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PERSONAL SAVINGS IN YUGOSLAVIA — TEST OF EXISTENT HYPOTHESES AND THE ROLE OF DATA SOURCE*)

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I. INTRODUCTION

Between National Income Accounts (NIA) and Flow-of-Funds (F/F) there is a natural connection: savings (s). In NIA, savings appear as a residual in the subtraction of expenditures from receipts, while in F/F, as the difference between net changes in financial assets and net changes in financial liabilities (Klein, 1975). Assuming that there is a statistical difference between both series of savings, the question is posed: How important is this difference: The problem of construction of savings series and the analysis of their differences for Yugoslavia is presented in an other report (Štiblar, 1978). In this paper, the main goal is to find answers to the following questions:

a) Which hypothesis about the savings function in Yugoslavia can be accepted empirically regarding different existing hypotheses for the market economies,***)

b) Whether or not the same savings hypotheses can be accepted or rejected for the series of savings from both sources of data, NIA and the F/F, simultaneously? Namely, even if there is a difference between savings from both sources of data, as long as both savings series behave theoretically in the same way, this difference is negligible.

As a basis for the analysis, five different series of savings were construced for the period 1963—1971 in Yugoslavia:

a) From the F/F:

— total personal savings (SHG), which consist of: two elements:

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*** Only a few studies of personal savings have been made for Yugoslavia. Among them, closest to this study although incomplete in the presentation of different savings hypotheses which were not empiricaly tested, is the study by Nikić (1977).

— real personal savings (SHR), indicating investments in consumer durables, and
— financial personal savings (SHF), indicating investments in financial assets.

b) From the NIA:

— financial personal savings (SNIA1), constructed as the difference between total personal receipts on one side and taxes and total personal expenditures on the other,
— total personal savings (SNIA2), constructed as SNIA1, but additionally enlarged for some expenditures, which actually represent investments in consumer durables.

As described in detail in a previous paper (Stiblar, 1978), data availability causes a real problem. Yugoslav statistics do not separate the consumption of durables and non-durables, and also do not distinguish between personal and household data on consumption and savings.

At the *first step* of the analysis we compared the series of savings *per se*. As Table I shows, the correlation coefficient between SHG and SNIA2 is 0.92, while between SHF and SNIA1, 0.91. They are high and definitely higher than the coefficients for some other pair of the S series. Both parts of gross S are also highly correlated with their total (correlation coefficients are 0.84 for the real S and 0.89 for the financial S).

Another way to compare the same conceptual series of the S from NIA and F/F is to calculate a simple regression between them,

$$S_{F/F} = a + b\,S_{NIA} + e \qquad (1)$$

Assuming the equality of the two series, the constant of the regression (a) should be 0 and the regression coefficient (b) should be 1. We obtained the following results:

SNIA—I—R	SHRF	CONST	R^2/SE	D/DF
OLS	0.796805	981.431136	0.799202	1.338492
	(0.139041)	(508.813965)	890.353271	7.000000
SHGR	SNIA2R	CONST	R^2/SE	D/DF
OLS	1.033255	1023.225505	0.823072	1.103356
	(0.167141)	(1685.542725)	1811.179199	7.000000

where: R^2 = coefficient of determination, SE = standard error, D = Durbin-Watson statistics, DF = degree of freedom, in parenthesis are t—statistics.

Although the proper way is to statistically test the significance of the variation of the coefficients from the hypothesized values, a = 0 and b = 1, at this stage we will discuss the results only qualitiavely. First, the determination coefficients are satisfactorily high, but the Durbin-Watson statistics is on the limit of significant autocorrelation, which indicates that perhaps the proper functional form for the specification was not used. The point values of the constant term are in both cases, away from 0, but they are not significant so that interval estimates should include 0. The slope coefficient is for the pair of the gross S very close to required 1, while in the pair of the financial S it is 0.8, but its interval estimate would include 1 as well. Thus, the results indicate that the overall similarity between the two variants of the gross S is higher than for the financial S, but the series are definitely not equal. Assuming that the explicitly-given series of S from the F/F are the correct ones, we can proceed in the *second step* to find the causes of difference (according to Adams, 1968). From the NIA, the series of the S are calculated as the residuals and, as such, they include also the statistical discrepancy which exists in NIA. Assuming the series of the S from the F/F as correct, and from the NIA as incorrect, we can calculate the differences ($S_{F/F} - S_{NIA}$) and regress them on the items of household income and expenditure account to find the main factors of the difference. The income items should be related negatively and the expenditure items positively to the difference which, in the final form, should represent only the statistical discrepancy. The items with significant regression coefficients in such an analysis would be the factors of the difference because of their incomplete treatment in both sides of the NIA. At the present stage, we did not perform the above analysis.

As we found differences between the same series of the personal savings from the different sources of data, it is important to know how important these differences really are. Therefore, in the *third step*, we will test these series of S in the framework of different theories of the saving function. No matter how different the series of S are, as long as they respond in the same way to the diferent existing theories of S function, in the conceptual sense this difference is not important. In this analysis, we follow Taubman's analysis concept (1966), which we broadened by adding the search for an appropriate theory of savings function for the Yugoslav household *per se*.

II. THE THEORIES OF THE SAVINGS FUNCTION

For the U.S., for example, some definite conclusions on the form of the personal savings function were already achieved on the basis of extensive empirical testing. For Yugoslavia, on the contrary, such definite conclusions do not exist. Therefore, in this study we will apply our personal S series from both sources of data NIA, and F/F to these different hypotheses:

a) absolute income hypothesis,
b) relative income hypothesis,
c) Brown's habit persistence hypothesis,
d) permanent income hypothesis,
e) life cycle hypothesis, and
f) new developments (tastes and structural changes).

Our stress in this study is not on the completeness of the analysis in the sense of giving a definite answer as to which of the hypotheses holds for the Yugoslav household sector. It is on the response of the different series of S for these hypotheses. If the responses of the series from the different sources of data differ,

— the source of the data becomes an important factor in the quantitative analysis, and

— this implies difficulties in the connection of the real and the financial models of the economy, whose estimations are based on the different sources of data.

It is noteworthy that in this paper we discuss only one source of the total savings of the economy, private personal savings, while to arrive at definite results, all the other savings components should be considered also.

We will describe the different theories of the S function only in the final form, accommodated to the empirical analysis.

a) The absolute income hypothesis
A simple Keynesian function is

$$S_t = a + b \cdot Y_t \tag{2}$$

where S are savings and Y disposable personal income; they can be measured in nominal or real terms, total or per capita.

b) The relative income hypothesis
Known as the Duesenberry-Modigliani racket effect, it has the form:

$$\frac{S_t}{Y_t} = a + b \cdot \frac{Y_t - Y^+}{Y_t} \tag{3}$$

where Y^+ is the previous peak income and all the variables are in real terms. Because, over the sample period, all three income variables grow monotonically, $Y^+ = Y_{t-1}$ and thus

$$S_t = a \cdot Y_t + b \cdot (Y_t - Y_{t-1}) = (a + b) \cdot Y_t + b \cdot Y_{t-1} = c \cdot Y_t + b \cdot Y_{t-1} \tag{4}$$

where $c = (a + b)$.

This can be included under normal income general form.

c) Brown's habit persistence hypothesis
According to this hypothesis, for empirical purposes the savings function has the form:

$$S_t = a + b \cdot Y_t + c \cdot S_{t-1} \tag{5}$$

d) The normal (permanent) income theory

A simple formulation of Friedman's theory is

$$S_t = b \cdot Y^P + c \cdot Y^T + u, \tag{6}$$

where Y^P = permanent income, Y^T = transitory income, and for the hypothesis to hold it should be $0 < b \leq 1$, $c = 1$.

Depending on the definition of the permanent income, the modified definition, given by Evans (1969), is:

$$S_t = b \cdot Y_t + d \cdot S_{t-1} \tag{7}$$

and by Taubman (1966):

$$S_t = a + k_1 \cdot Y^N_t + k_2 \cdot Y^T_t - b \cdot W_{-1} + u \tag{8}$$

introducing a wider concept of normal income (Y^N) and wealth at the beginning of the period (W_{-1}). For the hypothesis to hold, k_2 should be 1. If $k_1 = k_2 = k$, we have an absolute income hypothesis.

e) Ando-Modigliani life-cycle hypothesis
In the general theoretical formulation, it has the form:

$$S_t = a \cdot Y_L + b \cdot Y^E_L + c \cdot W_{-1} + u \tag{9}$$

where Y_L = labour income, Y^E_L = expected labour income, W_{-1} = personal wealth at the beginning of the period. The empirical formulation of the hypothesis by Branson (1973) is:

$$S_t = Y^L_t \cdot a + b \cdot W_{-1} + c + u \tag{10}$$

f) Further developments — tastes and structural shifts

We start the explanation of personal savings by income. Then we diversify it on the permanent and the transitory component, and in the life-cycle hypothesis we introduce the labour income. From a different point of view, we introduce the lagged values of income and savings to dynamize the analysis. The personal wealth stock was the next important variable in the analysis.

