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DOES GOVERNMENT AND CORPORATE SAVING INFLUENCE HOUSEHOLD SAVING IN FINLAND?

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ABSTRACT

The aim of this paper is to empirically assess whether government and/or corporate sector saving influence aggregate household saving in Finland. The aim is carried out using quarterly data from the period 1960 - 1988. We use both a consumption function and an Euler equation approach, and both linear and nonlinear models are employed. We fail to document indications that household saving has been influenced by government or corporate sector saving during our sample period. Our findings suggest that households have behaved rationally on the whole in accordance with the basic permanent income hypothesis according to which government and corporate saving are not considered to be part of household disposable income. We furthermore find that a fraction of the households have been liquidity constrained, and that intertemporal substitution has been weak.

CONTENTS

1. INTRODUCTION

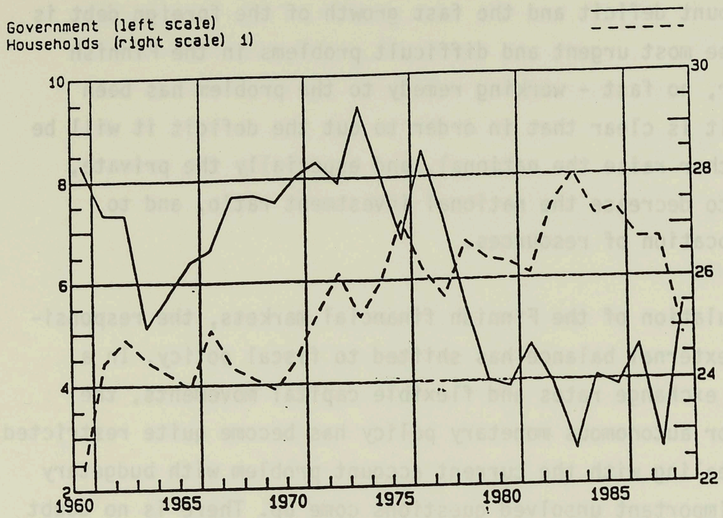
The current account deficit and the fast growth of the foreign debt is today seen as the most urgent and difficult problems in the Finnish economy. However, no fast - working remedy to the problem has been found. Anyhow, it is clear that in order to cut the deficit it will be necessary to either raise the national, and especially the private, saving rate or to decrease the national investment ratio, and to improve the allocation of resources.

After the deregulation of the Finnish financial markets, the responsibility for the external balance has shifted to fiscal policy. In a system of fixed exchange rates and flexible capital movements, the possibilities for autonomous monetary policy has become quite restricted. However, when dealing with the current account problem with budgetary policies, some important unsolved questions come up. There is no doubt that the most crucial of these is the question whether it in general will be possible to increase the national saving rate by increasing public sector saving. In this paper we investigate this question with Finnish macro data. In addition to the effects of government saving on household saving we are interested in the possible effects of corporate saving on household saving. The relevant question in this connection is whether households include corporate retained earnings, or part of them, in their permanent income and wealth or not.

Alongside the recent increased macroeconomic importance of the level of national saving in Finland our study was motivated also by some other considerations. Due to the major institutional changes in financial markets, household behavior seems to have changed dramatically in the eighties. Thus the inclusion of the most recent data as well as the utilization of recent developments in econometric methods might well give results differing from earlier studies of the subject. Visual inspection of the relevant time series is also somewhat encouraging. There seems to be some opposite short- and /or long-term movements between household and government saving on the one and household and corporate saving on the other hand (figures 1 and 2).

