

Income Inequality, Consumption Expenditures Inequality, and their relationships. Evidence from Iranian Developing Economy, 1966-2007

Mohammad Hassan Fotros,
fotros@basu.ac.ir

Reza Maaboudi,
R.Maaboudi@basu.ac.ir

Abstract

This paper studies the variation of income distribution, consumption expenditures distribution and investigates the eventual relationships between distribution of consumption expenditures and income inequality in the economy of Iran. For this purpose the data on urban and rural households of the economy of Iran for the period of 1966 to 2007 is chosen. To analyze this relationship, we have employed panel data econometrics procedure, Lorenz curve and concentration curve apparatus. Data on income and consumption expenditures of Iranian urban and rural households are extracted from various issues of “Survey of Iranian Households’ Budget” published by Statistical Center of Iran (SCI) and Central Bank of Iran (CBI). Results indicate that an increase in income volatility causes an income inequality during the period of study and transmits the fluctuations to the distribution of consumption expenditures. While both income inequality and consumption expenditures inequality have increased, the growth of income inequality exceeds the consumption expenditures inequality.

JEL Classification: *D31, D32*

Keywords: Consumption expenditures inequality; Income inequality; Iran; Panel data.

Introduction

Inequality could be defined as differences, disparities and variations in the distribution of income, consumption, wealth, and saving between groups or individuals. Income inequality, consumption inequality and their relationships seem to be of current economic issues.

As the table1 indicates over the period of 1966 to 2007 in Iran, the standard deviation of the log of after-tax labor total income has increased by 26%, while the standard deviation of log total consumption has increased by 3.1%. In urban areas, the standard deviation of the log of after tax labor income has increased by 18% whilst the standard deviation of log consumption has increased by 3.6%. In rural areas, the standard deviation of the log of after-tax labor income has increased by 20% whereas the standard deviation of log consumption has increased by 0.9%. So, both income inequality and consumption inequality have increased. Moreover, income inequality has been higher and faster than consumption inequality.

Table 1- Increase in STDV of the log income and log consumption

Groups	Increase in STDV of the log income	Groups	Increase in STDV Of the log consumption
Urban	18%	Urban	3.6%
Rural	20%	Rural	0.9%
Total	26%	Total	3.1%

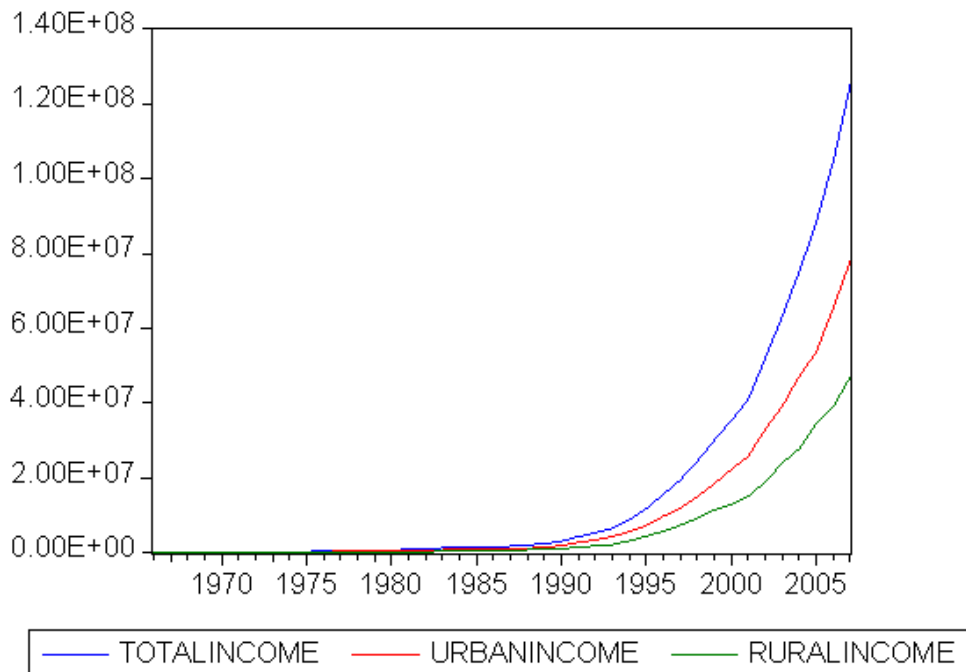
Source: Paper's calculation based on CBI data