In theory, it was recognized that changes in tastes and thus shifts of the structural coefficients over the sample period can bias the coefficients of the income and the wealth variable.*)

One way to explain the role of tastes is through the desired stock of wealth adjustment (Shiba 1977, Sato 1976, Taubman 1965). Personal savings are a function of the difference between the desired stock of the wealth at the beginning of the period. Thus, factors which change the

*) The Chow Test provides a measure for the shift of the structural coefficients in the one-equation models, but some other tests of this kind exist. For the case of Yugoslavia, the economic reform in 1965 would be a good point of introducing such a shift.

desired stock of the personal wealth will also change the personal savings. To find out why the desired stock of wealth changes means, first of all, to find out why we accumulate the wealth. While for Japan Sato models these shifts just by time dummy variable, Shiba finds the reasons of housing, education and marriage as the most important, and so tries to introduce some quantitative indicators in their shift. Taubman uses (S_{t-1}/Y^P_{t-1}) as the taste variable.

Though such a shift of the personal S function for Yugoslavia almost certainly occurs, at this point it is not clear which variables cause it. We will try with prices, time and Taubman's variable.

III. SPECIFICATION OF THE EXPLANATORY VARIABLES

a) Permanent income

Income can be presented as total receipts or better, as disposable income. However, which of the theories of the savings function we can accept depends crucially on the way of defining a permanent or a normal income variable. Once it is defined, transitory income is just the difference between actual income and permanent income. Taubman (1965) describes 6 methods for defining permanent income. They are:

1) Friedman suggested a weighted average of current and past income by weights exponentially declining. The data determine the number of years required for the definition.

2) Trend variable:

$$Y^P = a + b \cdot T + u . \tag{11}$$

Besides linear, some other functional form can be used in the analysis.

3) Koyck distributed lag with a geometrically-declining set of weights. In the final form:

$$Y^P = a \cdot \Sigma (1 - a)^i Y_{t-i} + \Sigma (1 - a)^i u_{t-i} \tag{12}$$

4) Simple average of past and current income for the different number of the years.

5) Weighted averages, where data determine the weights, as in the regression of lagged income on some more stable variables, for example, consumption.

6) The weighted average of past and current income, where the weights are arithmetically decreasing (Fisher's method).

In the actual analysis, Taubman calculates Y^P (1965) by Fisher's method of decreasing arithmetic weights of the simple average and the Koyck lag distribution. In the next paper (1966), he uses a time trend and the simple averages of the previous 3 years.

In their book, Dimitrijević and Macesich (1973) determine Y^P by 9 quarters of the Y_t as it is weighted through the consumption.

In our analysis, we chose two ways of calculating Y^P:

— linear regression on time:

$$Y^P = \hat{Y} = a + b \cdot T \tag{13}$$

— same Fisher's decreasing average scheme as Taubman:

$$Y^P = 0.4\, Y_t + 0.3\, Y_{t-1} + 0.2\, Y_{t-2} + 0.1\, Y_{t-3} . \tag{14}$$

There is no unique answer as to which variable of the Y^P is the correct one. At the same time, the ultimate answer to this question is not the final goal of this study, but it is the behaviour of the different S series under the permanent income hypothesis. This is the reason for choosing only a few more simple variants of permanent income.

b) Wages and salaries (ODR)

These represent a total labour income of the household, which we will use later in the testing of the life-cycle hypothesis. They exclude other components of household receipts which are not a result of the first distribution of labour income.

c) Financial wealth (WHFR)

This is used as a proxy for total personal wealth, for which data are not available. As we already showed, at least in the dynamic sense, the approximation is quite satisfactory.

d) Variables of tastes and structural shifts

Firstly, we use the variables which do not explicitly explain the shifts, though they take them in account:

— time variable T,

— taste variable S_{t-1}/Y^P_{t-1}.

Secondly, we also use the variables which hypothetically influence the desired stock of wealth variable;

— inflation (INFL), and

— expected inflation (PE2).

The only remaining important variable is the interest rate (RR). Many previous empirical works produced poor results in introducing it explicitly in the savings function (implicitly it is in the savings function through the wealth variable). Therefore, in this study also it is not introduced explicitly.

IV. AN EMPIRICAL ANALYSIS OF THE SAVINGS FUNCTION FOR THE YUGOSLAV HOUSEHOLD

IV. 1. *The Correlation Analysis*

Before running the regressions, we test a simple correlation:

I. between the explained variables (series of S) which we made at the beginning of Part two of the study;

II. between the explained variables and the explanatory variables;

III. between the explanatory variables (for testing multicollinearity.

Table I

SIMPLE CORRELATION MATRIX

	SHGR	SHRR	SHFR	SNIA1R	SNIA2	RYR	YTR	YTOR	YRP2	YTRP2	YTORP2	YRT2	YTRT2	YTORT2	YRP3	YTRP3
SHRR	0.89															
SHFR	0.84	0.50														
SNIA1	0.93	0.72	0.91													
SNIA2	0.92	0.73	0.88	0.94												
YR	0.96	0.88	0.77	0.89	0.96											
YTR	0.96	0.88	0.77	0.89	0.96	1.00										
YTOR	0.96	0.88	0.78	0.90	0.96	1.00	1.00									
YRP2	0.97	0.91	0.77	0.90	0.94	0.99	0.99	0.99								
YTRP2	0.97	0.91	0.77	0.90	0.94	0.99	0.99	0.99	1.00							
YTORP	0.98	0.90	0.78	0.91	0.93	0.99	0.99	0.99	1.00	1.00						
YRT2	0.64	0.55	0.57	0.61	0.80	0.79	0.79	0.77	0.72	0.72	0.69					
YTRT2	0.65	0.56	0.57	0.63	0.82	0.80	0.80	0.79	0.73	0.73	0.70	1.00				
YTORT	0.42	0.31	0.43	0.45	0.65	0.60	0.60	0.60	0.52	0.52	0.48	0.96	0.95			
YRP3	0.97	0.94	0.73	0.89	0.90	0.97	0.97	0.98	0.99	0.99	0.99	0.64	0.66	0.43		
YTRP3	0.97	0.94	0.73	0.89	0.90	0.97	0.97	0.98	0.99	0.99	0.99	0.64	0.66	0.43	1.00	
YTORP	0.97	0.94	0.73	0.89	0.90	0.97	0.97	0.98	0.99	0.99	0.99	0.64	0.66	0.43	1.00	1.00
YRT3	0.06	—0.13	0.27	0.08	0.35	0.23	0.29	0.21	0.13	0.13	0.09	0.71	0.69	0.82	0.00	0.00
YTRT3	0.06	—0.14	0.28	0.09	0.36	0.23	0.23	0.21	0.13	0.14	0.09	0.71	0.69	0.81	0.00	0.00
YTORT3	0.05	—0.20	0.33	0.14	0.37	0.22	0.22	0.21	0.13	0.13	0.10	0.68	0.67	0.82	—0.00	—0.00
ODR	0.97	0.91	0.76	0.90	0.93	0.99	0.99	0.99	1.00	1.00	1.00	0.71	0.73	0.52	0.99	0.99
TIME	0.97	0.94	0.73	0.89	0.90	0.97	0.97	0.98	0.99	0.99	0.99	0.64	0.66	0.43	1.00	1.00
SHF%	0.47	0.05	0.84	0.70	0.58	0.38	0.38	0.41	0.39	0.39	0.42	0.22	0.23	0.20	0.35	0.35
INFL	—0.10	—0.38	0.27	0.16	0.20	0.00	0.00	0.04	—0.02	—0.02	—0.01	0.13	0.15	0.29	—0.08	—0.08
PE1	0.15	0.16	0.09	0.09	—0.15	—0.08	—0.08	—0.06	0,02	0.02	0.07	—0.64	—0.63	—0.78	0.11	0.11
PE2YU	0.11	—0.09	0.33	0.21	—0.03	—0.11	—0.10	—0.07	—0.02	—0.02	0.02	—0.55	—0.54	—0.63	0.01	0.01
WHFR	0.93	0.98	0.60	0.78	0.83	0.95	0.95	0.94	0.96	0.96	0.95	0.66	0.68	0.44	0.97	0.97
RR1	—0.08	—0.08	—0.05	—0.04	0.21	0.15	0.15	0.13	0.05	0.05	0.01	0.69	0.68	0.81	—0.04	—0.04
RR2YU	—0.05	0.17	—0.30	—0.16	0.07	0.17	0.17	0.14	0.09	0.09	0.04	0.58	0.57	0.64	0.06	0.06
RR3P	0.20	0.48	—0.20	—0.06	—0.11	0.10	0.09	0.07	0.13	0.13	0.11	—0.08	—0.10	—0.26	0.19	0.19

	YTORP3	YRT3	YTRT3	YTORT3
YRT3	—0.00			
YTRT3	0.00	1.00		
YTORT3	—0.00	0.96	0.96	
ODR	0.99	0.10	0.10	0.12
TIME	1.00	0.0	0.00	—0.00
SHF%	0.35	0.14	0.15	0.31
INFL	—0.08	0.34	0.36	0.54
PE1	0.11	—0.82	—0.83	—0.77
PEYU2	0.01	—0.51	—0.51	—0.41
WHFR	0.97	0.04	0.03	—0.02
RR1	—0.04	0.82	0.82	0.76
RRZYU	0.06	0.49	0.49	0.38
RR3P	0.19	—0.38	—0.40	—0.55

	ODR	TIME	SHF%	INFL	PE1	PE2YU	WHFR	RR1	RR2YU
TIME	0.99								
SHF%	0.39	0.35							
INFL	—0.01	—0.08	0.59						
PE1	0.03	0.11	0.19	—0.28					
PE2YU	—0.02	0.01	0.56	0.05	0.84				
WHFR	0.95	0.97	0.14	—0.26	0.04	—0.12			
RR1	0.04	—0.04	—0.19	0.25	—1.00	—0.85	0.04		
RR2YU	0.09	0.06	—0.56	—0.08	—0.81	—1.00	0.20	0.83	
RR3P	0.12	0.19	—0.54	—0.99	0.33	—0.02	0.35	—0.29	0.06

a) The main conclusions from Table II are the following:

— ODR and TIME are somewhat less correlated with financial S than with real or total S.

