1967. Population and economic growth. Proc Am Phil Soc. 3: 170-193.

Kwiatkowski D, Phillips PCB, Schmidt P, Shin Y, 1991. Testing the null of stationarity against the alternative of a unit root: How sure are we that economic time series have a unit root?. Journal of Econometrics, Forthcoming.54:159-178.

Li H, Zou HF, 1998. Income inequality is not harmful for growth: theory and evidence. NY: Wiley Online Library Publications.

Malthus TR, 1992. An Essay on the Principle of Population. Cambridge: Cambridge University Publications.

Musai M, Mehregan N, Hekmat RK, 2011. Income distribution and economic growth in Iran. Journal of Social Welfare. 7: 56-77.

Narayan PK, 2005. The saving and investment nexus for China: evidence from cointegration tests. Applied Economics. 37: 1979-1990.

Narayan PK, Singh B, 2007. The electricity consumption and GDP nexus for Fiji Islands. Energy Economics. 29: 1141-1150.

Narayan PK, Smyth R, 2005. Electricity consumption, employment and real income in Australia: evidence from multivariate Granger causality tests. Energy Policy. 33: 1109-1116.

Odhiambo N, 2010. Energy consumption, prices and economic growth in three SSA countries: A comparative study. Energy Policy. 38: 2463-2469.

Panizza U, 2002. Income inequality and economic growth: evidence from american data. Journal of Economic Growth. 7: 25-41.

Parvin S, 1996. Income distribution and growth continuation. Tehran: Planning and Budgeting Publications.

Persson T, Tabellini G, 1994. Is inequality harmful for growth?. American Economic Review. 84: 600-621.

Pesaran M, Shin Y, 1999. An autoregressive distributed lag modeling approach to cointegration analysis. In: Strom S. (Edn.), Econometrics and Economic Theory in the 20th Century: The Ragnar Frisch centennial Symposium. Cambridge: Cambridge University Publications.

Pesaran M, Shin Y, Smith R, 2001. Bounds testing approaches to the analysis of level relationships. Journal of Applied Econometrics. 16: 289-326.

Phelps ES, 1968. Population Increase. Canadian Journal of Economics. 1(3): 497-518.

Phillips PCB, Perron P, 1988. Testing for a unit root in time series regression. Biometrika. 75: 335-346.

Portner C, 1996. Population and economic growth 1-103. Available at http://faculty.washington.edu/cportner/portner/MScDiss.pdf.

Savaş B, 2008. The relationship between population and economic growth: empirical evidence. The Central Asian Economies The Central Asian Economies. 6: 161-183.

Simon JL, 1981. The ultimate resources. Princeton: Princeton University Publications.

Simon JL, 1998. The economics of population: Classic Writings. NK: Transaction Publications.

Tamura R, 2002. Human capital and the switch from agriculture to industry. Journal of Economic Dynamics and Control. 27: 207-242.

Tamura R, 2006. Human capital and economic development. Journal of Development Economics. 79(1): 26-72.

Tiffen M, 1994. Population density, economic growth and societies in transition: boserup reconsidered in a kenyan case-study. Development and Change. 26: 31–66.

Todaro MP, 1995. Population growth and economic development: Causes, consequences, and controversies. In: Todaro MP. (Edn), Reflections on economic development: The selected essays of Michael P. Todaro, Hants, Edward Elgar.