Amongst the studies dealing with the consumption inequality and income inequality relationships we can mention the following works. Cutler and Katz (1991) used the US Consumer Expenditure Survey to examine inequality of income and consumption of the period of 1980's. They found a nearly perfect correspondence between income inequality and consumption inequality. Their results indicate that income inequality is greater than consumption inequality. Shipp and Johnson (1997), by using consumption-expenditure data of the period 1960-1993 of US Consumer Expenditure Survey, examined income inequality and consumption expenditures inequality. They found out that changes in the demographic characteristics of families affect the inequality of consumption expenditures. Moreover, their results showed that although the income inequality and consumption inequality have increased, but consumption inequality had been less than income inequality. Pendakur (1998), using Canadian cross-sectional income and expenditure data, examined the changes in the distribution of family income and family consumption of the period 1978 to 1992. He found that, both Canadian family income inequality and Canadian family consumption inequality trended upward over the period; however, the

changes in family consumption inequality were much smaller than the changes in family income inequality. Zaidi and DeVos (2001), using income and consumption data of nine European countries, studied the trends of income and consumption distributions. They suggested that during the 1980s, consumption inequality- in comparison to income inequality- has had a smoothed behavior. Airola and Juhn (2001), using the Mexican Household Income and Expenditure Survey (ENIGH) covering 1984-1998, analyzed income inequality and consumption inequality in Mexico in the aftermath of reforms and opening to international trade. Their findings indicate that as total households' income inequality increased, there is a little increase in inequality of households' consumption, suggesting that small part of the rise in inequality was due to changes in permanent income. Krueger and Perri (2005), using data from the Consumer Expenditure Survey of the US for a 25 years period, found that income inequality and consumption inequality had raised but a rising in income inequality has not been accompanied by a corresponding rise in consumption inequality. Blundell, Pistaferri and Preston (2008), examined the link between income inequality and consumption inequality through the degree of insurance to income shocks. They used household's income and consumption data of the US over the 1980s. Their results show that taxes and transfers as well as family labor supply play an important role in insuring permanent shocks and the change in the degree of persistence of income shocks, rather than the level itself, that explains the observed disjuncture between the evolution of income and consumption inequality. Gordon and Becker (2007) used Consumer Expenditure Survey (CEX) data to study the changes in income inequality and consumption distribution in U.S. They concluded that income inequality could lead to inequality in consumption distribution. Jappelli and Pistaferri (2009), using the Italian Households Income and consumption data of the period of 1980-2006, studied the relationship between income inequality and consumption inequality. They found that consumption inequality is due to income inequality and income inequality is higher and has grown faster than consumption inequality.

Based on empirical evidences, we constate that the rural, urban, and total households' real income has increased continiously during the period of observation. In this period, households' total real income had increased at a rate of 19 percent in average.

Fig1- Evolution of Iranian rural, urban, and total households' real income, 1966-2007(1997=100)



The urban households' real income had increased by 18 percent in average. But rural households' real income had increased 21 percent in average.

To compare the income distribution of Iranian economy we consider the pre and post socio-politic revolution periods. Before revolution, the rate of growth of total households' real income was 17 percent, but after revolution the rate of growth of income had reached to 20 percent. The rate of growth of urban households' real income before and after revolution had been respectively 16 and 20 percent. The rate of growth of rural households' real income before and after revolution had been 18 and 23 percent, respectively. The figure (1) retraces the evolution of Iranian rural, urban, and total households' real income for the period of 1966 to 2007. It must be noted that revolution occurred in 1979.