— The price variables are positively correlated with financial S, negatively with real S, and insignificantly positive with gross S.

— A negative correlation of the interest rate with financial S and a positive one with real S prevails. As for the price increase variable, this is an obscure result.

— Total actual income is highly correlated with gross S and somewhat less so with its components, which correctly indicates that a breakdown of the S into real and financial also depends on some variables other than the activity ones.

— Y^P has a higher correlation with S than Y^T, which is opposite to expectations. Y^T has an especially low correlation with S in the case of the trend as a permanent income variable.

b) Relation between the explanatory variables

— A correlation between Y^P and Y^T in a Fisher variant is in the range 0.48—0.73, while in the time variant of Y^P it is zero, as expected, because the residuals in the regression are independent of the dependent variable.

— TIME is highly correlated with all the other variables except Y^T and SHF%, which is acceptable.

— The correlation coefficient of inflation with the other variables never exceeds 0.6. The excepted inflation is significantly correlated only with Y^T, for which we do not know the explanation at this moment.

— WHFR is highly correlated with the income variables (not Y^T). This causes some problems later in the analysis because occasionally we use both of them together in the regression analysis.

— Real interest rate (RR) occasionally has a high correlation with the permanent income variables.

IV. 2. *The Regression Analysis*

a) The absolute income hypothesis

The first set of regressions are the simple ones of S on Y. We have 5 different measures of gross, real and financial S, and 3 measures of income (total receipts, total receipts minus taxes, and total receipts minus taxes minus other receipts). The last income variable is close to the disposable income concept. We perform a simple OLS regression, both in real terms and in nominal terms of the variables. Evans (1969) enlisted statistical and economic reasons for the preferability of the regression in real terms. We deflate the nominal series with a retail price index. Also, we investigate the total S function, not per capita, because there is only a slight monotonic increase in the population which does not significantly alter the results. The population in Yugoslavia grows over the sample period by a rate from 0.8 to 1.1% annually.

In Table II. we present the results of the regression analysis. Some of the interesting conclusions are the following:

— Real MPS (marginal propensity to save) is higher than nominal MPS in all cases. For a slightly different specification of the consumption function, Evans (1969) obtained analogous results.

— There is a stable relationship between physical and financial S. In nominal terms, 59—60% of the S are in the real commodities, while in real terms the percentage is slightly lower (58—59%). This means that the households save in real terms more than in nominal terms from the additional unit of income.

— The obtained results for the aggregate MPS are in accordance with Mencinger's (1975) for the aggregate consumption function.

— MPS for SNIA1 differs at most by 3% from the MPS for SHF. This very important result confirms our prior methodological assertion that SNIA1, calculated as residual, really represents the financial S, as given explicitly in F/F.

— The difference between the MPS of the two gross S series from the different sources of data is somewhat larger, more so in real terms than in nominal terms.

Table II.

SAVING FUNCTION, ABSOLUTE INCOME HYPOTHESIS

SHG		Y-T-YO	CONST	R/SE	D/DF
OLS	1	0.269368	—4019.523568	0.980296	2.568211
		0.013485	779.243164	1006.129883	7.000000
SHG		Y	CONST	R/SE	D/DF
OLS	2	0.193153	—3183.494895	0.980662	2.497234
		0.009578	734.684570	996.763916	7.000000
SHG		WHF	CONST	R/SE	D/DF
OLS	3	0.201072	—3005.848132	0.980090	2.461281
		0.010120	737.658691	1011.398437	7.000000
SHR		Y-T-YO	CONST	R/SE	D/DF
OLS	4	0.160501	—1870.885537	0.899349	1.109976
		0.018852	1089.393799	1406.584961	7.000000
SHR		Y	CONST	R/SE	D/DF
OLS	5	0.115141	—1376.312324	0.900633	1.098929
		0.013429	1030.116455	1397.583984	7.000000
SHR		WHF	CONST	R/SE	D/DF
OLS	6	0.119848	—1269.516687	0.899860	1.095706
		0.014038	1023.275879	1403.005615	7.000000
SHF		Y-T-YO	CONST	R/SE	D/DF
OLS	7	0.108867	—2148.638031	0.750625	2.086669
		0.021739	1256.184326	1621.938721	7.000000

SHF		Y	CONST	R/SE	D/DF
OLS	8	0.078012	—1807.182571	0.749722	2.074688
		0.015614	1197.645508	1624.874512	7.000000
SHF		WHF	CONST	R/SE	D/DF
OLS	9	0.081224	—1736.331445	0.749571	2.076141
		0.016263	1185.450439	1625.362549	7.000000
SNIA-I		Y-T-YO	CONST	R/SE	D/DF
OLS	10	0.107453	—1686.674473	0.924901	2.409692
		0.010771	622.408203	803.630371	7.000000
SNIA-I		Y	CONST	R/SE	D/DF
OLS	11	0.076723	—1330.764283	0.916185	2.269361
		0.008158	625.760254	848.983643	7.000000
SNIA-I		WHF	CONST	R/SE	D/DF
OLS	12	0.079866	—1260.062088	0.915589	2.262106
		0.008525	621.400391	851.997314	7.000000
SNIA-II		Y-T-YO	CONST	R/SE	D/DF
OLS	13	0.263008	—3149.545713	0.957717	1.361437
		0.019485	1125.936523	1453.767578	7.000000
SNIA-II		Y	CONST	R/SE	D/DF
OLS	14	0.188978	—2359.630669	0.962581	1.472808
		0.013141	1008.021973	1367.606934	7.000000
SNIA-II		WHF	CONST	R/SE	D/DF
OLS	15	0.196835	—2192.879706	0.963241	1.489848
		0.013563	988.625244	1355.496582	7.000000
SHG-R		Y-R	CONST	R/SE	D/DF
OLS	16	0.254441	—7289.904114	0.908874	1.604851
		0.028308	1831.536133	1299.822998	7.000000
SHG-R		Y-T-R	CONST	R/SE	D/DF
OLS	17	0.260634	—6789.859915	0.908629	1.625490
		0.029039	1780.111328	1301.566650	7.000000
SHG-R		Y-T-O-R	CONST	R/SE	D/DF
OLS	18	0.376926	09489.611191	0.909443	1.777178
		0.041792	2063.119385	1295.757812	7.000000
SHR-R		Y-R	CONST	R/SE	D/DF
OLS	19	0.147184	—3519.830450	0.749632	1.034296
		0.029465	1906.373779	1352.934570	7.000000

SHR-R		Y-T-R	CONST	R/SE	D/DF
OLS	20	0.150698	—3226.528767	0.748619	1.036464
		0.030246	1854.107178	1355.670410	7.000000
SHR-R		Y-T-O-R	CONST	R/SE	D/DF
OLS	21	0.215939	—4691.016697	0.733016	1.036132
		0.045061	2224.491455	1397.108398	7.000000
SHF-R		Y-R	CONST	R/SE	D/DF
OLS	22	0.107249	—3769.655429	0.533060	1.982281
		0.033692	2179.895508	1547.050049	7.000000
SHF-R		Y-T-R	CONST	R/SE	D/DF
OLS	23	0.109927	—3562.929815	0.533739	1.988652
		0.034491	2114.310547	1545.923584	7.000000
SHF-R		Y-T-O-R	CONST	R/SE	D/DF
OLS	24	0.160973	—4798.010408	0.551384	2.062680
		0.048909	2414.412598	1516.389893	7.000000
SNIA-I-R		Y-R	CONST	R/SE	D/DF
OLS	25	0.108601	—3477.237174	0.756973	1.761255
		0.021332	1380.196289	979.511719	7.000000
SNIA-I-R		Y-T-R	CONST	R/SE	D/DF
OLS	26	0.111365	—3270.981946	0.758716	1.772953
		0.021775	1334.834473	975.993164	7.000000
SNIA-I-R		Y-T-O-R	CONST	R/SE	D/DF
OLS	27	0.163524	—4543.738291	0.787293	1.942596
		0.029556	1459.064453	916.376465	7.000000
SNIA-II-R		Y-R	CONST	R/SE	D/DF
OLS	28	0.225478	—4759.038847	0.900419	1.777133
		0.026329	1703.534180	1208.981445	7.000000
SNIA-II-R		Y-T-R	CONST	R/SE	D/DF
OLS	29	0.231106	—4324.241654	0.901443	1.779092
		0.026834	1644.962402	1202.749756	7.000000
SNIA-II		Y-T-O-R	CONST	R/SE	D/DF
OLS	30	0.334401	—6726.745019	0.903367	1.890087
		0.038412	1896.245850	1190.951416	7.000000

— It can be predicted that the Chow Test will show a structural shift of the MPS coefficient over the sample period with 1965 as a change point. With the new economic reform there came some institutional changes relevant for personal savings.

