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12.1.1989 3/89

INTERNATIONAL DIFFERENCES IN SAVING RATES AND THE LIFE CYCLE HYPOTHESIS: A COMMENT

Forthcoming in European Economic Review

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**We are indebted to John W. Graham for helpful comments on an earlier version of this paper and to Maritta Lavikko for research assistance. Financial support from the Yrjö Jahnsson Foundation is gratefully acknowledged.

Suomen Pankin monistuskeskus
Helsinki 1989
ISBN 951-686-184-9
ISSN 0785-3572

ABSTRACT

In a recent paper, John Graham (1987) has argued that the life cycle approach performs rather well in accounting for intercountry differences in household saving rates so that the negative evidence sometimes reported is not warranted. This comment presents pieces of evidence against this view. Some new evidence from a somewhat larger data set casts considerable doubt on the ability of the conventional life cycle and demographic variables to explain intercountry differences in household saving rates. Graham's results, though taken at face value, are robust neither to data sample nor to time period.

CONTENTS

1 INTRODUCTION

In a recent paper, John Graham (1987) uses aggregate data from OECD countries during the 1970s demonstrate that life cycle and demographic variables - an economy's rate of income growth, its population age structure as well as the labour force participation rates of the working age and retired population - explain about two-thirds of the observed variation in their saving rates. In particular, he argues that the ability of the life cycle approach to explain the intercountry differences in the saving rates can be considerably improved by introducing the labour force participation rate of the working age female population as an additional explanatory variable into the saving rate equation. On the basis of his evidence Graham concludes that the life cycle approach performs rather well in the task of explaining intercountry differences in saving rates, and that the negative evidence reported e.g. in Koskela and Virén (1983) is not warranted (see Graham (1987), p. 1510).

We disagree with Graham and the purpose of this brief comment is to present pieces of evidence for our view. First, we argue in section 2 that the empirical evidence presented by Graham (1987) does not justify his fairly strong conclusions. Second, and more importantly, we present some new evidence from a somewhat larger data set in section 3, which does not support the view according to which conventional life cycle and demographic variables can explain intercountry differences in saving rates. This new evidence also means that Graham's results, though taken at face value, are not robust.

2 SOME COMMENTS ON GRAHAM'S EVIDENCE

Graham uses cross-section data from 24 OECD countries. The data represents either the average values over the period 1970 - 1980 or the 1975 values. The estimation results are presented both for the household saving rate and the national saving rate the number of observations being only 18 in the former case. The savings function to be fitted into these data is of the form:

$$(1) \qquad SR = a_0 + a_1 G + a_2 DEP + a_3 RET + a_4 MLE + a_5 LFRET + a_6 BPA/Y + a_7 LFWORK + u$$

where SR denotes the (household or national) saving ratio, G = the income growth rate, DEP = the ratio of the population age 0 - 14 to the population age 15 - 64, RET = the ratio of the population age 65 + to the population age 15 - 64, MLE = the (1975) male life expectancy at birth, LFRET = the labour force participation rate of males age 65-, BPA/Y = social security replacement ratio, LFWORK = the labour force participation rate of females age 25 - 64 and u is the error term.

With the exception of the female labour force participation rate variable LFWORK the savings function (1) is analogous to the specifications used by Modigliani (1970) and by Feldstein (1977, 1980).

What is the justification for introducing the (endogenous) LFWORK variable into the savings function? Graham says "This variable is used to capture differences in the labour supply of the working age population across countries" (Graham (1987), p. 1520). This is problematic in a number of respects: First, if we take for granted that the working age population cohort is exogenous, then we have effectively a regression between the savings rate on the one hand and