We constate that after Iranian revolution although the urban and rural households' real income has increased but

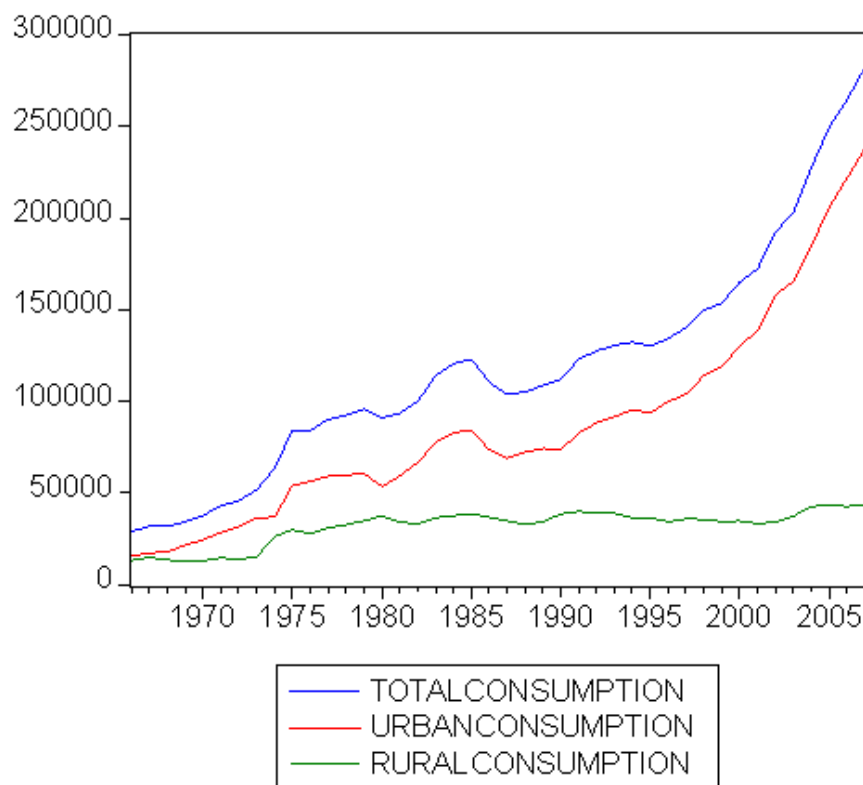
The rate of growth of urban households' real income had been grater than rate of growth of rural households' real income. So, the augmentation of total real income is mostly due to urban real income augmentation. Also, rural-urban differentiation of rate of growth of income is expected to be reflected in the duality of Iranian economy which was translated in huge rural migration towards urban areas.

Before revolution, the average rate of growth of total households' consumption expenditures was 6 percent. After revolution, it had fallen to 4 percent. The rate of growth of urban households' consumption expenditures before and after revolution had been respectively 9 and 6 percent. The rate of

growth of rural households' consumption expenditures before and after revolution had been 8 and 5 percent, respectively.

The examination of the trend of consumption expenditures for Iranian urban and rural households indicates that the rural households' consumption expenditures have a smoother behaviour than the urban households' consumption expenditures. This indicates the subsistence characteristic of Iranian rural households where they have also a self-consumption part in their consumption basket.

Fig.2- Evolution of Iranian rural and urban households' real consumption expenditures, 1966-2007(1997=100)



The total households' consumption expenditures changes are mostly due to the changes in urban households' consumption expenditures. Table (2) shows the correlation between rate of growth of consumption expenditures and rate of growth of income in urban, rural and total households. We see that the correlation between rate of growth of consumption expenditures and rate of

Table 2- Correlation between income and consumption expenditures

Households	Growth rate of Consumption and Growth rate of income
Urban	0.16
Rural	0.08
Total	0.19

Source: Paper's calculation

growth of income in urban households is greater than rural households, and the corresponding correlation of total households' one is the greatest.

The fluctuations of income and consumption expenditures are grosso modo similar. Figure (3) shows that the fluctuations of total consumption expenditures track the fluctuations of total income distribution.