— Total explanation (R^2) with the income variables of gross S is higher than that of its components (structure of gross S depends also on other factors), and that of the nominal series is higher than of the real ones (because of the presence of the prices in the former).

— In almost all cases, the Durbin-Watson statistic shows no presence of autocorrelation, which can indicate that the linear specification is correct.

— In the sense of statistical significance as well as economic reasoning, Y-T-O is preferred over Y, and this over Y-T.

The definite result is that for the above absolute income hypothesis, different sources of savings do not yield dramatic differences in either statistical significance or in the value of the MPS (regression coefficient). Our reconciliation of the data from both sources proves to be quite successful at this first step, a natural link between the two sources of data, strong, and the data base for the connecting two models of the economy, real and financial, firm. However, perhaps the marginal differences are only the result of the oversimplified hypothesis on the savings behaviour. As a matter of fact, once we disaggregate the actual income on the permanent and the transitory component, the regression coefficient of the two differs significantly; thus, this indicates a rejection of the absolute income hypothesis.

b) Relative income hypothesis

In the case of the monotonically increasing actual income, this hypothesis results in a form of the permanent income hypothesis, as we showed in the section on theory.

c) Brown's habit persistence theory

As Evans showed (1969), this breaks down to the final applicative formulation in (10). We test this formulation for the two pairs of S, gross and financial, from both sources of data. For the income variable we use only the disposable real income (Y-T-O).

MPS out of disposable income is significant, but not so out of previous S. The explanation is higher for the pair of gross S variables (R^2). The autocorrelation in the equations does not exist. The value of the coefficients within the pairs is quite equal, with the exception of SNIA2, for which the coefficient is 0.

The results (Table III) show that this theory should be rejected for the sample period under investigation, more decisively for the financial than for the gross S variables. On the other hand, similarities in the value of the coefficients as well as in the significance of the equations show that the specification of the S series is correct. This result is similar to the one which we obtained for the absolute income hypothesis.

Table III

SHGR		Y-T-O-R	SHGR-	R/SE	D/DF	
OLS	1	0.074982	0.735726	0.815341	2.568604	
		0.047070	0.282671	1729.922607	6.000000	
SHGR-		Y-T-O-R	SHGR	CONST	R/SE	D/DF
OLS	2	0.309891	0.243347	—8084.054749	0.872711	2.245792
		0.128152	0.347162	4200.117187	1436.269531	5.000000
SHGR-		Y-T-O-R	SHFR	R/SE	D/DF	
OLS	3	0.063936	0.095896	0.238042	1.881566	
		0.025520	0.435009	1890.259766	6.000000	
SHFR-		Y-T-O-R	SHFR	CONST	R/SE	D/DF
OLS	4	0.160477	—0.025342	—4697.993158	0.314678	2.017014
		0.078508	0.423080	3634.371094	1792.682129	5.000000
SNIA-1		Y-T-O-R	SNIA-1-	R/SE	D/DF	
OLS	5	0.053092	0.371118	0.575496	2.185050	
		0.020686	0.301727	1141.837646	6.000000	
SNIA-1		Y-T-O-R	SNIA-1-	CONST	R/SE	D/DF
OLS	6	0.145259	0.055917	—3750.493737	0.632316	2.095059
		0.069126	0.361116	2701.591797	1062.675293	5.000000
SNIA-2-R		Y-T-O-R	SNIA-2-	R/SE	D/DF	
OLS	7	0.129829	0.431115	0.742968	1.570144	
		0.070496	0.401995	1817.409180	6.000000	
SNIA-2-R-		Y-T-O-R	SNIA-2-	CONST	R/SE	D/DF
OLS	8	0.346638	0.000281	—7401.191234	0.850654	1.849739
		0.108224	0.358809	3206.850586	1385.338135	5.000000

d) The normal income hypothesis

This title includes Friedman's permanent income hypothesis. Out of many available ways, we use two (trend and Fisher's weighted averages) for Y^p. We engage the different types of the final empirical equation for this hypothesis.

Evans suggested (11), which differs from Brown's habit persistence only by the fact that it does not include the constant term. The results (Table III) show for us positive pairwise similarity for SNIA1—SHF and SNIA2—SHG. The statistical significance is higher for the gross S variants, which is correct because the theory was really intended for them. The autocorrelation is not significant and the t- statistics are very low. Compared to the previous regression with the constant term, the values of the coefficients of Y_t are here lower, while of the S_{t-1} higher.

As Taubman pointed out (1966), the general formula for the normal (permanent) income hypothesis is (Table IV):

$$S_t = a + b \cdot Y^P + c \cdot Y^T + u \qquad (15)$$

In this formulation without the wealth variable, the results for both types of the permanent income variable are statistically more significant for the gross S than for the financial S. Y^P has a significant coefficient, Y^T does not. Opposite to the permanent income theory, MPS_YP is higher than MPS_YT, the exception being SNIA2. The constants are, in all cases, significantly negative, as was expected.

Table IV

SHG-R		YRT2	YP2-R	CONST	R/SE	D/DF
OLS		—0.204477	0.318757	—8320.223940	0.941105	3.085191
		0.210033	0.037070	1545.241455	1044.963135	6.000000
SHG-R		YTORT-2	(Y-TO)P2	CONST	R/SE	D/DF
OLS	2	—0.169910	0.431482	—9695.235411	0.941129	2.974596
		0.252703	0.041950	1666.138428	1044.757812	6.000000
SNIA-I-		YTORT2	(Y-TO)P2	CONST	R/SE	D/DF
OLS	3	0.016571	0.178185	—4598.996364	0.767707	2.195726
		0.231631	0.038452	1527.200684	957.636475	6.000000
SNIA-II		YTORT2	(Y-TO)P2	CONST	R/SE	D/DF
OLS	4	0.595802	0.308322	—6628.451782	0.900768	2.134241
		0.291913	0.048459	1924.659180	1206.864014	6.000000
SHFR		YRP2	YRT2	CONST	R/SE	D/DF
OLS	5	0.119107	0.022636	—3959.620528	0.461066	2.056839
		0.058960	0.334062	2457.743896	1662.039062	6.000000
SHFR		YTRP2	YTRT2	CONST	R/SE	D/DF
OLS	6	0.123718	0.011194	—3754.041806	0.460762	2.065654
		0.061856	0.344128	2389.380371	1662.508057	6.000000
SHFR		YTORP2	YTORT2	CONST	R/SE	D/DF
OLS	7	0.166944	0.101122	—4820.515819	0.478642	2.090020
		0.065638	0.395400	2606.976807	1634.713867	6.000000
SHGR		YTORP3	YTORT3	CONST	R/SE	D/DF
OLS	8	0.390696	0.092033	**********	0.928279	2.630508
		0.038080	0.173236	1877.950439	1153.151367	6.000000
SNIAIR		YTORP3	YTORT3	CONST	R/SE	D/DF
OLS	9	0.165544	0.121739	—4641.115402	0.755268	2.021046
		0.032460	0.147666	1600.758301	982.942139	6.000000

SNIA2R		YTORP3	YTORT3	CONST	R/SE	D/DF
OLS	10	0.321430	0.602928	—6100.372493	0.925271	2.520256
		0.034585	0.157337	1705.589111	1047.313232	6.000000
SHFR		YRP3	YRT3	CONST	R/SE	D/DF
OLS	11	0.103934	0.166755	—3561.166162	0.468788	1.898588
		0.036923	0.156420	2385.410645	1650.089111	6.000000
SHFR		YTRP3	YTRT3	CONST	R/SE	D/DF
OLS	12	0.106431	0.173619	—3355.020602	0.470556	1.904179
		0.037749	0.161185	2310.432129	1647.342529	6.000000
SHFR		YTORP3	YTORT3	CONST	R/SE	D/DF
OLS	13	0.153390	0.317970	—4431.867526	0.513837	2.000759
		0.052129	0.237147	2570.765381	1578.572754	6.000000

To summarize, the important condition of this theory, $MPS_YT = 1$, is nowhere satisfied and even the relaxed condition $MPS_YP < MPS_YT$ occurs only in the 2 cases. The reason for these results can be either an inappropriately calculated Y^P or S, or that the permanent income theory in this simple form does not hold for the Yugoslav household.

In the more sophisticated formulation, we add to the previous formulation stock of wealth as an explanatory variable (Table V). The problem is that we have available only the data on financial wealth, and the question is posed of how good such an approximation is. We discussed this earlier in the paper.

In an extensive analysis of this formulation of the permanent income hypothesis, the main results which we obtained are the following:

— For the Fisher variant Y^{P2}, the statistical significance of the pair of gross S is higher than of the financial S. The regression coefficient of Y^{P2} is significant in all the cases, while of Y^{T2} only for the SNIA2, for W_{-1} it is significant (and of the right negative sign) in all cases except for SHG, and the constant is significantly negative all the time. As far as the values of the coefficients are concerned, MPS_YP is again higher than MPS_YT with the only exception being SNIA2, as before.

— A comparison of the coefficients of the different series of S indicates only a weak similarity within the two groups.