the labour supply on the other hand. But now in the light of the definition of the households' disposable income (1-t)wH, where t = the tax rate, w = the wage rate and H = the employment, there is quite likely a spurious negative correlation between the savings rate and the LFWORK variable. Second, while Graham does point out the possible endogeneity of the LFWORK variable and tries to correct the resulting simultaneity by using TSLS, the results are not particularly compelling. Because of the small sample size the TSLS estimation is not well-founded and in this case and, effectively, only the lagged value of the LFWORK variable is used as an instrument. Moreover, if the life cycle view with endogenous labour supply is correct, then both the labour supply and saving functions should fit the data and both should depend on real (relative) wages instead of the income variables. This does not, however, seem to be the case. In saving regressions of Table 1 the adjusted R^2 varies between .00 - .04 without the LFWORK variable and between .42 - .51 with the LFWORK variable. Similarly, the labour force participation equations, estimated on the context of the TSLS estimation, suffer from weak performance; in Table 2, all the life cycle and demographic variables have t-values far below 2 and in many cases close to zero (the respective R^2's are not reported).[1)] Finally, in the case of the national savings ratio (cf. Table 3) the LFWORK variable is far from being statistically significant which, in turn, suggests to the "simultaneity" bias explanation.

Finally, we have some doubts about the data. Looking at the data which have been reported by Graham in Appendix A, indicates for instance that in 1960 LFWORK had the value 66.0 % for Turkey, 38.9 % for Greece and 36.9 % for Sweden, while in 1975 the corresponding values were 46.5 %, 31.5 % and 74.3 % respectively. Except that it is hard to believe in those figures, we notice that comparing Graham's OECD figures with the corresponding ILO Yearbook of Labour Statistics figures (for the same concept and the same year), reveals some big discrepancies and the mean of absolute deviations between these two samples of 22 countries is so high as 5.7 percentage points. This is not to say that the ILO Yearbook of Labour Statistics figures are right and the OECD figures wrong, but only to emphasize that the key variable in Graham (1987) may be subject to measurement errors of quite a large magnitude.

3 SOME FURTHER EMPIRICAL EVIDENCE

But even if the findings in Graham (1987) were taken at face value, one might ask: Are the results robust in the sense that the specification (1) performs about equally well in other data sets and time periods. The purpose of this section is to shed light to this robustness issue.

We re-estimated (1) using data from 23 countries (most of them but not all are OECD countries)[2] and the data consisted of two samples: the one representing the average values for the period 1969 - 1973 and the other for the period 1979 - 1983. The definitions of the variables are, as much as possible, similar to those in Graham (1987). Now the main data source is the United Nations Yearbook of National Accounts.[3]

The unweighted[4] OLS estimation results for the household saving ratio equation are presented in Table 1 with and without the LFWORK variable. We have introduced the inflation rate and the GNP per capita variable as additional explanatory variables. Moreover, in order to account for possible sectoral substitution effects (some evidence for those substitution effects is presented in Koskela and Virén (1986)) both the corporate and public sector saving variables have been experimented with in equations (1) and (2) of Table 1.[5]

The following features of results merit attention: while it is possible to get a reasonable explanatory power in particular if the sectoral saving substitution possibilities are taken into account, the results are otherwise far from satisfactory. With the exception of the demographic variables DEP and RET and the corporate and public sector saving variables SF and SG the coefficients are not precisely estimated. In particular, the LFWORK variable, stressed by Graham (1987), is insignificant in all regressions at standard significance levels. And finally, in some cases the coefficients are of incorrect

sign and the estimates seem to be unstable over time. Clearly, Graham's results are far from being robust.

An obvious explanation to these findings is the existence of outliers (which, in turn, may result e.g. from measurement errors). In order to find out whether this is true or not we tested for the presence of outliers in various ways: First, we used the Cook-Weisberg (1982) test procedure and to given the test results modelled the outlier observations by dummy variables. Alternatively, we estimated the equations using both the Least Absolute Deviations estimator and some robust estimators, in particular the Huber M-estimator (see Huber (1981) for details). The results of these analyses (which are available upon request from the authors) were very much in line with those presented in Table 1.

On the basis of the OLS and robust estimation results it is tempting to argue against the invariance of the household saving function across countries with widely different level of development (e.g. measurement by the GNP per capita). A way of trying to control for this possibility is to make use of the so-called digression analysis by estimating two, instead of one, regression relationships simultaneously from the data sample.[6] A set of result from this kind of exercise is reported in Table 2.