Fig.3- The growth rate of total income and total consumption expenditures in Iran during of period 1966-2007(1997=100)

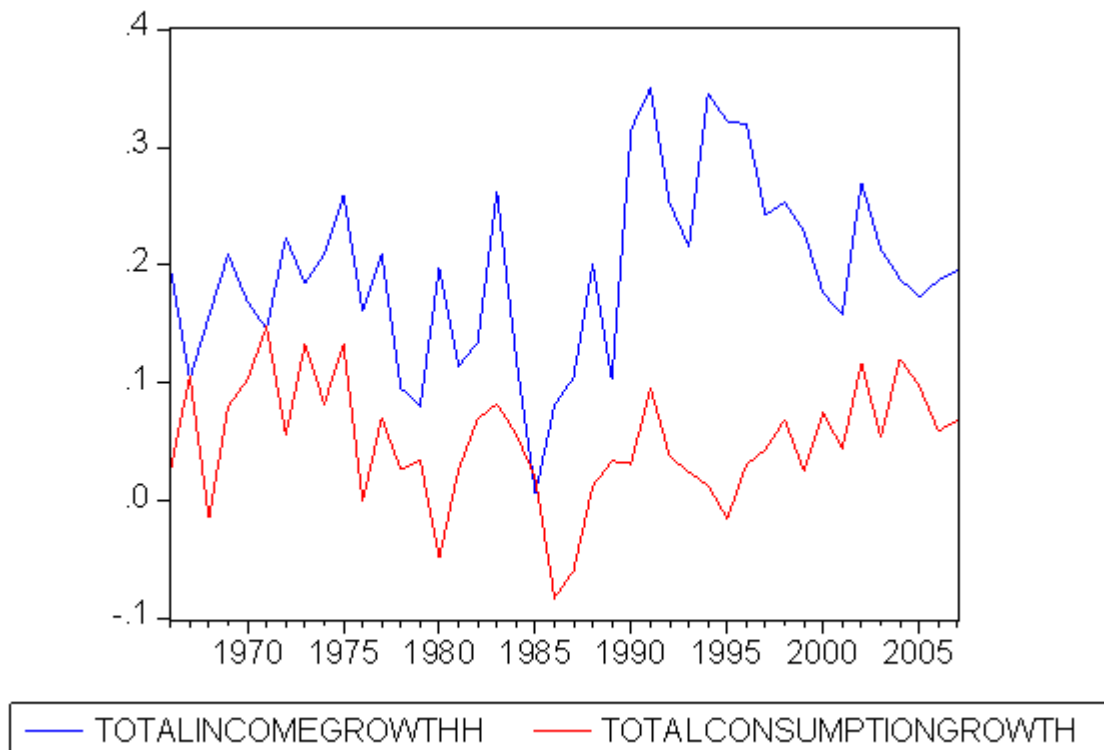


Figure (4) shows the rate of growth of urban income and the rate of growth of urban consumption expenditures. It can be observed that the fluctuations of urban households' income and consumption expenditures are like the total households' ones.

The fluctuations of income and consumption expenditures of Iranian rural households' are smaller than the urban households but that they have similar behaviour in the period of study. Figure (5) shows the rate of growth of rural income and the rate of growth of rural consumption expenditures in the period 1966-2007.

Fig.4- The growth rate of urban income and urban consumption expenditures in Iran during of period 1966-2007(1997=100)