FIGURE 1

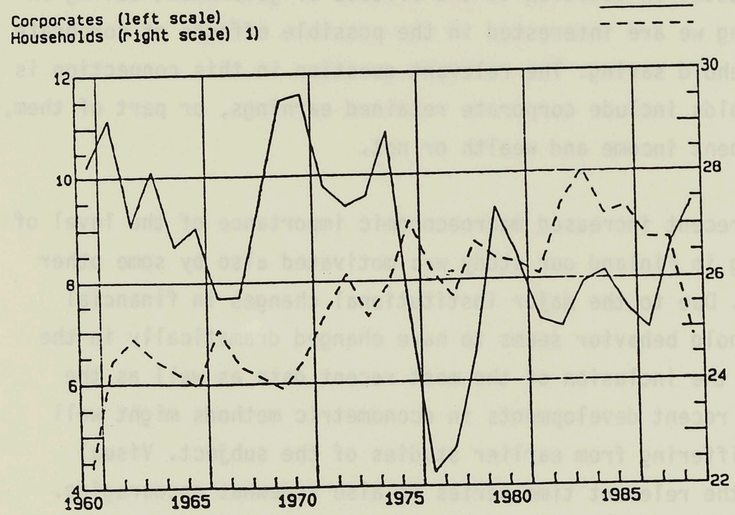
GROSS SAVING AS % OF GNP 1960-1988



1) Saving defined as disposable income less consumption of nondurables

FIGURE 2

GROSS SAVING AS % OF GNP 1960-1988



1) Saving defined as disposable income less consumption of nondurables

2. THEORETICAL CONSIDERATIONS

The traditional consumtion function relates household consumption to the present value of household lifetime wealth. In empirical investigations, household disposable income as well as the stock of their financial and real assets are usually used as proxies for wealth or life cycle income. Thus current taxes, government transfers and government debt are accounted for relating household consumption to their disposable income and including the stock of government interest-bearing debt in their stock of wealth. This means that in this otherwise intertemporal framework, the effects of future taxes and transfers (including interest payments) as well as the effects of current and future government consumption on household consumption are ignored. Because no allowance is made for the ability of households to foresee future budget constraints faced by the government, these functions deal in an asymmetric way with the influence of fiscal variables on household consumption. An increase in the budget deficit, given the level of government expenditure, leads to increased household disposable income, an expansion of aggregate consumption, a rise in the interest rate and therefore to a crowding out of private saving and capital formation.

The asymmetries in dealing with the effects of government present and future taxation and consumption or saving on household consumption or saving was first discussed by Bailey (1962) in a perfect foresight framework. In this framework households determine their saving (consumption) in conjunction with corporate and government sector saving (consumption). In this approach households are assumed to incorporate the intertemporal constraint of the government into their own budget constraints and to take account of the consequences of government activities for their own welfare.

An important implication of this hypothesis is the possibility of a direct substitution between private and government related activities. This can occur either through a substitution of public consumption for private consumption or through substitution of public savings for private savings. The first effect derives from the assumption that government consumption yields utility to individuals in a non-separable

way. The second effect depends on the idea that individual agents foresee the future tax liabilities associated with current and future deficit financing of government expenditures and take account of them in their present behaviour.

David and Scadding (1974) continued Bailey's work and introduced the concept of ultrarationality as an alternative to perfect foresight. Their modification was based on the observation that the private saving rate is more stable than either the personal or corporate saving rate or the national saving rate. David and Scadding argued that Bailey's formulation actually was a better description of relations within the private sector than of connections between the private and public sectors. For this reason, they focussed instead on the relationship of household and government saving, and on the relationship between household and corporate sector saving. According to them, wealth holders behave as if corporate and personal saving were near-perfect substitutes in their portfolio.

The implications of the hypotheses of perfect foresight and ultra-rationality have been pursued on different levels. The extreme view, mostly stemming from the work of Barro (1974), is based on a dynastic model. This model subsumes the aggregate behaviour of different overlapping generations of finitely lived consumers in the behaviour of a single infinitelly-lived representative consumer. The combination of ultrarationality and of dynastic behaviour has strong implications. Firstly, household consumption behaviour depends on total resources available to the economy rather than on disposable income. Given the level of public spending, households respond to every government bond issue with a one-for-one increase of private saving. Secondly, government debt ceases to be considered net wealth by the private sector since its currency value is exactly offset by the discounted value of the future taxes necessary to finance the implied stream of interest payments. The stock of outstanding government debt does not affect consumption levels since it leaves household lifetime wealth unaffected. Thirdly, there is no replacement of government debt for private assets in household portfolios, because households maintain the pre-debt optimal allocation of resources across generations by altering the level of private bequest.

However, because of the restrictive assumptions nesessary for the Ricardian equivalence hypothesis to hold, its empirical relevance can be questioned. In particular, the following restrictive assumptions have to hold if the world is to be Ricardian;

a) existence of intergenerational transfers motivated by altruism,

b) certain knowledge about household lifetimes, government future taxes and public expenditures,

c) absence of capital market imperfections,

d) existence of non-distionary taxation only.

The existence of distortive income taxation, double taxation of distributed corporate profits, imperfections in intergenerational transfers, household liquidity constraints and differing discount rates between households and the government make it hard to believe in Ricardian equivalence in the real world. Hence, the other two earlier mentioned non-traditional approaches might have some importance in reality, too. For this reason, we are focussing on the possible direct substitution between public and personal saving on the one hand, and between personal and government saving on the other hand.

If households do see through the corporate as well as the government veil, higher corporate or government saving will result in higher consumer expenditure and lower personal saving, and thus has important implications for economic policy. However, whether this holds or not is ultimately an empirical question. In order to shed some light on this question, we test the substitution hypotheses using Finnish macroeconomic time series from 1960 to 1988.

3. EMPIRICAL RESULTS

There are basically two frameworks within which to draw inference on the ability of households to see through the government and/or the corporate veil. These are the consumption function and the Euler equation for consumption. As both approaches can give insights the other cannot, we utilize both.