According to the digression estimation results there is a clear difference between low and high income countries and accounting for this difference by means of digression analysis helps to make explanatory power in the respective subsamples considerably higher over both periods 1968 - 1973 and 1978 - 1983. Unfortunately, however, the estimates in those subsamples show - like earlier - parameter instability over time, not to mention other problems.

All in all, the international cross section data we have used does not seem to provide much help in understanding why saving ratios differ across countries. In our view, the reported estimation results cast considerable doubt on the ability of the conventional life cycle and demographic variables a lá Modigliani-Felstein to account for the observed intercountry differences in household saving rates.[7]

Table 1 OLS ESTIMATION RESULTS FOR THE HOUSEHOLD SAVING RATIO

	69-73 (1)	79-83 (2)	69-73 (3)	79-83 (4)	69-73 (5)	79-83 (6)	69-73 (7)	79-83 (8)
$\hat{a}_0$	91.799	1.424	93.904	52.435	57.734	45.514	11.240	7.103
	(3.12)	(0.02)	(2.36)	(0.87)	(3.26)	(1.77)	(2.20)	(1.08)
SF	.752	-.492						
	(2.53)	(1.61)						
SG	-.643	-.486						
	(3.44)	(2.05)						
G	.393	2.890	.303	1.748	.084	.906	.395	1.646
	(0.98)	(2.20)	(0.61)	(1.09)	(0.19)	(0.67)	(0.80)	(1.32)
PCY	-.120	-.266	-.071	-.097	-.280	.639	.250	.048
	(0.36)	(0.43)	(0.17)	(0.13)	(0.84)	(1.28)	(0.88)	(0.12)
DEP	-1.191	-.018	-1.112	-.645	-.879	-.729		
	(4.11)	(0.03)	(2.84)	(1.06)	(2.92)	(1.68)		
RET	-1.298	.095	-1.366	.435	-1.234	-.758		
	(2.64)	(0.09)	(2.05)	(0.38)	(1.97)	(0.79)		
INFL	.325	-.095	-.128	.264	-.051	.235	-.618	.134
	(0.87)	(0.34)	(0.27)	(0.85)	(0.11)	(0.90)	(1.47)	(0.50)
LFWORK	.017	-1.49	-.029	-.129				
	(0.26)	(1.72)	(0.35)	(1.19)				
MLE	-.397	.293	-.395	-.180				
	(1.42)	(0.63)	(1.05)	(0.32)				
SEE	3.06	4.08	4.15	5.14	4.08	5.05	4.72	5.42
R2	.777	.669	.527	.393	.492	.334	.225	.143
F	5.02*	2.92*	2.39	1.39	3.29*	1.71	1.83	1.06

The dependent variable is the household saving ratio, INFL denotes the (sample average) rate of inflation, and SF (SG) corporate (public) sector saving relative to household's disposable income. All other variables are analogous to Graham's variables defined above. t-ratios are presented in parentheses. Starred F-statistics indicate that the null hypothesis of all coefficients being equal to zero cannot be rejected at the 5 per cent level of significance.

Table 2 DIGRESSION ESTIMATION RESULTS FOR THE HOUSEHOLD SAVING RATIO

	69-73			79-83		
	(1)	(2)	(3)	(4)	(5)	(6)
$\hat{a}_0$	75.146	67.968	52.481	27.670	49.260	20.466
	(10.10)	(10.15)	(4.07)	(2.62)	(2.19)	(0.95)
SF	.941	.543	.572	-.268	-1.304	-.630
	(4.42)	(7.37)	(2.04)	(2.24)	(2.62)	(2.13)
SG	-.577	-.750	-.552	-.611	.919	-.358
	(4.76)	(10.74)	(3.17)	(7.20)	(2.31)	(1.59)
G	-.209	.888	.303	6.325	-2.077	2.207
	(1.04)	(5.75)	(0.86)	(9.55)	(2.31)	(2.04)
DEP	-1.117	-1.584	-.814	-.555	-.424	-.137
	(10.26)	(11.15)	(3.94)	(3.29)	(1.14)	(0.38)
RET	-2.290	-.541	-1.227	-.483	-1.615	-.419
	(7.02)	(2.52)	(2.48)	(1.28)	(1.62)	(0.48)
SEE	1.22	0.55	3.19	1.49	2.15	4.35
R2	.970	.991	.683	.962	.917	.506
F	46.56*	85.51*	7.32*	35.06*	8.79*	3.48*
n	13	10	23	13	10	23
E:PCY	4709	8104	6185	6524	8467	7369

