JOURNAL OF ECONOMIC DEVELOPMENT
Volume 12, Number 2, December 1987

Private Savings Behavior and Estimation of Structural Change: The Case of Korea

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This study analyzes the Korean private savings behavior, examines the interest rate-savings linkage and tests for structural change during the post-1979 period. A significant structural break is observed.

The savings model used in this study is modified to allow for structural stability analysis. The econometric results show that structural break did occur around 1979 in the savings behavior.

The analysis also reveals that permanent income has a positive and significant impact on savings, whereas both the nominal and real interest rates have a neutral direct effect. This seems to contradict the implied assumptions of the IMF policy recommendations.

I. Introduction

It is widely accepted that, in general, developing countries in relation to developed economies face more limitations regarding savings, fixed investment, capital growth, and economic growth.

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policy actions are intended to readjust the behavior. The IMF recommendations suggest that interest rates play a significant role in determining savings and that increase in interest rates will increase national savings. Although some studies indicate that such relationship may exist in a number of countries, traditional theory also suggests that interest rates affect negatively private fixed investment and thus economic growth.

It is also apparent from the IMF recommendations that the changed savings behavior may have contributed to the lower rate of economic growth and the huge foreign debts. Given the importance of this issue, the main objectives of this study are to analyze the Korean private savings behavior, examine the interest rate-savings linkage, and carry out stability analysis to test empirically the hypothesis of structural change during the post-1979 period. For this purpose, the private savings model used is modified appropriately to allow for such empirical analysis. More specifically, this study is unique in relation to previous studies in that it tests for the suggested structural break in light of the August 1977 interest rate target policy changes and the post-1979 political instability.

The empirical analysis using 1963-1982 annual data indicates that there is strong statistical evidence of a structural break in the private savings behavior around 1979. In contrast to suggestions made by others, the econometric results indicate a neutral relationship between the real (and nominal) interest and real per capita private savings. Section II of this study reviews some other recent empirical studies on this issue and presents the model used for estimation. Section III discusses the empirical results and the concluding remarks are presented in Section IV.

II. Review of Recent Studies and the Model

A. Review of Some Empirical Studies

In a recent study of Korea's household saving behavior, for the period of 1962-1976, Ortmeyer concluded that a negative correlation exists between the lagged nonhuman wealth stock and the flow of household savings indicating a substantial preference for

real per capita permanent income have a negative and statistically insignificant influence on real personal savings. Real per capita transitory income has a positive sign but is not significantly related to real per capita savings.

The contradictory conclusion reached in the forementioned studies (conducted by Williamson; Sung; Gupta; Ortmeyer) may primarily be a reflection of differences in the conceptual and statistical approaches adopted, model specification, sample limitations, and variable measurement differences. Therefore, given the conflicting results, this study also attempts (in addition to testing for a structural break) to re-examine the effects of changes in real interest rates, real per capita permanent disposable income, and real per capita transitory income on the Korean real per capita private savings behavior.

B. The Empirical Model

Economic theory, in general, suggests that changes in domestic savings are directly related to changes in income. The simple Keynesian savings function, which has been used widely, states that saving is a function of disposable income. A number of alternative savings function hypotheses have been presented in the literature. The "permanent and transitory income" hypothesis, initially presented by Milton Friedman, has also been applied extensively in examining the private savings behavior. Friedman expressed private savings as a function of permanent income and transitory income. Some of these savings relationships have been examined by Bodkin; Friend and Taubman; Williamson; and Wright among others.

For our estimations, the savings function used in this study reflects the basic model framework of Friend and Taubman and can be stated as follows:

$$S_t = f(Y_t^P, Y_t^T, S_{t-1})$$

where the variables measure in real terms:

S_t : private savings
Y^P : permanent disposable income
Y^T : transitory income

follows in order to carry out the structural break analysis:[5]

$$(3)\quad \left(\frac{S}{N}\right)_t = c_0 + c_1 D_t + c_2\left(\frac{Y^P}{N}\right)_t + c_3\left(\frac{Y^T}{N}\right)_t + c_4 \left(i_t - \frac{\Delta CPI_t}{CPI_{t-1}}\right) + c_5\left(\frac{S}{N}\right)_{t-1} + c_6 D_t\left(\frac{Y^P}{N}\right)_t$$

or

$$(4)\quad \left(\frac{S}{N}\right)_t = d_0 + d_1 D_t + d_2\left(\frac{Y^P}{N}\right)_t + d_3\left(\frac{Y^T}{N}\right)_t + d_4 i_t + d_5\left(\frac{S}{N}\right)_{t-1} + d_6 D_t\left(\frac{Y^P}{N}\right)_t$$

where

i_t: the nominal rate of interest rate

D_t: 1 for the period 1979-82 and zero elsewhere[6]

$D_t\left(\frac{Y^P}{N}\right)_t$: interaction variable on real per capita permanent disposable income and where $D_t\left(\frac{Y^P}{N}\right)_t = D_t^* \left(\frac{Y^P}{N}\right)_t$

On an *a priori* basis, the coefficients of the dummy and the interaction variables can be either positive or negative depending on the direction of change in the intercept and slope of the savings equation, during the post-1979 period.

C. The Data

The real per capita private savings variable in the above model includes savings from households, private non-profit institutions, and public and private corporations. Such treatment of the real per capita private savings variable reflects the data limitations.

[5] For more details in using this stability analysis approach see Giannaros (1985).

