THE EFFECT OF INCOME INEQUALITY ON AGGREGATE SAVING: A PANEL ANALYSIS

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Abstract

Savings problem has become a crucial issue since it is one of the reasons of today's frequently-observed-financial crisis. There are several theories explaining this problem in the framework of consumption theory. Inequality in income distribution affects saving behavior. In this sense, our topic is substantial. As a matter of fact, if income inequality contracts savings, overcoming inequality should be held as a prior economic and social policy. In this study, the relationship between aggregate domestic savings as a ratio of GDP and GINI coefficient as an indicator of income inequality are tested under "Second Generation" type of panel cointegration analysis in order to take into account of the prospective existence of dependency between cross sectional units. The countries included in the analysis are grouped as developed, developing and miracle countries. Results reflect that the relationship depends on the country groups.

***Keywords*:** Saving, Income Distribution, Panel Cointegration Analysis

***JEL Codes*: C23, E21, O15, O16**

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1. Introduction

Many countries very often face economic crises which are serious obstacle for sustainable growth since as result of these crises they drop behind on their development paths. Sensitivity of the derivative products to even small turbulences in financial markets together with the nonperforming loans are often attributed to financial deficiencies in these countries. Lack of savings can be seen as the major reason for such a financial problem. Under these circumstances, it is crucial to understand the operating mechanism of the saving behavior. The purpose of this study is to check the impact of the income distribution on saving behavior. Such analysis of the impact of income distribution on savings date back to about 1950s. The impact of income distribution on saving rate is ambiguous in a theoretical sense. In the same manner, the empirical observations are found to reflect mixed results. These mixed results are and can be attributed to the characteristics of the economies. Hence, an analysis that split countries into groups in order to include different idiosyncratic structures is crucial. We employ three country groups, namely developed, developing and miracle countries with a recent dataset. Moreover, a brand-new econometric technique of second generation type of panel cointegration analysis is employed in order to solve problems faced when using panel data.

The next section reviews the literature on the relationship between income distribution and savings and the relevant theoretical mechanisms. The first and second generation type of panel unit root tests, second generation panel cointegration test, and the coefficient estimation method are discussed in Section 3. Empirical findings for the three country groups and possible interpretations are provided in Section 4. Section 5 concludes the study.

2. Literature Review

The analysis of the effect of income inequality on saving dates back to 1950s: Kaldor (1957), Lewis (1954), and Passinetti (1962) conducted the pioneering studies in this field. However, the theoretical perspectives employed differ substantially from analysis to analysis. Kaldor (1957) and Lewis (1954) presume a positive relationship between income inequality and saving rate under the assumption that workers may not save since their earnings are at the subsistence level and entrepreneurs save a high ratio of their income. On the other hand, Passinetti (1962) criticizes this assumption and argues that the saving rate differs according to individuals.

The empirical studies are similarly contradictory to each other. There are studies that obtain positive, negative relationship and no relationship. For the aggregate United States (US) data Blinder (1975) found that when income is less equally distributed average propensity to consume rises (and therefore average propensity to save decreases), and explained this result by the effect of relative rather than absolute income and change in the composition of labor force. For a cross-country data set from 37 countries Della Valle and Oguchi (1976) reached to a similar result: consumption propensity depends on income level but is independent of inequality. Splitting the countries into developed and less developed country groups for the period 1968-1973, Lim (1980) analyzes the impact of income distribution and export instability on saving rate. He points out to the danger of generalizing the theories on all economies since the results reflect that the positive effect of income inequality on saving rate is not true for all economies. Cook (1995), employing 49 less developed countries' data in a cross section analysis, supports Kaldor effects in the way that income inequality brings about higher savings rates. In his regression, he includes some control variables, such as the share of agriculture in GDP, share of industry in GDP, GDP per capita, growth rate, etc. Smith (2001) uses cross sectional and panel analysis for industrial and developing country groups. His findings display a positive relationship in both country groups and in both analysis. Edwards (1996) employs panel analysis for developing and OECD countries for the period of 1970-1992. He observes a positive relationship in one of the regression and insignificantly negative relationship in another regression model. In line with the theoretical ambiguity, Schmidt-Hebbel and Serven (2000), using cross section and panel analysis for industrial and developing countries for the period 1965–1994, obtain mixed results in different regressions. Similar to Cook (1995), they employ many variables other than GINI and saving rate. Some regressions reflect significantly positive, some significantly negative coefficient and some regressions show no relationship at all.