Equations (1) and (2) (and (4) and (5)) represent the estimates for the subsamples determined by the digression algorithm. Equations (3) and (6), in turn, represent OLS estimates for the whole sample. n denotes the number of observations and E:PCY the (sub)sample mean of GNP per capita in constant US dollars. All other symbols are the same as in Table 1.

FOOTNOTES

1) The participation equation Graham uses is of the form

(2) LFWORK = F(S/Y, PCY75, LFWORK60)

where LFWORK60 = the (lagged) labour force participation rate of females for the year 1960, PCY = the per capita income in 1975 and S/Y = the household savings ratio. It is hard to justify (2), if the life cycle view is stressed and if the savings ratio specification includes neither wealth nor persistence variables. For the qualitative properties of saving and labour supply which result from the intertemporal utility maximization, see e.g. King (1985).

2) The countries are: Australia, Austria, Belgium, Canada, Columbia, Equador, Finland, France, Germany, India, Italy, Japan, Korea, Malta, Netherlands, Phillippines, Portugal, South Africa, Spain, Sweden, Switzerland, United Kingdom and United States.

3) The exact definitions and data sources are reported in an unpublished data appendix, which is available from the authors upon request. Graham (in a private communication) has reproduced the data for the first sample period 1969 - 1973 and found some differences, particularly between the revised and unrevised savings ratio data. We have also found the same differences and, as it stands now, we might be willing to accept Graham's argument that the revised data are of better quality. But that does not make any difference. The simple truth is namely that in the regressions which Graham obtains both G and LFWORK fail to be significant. Moreover, one is hardly able to reject the hypothesis that the coefficients of the included variables are identically equal to zero (the corresponding significance levels are .07 and .05). Thus, it is only with Graham's OECD data when the household savings ratio is the dependent variable that these variables are significant.

4) Graham also reports results from the data, which are weighted by population. Given the fact that USA and Japan represent almost half of the total weight, this alternative is not very attractive. Because our sample includes India among others, weighting by population is even less reasonable.

5) In standard formulations of household saving behavior households are assumed to see neither through the "corporate" nor through the "government veil" in the sense that corporate saving, on the one hand, and government saving, on the other hand, have no direct effect on

household saving behavior. By introducing corporate and government savings as additional explanatory variables we try to account for these potential direct substitution effects.

6) In the digression analysis procedure data points are selected to two subsamples using either the least squares or the maximum likelihood criterion. We report the results obtained by the least squares method (the results obtained by the maximum likelihood method were practically identical). See Mustonen (1982) for details.

7) This may not be so surprising in the light of the difficulties to justify theoretically the "rate of growth" effects, which are so essential to the life cycle approach a lá Modigliani-Feldstein. See Farrell (1970) and Russel (1977) for details.

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DATA APPENDIX

Variable name	Definition
SH	Household savings ratio (net savings of households and non-profit institutions as a percentage of disposable income), average for 1969 - 1973, or 1979 - 1983.
SF	Corporate and quasicorporate enterprises' net savings as a percentage of households' disposable income, averaged for 1969 - 1973, or 1979 - 1983.
SG	General government's net savings as a percentage of households disposable income, averaged for 1969 -1973, or 1979 - 1983.
G	Growth rate of households' real disposable income, %, continously compounded average growth rates for 1969 - 1973, or 1979 - 1983.
PCY70	Gross National Product per head of mid-year population 1972, in constant U.S. dollars.
PCY80	Gross National Product per head of mid-year population 1982, in constant U.S. dollars.
DEP	Population aged 0 - 19 as a percentage of total population, averaged for 1969 - 1973, or 1979 - 1983.
RET	Population aged 65 plus as a percentage of total population, averaged for 1969 - 1973, or 1979 - 1983.
INFL	Rate of inflation, %, in terms of the implicit deflator private final consumption expenditure, continously compounded average growth rates for 1969 - 1973, or 1979 - 1983.
LFWORK	Labour force participation rate of females aged 25 - 54, %, in 1970, or 1980.
MLE	Life expectancy at birth, years, 1972 or 1982 figures.
POP	Mid-year population, millions, in 1972 or 1982.