Table V

SHG-R		Y-R	YP2-R	WHF-R	CONST	R/SE	D/DF
OLS	1	—0.215007	0.567747	—0.082595	—9419.856983	0.930853	2.968371
		0.229778	0.290668	0.248603	3709.177002	1132.270752	5.000000
SHG-R		Y-T-R	(Y-T)P2-	WHF-R	CONST	R/SE	D/DF
OLS	2	—0.240311	0.610255	—0.094509	—8983.607893	0.932884	2.998466
		0.236712	0.301679	0.246565	3498.790283	1115.513672	5.000000

	Y-T-O-R	(Y-TO)P2	WHF-R	CONST	R/SE	D/DF
SHG-R						
OLS 3	—0.171244	0.609521	—0.011973	—9877.326213	0.929392	2.951015
	0.277927	0.339510	0.229500	3938.403320	1144.169189	5.000000

	Y-R	YP2-R	WHF-R	CONST	R/SE	D/DF
SNIA-I-						
OLS 4	—0.095721	0.374411	—0.359412	—8618.104914	0.827391	2.420999
	0.167522	0.211915	0.181247	2704.219238	825.495361	5.000000

	Y-T-R	(Y-T)P2-	WHF-R	CONST	R/SE	D/DF
SNIA-I-						
OLS 5	—0.102204	0.391291	—0.365054	—8200.078103	0.828883	2.415732
	0.174411	0.222280	0.181671	2577.935059	821.918945	5.000000

	Y-T-O-R	(Y-TO)P2	WHF-R	CONST	R/SE	D/DF
SNIA-I-						
OLS 6	—0.017721	0.370611	—0.307821	—9280.296748	0.840544	2.465028
	0.192727	0.235432	0.159146	2731.068848	793.419189	5.000000

	Y-R	YP2-R	WHF-R	CONST	R/SE	D/DF
SNIA-II						
OLS 7	0.330810	0.096431	—0.550154	**********	0.956644	2.489707
	0.161888	0.204788	0.175151	2613.271240	797.732422	5.000000

	Y-T-R	(Y-T)P2-	WHF-R	CONST	R/SE	D/DF
SNIA-II						
OLS 8	0.343254	0.092478	—0.546281	**********	0.957600	2.471649
	0.167401	0.213346	0.174369	2474.322021	788.884033	5.000000

	Y-T-O-R	(Y-TO)P2	WHF-R	CONST	R/SE	D/DF
SNIA-II						
OLS 9	0.554474	-0.035596	—0.370986	**********	0.927526	2.332574
	0.250533	0.306046	0.206879	3550.206543	1031.391846	5.000000

	Y-R	YP2-R	CONST	R/SE	D/DF
SHG-R					
OLS 10	—0.204477	0.523234	—8320.223940	0.941105	3.085191
	0.210033	0.238058	1545.241455	1044.963135	3.085191

	Y-T-O-R	(Y-TO)P2	CONST	R/SE	D/DF
SHG-R					
OLS 11	—0.169910	0.601392	—9695.235411	0.941129	2.974596
	0.252703	0.275433	1666.138428	1044.757812	6.000000

	Y-T-O-R	(Y-TO)P2	CONST	R/SE	D/DF
SNIA-I-					
OLS 12	0.016571	0.161614	—4598.996364	0.767706	2.195726
	0.231631	0.252465	1527.202637	957.637695	6.000000

	Y-T-O-R	(Y-TO)P2	CONST	R/SE	D/DF
SNIA-II					
OLS 13	0.595802	-0.287480	—6628.451782	0.900765	2.134241
	0.291917	0.318174	1924.687012	1206.881592	6.000000

	YRT2	YP2-R	WHF-R	CONST	R/SE	D/DF
SHG-R						
OLS 14	—0.215007	0.352740	—0.082595	—9419.856983	0.930850	2.968371
	0.229782	0.109891	0.248608	3709.250732	1132.293213	5.000000

	YTRT2	(Y-T)P2-	WHF-R	CONST	R/SE	D/DF
SHG-R						
OLS 15	—0.244828	0.370238	—0.092244	—8988.297326	0.933798	2.999838
	0.231966	0.111634	0.244345	3469.933838	1107.895752	5.000000

	YTORT2	(Y-TO)P2	WHF-R	CONST	R/SE	D/DF
SHG-R						
OLS 16	—0.171244	0.438278	—0.011973	—9877.326213	0.929392	2.951015
	0.277927	0.138119	0.229500	3938.403320	1144.169189	5.000000

	YRT2	YP2-R	WHF-R	CONST	R/SE	D/DF
SNIA-I						
OLS 17	—0.095721	0.278690	—0.359412	—8618.104914	0.827378	2.420999
	0.167529	0.080119	0.181253	2704.320801	825.526367	5.000000

	YTRT2	(Y-T)P2-	WHF-R	CONST	R/SE	D/DF
SNIA-I						
OLS 18	—0.093114	0.287055	—0.362346	—8164.249838	0.827139	2.398819
	0.172965	0.083239	0.182195	2587.342773	826.098389	5.000000

	YTORT2	(Y-TO)P2	WHF-R	CONST	R/SE	D/DF
SNIA-I						
OLS 19	—0.017721	0.352891	—0.307821	—9280.296748	0.840544	2.465028
	0.192727	0.095778	0.159146	2731.068848	793.419189	5.000000

	YRT2	YP2-R	WHF-R	CONST	R/SE	D/DF
SNIA-II						
OLS 20	0.330810	0.427241	—0.550154	**********	0.956651	2.489707
	0.161875	0.077415	0.175137	2613.061035	797.668213	5.000000

	YTRT2	(Y-T)P2-	WHF-R	CONST	R/SE	D/DF
SNIA-II						
OLS 21	0.346855	0.435869	—0.549967	**********	0.959344	2.456630
	0.161741	0.077838	0.170372	2419.448730	772.492432	5.000000

	YRP2	YRT2	WHFR	CONST	R/SE	D/DF
SHFR						
OLS 22	0.412780	—0.068365	—0.713771	**********	0.765626	2.468766
	0.106373	0.222426	0.240649	3590.508057	1096.045654	5.000000

	YTRP2	YTRT2	WHFR	CONST	R/SE	D/DF
SHFR						
OLS 23	0.430578	—0.092011	—0.722734	**********	0.771914	2.479549
	0.108948	0.226386	0.238466	3386.455078	1081.242432	5.000000

	YTORP2	YTORT2	WHFR	CONST	R/SE	D/DF
SHFR						
OLS 24	0.502248	0.035307	—0.590785	**********	0.712853	2.349372
	0.146450	0.294690	0.243343	4175.953125	1213.181396	5.000000

	YTORT2	(Y-TO)P2	WHFR	CONST	R/SE	D/DF
SNIA-II						
OLS 25	0.554474	0.518878	—0.370986	**********	0.927529	2.332574
	0.250526	0.124502	0.206874	3550.121582	1031.366943	5.000000

	YRP3	YRT3	WHFR	CONST	R/SE	D/DF
SHGR						
OLS 26	0.320819	0.078351	—0.155219	—9995.895907	0.919987	2.507555
	0.111702	0.116667	0.299810	4349.429687	1217.991699	5.000000

SHGR	YTRP3	YTRT3	WHFR	CONST	R/SE	D/DF
OLS 27	0.327353	0.077910	—0.152019	—9319.996439	0.919498	2.518539
	0.114567	0.120602	0.300250	4139.242187	1221.708252	5.000000
SHGR	YTORP3	YTORT3	WHFR	CONST	R/SE	D/DF
OLS 28	0.451141	0.085450	—0.113358	**********	0.916246	2.554525
	0.167720	0.188041	0.304927	5366.136719	1246.134033	5.000000
SNIA-1-R	YRP3	YRT3	WHFR	CONST	R/SE	D/DF
OLS 29	0.282027	0.070765	—0.470099	—9937.709572	0.868996	2.374198
	0.065954	0.068886	0.177022	2568.110840	719.160156	5.000000
SNIA-1-R	YTRP3	YTRT3	WHFR	CONST	R/SE	D/DF
OLS 30	0.287974	0.072369	—0.467839	—9350.419898	0.868565	2.380856
	0.067551	0.071109	0.177032	2440.567383	720.340088	5.000000
SNIA-1-R	YTORP3	YTORT3	WHFR	CONST	R/SE	D/DF
OLS 31	0.394416	0.096814	—0.429226	**********	0.862172	2.378891
	0.099282	0.111311	0.180502	3176.495361	737.651611	5.000000
SNIA-2-R	YRP3	YRT3	WHF-R	CONST	R/SE	D/DF
OLS 32	0.410558	0.393088	—0.533499	**********	0.955011	2.510908
	0.074525	0.077837	0.200026	2901.836426	812.614990	5.000000
SNIA-2-R	YTRP3	YTRT3	WHFR	CONST	R/SE	D/DF
OLS 33	0.416330	0.406082	—0.522429	**********	0.956088	2.500788
	0.075287	0.079253	0.197307	2720.065186	802.834473	5.000000
SNIA-2-R	YTORP3	YTORT3	WHFR	CONST	R/SE	D/DF
OLS 34	0.480916	0.585559	—0.299099	**********	0.930682	2.550460
	0.135761	0.152209	0.246823	4343.613281	1008.681641	5.000000
SHFR	YRP3	YRT3	WHF-R	CONST	R/SE	D/DF
OLS 35	0.361888	0.206618	—0.713932	**********	0.690776	2.161639
	0.115459	0.120590	0.309894	4495.714844	1258.955811	5.000000
SHFR	YTRP3	YTRT3	WHF-R	CONST	R/SE	D/DF
OLS 36	0.368178	0.211272	—0.707412	**********	0.687946	2.169303
	0.118599	0.124846	0.310816	4284.906250	1264.701904	5.000000
SHFR	YTORP3	YTORT3	WHFR	CONST	R/SE	D/DF
OLS 37	0.470394	0.283447	—0.594508	**********	0.646902	2.198712
	0.181068	0.203006	0.329194	5793.195312	1345.306396	5.000000

— In the first part of Table VI we try the two types of the regression,

$$a + b \cdot Y + c \cdot Y^P = a + b \cdot Y^T + (b + c) \cdot Y^P \qquad (16)$$

where $Y = Y^P + Y^T$.