3.1 Consumption function estimates

Within the consumption function framework, our aim boils down to testing whether government and corporate saving variables belong in the equation or not.[1] We circumvent the problem of deriving "the" correctly specified consumption function by merely finding a data-congruent representation. Defining the consumption function as an optimal contingency rule that relates optimal current consumption to the information set currently available, we let economic theory indicate which variables to enter into the information set, but let empirical evidence guide us to the final, most parsimonious approximation of the data generating mechanism for consumption. In particular, this entails considering the trending - stochastic or otherwise - properties of the variables.

The following variables may be part of the information set determining optimal consumption of nondurables c according to theoretical considerations : disposable income y, the real interest rate r, wages w, the rate of inflation Δp, the unemployment rate u and household liquidity l. Unfortunately, wealth cannot be included in the list, since no reliable measure of household wealth in Finland is available. Variables y, r and w follow from conventional intertemporal optimization considerations (y proxying for wealth), while Δp and u may capture the degree of uncertainty and l the effects of credit

[1]This has been done by Koskela - Virén (1984, 1986), who using annual data for Finland covering the period 1960 - 1980 do not find support for the substitutability hypotheses. However, their findings may be hampered by the very low degrees of freedom in their studies.

rationing. Alternatively, Δp may proxy the gains and losses in wealth due to inflation, u could represent general business cycle conditions and l may proxy for wealth. This list is by no means exhaustive, but it conforms to the set of variables most commonly used in descriptive consumption functions. Government and corporate saving is denoted sg and sc, respectively.

In estimation, we use Finnish seasonally adjusted quarterly observations spanning the period 1960Q1 - 1988Q4. Data are, were suitable, logged and expressed in real per capita terms (see Appendix 1 for a more detailed account of the construction of variables and data sources). The joint integrating properties of the variables were first investigated, employing Dickey-Fuller -type tests in the univariate case and Johansen tests in the multivariate case (see e.g. Pagan & Wickens (1989) for an exposition of these methods). As expected, all variables turned out to be I(1), except r, Δp and u, which are I(0) (results not shown for sake of brevity). Hence, the maximum likelihood procedure is applicable.

According to the Johansen procedure, many of our variables form (zero frequency) cointegrated systems. Thus, c and y are cointegrated, while e.g. c, y and l do not form a stationary system. However, a steady state exists between c, y, l, sg and sc (although the equilibrating forces in this case appear to be very weak).[2] For brevity, and anticipating further results, only results for the consumption-income relation is shown (Table A2.1, Appendix 2). According to the estimates, the cointegration parameter is 0.720 while the speed of adjustment of consumption toward its steady state value is 0.380.[3] All in all, our

[2]Note that cointegration between c, y, l, sg and sc does not imply that sg and/or sc affect c. While cointegration implies causation, it is silent about the direction of causation. Since Starck (1989) has shown that y is Granger causally prior to c, the case that sg and sc do not influence c is left standing.

[3]While the parameter estimates are reasonable, the evidence for cointegration is not overly strong. The max test barely rejects noncointegration whereas the trace test does not reject this null hypothesis. However, the max test is known to be superior in power when the eigenvalues are of clearly different magnitude (the current case). Moreover, noncointegration cannot be rejected if one assumes that the series are not linearly trending.

preliminary data analysis leads us to formulate a consumption function in first differences including error correction terms.

Lengthy sequential simplification of an unrestricted autoregressive distributed lag model for consumption based on the variables Δc, Δy, r, Δw, Δp, u, and Δl, a constant and a dummy variable d for an aberrant observation (1969Q4) yielded an empirically satisfactory equation in the variables Δc, Δy, r, d, a constant and the maximum likelihood estimate of the equilibrium error between c and y. Estimation results for this preferred model are displayed in Table 1, which comprises ordinary least - squares (OLS) as well as instrumental variables (IV) estimates.[4]

The preferred model estimated by OLS is displayed as equation 1 in Table 1. All explanatory variables, notably the error correction term, are highly significant, and the explanatory power of the model is quite satisfactory for a specification in differences.[5] The representation appears to be free from autocorrelation and unconditional as well as autoregressive conditional heteroskedasticity, but the normality of the residuals can be rejected. Judging by a Chow test, the specification furthermore is stable across the period of financial deregulation - a period in which conventional consumption functions typically have failed (Brodin & Nymoen (1989) and Lehmussaari (1990)). Extensive scrutiny of sequential Chow tests, 1-step residuals and recursive estimates (not shown) reinforced the stability of the model.

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[4]In the reported estimates, r is the real interest rate on bank lending and sg and sc are net SNA values. Results were remarkably robust to the operationalization of r, sg and sc (see Appendix 1). In IV estimation, the following instruments were used: lag 3 of Δc and lags 2 and 3 of Δc, r, Δw, Δp, u and Δl. Since c and y are measured as quarterly averages rather than at points in time, first lags are inadmissible (Hall (1988)). All results were robust to the choice of instruments and their lag lengths.