DATA SOURCES

SH, SF, SG, G, INFL: Yearbook of National Accounts Statistics, Volume I, Individual Country Data, 1974 - 1978, and National Accounts Statistics: Main Aggregates and Detailed Tables, 1983, United Nations, New York, 1975 - 1979, and 1986.

PCY70, PCY80: International Financial Statistics, Supplement on Output Statistics, No. 8, International Monetary Fund, Washington, 1984.

DEP, RET, MLE: Demographic Yearbook 1975, United Nations, New York, 1976, and Demographic Yearbook Special Issue: Historical Supplement, United Nations, New York, and Economically Active Population 1950 - 2025: Estimates 1950 - 1980, and Projections 1985 - 2025, International Labor Office, Geneva, 1986.

LFWORK: Economically Active Population 1950 - 2025: Estimates 1950 - 1980, Projections 1985 - 2025, International Labor Office, Geneva, 1986.

POP: International Financial Statistics, Yearbook 1986, International Monetary Fund, Washington, 1987, and OECD National Accounts: Main Aggregates, Volume I, 1960 - 1985, OECD, Paris, 1987.

1969 - 1973 DATA

		SH	SF	SG	G	PCY70	DEP	RET	INFL	LFWORK	MLE	POP
1	AUSTRALIA	12.20	5.07	8.40	6.98	9740.0	37.36	8.38	6.48	39.88	72	13.30
2	AUSTRIA	11.92	6.27	9.25	6.62	7182.0	31.21	14.55	4.57	52.47	70	7.54
3	BELGIUM	17.23	2.70	1.78	6.43	8405.0	30.87	13.62	4.46	38.90	71	9.71
4	CANADA	7.35	7.15	4.91	5.90	9483.0	38.35	8.24	3.94	41.10	73	21.82
5	COLOMBIA	2.35	3.17	7.39	7.75	1039.4	56.17	3.03	12.04	22.01	60	21.67
6	ECUADOR	1.93	6.31	10.25	8.69	839.7	55.33	3.81	8.75	17.37	56	6.38
7	FINLAND	12.59	6.68	14.29	6.69	8102.0	32.42	9.72	5.33	70.75	70	4.64
8	FRANCE	16.39	12.75	6.85	6.23	8900.0	32.04	13.49	6.13	51.17	73	51.70
9	GERMANY	13.48	4.03	8.99	5.83	9622.0	29.54	13.52	4.77	47.62	71	61.67
10	INDIA	10.84	1.15	1.52	2.45	202.6	50.69	3.28	11.61	43.49	52	563.53
11	ITALY	18.19	1.49	-1.56	6.26	5255.0	31.54	11.54	6.04	33.89	72	54.40
12	JAPAN	21.32	7.88	11.25	9.87	6952.0	32.27	7.37	6.74	55.20	73	107.18
13	KOREA RE	6.12	2.46	7.66	11.19	931.9	51.41	3.37	12.28	40.57	65	33.51
14	MALTA	13.16	4.04	0.90	3.98	1519.0	38.65	8.55	1.00	15.00	71	0.30
15	NETHERLANDS	15.04	6.16	7.24	5.15	9285.0	34.39	10.65	7.24	22.89	74	13.33
16	PHILIPPINES	7.80	3.08	2.05	4.94	567.5	55.90	2.83	11.59	44.06	58	38.99
17	PORTUGAL	10.55	5.26	4.82	8.74	1824.3	36.50	9.94	5.89	23.31	67	8.97
18	SOUTH AFRICA	10.62	6.25	5.43	5.10	2337.0	51.05	4.07	6.31	43.30	58	23.67
19	SPAIN	9.87	5.21	5.29	5.78	4350.0	35.78	9.69	6.41	15.29	73	34.50
20	SWEDEN	5.53	3.65	16.01	3.01	11760.0	27.49	14.28	5.67	53.15	75	8.12
21	SWITZERLAND	15.06	8.13	6.63	3.56	14978.0	30.31	11.88	6.06	42.70	73	6.40
22	UNITED KINGDOM	5.69	1.29	7.34	3.46	7946.0	30.43	13.74	7.04	51.26	72	56.08
23	UNITED STATES	8.30	2.75	0.21	4.44	11043.0	36.77	10.10	4.27	49.83	71	209.90