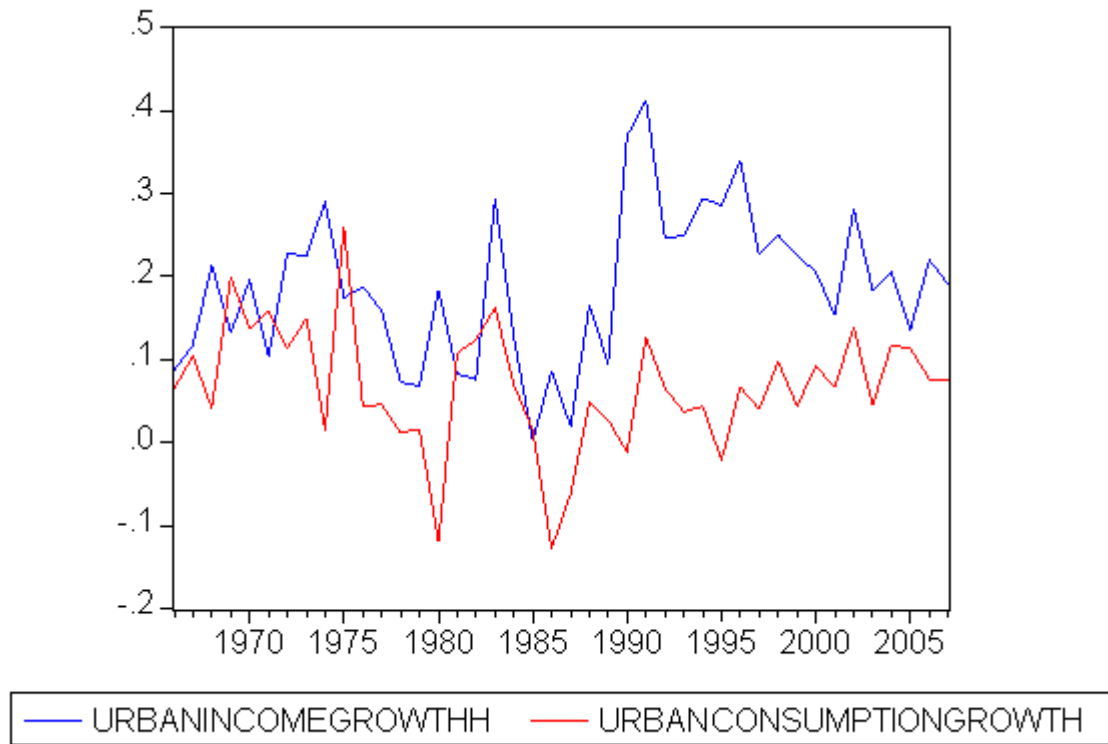
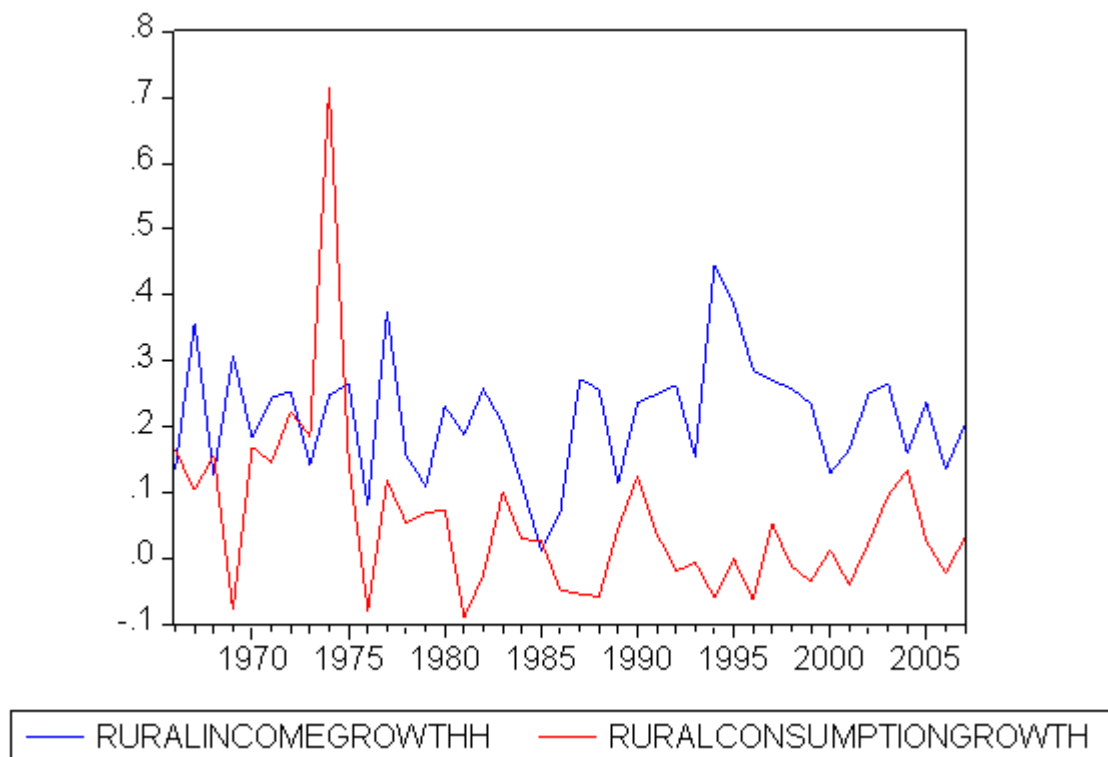