[5]The positive sign of the real interest rate variable is convincingly data-congruent; it is a salient, constant feature of all specifications and all operalizations of the real interest rate variable in both OLS and IV estimations.

TABLE 1
CONSUMPTION FUNCTION ESTIMATES

Regressors/ Statistics	Regressand Δc_t (1)	(2)	(3)	(4)
constant	0.015 (2.16) [2.16]	0.010 (1.43) [1.49]	0.013 (1.37)	0.009 (0.923)
Δc_{t-1}	-0.253 (-3.21) [-3.20]	-0.253 (-3.21) [-3.11]	-0.185 (-1.10)	-0.217 (-1.36)
Δy_t	0.197 (2.92) [2.80]	0.246 (3.39) [3.23]	0.235 (2.05)	0.263 (2.13)
r_t	0.429 (3.13) [3.35]	0.362 (2.58) [2.48]	0.512 (2.65)	0.426 (2.34)
$c_{t-1}-0.720y_{t-1}$	-2.00 (-6.32) [-6.32]	-2.11 (-6.57) [-6.32]	-2.64 (-1.67)	-2.41 (-1.63)
d_t	0.264 (3.91) [18.0]	0.269 (4.02) [1.08]	0.254 (3.64)	0.262 (3.86)
Δsg_t		8.62×10^{-3} (1.46) [0.85]		8.63×10^{-3} (1.25)
Δsc_t		8.87×10^{-7} (1.59) [0.97]		8.57×10^{-7} (1.53)
$\bar{R}^2$	0.456	0.466		
SEE	0.066	0.065	0.066	0.065
SC	-5.24	-5.20		
HQ	-5.33	-5.31		
FPE	0.005	0.005		
LM(1)	0.486	0.752		
LM(4)	0.660	0.748		
ARCH(1)	0.658	0.833		
JB	30.2	38.5		
CHOW(1986Q1)	0.641	0.702		
Estimation method	OLS	OLS	IV	IV

The estimation period is 1961Q1 - 1988Q4 for equations (1) - (2) and 1961Q4 - 1988Q4 for equations (3) - (4). Numbers in parentheses are t statistics and numbers in square brackets heteroskedasticity consistent t statistics. SC is the Schwarz information criterion, HQ the Hannan-Quinn criterion and FPE denotes the final prediction error. LM(1) and LM(4) are LM tests for first and fourth order residual autocorrelation, respectively. ARCH(1) is a LM test for first - order autoregressive conditional heteroskedasticity. JB is a $\chi^2(2)$ - distributed test for normality of residuals. CHOW(1986Q1) is a Chow test for parameter constancy assuming the breaking point 1986Q1. Marginal significance levels are reported for LM(1), LM(4), ARCH(1) and CHOW (1986Q1).

Since we wish to introduce variables describing government and corporate sector saving, the failure to treat potential endogeneity could be a serious omission. Hence, our preferred model was re-estimated using a consistent and asymptotically normal instrumental variables estimator (equation 3). The resulting parameter estimates were close to those obtained with the inconsistent estimator, but some efficiency was, as can be expected, lost.

Introducing the variables Δsg and Δsc into our preferred model (equations 2 and 4) finally gives a fairly clear-cut picture of their relevance in influencing household consumption. The savings variables enter with the expected signs, but it is not possible to reject the hypotheses that government and corporate sector saving carry zero weight in the household consumption function. In fact, nonrejections are encountered at all reasonable levels of significance, across all operationalizations of the savings variables and for all lags, distributed or other, of these variables, and importantly enough also across subperiods.

3.2 Euler equation estimates

As in the consumption function approach, the relevance of government and corporate sector saving for household saving can be investigated by contrasting models incorporating these additional variables and conventional models. In nonlinear frameworks this amounts to tests of overidentifying restrictions generated by expanded sets of instruments, and in linear environments to inclusion of the additonal variables as explanatory variables.

However, the Euler equation approach is a weaker framework for testing in the following sense. Under the null hypothesis, orthogonality obtains both when sg and sc are, and when they are not, in the household information set. Moreover, the alternative hypothesis is much more vague than in the consumption function approach. Rejection of the null hypothesis may thus be congruent with either the view that sg and sc have not been taken into account (when they should have been

taken into account), or with the view that sg and sc proxy for some component of disposable income (when sg and sc do not matter). Hence, only rejection of the null hypothesis is informative, and even in that case the exact interpretation remains open to discussion.