3. Methodology

A well known fact in empirical studies is that most of the economic series are trended and therefore non-stationary. Non-stationary series cause spurious regression problems which indicate that application of the classical estimation methods based on the assumption that the time series with constant mean and constant variance are stationary gives misleading results; therefore, cointegration analysis introduce the idea that even if underlying time series are non-stationary, linear combinations of these series might be stationary. For this reason, before employing panel cointegration techniques, it is essential to verify that all variables are integrated of the same order in levels.

For cointegration analysis, the series must be nonstationary series and also have the same integration order which can be checked using unit root tests. Using panel data, we check the nonstationarity by means of Im, Pesaran and Shin (2003) test and Pesaran (2007) CIPS test. The latter one is a panel unit root test that considers the possibility of cross sectional dependency. After ensuring the existence of unit root, we pass on the panel cointegration test to check whether the variables reflect a long run relationship or not. If there is cointegration, we estimate the coefficient of our independent variable.

3.1. Panel Unit Root Tests

IPS (2003) test

Im, Pesaran and Shin (2003) (IPS hereafter) test is an extension of the Levin, Lin and Chu (2002) (LLC hereafter) test in the way that it allows for heterogeneity on the autoregressive coefficient and propose standardized t-bar test statistic based on the average of the individual unit root test statistics that is averaging augmented Dickey Fuller (1981) statistics across the groups.

IPS test is performed under the null hypothesis that all series are non-stationary processes against the alternative hypothesis that assumes a fraction of the series in the panel to be stationary.

$$\Delta Y_{i,t} = \alpha_i + p_i Y_{i,t-1} + \sum \varphi_k \Delta Y_{i,t-k} + \lambda_{i\,t} + \delta_t + \varepsilon_{it} \qquad i=1,\ldots,N \qquad t=1,\ldots,T$$

Pesaran (2007) CIPS test

This test is different from PIP and LLC tests in the way that it allows for cross sectional dependency. In the recent econometric literature, cross sectional dependency has become a crucial topic in panel analysis. In the former literature, it is assumed that the cross sectional units are independent from each other. However, it is unrealistic to assume independency for all panel data. Accordingly, the second generation panel unit root tests that allow for dependency among cross sectional units are generated. In this study, we also employed a second generation panel unit root test to ensure that the variables are nonstationary and integrated of the same order. Pesaran (2007) CIPS test is a second generation panel unit root test that assumes unit root in the null hypothesis. It is the existence of the common factors that generate cross sectional dependency. In order to overcome the cross sectional dependency, Pesaran includes cross sectional averages of the lagged levels as the common factor. The average of the cross sectionally augmented Dickey-Fuller t statistics brings out CIPS t statistics.

$$\Delta y_{i,t} = \alpha_i + b_i y_{i,t-1} + c_i \bar{y}_{t-1} + \sum_{j=0}^{p} d_{ij} \Delta \bar{y}_{t-j} + \sum_{j=1}^{p} \delta_{ij} \Delta \bar{y}_{i,t-j} + e_{it} \quad i=1,\dots,N \quad t=1,\dots,T \qquad (6)$$

3.2. Panel Cointegration tests

After checking our panel data using panel unit root tests and figuring out that they are nonstationary and have the same integrated order, we can proceed to panel cointegration analysis. In this study, we apply Westerlund and Edgerton (2007) panel cointegration test.

Westerlund and Edgerton (2007) panel bootstrap cointegration test

Westerlund and Edgerton (2007) test is a panel bootstrap cointegration test that assumes cointegration in the null hypothesis. The test is based on the Lagrange multiplier test of McCoskey and Kao (1998)[3]. It is argued that the bootstrap mentality have shown that some optimality properties rarely materialize in small samples cases. Via bootstrapping, the cross sectional dependency is replicated adequately. Westerlund and Edgerton (2007) use this bootstrap property to handle the dependency both within and between cross sectional units. The test is shown to work well in small sample cases.

[3] McCoskey and Kao (1998) test does not consider the possibility of cross sectional dependency.