Fig.5- The growth rate of rural income and rural consumption expenditures in Iran during of period 1966-2007(1997=100)



After this summerized survey of empirical evidence, the paper investigates econometric eventual relationships between distribution of consumption expenditures and income inequality in the Iranian economy for the period 1966 - 2007. To analyze such relationships, we use the panel data methodology, the Lorenz curve and the concentration curve. The data on consumption expenditures of Iranian urban and rural households for the chosen period are sourced from the various issues of “Survey of Iranian Households’ Budget” produced by Statistical Center of Iran (SCI) and Central Bank of Iran (CBI).

Methodology

In this paper for analyzing the relation between income inequality and consumption expenditures inequality, we apply the Lorenz curve and the concentration curve apparatus. The Lorenz curve relates the cumulative proportion of total income received to the cumulative proportion of population units, with units arranged by ascending level of income. The concentration curve relates the cumulative proportion of economic variables other than income to the cumulative proportion of the population (Kakwani & Podder, 1976). So, holding other things constant, the Lorenz curve and concentration curve are directly related to each other via the relationship between income and consumption.

A related issue of interest is to know how a change in income distribution affects the distribution of consumption. To examine it statistically, we use the summary measures of relative inequality of income and consumption based on the Lorenz curve (that gives the Lorenz Ratio (LR)) and the Specific Concentration Curve (that gives the Specific Concentration Ratio (SCR)). To examine the eventual relations between the Lorenz curve and the concentration curve we have recourse to the approach employed by Dipankor Coondoo and Soumyananda Dinda (2008).

These measures are defined as below:

$$LR = 1 - 2 \int_0^1 G_y^*(y) dG(y) \quad (1)$$

$$SCR = 1 - 2 \int_0^1 G_z^*(y) dG(y) \quad (2)$$

It is to note that LR belongs to [0, 1]; LR=0 means complete equality while LR=1, signifies complete inequality of income distribution. Also, it should be noted that SCR belongs to [-1, 1]; SCR takes the value -1 when goods is an inferior goods consumed by the poor. It takes the value +1 in case of luxury goods consumed by the rich. A rise in the value of the measures signifies a rise in the corresponding inequalities.

To examine the relationship between income inequality and consumption expenditures inequality we take SCR as a function of LR:

$$SCR = f(LR) \quad (3)$$

A linear combination of relation (3) with respect to coefficients is:

$$SCR_{it} = \alpha_{it} + \beta LR_{it} + u_{it} \quad (4)$$

α , β and u denote respectively intercept, slope and white noise; i implies the group of goods and services and t indicates an annual period of time. In equation (4), β shows the ratio of consumption expenditures inequality to income inequality, or

$$\beta = \frac{\Delta SCR_{it}}{\Delta LR_{it}}$$

It means that if inequality of income changes one percent, consumption expenditures inequality would change β percent.