The basic first-order condition characterizing an optimal consumption plan is

$$(3.1) \qquad E\left[\{(1+r)\beta U'(c_{t+1})/U'(c_t) - 1\} \mid I_t\right] = 0$$

where $E[.]$ is the expectations operator, $\beta = 1/(1+\delta)$ is a discount factor where $\delta \leq r$ is the rate of subjective time preference, $U(.)$ is a time-separable, strictly concave utility function in the level of consumption and I is the information set relevant for the consumer. Equation (3.1) embodies the notion that, ex ante, the marginal rate of substitution and the marginal rate of transformation are equated. Of course, the two rates can differ ex post, since the realization of future income is not perfectly foreseen. This discrepancy is represented by the consumption innovation defined by the term in brackets. This residual should be uncorrelated with any variable in I, a restriction which is referred to as an orthogonality condition.

Now assume that the utility function is of the constant elasticity of substitution form, i.e. $U(c) = c^{1-1/\sigma}$, $\sigma > 0$, $\sigma \neq 1$, where σ is the elasticity of intertemporal substitution.[6] Then the Euler equation (3.1) takes the form

$$(3.2) \qquad E\left[\{c_{t+1}/c_t - [(1+r)\beta]^{\sigma}\} \mid I_t\right] = 0$$

or, with the addition of a drift term θ to account for the growth in consumption caused by factors such as technological change, it takes the form

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[6]Given the assumed utility function, σ can formally be thought of as the reciprocal of the Arrow-Pratt coefficient of relative risk aversion. However, since we are dealing with changes in consumption over time, interpreting σ as an intertemporal elasticity is more natural (Hall (1988)). Assuming a more general utility function would spell out this interpretation explicitly (Weil (1990)), but it would complicate estimation considerably.

$$(3.3) \qquad E\left[\{c_{t+1}/c_t - [\theta+((1+r)\beta)^{\sigma}]\} \mid I_t\right] = 0$$

which displays consumption growth as a random walk with drift. Equation (3.3) is our basic estimating Euler equation.

In addition to investigating if government and corporate sector saving influence household saving within the basic Euler equation (3.3), we will pursue our aim within generalizations of the basic model. We consider three generalizations, which result from relaxing the following assumptions implicit in the basic representation: a constant real rate of interest, perfect capital markets, and additive separability of consumption and leisure in the utility function. However, rather than analyzing the plethora of permutations generated by relaxing these assumptions, we will only present a representative selection of models.

The most straightforward generalization of the basic Euler equation is to introduce a stochastic real rate of interest. Equation (3.3) then simply turns into

$$(3.4) \qquad E\left[\{c_{t+1}/c_t - [\theta+((1+r_t)\beta)^{\sigma}]\} \mid I_t\right] = 0.$$

Relaxing the assumption of perfect capital markets is slightly more involved, since the Euler equation simply does not hold in the presence of e.g. liquidity constraints. One can nevertheless proceed by assuming that there are two groups of consumers, the first of which obeys the basic Euler equation (3.3), and the second of which are rule-of-thumb consumers who simply consume a constant fraction of current income. For the second group of consumers - who can be thought of as being liquidity constrained - the expected rate of growth of consumption is equal to the expected rate of growth of disposable income

$$(3.5) \qquad E\left[\{c_{t+1}/c_t - y_{t+1}/y_t\} \mid I_t\right] = 0$$

where y denotes the level of disposable income. Consumption in the aggregate is then obtained by weighting equations (3.3) and (3.5) by

the proportion of aggregate consumption in the two categories of consumers

$$(3.6) \qquad E\left[\{c_{t+1}/c_t - \lambda y_{t+1}/y_t - (1-\lambda)[\theta+((1+r)\beta)^{\sigma}]\} \mid I_t\right] = 0$$

where λ denotes the fraction of aggregate consumption that accrues to individuals who are liquidity constrained. Under the standard permanent income hypothesis $\lambda = 0$, whereas if consumers are liquidity constrained $0 < \lambda < 1$. Hence, an estimate of λ close to 0 may be thought of as evidence in favor of the permanent income hypothesis, while a large estimate of this parameter point away from the permanent income hypothesis. Coupled with a stochastic interest rate the more general model becomes

$$(3.7) \qquad E\left[\{c_{t+1}/c_t - \lambda y_{t+1}/y_t - (1-\lambda)[\theta+((1+r_t)\beta]^{\sigma}\} \mid I_t\right] = 0.$$

Lastly, relaxing the separation between the consumption and labor supply decision can be shown to introduce a term w_{t+1}/w_t into the basic Euler equation (3.3), with corresponding additions to other permutations of the first-order condition.

Proceeding to estimation, we note that the class of generalized method of moments (GMM) estimators are, by their very nature, well suited for the estimation of first-order conditions (strict equalities). In particular, the nonlinear, instrumental variables GMM estimator of Hansen(1982) can handle equations like ours. This procedure yields unbiased, efficient and robust parameter estimates even in small samples, and it delivers a test of the orthogonality conditions implied by the rational expectations hypothesis. When computing the consistent covariance matrix, we furthermore incorporate a correction for heteroskedasticity.