The results confirm the above analytical explanation.

— When we perform the same regressions with Y^{P3} defined as the trend value of the Y, the overall results are not significantly different from the previous case of Y^{P2} in the sense of statistical significance (R^2, t, d statistics). And again, there is the exception of SNIA2 for Y^D $MPS_YP > MPS_YT$, so that even the weaker assumption of the permanent income hypothesis is not satisfied.

— Compared with the results reported by Taubman for the U. S., the coefficients of gross S have similar values except for Y^T, which is low and insignificant for Yugoslavia.

Taking them together, although not all the possible variants of Y^P were used in the analysis (in our case the results between the two used do not differ significantly), it is clearly indicated that regardless of the definition of Y^P, we can reject the permanent income hypothesis for personal savings in Yugoslavia over the sample period. At the same time, though in general homogeneous in the rejection of this hypothesis, the saving series from the different sources of data differ significantly in the values of their regression coefficients.

e) Ando-Modigliani life-cycle hypothesis

This hypothesis was tested less intensively as a permanent income hypothesis. We used the empirical formulation of the hypothesis as given by Branson (15). Besides labour income, defined closest as wages and salaries of the productive sector of the economy, we also tried with the more general income variables, Y and Y^D, to increase in this way the impact of the non-labour income in the analysis. Our prime concern is, however, the life-cycle hypothesis as initially stated.

The results in Table VI show a high statistical significance because, besides R^2, the regression coefficients are also highly significant except the wealth coefficient for SHG. The values of the constants are significantly negative, that of the income variable coefficient always being significantly positive, and of the W_{-1} coefficient significantly negative. Thus, they are all satisfactory for the acceptance of the life-cycle hypothesis. On the other hand, the series of S differ even more significantly with the values of the regression coefficients, as was the case for the permanent income hypothesis.

In a further step we tested the life-cycle hypothesis by modifying the included income variable, total or disposable income instead of labour income. The results do not differ significantly. This modification was also introduced to test in yet another way the absolute income hypothesis: if it holds, the MPS_Y here and the MPS_YP and MPS_YT from the previous analysis should have equal values, which is clearly not the case here. But in most cases, the equality:

Table VI

SHG-R	Y-R	WHF-R	CONST	R/SE	D/DF
OLS 1	0.205690	0.141228	—5559.544236	0.898409	1.831293
	0.097028	0.267412	3804.546387	1372.431396	6.000000
SNIA-I	Y-R	WHF-R	CONST	R/SE	D/DF
OLS 2	0.181716	—0.211807	—6072.350457	0.766355	1.560972
	0.067899	0.187133	2662.398193	960.419189	6.000000
SNIA-II	Y-R	WHF-R	CONST	R/SE	D/DF
OLS 3	0.402265	—0.512138	**********	0.962269	2.536827
	0.052612	0.145001	2062.970703	744.184814	6.000000
SHG-R	Y-T-O-R	WHF-R	CONST	R/SE	D/DF
OLS 4	0.287306	0.177127	—6837.006667	0.903229	2.071239
	0.128271	0.238707	4162.667969	1339.476807	6.000000
SNIA-I	Y-T-O-R	WHF-R	CONST	R/SE	D/DF
OLS 5	0.261095	—0.192841	—7431.670736	0.801273	1.841703
	0.084821	0.157848	2752.628174	885.749512	6.000000
SNIA-II	Y-T-O-R	WHF-R	CONST	R/SE	D/DF
OLS 6	0.527694	—0.382029	**********	0.939442	2.275804
	0.090285	0.168015	2929.918457	942.798584	6.000000
SHFR	ODR	WHF-R	CONST	R/SE	D/DF
OLS 7	0.474581	0.053071	—7804.645546	0.917599	2.398543
	0.180174	0.249507	3912.305908	1236.034424	6.000000
SNIA-I	ODR	WHF-R	CONST	R/SE	D/DF
OLS 8	0.417818	—0.287774	—8025.013411	0.834290	2.337271
	0.117902	0.163271	2560.114258	808.829834	6.000000
SNIA-II	ODR	WHF-R	CONST	R/SE	D/DF
OLS 9	0.709762	—0.395823	**********	0.863855	1.533803
	0.206060	0.285355	4474.394531	1413.618408	6.000000
SHFR	YR	WHFR	CONST	R/SE	D/DF
OLS 10	0.288161	—0.524089	**********	0.690478	1.894242
	0.089048	0.245420	3491.656006	1259.561035	6.000000
SHFR	YTR	WHFR	CONST	R/SE	D/DF
OLS 11	0.294315	—0.521568	—9597.356418	0.690397	1.912577
	0.090969	0.244728	3314.433350	1259.726562	6.000000
SHFR	YTOR	WHFR	CONST	R/SE	D/DF
OLS 12	0.386592	—0.445920	**********	0.680192	2.132855
	0.122606	0.228164	3978.827637	1280.319824	6.000000

SHFR	ODR	WHFR	CONST	R/SE	D/DF
OLS 13	0.574439	—0.528035	**********	0.655239	2.194575
	0.193774	0.268340	4207.601562	1329.328857	6.000000

$MPS_Y = MPS_YP + MPS_YT$ is preserved.

In general, SNIA2 shows the best results and SHF the worst; the gross S variables show better results than the financial S variables.

Within the two pairs, the values of the regression coefficients differ significantly as before, in the more sophisticated hypothesis on the savings function.

f) The structural shifts of coefficients and tastes

As in most of the theory test-type analysis of this paper, this one is also incomplete. However, while giving us some flavour on the role of tastes in the savings function, it answers one question of the homogeneity of the performance of the differently-formed series of S representing the same concept.

We performed this analysis only for the permanent income hypothesis, according to Taubman:

$$S_t = a + b \cdot Y^P_t + c \cdot Y^T_t + d \cdot TA_t + u \qquad (17)$$

where the taste variable (TA) can be: — TIME,
— S_{t-1}/Y^P_{t-1},
— Inflation,
— Expected inflation.

The results vary from one to the other variable of tastes (Table VII.).

Time shows a negative impact on savings in all cases, but is poorly significant only for SHF.

Table VII

SAVING FUNCTION — LAGS, TASTES

SNIA2R	YTORP2	YTORT2	S/Y-4	CONST	R/SE	D/DF
OLS 1	0.285974	0.659650	111.244335	—8118.975497	0.848122	2.480358
	0.086194	0.354046	186.724579	3167.699707	1397.031250	4.000000
SNIA2R	YTORP3	YTORT3	S/Y-8	CONST	R/SE	D/DF
OLS 2	0.321751	0.601780	54.678222	—7153.590353	0.880580	2.559892
	0.056482	0.188246	149.832794	2814.059570	1238.788086	4.000000
SHGR	YTORP2	YTORT2	S/Y-1	CONST	R/SE	D/DF
OLS 3	0.547402	—0.338651	—158.415245	**********	0.925567	3.051173
	0.116566	0.323946	172.427155	2402.185547	1098.307373	4.000000

SHGR	YTORP3	YTORT3	S/Y-5	CONST	R/SE	D/DF
OLS 4	0.485793	—0.001164	—177.117757	**********	0.897600	2.450275
	0.125653	0.246285	257.954346	3057.115234	1288.224365	4.000000
SHFR	YTORP2	YTORT2	S/Y-2	CONST	R/SE	D/DF
OLS 5	0.176034	0.038896	—36.425053	—4767.031013	0.148930	2.021785
	0.133246	0.704046	300.691650	4011.806396	1997.738281	4.000000
SHFR	YTORP3	YTORT3	S/Y-6	CONST	R/SE	D/DF
OLS 6	0.134087	0.384820	103.849945	—3975.028815	0.240552	2.262772
	0.082577	0.326400	238.696121	3847.125732	1887.143555	4.000000
SNIA1	YTORP2	YTORT2	S/Y-3	CONST	R/SE	D/DF
OLS 7	0.179039	—0.013670	—26.747693	—4292.674615	0.566507	2.241719
	0.115114	0.403776	264.681396	2851.938232	1153.863525	4.000000
SNIA1	YTORP3	YTORT3	S/Y-7	CONST	R/SE	D/DF
OLS 8	0.143199	0.133348	52.594816	—3798.592515	0.550881	2.227395
	0.069060	0.191043	210.019333	2691.165771	1174.476074	4.000000
SHGR	YTORP2	YTORT2	INFL	CONST	R/SE	D/DF
OLS 9	0.439185	—0.111393	—2.795215	**********	0.915259	3.148658
	0.059350	0.305082	5.536829	2687.580566	1171.890381	4.000000
SHGR	YTORP2	YTORT2	PE2YU	CONST	R/SE	D/DF
OLS 10	0.432776	0.186349	10.356974	**********	0.935236	2.934342
	0.049798	0.376402	8.272940	2510.646973	1024.489746	4.000000
SHGR	YTORP2	YTORT2	TIME	CONST	R/SE	D/DF
OLS 11	0.527305	—0.197989	—271.969495	**********	0.910534	3.272122
	0.440675	0.337288	1560.297363	11116.101562	1204.123291	4.000000
SHFR	YTORP2	YTORT2	INFL	CONST	R/SE	D/DF
OLS 12	0.203022	—0.083196	9.037301	—6889.397716	0.340863	2.784364
	0.089038	0.457693	8.306499	4031.979736	1758.101074	4.000000
SHFR	YTORP2	YTORT2	PE2YU	CONST	R/SE	D/DF
OLS 13	0.113521	1.086058	28.766077	—9810.830839	0.822335	2.980049
	0.044367	0.335352	7.370713	2236.842041	912.761230	4.000000
SHFR	YTORP2	YTORT2	TIME	CONST	R/SE	D/DF
OLS 14	1.172501	—0.291341	—3598.306968	**********	0.556894	2.970869
	0.527542	0.403775	1867.866943	13307.332031	1441.482910	4.000000
SNIA1	YTORP2	YTORT2	INFL	CONST	R/SE	D/DF
OLS 15	0.186131	—0.067184	4.073977	—5110.542916	0.625921	2.699700
	0.054285	0.279046	5.064298	2458.213379	1071.877441	4.000000