Discussion and Results

Recent literature suggests that panel-based unit root tests have higher power than unit root tests based on individual time series. Panel data unit root tests allow the possibility of considering data sets with a short time dimension. We use approaches developed by Hardi (2000) and Im, Pesaran and Shin (2003). Hardi panel unit root test is similar to the Kwiatkowski, Phillips, Schmidt, and Shin (KPSS) unit root test, and has a null hypothesis of no unit root in any of the series in the panel. The Hadri test is based on the residuals from the individual OLS regressions of dependent variable in every cross-section on a constant, or on a constant and a trend. The Im, Pesaran, and Shin, test deals with individual unit root processes. It is characterized by the combining of individual unit root tests to derive a panel-specific result. Table (3) shows that according to IPS and Hardi tests, all variables are stationary at the level, first differences or second differences.

As most of the variables are not stationary at the level, we apply the cointegration test. To determine whether a group of non-stationary series is cointegrated or not, we use of Johansen cointegration test (Johansen, 1991). Engle and Granger (1987) pointed out that a linear combination of two or more non-stationary series may be stationary.

Table 3- Results of panel unit root tests: Computed values of IPS t statistic and Hardi t statistic by households groups

Method: Im, Pesaran and Shin W-stat for Households Groups				
	LR of Income		SCR of Consumption	
	Statistic	Prob**	Statistic	
Prob**				
Urban				
Level	-2.64	0.0041*	11.0128	1.0000
First Difference			4.7373	1.0000
Second Difference			-9.0630	0.0000*
Rural				
Level	-6.89	0.0000*	-10.32	0.0000*
Total				
Level	-6.83	0.0000*	4.7389	1.0000

First Difference			1.6940	0.9549
Second Difference			-11.5093	0.0000*
Method: Hardi Z - Stat for Households Groups				
		LR of Income		SCR of Consumption
		Statistic	Prob**	Statistic
Prob**				
Urban				
Level	1.06	0.150*	7.4616	0.0000
First Difference			5.7805	0.0000
Second Difference			1.0114	0.7432*
Rural				
Level	0.206	0.418*	7.48	0.0000
First Difference			3.0363	0.0012
Second Difference			0.9141	0.1803*
Total				
Level	1.061	0.144*	9.1894	0.0000
First Difference			4.2465	0.0000
Second Difference			1.0722	0.4247*
*Significant at the %1				
** Probabilities are computed assuming asymptotic normality				

Source: Paper's calculation

Table (4) summarizes the Johanson cointegration test results. Results indicate that there is a stationary linear combination and there exists a long-run equilibrium relationship between SCR and LR.

Table 4- Results of panel Johanson cointegration test

	No. of cointegrating Vectors estimated	Trace		Eigenvalu	
		Trace Statistic	Critical Value*	Max-Eigen Statistic	Critical Value*
Urban					
	1	123.32	20.26	109.34	
15.89					
Rural					
	1	64.05	15.49	63.79	
14.26					
Total					
	2	149.1	19.89	138.1	
15.24					
*Significant at the %5					

Source: Paper's calculation

To analyze relation between SCR of consumption expenditures and LR of income, on the basis of equation (4) we regress the SCR on LR. According to panel data approach, we use Hausman test. Hausman test's results have commended the use of fixed effects estimation. Table 3 shows the results of estimated relation between SCR of consumption expenditures and LR of income.

Results of table (5) show that Coefficient of LR is significant. The quantity of LR coefficient in urban region is higher than rural region.

Table 5- Estimated regression equations of SCR consumption expenditure on LR of income for different households groups

Households Group	Explanatory variables	Estimated coefficient Fixed effect
Urban Households	Intercept	-28×10^{-2}
	LR of income	803×10^{-3}
	Adjusted R-square	0.962
	Hausman Test Statistic	135
Rural Households	Intercept	4×10^{-3}
	LR of income	559×10^{-3}
	Adjusted R-square	0.937
	Hausman Test Statistic	110.6
All Households	Intercept	62×10^{-4}
	LR of income	713×10^{-3}
	Adjusted R-square	0.998
	Hausman Test Statistic	189

Source: Paper's calculation

Regarding to the results, the coefficients of LR, in three groups, are significant. So, there is a relationship between income inequality and consumption expenditures inequality. The coefficients are less than one. This implies that income fluctuations do not pass completely on consumption expenditures. Thus, consumption is not affected much by income changes. It may be due to the fact that people save when their income is high and borrow when their income is low. That is, they recourse to their savings or ask for borrowing when their income do not cover their expenditures.