Despite the desirable theoretical properties of the Hansen -estimator, the Euler equations with stochastic real rates of return and/or wages are highly nonlinear and thus difficult to work with. In order to side-step the difficulties associated with nonlinear estimation, the Euler equations can be made linear by distributional assumptions on the model variables. Specifically, assuming lognormality renders the

models (log)linear, in which case the tests of overidentifying restrictions can be performed as conventional t tests. Of course, parameter estimates will generally not be consistent if this distributional assumption is incorrect.[7] Hence, we will present both GMM and IV estimates of the above Euler equations while relying on loglinear specifications in more complicated cases.

Estimation results for a selection of nonlinear and linear Euler equations are presented in Table 2.[8] With respect to the GMM estimates, equation 5 presents the estimation results for the basic random walk with drift model (3.3). In equation 6 a stochastic real rate of interest is introduced (see (3.4)), in equation 7 liquidity constrained consumers are introduced (see (3.6)) and in equation 8 an environment with stochastic real rates of interest and liquidity constraints is considered (see (3.7)).

Using the Hansen estimator, the basic random walk with drift specification performs best in terms of the standard error of estimation. However, some autocorrelation remains in the residual from all specifications hence casting some doubt on the models. In particular, the low DWs may signal the use of an incorrect functional form or a problem with omitted variables. The low DWs may also be picking up the presence of MA(1) errors introduced by the twice-lagged instruments and the partial

[7] Note that the GMM estimation procedure does not require that the distribution of the model variables be specified a priori. In particular, it does not require that the logarithmic form of the orthogonality conditions hold.

[8] In the reported estimates, r is the real interest rate on new bank lending and sg and sc are net SNA values. Results were remarkably robust to the operationalization of r, sg and sc (see Appendix 1). In GMM estimation, the following instruments were used: lags 2 and 3 of Δc, Δy, r, Δsg and Δsc. Short lags are preferrable in GMM estimation (Tauchen (1986)), and twice-lagging of instruments reduces the adverse effects introduced into estimation by delays in the publication of consumer statistics, durability in c and white noise measurement errors in c (Campbell & Mankiw (1987)). The discount factor β was fixed at the value 0.99, since free estimation of this parameter turned out to be difficult. In IV estimation, lags 2 and 3 of the stochastic regressors were used as instruments. First lags of instruments were not used because of the reason spelled out in footnote 4. All results were robust to the value of β and to the choice of instruments and their lag lengths.

TABLE 2
EULER EQUATION ESTIMATES

Parameters/ Regressors/ Statistics	Regressand Δc_t								
	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
constant	0.017		0.016		0.015	0.013	-0.016	0.011	-0.017
	(1.83)		(1.46)		(1.72)	(1.45)	(-0.650)	(0.922)	(-0.759)
θ		-0.986		-0.979					
		(-101)		(-70.8)					
σ		0.206		0.339		0.187	0.158	0.234	0.158
		(1.33)		(1.32)		(0.978)	(0.638)	(0.511)	(0.591)
λ			0.326	0.263			0.898		0.922
			(2.16)	(2.63)			(1.34)		(1.67)
Δw_t								0.044	0.005
								(0.178)	(0.014)
d_t	0.127	0.018	0.035	-0.096	0.224	0.013	0.217	0.212	0.217
	(0.465)	(0.053)	(0.105)	(-0.233)	(2.60)	(1.45)	(1.92)	(2.29)	(1.85)
Δsg_t					0.00011	0.00012	0.00035	0.00012	0.00035
					(1.29)	(1.43)	(1.72)	(1.32)	(1.97)
Δsc_t					0.00797	0.00725	0.00934	0.00743	0.00943
					(1.17)	(1.05)	(1.03)	(1.00)	(0.978)
SEE	0.087	0.088	0.090	0.092	0.086	0.086	0.111	0.086	0.113
4-DW	1.21	1.22	1.09	1.13	1.18	1.14	1.24	1.14	1.24
Orthogonality	0.276	0.209	0.214	0.124					
Estimation method	GMM	GMM	GMM	GMM	IV	IV	IV	IV	IV

The estimation period is 1961Q4-1988Q4. Numbers in parentheses are t statistics. Orthogonality denotes the Hansen (1982) test for overidentifying restrictions. Marginal significance levels are reported for this test.

semidurable character of our consumption series (see Mankiw (1982), Cambell & Mankiw (1987) and Appendix 1). Interestingly and importantly enough however, in no case is one formally able to reject the specifications.[9] In other words, it seems that Finnish data from the period 1960 - 1988 are not at variance with the permanent income hypothesis and rational, albeit possibly myopic, behavior on part of at least some of the consumers. These results tend to confirm the earlier findings by Starck (1987).