SNIA1	YTORP2	YTORT2	PE2YU	CONST	R/SE	D/DF
OLS 16	0.146606	0.444015	12.503446	—6344.952316	0.760550	2.179867
	0.041684	0.315076	6.925056	2101.594971	857.572754	4.000000
SNIA1	YTORP2	YTORT2	TIME	CONST	R/SE	D/DF
OLS 17	0.363061	—0.059798	—693.627825	—8947.035023	0.588704	2.403104
	0.411328	0.314827	1456.389404	10375.820312	1123.934570	4.000000
SNIA2R	YTORP2	YTORT2	INFL	CONST	R/SE	D/DF
OLS 18	0.358040	0.414006	8.968162	—9385.949860	0.904734	2.996910
	0.056035	0.288043	5.227593	2537.476807	1106.439453	4.000000
SNIA2R	YTORP2	YTORT2	PE2YU	CONST	R/SE	D/DF
OLS 19	0.288510	1.201266	17.652909	**********	0.927617	3.025856
	0.046879	0.354342	7.788086	2363.505127	964.447266	4.000000
SNIA2R	YTORP2	YTORT2	TIME	CONST	R/SE	D/DF
OLS 20	1.004882	0.330116	—2445.577140	**********	0.903940	2.804654
	0.406609	0.311215	1439.681152	10256.789062	1111.040527	4.000000

Taubman's type S_{t-1}/Y^P_{t-1} variable is not significant, no matter which definition of Y^P we use. Besides that, the overall significance of the savings without this variable is even higher.

The inflation is mainly positively related to S, though insignificantly in all cases. There is a definite problem in finding an explanation for this result.

The expected inflation is the only highly significant taste variable in our experiments, as the results show. Again, it is positively related to S (higher inflation, higher savings). It improves the statistical significance for all the series of S and leads to the significantly $MPS_YT > MPS_YP$ in the case of financial S.

Comparing the S series performance, their response to the introduction of the taste variable is much more homogeneous and also significant for the financial S. Contrary to the income variables, the taste variables are much more important for the financial S than the gross S, which is a reasonable result. But also, not for the first time, SNIA2 performs very well. Throughout the testing of the theories, the role of the different S series changes: sometimes one is important and then another, depending on the type of the hypothesis we test.

Though similar, the regression coefficients of the variables for the conceptual pairs of S still differ significantly.

V. CONCLUSIONS

Judging both by significance and size of the coefficients, the character of the savings function depends crucially on the choice of the savings series. The evaluation of multipliers and the validity of various theories of savings function depend on the choice of the source of data (NIA or F/F).

More specifically, the series of S do behave quite similary in the case of more simple theories, such as absolute income hypothesis and partly habit persistence theory. However, the more the theories are sophisticated, the greater is the difference in the size and significance of the coefficients between the two conceptually-equal series of S from the two sources of data. Thus, while for the simplest version of the permanent income hypothesis the coefficients are still similar to a certain degree, in the variant with a wealth variable included the difference increases. And the further we go, to the theory of the life-cycle and after that to the structural shift analysis (changes in tastes), the homogeneity of the coefficients diminishes even more.

The second goal of our twofold analysis was to test the appropriateness of the different existing theories of savings function for the case of the Yugoslav household. Answers to this question are even more tentative; they are only indications serving as a basis for further analysis. Though at first sight the absolute income hypothesis, as the simplest theory, seems to perform well, in further analysis with a partition of the actual income variable on its permanent and transitory component, MPS differ significantly from the two; this rejects the absolute income hypothesis. On the other hand, this difference is not in the sense of accepting the permanent income hypothesis either. MPS out of the transistory component is not one, and the even more relaxed assumption that MPS out of the permanent component is higher than out of the transitory component is satisfied only as the exception, not as a rule. The habit persistence theory, which we test in the form given by Evans, has to be rejected because the coefficient of S_{t-1} is sinsignificant throughout. Some better results were obtained for the life-cycle hypothesis and for the structural shifts represented by the expected inflation. In fact, the statistical results for these two hypotheses are quite satisfactory and the economic implications of the size of the coefficients are acceptable. Looking for the two variants of the savings, gross and financial separately, it was empirically proved that in some theoretical schemes, total S perform better (which is natural because in the last consequence the theory was built for them), while for the taste variables according to expectations, the financial variant performs better.

We do not pretend that the study is complete and in its finite form. Further improvements and extensions of the analysis can be made. As far as improvements are concerned, among others these include the prolongation of the sample period introducing the total wealth variable, further estimation of the normal (permanent) income variable, and the real interest rate (with different expectation theories). For the extensions, the analysis can be performed for the other sectors of the economy as well, so that we would really obtain a complete picture of savings as a natural link between the sources of data, NIA and F/F, which we need for model building and integration. Also, further testing of the proposed theories as well as some new theories of the savings function is possible. The relevant direction in this sense is the further introduction of institutional characteristics specific for the Yugoslav economy.

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APPENDIX I: VARIABLES AND SYMBOLS

C = consumption
Cg = consumption of goods (durables and non-durables)
Cs = consumption of services
CONST = constant of regression
D = degrees of freedom
DW = Durbin-Watson statistic = d
E = expenditures
F/F = Flow of Funds Accounts
INFL = inflation
MPS = marginal propensity to save
NIA = National Income Accounts
ODR = wages and salaries in the productive sector
P = prices (retail)
PE = price expectations
R = nominal interest rate
RR = real interest rate
R^2 = coefficient of determination
S = savings
SE = standard error
SHF = financial savings of the household sector, from F/F
SHG = gross savings of the household sector, from F/F
SHR = real savings of the household sector, from F/F
SHF% = percentage of the financial savings in the gross savings
SNIA1 = constructed financial savings from the NIA
SNIA2 = constructed gross savings from y NIA
T = income taxes of the household sector
TA = variable of tastes
TI = time
t = Student t-statistic
Y = income
Y^* = previous peak income
Y^D = disposable income
Y^L = labour income
YE^L = expected labour income
Y^N = normal income
Y^P = permanent income
Y^T = transitory income
YR = real income
Y-T = income — taxes = YT
Y-T-O = income — taxes — other income = YTO
WHF = financial wealth of the household sector
WHF* = desired financial wealth of the household sector
WHFR = real financial wealth of the household sector

APPENDIX II: SERIES OF DATA

		1 SHGR	2 SHRR	3 SHFR	4 SNIA1R	5 SNIA2R	6 YR	7 YTR	8 YTOR	9 YRP2	10 YTRP2
1	1963-1	3137.000	2862.000	276.000	356.000	4474.000	40994.000	38094.000	32139.000	37204.000	34535.000
2	1964-1	4033.000	3317.000	716.000	1063.000	5880.000	48928.000	45649.000	38768.000	42501.000	39576.000
3	1965-1	4073.000	2840.000	1233.000	1839.000	7290.000	52197.000	49220.000	41909.000	47323.000	44317.000
4	1966-1	8715.000	3105.000	5610.000	4805.000	10609.000	57025.000	53818.000	44972.000	52354.000	49232.000
5	1967-1	9090.000	5888.000	3201.000	3357.000	7785.000	58796.000	55417.000	46202.000	55958.000	52721.000
6	1968-1	9332.000	7734.000	1597.000	2706.000	8047.000	62816.000	59445.000	48053.000	59389.000	56088..000
7	1969-1	11924.000	8305.000	3619.000	4709.000	10400.000	71811.000	68213.000	54538.000	65030.000	61583.000
8	1970-1	12206.000	8677.000	3529.000	5454.000	13745.000	80944.000	77103.000	60385.000	72363.000	68735.000
9	1971-1	15838.000	8867.000	6971.000	5860.000	16509.000	92267.000	88109.000	67481.000	81833.000	77961.000