3.3. Panel Fully Modified OLS test

Pedroni (2000) proposes to use Fully Modified Ordinary Least Square to estimate coefficients of cointegrating vectors which are observed by panel cointegration tests. This method permits the existence of heterogeneity between cross section members. According to Pedroni (2000) there are two sources which cause cross member heterogeneity. Firstly, heterogeneity exists because of the different mean levels between the variables of each group member in panel. This source of heterogeneity is modeled by adding individual specific intercepts. Secondly, individual member of panel respond differently to short-run deviations from equilibrium cointegrating vectors that develop in response to stochastic disturbance. The source of heterogeneity is modeled by permitting the associated serial correlation properties of the error processes to vary across individual members of the panel. Moreover, Pedroni (2000) evaluated the performance of FMOLS in small samples and observed that t statistics perform well with Monte Carlo stimulation in small samples.

The group mean panel FMOLS provides t statistic to test a common value for cointegrating vector under the null hypothesis which states that values of the cointegrating vector are common versus the alternative hypothesis that states those values need not to be common. The null and alternative hypotheses are formulated as:

H_0: $B_i = B_0$ for all i
H_1: $B_i \neq B_0$ for all i

The FM-OLS group mean estimator is derived by averaging the value of individual FM-OLS estimates.

4. Empirical Findings

4.1. Data

Ratios of Gross Domestic Saving to GDP (GDS, hereafter) are obtained from World Development Indicators website. GINI coefficient data are employed from WIID2 (The UNU-WIDER World Income Inequality Database), Eurostat and UNICEF TransMONEE

2008 database. GINI data refer to the distribution of household income. The data are annual and the periods are selected according to the existence of GINI variables.

As mentioned above we analyze the relationship between the variables in question by splitting the data into three groups; developed, developing and miracle countries. Developing countries include Argentina, Brazil, Czech Republic, Hungary, Poland, Bulgaria, Romania, Macedonia, Belarus, and cover the data period between 1995 and 2006. Miracle countries include China, Korea, Malaysia, Singapore, Thailand, and cover the years between 1990 and 2005. Lastly, developed countries include Austria, Belgium, Germany, Denmark, Spain, Finland, France, Italy, Luxembourg, Netherlands, Portugal, United Kingdom, and cover the data period between 1995 and 2007.

4.2. Unit Root Tests

Table 1 displays the unit root tests of IPS and CIPS for each variable in each country group. We fail to reject the null hypothesis of IPS test that there is unit root in both intercept and intercept/trend case since the p values given in brackets are higher than the significance level of 5 %. CIPS test is a second generation type of panel unit root test which allows for cross sectional dependency. Pesaran (2007) test assumes that there is one common factor. Second part of Table 1 gives the statistics of CIPS test. The test suggests that the same situation is obtained via CIPS statistics in both intercept and intercept/trend case with only three exceptions. Hence, the first and the second generation type of panel unit root tests detect the existence of unit root for all variables in question. After obtaining the result that the variables are integrated of order one, we pass on to the panel cointegration test.

Table 1: Panel Unit Root Tests

IPS							
Groups		**Developed**		**Developing**		**Miracle**	
Variables		**C**	**C&T**	**C**	**C&T**	**C**	**C&T**
GINI		-1.14508 (0.1261)	-0.30798 (0.3790)	-0.17876 (0.4291)	-0.39071 (0.3480)	1.53569 (0.9377)	-0.50303 (0.3075)
GDS		-0.08970 (0.4643)	-0.42262 (0.3363)	-0.90749 (0.1821)	-0.82395 (0.2050)	-0.04272 (0.4830)	-0.08284 (0.4670)
CIPS							
Groups		**Developed**		**Developing**		**Miracle**	
Variables		**C**	**C&T**	**C**	**C&T**	**C**	**C&T**
GINI	p=0	-1.241	-1.508	-2.783*	-3.767*	-1.321	-2.607
	p=1	-1.758	-1.339	-1.961	-2.453	-2.175	-3.751*
	p=2	-1.294	-2.335	---	---	-1.533	-2.505
GDS	p=0	-1.096	-2.047	-1.683	-2.752	-0.805	-1.476
	p=1	-1.670	-4.137*	-1.764	-2.211	-1.066	-2.019
	p=2	-0.261	-2.316	---	---	-0.333	-1.339

C denotes to constant case and C&T denotes constant and trend case. Lag length is selected automatically via Schwarz information criteria. Values in brackets refer to p-values. In CIPS statistics, p refers to lag lengths. Critical values are given in Pesaran (2007), Tables II(b) and II(c), in 5% significance level for intercept only case is -2.28 and for intercept and trend case is 2.83 where N/T is 15/15. The critical values are higher in regression swith lower time series and cross section data. (---) denotes that the unit root test for the corresponding lag length is not calculated due to the small sample case. (*) denotes the rejection of the null hypothesis.