Some 30 per cent of the households have, on average, been subject to liquidity constraints according to the estimates. This is in accordance with some earlier empirical results (Haaparanta et al. (1988)), although higher percentages have also been documented (Kosonen (1986)). See Jappelli & Pagano (1989) for results for other countries and additional references. There does not seem to be much tendency toward intertemporal substitution; parameter estimates lie in the range 0.2 - 0.3, but do not differ significantly from zero. Using Finnish data from the period 1960 - 1984, Starck (1987) attributes an order of magnitude of 0.1 to the elasticity of intertemporal substitution, but this estimate is also statistically indistinguishable from zero. The negative sign of the drift parameter picks up the negative trend in per capita consumption caused by our choice of population measure (see Appendix 1). It may also reflect the gradual decrease in income uncertainty during our sample period.

With regard to the results on the effects of government and corporate sector saving on household saving, nonrejection of the relevant overidentifying restrictions are, as noted earlier, unfortunately

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[9]Nonrejection occurred both when Δsg and Δsc were included in the list of instruments and when they were excluded from the list. Nonrejection was also a salient feature in subsample analyses. However, one cannot exclude the possibility that nonrejections partly may be attributable to the difficulty of finding good instrumental variables (Nelson & Startz (1990a, b)). Furthermore, there is only very limited evidence on the small sample properties of the GMM approach. Nevertheless, some Monte Carlo results have been generated to show that the test of the overidentifying restrictions performs well in small samples; if anything, the test is biased toward acceptance of the null hypothesis (Tauchen (1986)).

relatively uninformative. The empirical evidence is both consistent with the standard permanent income hypothesis according to which sg and sc are not part of household disposable income, and with a nonstandard interpretation according to which households take sg and sc into account. However, coupled with the results from consumption function estimates, the findings point to the view that government and corporate sector saving has not significantly influenced household saving.

Turning to the loglinear specifications, we note that equation 9 is the counterpart to equation 5, equation 10 to equation 6 and equation 11 to equation 8. Equations 12 and 13 add wage growth to the equations 10 and 11, respectively. Some of the linear specifications outperform their nonlinear counterparts in terms of the standard error of estimation. However, all estimating equations have autocorrelated residuals. The most data congruent Euler equation is, again, the basic random walk with drift specification (equation 9).

The fraction of the consumers who are subject to liquidity constraints is in the linear models estimated to lie, on average, in the vicinity of 90 per cent. This stands in sharp contrast to the results obtained from the nonlinear specifications. However, more weight should probably be given to the nonlinear estimates, since the point estimates from the linear specifications do not significantly differ from zero, and since the distributional assumptions underlying the linear models may be wrong. On the contrary, the estimates of the elasticity of intertemporal substitution is more believable, being, albeit statistically indistinguishable from zero, in the range of 0.2.[10] The sign of the coefficient on the wage growth variable indicates that consumption and leisure are gross complements as an increase in leisure will raise the marginal utility of consumption.

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[10]Monte Carlo evidence presented by Mao (1989) indicates that the point estimate of σ produced by a loglinear model tends to be unbiased with a small standard error. On the other hand, Attanasio & Weber (1990) present evidence suggesting that aggregation bias may cause our estimate of σ to be understated. In general, one has to interpret parameter estimates with some caution, however, since the IV procedure can be unreliable if the instruments are poor (Nelson & Startz (1990a, b)).

With regard to the results on the effects of government and corporate sector saving on household saving, a clear-cut picture, once again, emerges. The savings variables display the expected signs, but in not a single case is it possible to reject the hypotheses that government and corporate sector savings do not influence household saving.[11] All in all, the results from the Euler equations suggest that Finnish households have behaved rationally during the period 1960 - 1988 in accordance with the basic permanent income hypothesis according to which government and corporate saving are not considered to be part of household disposable income.

The finding that government saving does not influence household saving is, given constancy of taxes and government debt, at variance with the Ricardian Equivalence proposition (REP). A possible explanation for the evidence against this hypothesis is our finding that liquidity constraints have been prevalent. However, the existence of imperfect credit markets does not necessary imply that the REP fails (Hayashi (1987)). This is, inter alia, because observed liquidity constraints may be an endogenous feature of an equilibrium (Stiglitz & Weiss (1981)). Under such circumstances, liquidity constraints adjust in response to government policies, and the nature of this adjustment restores Ricardian equivalence (see also Hayford (1989)). Testing for the equality of the planning horizon for the public and private sectors along the line suggested by Hague (1987) and Leiderman & Razin (1988) failed to turn up evidence against the REP. See Bayoumi (1990) for additional evidence in favor of the REP for the Finnish case.