Conclusion

Experimental evidences indicate that during 1966- 2007 in both urban and rural Iranian households the STDV of the log of income and the STDV of log consumption has increased. But, STDV of log income has had a higher speed than STDV of log consumption. A look at income distribution and consumption distribution show that income inequality and consumption inequality have increased. So, income inequality and consumption distributions have had a volatile behavior. Lorenz curve and specific concentration curve methods have been used as an analytical framework for analyzing the relationship between income inequality and consumption inequality. The results indicate that income inequality has been higher and has grown faster than consumption inequality. So, the consumption expenditures inequality is the direct outcome of the income inequality, both in the rural areas and in the urban

areas of Iranian economy during the period of investigation. As a result, large increase in income inequality leads to small increase in consumption inequality. So, consumption expenditures inequality is more stable than income inequality.

References

Blundell, R., L. Pistaferri, and I. Preston (2008); Consumption Inequality and Partial Insurance. *American Economic Review*, 98(5): 1887–1921.

Coondoo, D. and S.Dinda (2008); Carbon dioxide emission and income: A temporal analysis of cross-country distributional patterns. *Ecological Economics*, 65(2): 375-385.

Cutler, D. and L. Katz (1991); Rising Inequality? Change in the Distribution of Income and Consumption in the 1980s, *American Economic Review*. 82(2):546-551.

Cowell, Frank A. (2000); *Measuring Inequality*, Third Edition, UK. Sticerd.lse.

Gordon, Robert, J. and Ian Dew Becker (2007); Unresolved Issues in the Rise of American Inequality. Presented at Brookings Panel on Economic Activity, Washington, DC September 7.

Hardi, Kaddour (2000); Testing for Stationarity in Heterogeneous Panel Data, *Econometric Journal*, 3: 148-161.

Im, Kyung So, M. Hashem Pesaran, and Yongcheol Shin (2003); Testing for Unit Roots in Heterogeneous Panels, *Journal of Econometrics*, 115 (1):53-74.

Johnson, David and Stephanie Shipp (1997); Trends in Inequality Using Consumer Expenditures: The U.S. from 1960 to 1993, *Review of Income and Wealth*, 43(2): 215-226.

Jappelli, Tullio and Luigi Pistaferri (2010); Does Consumption Inequality Track Income Inequality in Italy *Review of Economic Dynamics* 13(1): 133-153.

Kagan, Abram and Lawrence Shepp (1998); Why the Variance? , *Statistics & Probability Letters*, 38(4): 329-333.

Kakwani, N. and N. Podder (1976); Efficient Estimation of the Lorenz Curve and Associated Inequality Measures from Grouped Observations. *Econometrics*, 44: 137-48.

Kao, C. (1999); Spurious Regression and Residual-Based Tests for Cointegration in Panel Data, *Journal of Econometrics*, 90: 1-44.

Kaplow, Louis (2005); Why Measure Inequality? *Journal of Economic Inequality*, 3(1): 65–79.

Krueger, Drik and Fabrizio Perri (2005); Does Income Inequality Lead to Consumption Inequality? Working Paper, 2005/15. Center for Financial Studies.

Leser, C. E.V. (1963); Forms of Engel Function. *Econometrica*, 31:694-703.

Pendakur, Krishna (1998); Changes in Canadian Family Income and Family Consumption Inequality between 1978 and 1992, *Review of Income and Wealth*, 44 (2): 259-283.

Sen, A. (1973), *On Economic Inequality*, Oxford: Oxford University Press.

Zaidi, M. A. and K. De Vos (2001); Trends in Consumption – Based Poverty and Inequality in the European during the 1980s, *Journal of Population Economics*, 14(2): 367-390.