4.3. Panel Cointegration Tests

In Table 2 we have Westerlund and Edgerton (2007) Panel Bootstrap Cointegration Test which has the null of cointegration. In developing and miracle countries we see that the null hypothesis is failed to reject in both bootstrap and asymptotic p values. However, it is reverse in the panel of developed countries. The p values are lower than 5 % significance level. Thus, we reject the null of cointegration for developed countries. Hence, the developing and the miracle countries reveal a long run relationship between GINI and saving ratio. However, the test does not reflect a long run relationship for the developed country group.

Table 2: Westerlund & Edgerton (2007) Panel Bootstrap Cointegration Test

Country Groups	
Developing	lm statistic = 0.155 bootst p-val = 0.616 asymp p-val = 0.438
Developed	lm statistic = 2.974 bootst p-val = 0.010 asymp p-val = 0.001
Miracles	lm statistic = 0.719 bootst p-val = 0.232 asymp p-val = 0.236

p-val refers to the p values for the bootstrap and asymptotic tests. lm refers to Lagrange Multiplier. For sieve estimation Yule-Walker is used. There is cointegration in the null hypothesis. Constant case is selected.

4.4. FMOLS Tests

The developed countries do not reflect the existence of cointegration, in other words, we cannot verify any relationship between income inequality and saving ratio. However, for miracle and developing countries, the existence of such a relationship is confirmed via second generation type of panel cointegration test. Afterwards, we continue our analysis by estimating the coefficient of income inequality. FMOLS test is applied to the country groups that reflect cointegration between the variables. Table 3 provides the results of our estimates. Developing countries are found to have a significantly negative, miracles countries have significantly positive estimates for GINI variable. Put it differently, an increase in income inequality in developing countries leads to a decline in saving ratio. On the contrary, the worse the income equality is, the better will be the saving ratio in miracle countries.

Table 3: Panel Fully Modified Ordinary Least Squares test

GINI	PANEL GROUP FMOLS RESULTS
Developing	-0.20* (-12.58)
Miracles	0.80* (-5.96)

N = 9 , T = 12 for developing countries, N = 5 , T = 16 for miracle countries. Constant case is selected. Max-lag is chosen as 2. Values in brackets refer to the t statistics. (*) denotes significancy in 5% significance level.

4.5. Results

It is observed that the economies with different structures reflect distinctive relationships between the variables in question. Kaldor (1957) and Lewis (1954) argue that it is the income levels that determine the saving structures of the nations. In that manner, they argue that rich income groups save a higher fraction of their incomes compared to the low income groups which mathematically signifies a higher overall saving rate. As Passinetti (1962) argues, it is also possible that saving rate depends on the classes of individuals rather the income classes. The distinctive structures of the economies may be the deterministic factor. The miracle countries reflect a positive relationship between income inequality and saving rate. This result may be attributed to the idiosyncratic structure of these economies in a very sensible way. The citizens of these economies tend to save more typically, and it results in a positive impact of income inequality on overall saving rate. Because the people at the subsistence level will not be able to save and the middle income earners’ savings will be subject to their income levels, overall saving rate of the society improves as the rich save more and more when their income levels increase. The developing countries display an inverse relationship where the higher income inequality deteriorates the saving. We may attribute this to the precautionary reasons that the lower income earners are more inclined to save due to the concerns about the future whereas it is the reverse for the rich. The developed countries reflect no significant relationship. In these countries, the low income group generally earns income that is quite above the subsistence level. Therefore, it is, in a sense, possible for these groups to save. The lack of relationship between inequality and saving may bring out the notion that the overall saving rate depends on the decisions rather than the income inequality. Hence there is no direct link for the developed economies.

5. Conclusion

This study examines the relationship between income distribution and saving rate using a new panel analysis technique. Not only the theoretical articles, but also the empirical studies reflect mixed results on the relationship. We employ three country groups for the analysis and similarly obtain ambiguous results for different country groups. Developed countries reflect no relationship and we attribute this to the individual decisions of the income earners. Developing countries display negative and significant results. Precautionary savings may be considered as an explanation for such a finding. Lastly, miracle countries display a positive relationship. We attribute this finding to the saving tendency of these economies and the possibility of the richer income groups to save a higher fraction of their income. As a result, economies with different structures reflect distinct results for the analysis. Hence, as Lim (1980) argues, generalization of the saving- income distribution theories will be problematic and fallacious.

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