1979 - 1983 DATA

		SH	SF	SG	G	PCY80	DEP	RET	INFL	LFWORK	MLE	POP
1	AUSTRALIA	13.39	3.30	2.67	2.60	10734.0	33.11	9.86	9.68	55.58	74	15.18
2	AUSTRIA	8.96	7.04	4.26	1.58	9333.0	27.91	14.80	5.55	60.06	73	7.57
3	BELGIUM	15.43	0.90	-8.43	1.02	10130.0	27.27	13.89	6.67	47.00	73	9.86
4	CANADA	13.66	6.07	-2.52	1.70	10741.0	30.56	10.06	9.58	60.47	75	24.66
5	COLOMBIA	11.02	8.84	1.79	2.63	1380.6	49.96	3.64	24.61	23.38	64	26.97
6	ECUADOR	13.96	7.36	5.33	1.46	1149.7	53.54	3.66	20.70	22.08	63	8.61
7	FINLAND	5.15	7.34	4.99	3.27	10223.0	27.46	12.12	9.92	81.28	73	4.83
8	FRANCE	12.03	-1.16	0.79	1.45	11107.0	29.61	13.16	11.43	60.92	75	54.48
9	GERMANY	10.71	3.25	2.12	0.86	11724.0	25.00	15.00	4.70	54.97	73	61.64
10	INDIA	15.68	1.69	2.96	3.02	240.4	48.08	4.18	8.48	38.03	55	716.88
11	ITALY	21.39	0.10	-7.45	2.13	6510.0	28.69	13.22	16.86	39.08	74	56.64
12	JAPAN	18.88	1.68	3.65	2.27	9398.0	29.89	9.54	3.87	55.06	77	118.45
13	KOREA RE	11.25	2.03	8.65	2.85	1657.5	44.02	3.92	14.98	41.07	67	39.33
14	MALTA	12.49	6.34	15.23	3.26	3473.5	30.99	9.71	6.90	19.75	72	0.36
15	NETHERLANDS	13.11	2.91	-1.03	-0.01	10335.0	29.65	11.65	5.17	37.49	76	14.31
16	PHILIPPINES	7.78	7.11	5.75	2.85	771.7	52.14	3.42	13.08	42.78	64	50.78
17	PORTUGAL	28.01	2.10	-2.21	3.95	2344.5	34.13	10.50	21.35	48.22	71	9.93
18	SOUTH AFRICA	6.92	16.44	2.56	3.00	2516.0	51.48	4.05	13.44	43.75	63	30.04
19	SPAIN	8.54	4.16	1.42	0.62	5027.0	33.94	10.89	17.98	22.47	74	37.96
20	SWEDEN	2.73	7.54	-1.46	-0.71	13344.0	25.93	16.62	10.48	78.02	77	8.33
21	SWITZERLAND	11.27	7.95	4.77	1.56	15859.0	26.45	13.93	4.75	52.18	79	6.47
22	UNITED KINGDOM	9.63	2.52	-2.43	1.25	8993.0	28.22	15.08	10.85	61.20	74	56.34
23	UNITED STATES	7.89	2.03	-3.48	1.99	12495.0	30.71	11.49	7.59	63.49	75	232.52

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ISSN 0785-3572

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