[6] The 1979-1982 period is used for our structural break analysis since we assume that the August 1977 government policy actions may have influenced the savings behavior with a one year lag.

from one period to another and its coefficient estimates the difference in the coefficients between the two periods. The dummy (D_t) allows the regression line to change intercept from one period to another. The introduction of the interaction variable and the dummy allows one to separately estimate the coefficient(s) of the two periods and test for structural stability. On an *a priori* basis, the coefficients of the interaction variables and the dummy can be either positive or negative depending on the direction of the slope and intercept of the savings equation during the post-1979 period. Because the dummy has units for the post-1979 period, a positive sign of the coefficient of the interaction variable would mean that slope of savings function increased during the second period.

The regression results presented in Table 1 reveal that both the dummy (D_t) and the interaction variable ($D_t \cdot (Y^P/N)_t$) are systematically highly significant. The statistical significance of the dummy and the interaction variable is also observed even when the lagged savings variable is excluded as an explanatory variable of savings (see Table 2). Therefore, it can be concluded that the null hypothesis of no structural break in the Korea's real per capita private savings model is rejected.[7] The regression estimates indicate that the slope and the intercept of the regression line changes significantly between the pre-and post-1979 periods. This conclusion is reinforced if one examines equations (2) and (5) in Table 1 and 2, where the interaction variables and dummy are excluded, and compare them to equations (1) and (4). It is evident from the estimations that the summary statistics improve substantially when our equations are modified to take into account the structural change. The estimates of equation (1) in Table 1 provide the following information:

Coefficient of	Constant	$(Y^P/N)_t$
Pre-1979 period	$-26{,}589.7 = c_0$	$0.1492 = c_2$
Post-1979 period	$-712{,}914.7 = c_0 + c_1$	$1.0880 = c_2 + c_6$
Change in coefficient	$-686{,}325.0 = c_1$	$0.9388 = c_6$

It can be observed from the above results that there was a

[7] The Chow-test for structural stability was also applied confirming that the estimated equations of the savings function coefficients are not stable during the two periods.

Table 2

ESTIMATES OF THE PRIVATE SAVINGS EQUATIONS (1963-1982)

Equation Number	Constant	D_t	$(\frac{Y^P}{N})_t$	$(\frac{Y^T}{N})_t$	i_t	$(i_t - \frac{\Delta CPI_t}{CPI_{t-1}})$	$D_t \cdot (\frac{Y^P}{N})_t$	R^2 ($\bar{R}^2$)	D.W.	F-Stat.
1	-35,022.4	-736,494	0.2100	-0.3938		-171.3610	1.0104	0.84	1.72	10.53*
	(2.99)*	(2.93)*	(7.13)*	(1.27)		(0.41)	(2.76)*	(0.78)		
2	-38,818.0		0.1893	0.1711		607.6240		0.40	1.22	3.34*
	(1.28)		(3.07)*	(0.62)		(1.12)		(0.29)		
3	-35726.8	-565,421	0.2171			-40.1437	0.7548	0.79	1.49	11.11*
	(2.75)*	(2.57)*	(6.81)*			(0.09)	(2.40)*	(0.73)		
4	-46,802.2	-711,704	0.2209	-0.3498	390,279		0.9724	0.83	1.67	9.71*
	(1.85)**	(2.95)*	(6.48)*	(1.16)	(0.45)		(2.78)*	(0.77)		
5	-20,308.0		0.1663	0.0498	-316.175			0.40	1.38	3.28*
	(0.52)		(3.10)*	(0.17)	(0.25)			(0.28)		
6	-47,858.7	-580,758	0.2263		457.537		0.7756	0.79	1.49	11.22*
	(1.80)**	(2.69)*	(6.30)*		(0.50)		(2.51)*	(0.73)		
7	-36,657.8	-699,761	0.2132	-0.3600			0.9568	0.83	1.68	14.58*
	(3.31)*	(3.00)*	(7.48)*	(1.23)			(2.82)*	(0.78)		
8	-36,042.1	-560,041	0.2175				0.7473	0.78	1.48	18.24*
	(2.96)*	(2.71)*	(7.09)*				(2.52)*	(0.74)		

Values in parentheses are the estimated absolute t-values.

* Significant at the 0.05 level.

** Significant at the 0.10 level.

All equations are estimated by using the Maximum Likelihood procedure assuming first order serial correlation in the disturbance term.

seem to improve the quality of our estimations. In fact, in all estimated equations neither the nominal nor real interest rate is statistically significant in explaining the real per capita private savings behavior. This neutrality effect of interest rates on savings seems to contradict the implied assumptions of the IMF policy recommendations to the government. The IMF recommended a policy of higher savings deposits interest rates to encourage increased savings which imply a positive linkage. The results of this study allow one to question that assumption. In fact, if fixed investment is negatively related to interest rates, higher interest rates may suppress fixed capital investment and economic growth.

IV. Concluding Remarks

Some have suggested that the savings behavior has changed during the post-1979 period and that an increase in interest rates (as suggested by the IMF) will stimulate domestic savings and decrease the foreign debt. A number of empirical studies have studied the Korean private savings behavior but to our knowledge none has attempted to determine if a structural change has recently taken place.

In an attempt to further examine the important issue of savings behavior, this study concentrates on testing empirically the influence of interest rates, real per capita permanent disposable income, and real per capita transitory income on real per capita private savings. Moreover, it also concentrates on testing for structural break during the post-1979 period.

The overall results and analysis of the estimated real per capita savings models allow for the following summary remarks to be made regarding the propositions tested:

1. The coefficient stability analysis indicates that structural change took place around 1979 in the private savings behavior. This conforms with our *a priori* expectations. The implication here is that the governmental policy actions and the political instability may have had a positive effect on savings.
2. The real per capita permanent disposable income is positively related to the real per capita private savings. The evidence indicates that this relationship strengthened

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