		11 YTORP2	12 YRT2	13 YTRT2	14 YTORT2	15 YRP3	16 YTRP3	17 YTORP3	18 YRT3	19 YTRT3	20 YTORT3
1	1963-1	29323.000	3790.000	3559.000	2816.000	39786.000	36916.000	32634.000	1207.000	1177.000	-495.000
2	1964-1	33575.000	6427.000	6073.000	5193.000	45555.000	42550.000	36543.000	3371.000	3098.000	2224.000
3	1965-1	37654.000	4874.000	4903.000	4255.000	51325.000	48184.000	40452.000	871.000	1035.000	1455.000
4	1966-1	41529.000	4671.000	4586.000	3443.000	57094.000	53818.000	44362.000	-69.000	-1.000	609.000
5	1967-1	44231.000	2838.000	2696.000	1971.000	62863.000	59452.000	48271.000	-4068.000	-4035.000	-2069.000
6	1968-1	46267.000	3427.000	3357.000	1786.000	68632.000	65085.000	52181.000	-5817.000	-5640.000	-4128.000
7	1969-1	49968.000	6781.000	6630.000	4570.000	74402.000	70719.000	56090.000	-2591.000	-2506.000	1552.000
8	1970-1	54746.000	8581.000	8638.000	5639.000	80172.000	76353.000	59999.000	771.000	749.000	385.000
9	1971-1	60820.000	10434.000	10148.000	6661.000	85941.000	81987.000	63909.000	6325.000	6121.000	3571.000

		21 ODR	22 TIME	23 SHF%	24 INFL	25 PE1	26 PE2YU	27 WHFR	28 RR1	29 RR2YU	30 RR3P
1	1963-1	21103.000	1.000	88.000	36.000	73.000	72.000	3392.000	-23.000	-22.000	-14.000
2	1964-1	26106.000	2.000	178.000	92.000	61.000	50.000	3629.000	-11.000	-1.000	-42.000
3	1965-1	28644.000	3.000	300.000	298.000	66.000	73.000	4057.000	-16.000	-23.000	-248.000
4	1966-1	30960.000	4.000	640.000	230.000	142.000	210.000	4388.000	-92.000	-160.000	-180.000
5	1967-1	33234.000	5.000	360.000	65.000	207.000	237.000	9165.000	-147.000	-177.000	-5.000
6	1968-1	35075.000	6.000	170.000	45.000	197.000	138.000	11917.000	-137.000	-78.000	15.000
7	1969-1	39083.000	7.000	300.000	73.000	113.000	70.000	13688.000	-53.000	-10.000	-13.000
8	1970-1	42435.000	8.000	290.000	98.000	61.000	64.000	16450.000	-1.000	-4.000	-38.000
9	1971-1	46948.000	9.000	440.000	151.000	72.000	86.000	18347.000	-12.000	-26.000	-91.000

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LIČNA ŠTEDNJA U JUGOSLAVIJI
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Rezime

Osnovni cilj studije je kvantitativna empirijska analiza lične štednje u Jugoslaviji. U tu svrhu utvrđuje se:

a) koju od u teoriji postojećih hipoteza o ličnoj štednji moguće je na osnovu empirijskog istraživanja prihvatiti za stanovništvo Jugoslavije, i

b) da li odgovor na prvo pitanje zavisi od upotrebljenog izvora podataka.

Na makro nivou lična štednja stanovništva može se, naime, utvrditi iz društvenih računa kao rezidual između dohodaka i izdataka stanovništva ili iz računa novčanih tokova kao razlika između promena u aktivi (sredstvima) i promena u pasivi (izvorima sredstava) stanovništva. Izvor podataka postaje irelevantan jedino u slučaju, ako se odgovor u pogledu prihvaćanja odnosno odbacivanja pojedinih hipoteza na osnovu empirijske verifikacije ne menja bez obzira na izvor podataka.

Pošto je utvrđena izvesna razlika između serija štednje iz oba izvora podataka, u teorijskom delu studije prikazane su, u obliku prikladnom za empirijsko ocenjivanje, iz literature poznate glavne hipoteze o ličnoj štednji stanovništva: Keynesova hipoteza apsolutnog dohotka, Duesenberryjeva hipoteza relativnog dohotka, Brownova hipoteza trajne navike, Friedmanova hipoteza permanentnog dohotka, proširena u hipotezu normalnog dohotka prema Taubmanu, Ando-Modiglianijeva hipoteza životnog ciklusa i na kraju neki najnoviji rezultati u pogledu istraživanja uloge ukusa i strukturalnih promena u funkciji štednje.

Nakon metodološke deskripcije konstrukcije nekih eksplanatornih varijabli (permanentni dohodak, očekivana inflacija, bogatstvo stanovništva) u empirijskom delu studije prvo su utvrđene korelacione veze između varijabli upotrebljenih u analizi. Zatim su regresijskom analizom ocenjene pojedine funkcije štednje, kako su predstavljene u teorijskom delu studije. Zbog boljeg uvida publicirani su svi rezultati bez obzira na statističku signifikantnost odnosno sadržajni smisao, a potom je u interpretaciji obavljena selekcija između njih.

Glavni zaključci studije sledeći su:

1) Prihvatljivost pojedinih hipoteza o obliku funkcije lične štednje jugoslovenskog stanovništva bitno zavisi od toga da li su kao izvor podataka o štednji uzeti računi novčanih tokova ili društveni računi.

2) Ponašanje serija štednje iz oba izvora slično je u slučaju jednostavnijih teorija (hipoteza apsolutnog dohotka), ali što su teorije kompleksnije, veće su razlike u veličini i signifikantnosti regresionih koeficijenata izračunatih za istu teoriju ali na osnovu dva različita izvora podataka.

3) S druge strane, u pogledu pogodnosti različitih hipoteza o štednji iz literature za objašnjenje ponašanja jugoslovenskih stanovnika kao celine, iako na prvi pogled pa i u jugoslovenskoj literaturi već prihvaćena i primenjena hipoteza apsolutnog dohotka, posle detaljnijeg istraživanja ukazuje se kao nedostatna. Postoje empirijski potvrđene indikacije, da je najprihvatljivija za ponašanje našeg stanovništva hipoteza životnog ciklusa, dalje usavršena sa dodavanjem očekivane inflacije kao eksplanatorne promenljive.

Studija implicira:

— nužnost pažnje kod upotrebe izvora podataka, društvenih računa ili računa novčanih tokova, uz potrebu po njihovom statističkom usaglašavanju, i

— potrebu po daljem empirijskom istraživanju funkcije štednje jugoslovenskog stanovništva uz uvođenje novih eksplanatornih varijabli u analizu, a zna se da su u tom smeru neki koraci već učinjeni i u jugoslovenskoj literaturi.

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JEDAN PRISTUP ANALIZI PRELAZNIH REŽIMA U EKONOMSKIM I ORGANIZACIJSKIM SISTEMIMA

*Vlastimir MATEJIĆ**

1. OPŠTA UVODNA OBJAŠNJENJA

Jedan od osnovnih predmeta istraživanja je određivanje zavisnosti između ulaznih (uzročnih) i izlaznih (posledičnih) veličina posmatranog sistema. Upravljačke akcije su jedna vrsta ulaznih veličina sistema. Zavisnost između ulaza i izlaza može biti deterministička ili stohastička. Kad god je moguće stohastička zavisnost se aproksimira determinističkom, u cilju poželjnih uprošćenja. Relacija koja povezuje ulazne i izlazne veličine može biti kvantitativne ili kvalitativne prirode. Kvantitativne relacije omogućuju veoma detaljan uvid u sisteme i procese, koji se u njemu odvijaju.

Posmatrajmo jednostavan deterministički sistem S sa jednim ulazom, x, i jednim izlazom, y. Neka su unutrašnji parametri sistema nepromenljivi tako da se izlaz može menjati samo promenom ulaza. Stanje sistema identifikujemo sa izlazom; tako je izlaz, y, istovremeno stanje, s. Ako na sistem dovoljno dugo deluje ulaz x_0 izlaz će biti y_0, koji je posledica ulaza a dat relacijom $y_0 = f(x_0)$. Stanje s_0 nazivamo stacionarno a režim u kome se sistem nalazi stacionarni ili permanentni.

Neka se u trenutku $t = 0$ promeni ulaz sistema i postane x_1. Ako se promena ulaza odrazi na izlaz tek nakon nekog vremenskog perioda τ tada kažemo da je to sistem sa kašnjenjem. Nakon izvesnog vremenskog perioda (konačnog ili beskonačnog) izlaz sistema će se ustaliti na nivou y_1, pa kažemo da je sistem u stanju s_1, i znamo da je $y_1 = f(x_1)$. Promena stanja odnosno izlaza sistema ne obavlja se, dakle, trenutno već je to proces. Proces u kome se od izlaza y_0 prelazi na izlaz y_1 odnosno u kome sistem prelazi iz s_0 u s_1 naziva se prelazni proces i kaže se da je sistem u prelaznom režimu. U svakom realnom sistemu brzina promene stanja sistema je konačna tj. prelaz iz jednog u drugo stanje se obavlja preko prelaznog režima.

Procesi u prelaznim režimima su predmet najdetaljnijeg istraživanja u fizičkim sistemima. Projektanti mehaničkih sistema posvećuju veliku pažnju ponašanju sistema u prelaznim režimima jer se mnogi osnovni problemi pouzdanosti ovih sistema pojavljuju u prelaznim režimi-

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