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[11] In equation 13, the coefficient on Δsg is nominally very close to being statistically distinguishable from zero at the 5 per cent level of significance. However, the estimated standard error of this coefficient is biased downward for two reasons. Firstly, the equation is plagued with autocorrelated errors (Vinod (1976) and Kiviet (1980)). Secondly, a Monte Carlo study indicates that IV estimation of loglinear models like ours may yield too small standard errors on the estimated parameters (Mao (1989)). Nonrejection furthermore occurred in many other models, e.g. including lags of Δsg and Δsc, and in analyses of subsamples.

4. CONCLUSIONS

The aim of this paper was to empirically assess whether government and/or corporate sector saving influence household saving in Finland. In other words, the question is whether saving by the government and corporate retained earnings are considered to be part of the disposable income of households. The aim was carried out using quarterly data from the period 1960 - 1988 using both an approach based on the consumption function and an Euler equation approach. Both linear and nonlinear models were employed, and estimation was carried out using OLS, IV and GMM techniques.

The empirical evidence presented in this paper appears to be unanimous and robust. Despite fairly thorough attempts to reject the null hypothesis that government and corporate saving does not influence household saving, we fail to pick up any credible indications that household saving is influenced by government or corporate sector saving. We interpret the findings to suggest that Finnish households have, on the whole, behaved rationally during our sample period in accordance with the basic permanent income hypothesis according to which government and corporate saving are not considered to be part of household disposable income. We furthermore find that a fraction of the households have been facing liquidity constraints, and that the tendency toward intertemporal substitution has been weak.

Regarding the conclusions of our study, some cautionary remarks are in order. Firstly, there are still evidently too few observations of household behavior from the period of liberalized financial markets. Thus the visually observed recent opposite trends in the relevant time series do not carry more than their relative weight in the analyses. Secondly, the exclusion of the service flow of durables from household consumption may be harmful. Thirdly, experimentation with variables like government present and future saving versus taxation might have som implications for the results. Fourthly, unavoidable issues involving measurement errors, aggregation biases and the use of seasonally adjusted data may distort the results.

APPENDIX 1

Variables and data sources

c	log of real per capita private consumption of non- and semidurables
y	log of real per capita household disposable income
r	real rate of interest, per cent. Three variants of the nominal rate are used: average rate of deposit banks' new lending, after-tax (using the BOF4 estimate of the personal marginal tax rate; see the publication on the BOF4 quarterly model of the Finnish economy) short-term money market rate and the market yield on tax-free bonds. See the main text for documentation of which variant is being employed at each instant.
w	log of real per capita total wage rate
Δp	growth rate of private consumption prices of non- and semidurables, per cent
u	unemployment rate, per cent
l	log of real per capita currency in circulation plus banks' deposits by the public
sg	real per capita government sector (central government and municipals) saving. Three variants are used: net and gross SNA values and net values of the BOF4 model (see the publication on the BOF4 quarterly model of the Finnish economy). Annual SNA values are interpolated to quarterly values using observations on quarterly government sector real per capita disposable income. See the main text for documentation of which variant is being employed at each instant.
sc	real per capita corporate saving. Three variants are used: net and gross SNA values and net values of the BOF4 model (see the publication on the BOF4 quarterly model of the Finnish economy). Annual SNA values are interpolated to quarterly values using the BOF4 values. See the main text for documentation of which variant is being employed at each instant.
d	dummy variable taking the value 1 in 1969Q4 and 0 otherwise

Private consumption prices of non- and semidurables (1985 = 100) have been used as the deflator. Per capita values are obtained utilizing the population of working age (15 - 74 years, 1000 persons). Growth rates are per annum per cents. All series are seasally adjusted at the source. Data are quarterly Finnish observations covering the period 1960Q1 - 1988Q4. Data sources are the Central Statistical Office of Finland and the Bank of Finland.

APPENDIX 2

Maximum likelihood inference on cointegration between consumption and income

TABLE A2.1

Estimation results for a VAR(4) model of consumption and income

Eigenvalues

0.123	0.005

Tests for cointegration

H_2	trace	trace (0.95)	max	max (0.95)
$r \leq 1$	0.614	8.08	0.614	8.08
$r = 0$	15.3	17.8	14.6	14.6

Normalized eigenvectors and loadings

$$\begin{array}{c} \\ c \\ y \end{array} \begin{array}{c} \begin{array}{cc} c & y \end{array} \\ \begin{bmatrix} 1.00 & -0.720 \\ -4.87 & 1.00 \end{bmatrix} \end{array} \quad \begin{array}{c} \begin{array}{cc} c & y \end{array} \\ \begin{bmatrix} -0.380 & 0.002 \\ 0.216 & 0.003 \end{bmatrix} \end{array}$$

The estimation period is 1961Q1 - 1988Q4. Critical values (95 per cent quantiles) for the test statistics have been tabulated by Johansen & Juselius (1990).

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