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TESTING THE DIRECT SUBSTITUTABILITY HYPOTHESIS OF SAVING

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TESTING THE DIRECT SUBSTITUTABILITY HYPOTHESIS OF SAVING

by

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Abstract:

This paper contains some tests for the direct substitutability hypotheses of household saving with respect to corporate and/or government saving by using an international data set from 12 OECD countries. On the whole findings suggest that the hypothesis according to which households pierce (partly) through the 'corporate veil' cannot be rejected, while the hypothesis that household subsume government behaviour under its own behaviour does not get clear support.

1. INTRODUCTION

Standard formulations of consumption and saving behaviour of households typically use disposable income or their corresponding 'permanent income' proxies as the relevant concept of income. Households are thus assumed to see neither through the 'corporate' nor through the 'government veil' in the sense that corporate saving (corporate retained earnings), on the one hand, and government saving, on the other hand, have no direct effect on household consumption and saving behaviour. Accordingly, the corporate dividend policy and the way of financing government expenditure matter for household consumption and saving only to the extent they affect households' disposable income.

As far as the corporate saving is concerned, it, in fact, may affect household saving and consumption at least via two channels. First there is a capital gains effect which results from the increase in the real market value of existing assets when retained earnings increase and secondly according to a direct substitution effect an increase in corporate retained earnings directly offsets saving - household and corporate savings are just close or even perfect substitutes. Empirical evidence on the corporate substitution hypothesis is mixed (see Feldstein (1973), Feldstein and Fane (1973), and Koskela and Virén (1984) on the one hand and Bhatia (1979) on the other hand). The idea behind the direct substitution hypothesis of government saving with household saving in turn is that there would be no more reason for treating government as an entity separate from the household sector than there would be for treating corporations as entities separate from stockholders. The government substitution hypothesis implies that changes in government saving induces offsetting changes in household saving.

Empirical evidence about the direct government substitution hypothesis is somewhat inconclusive (see Blume and Siegel (1982), von Furstenberg (1981) and Miller (1983)). In this connection one should notice a difficulty to distinguish between this and Barro´s debt neutrality hypothesis according to which a switch from tax to debt financing of government expenditures does not matter for household consumption behaviour. There are various ways of testing this debt neutrality hypothesis (see e.g. Buiter and Tobin (1979)) but if a weak test of debt neutrality is compared with the direct government substitution hypothesis, then the difference between them boils down to the question of whether government deficit or government saving should be introduced into household consumption function. Empirical evidence on debt neutrality hypothesis is also rather mixed (see Kochin (1974), Buiter and Tobin (1979), Koskela and Virén (1983) and Seater (1982)).

With few exceptions empirical evidence concerning all these hypotheses thus far discussed has been obtained from US time series data. Typically time series which have been used have been very short which may partly explain relatively large differences in results.

The potential importance of these substitution hypotheses can be illustrated by considering the effects of tax-induced changes in corporate dividend policy. If households see through the 'corporate', but not through the 'government veil', then they adjust their personal savings to changes in corporate savings so that dividend policy have little or no effect on private sector savings. However, if households see through the 'corporate and government veil', then one must take into account the eventual offsetting effects of changes in government saving (due to changes in government tax revenue) on household saving. If the latter effect is strong

enough, then the private sector savings will vary over time resulting e.g. from tax-induced changes in corporate dividend policy. Obviously, this kind of behaviour would be, not only at variance with the "ultra-nationality" hypothesis presented by David and Scadding (1974), but also of considerable bearing from public finance point of view.

The purpose of this paper is to present some further empirical evidence on the question of whether or not corporate and/or government saving are 'substitutes' for household saving in the following respects: First, by taking both corporate and government saving explicitly into account we provide a systematic analysis of the direct substitutability issue without any restrictive assumptions about the substitutability of either corporate or government saving. Thus for instance the substitutability of government saving is tested by allowing the imperfect substitutability of household and corporate savings. The concentration of the existing literature on the role of either the corporate or the government sector is a bit surprising because in both cases the real issue concerns the relevant perceived budget constraint for households. Second, we use a large international cross-country data from 12 OECD-countries the total number of observations being 193. Given the scanty and a bit inconclusive evidence about the direct substitutability hypotheses particularly when considered simultaneously (see Blume and Siegel (1982), von Furstenberg (1981), Miller (1983)), the use of large international-data basis seems to be well-motivated.

In what follows theoretical considerations are discussed in section 2 while section 3 is devoted to empirical results.

2. THEORETICAL CONSIDERATIONS

A fairly conventional consumption function explains consumption in terms of lagged consumption and households´ real disposable income. If we include corporate saving, government saving, the first difference in unemployment rate and country dummies as additional explanatory variables, then we end up with the following standard consumption function specification to be estimated from pooled cross section-time series data

$$(1) \qquad c_t = a_1 y_t + a_2 s_{ct} + a_3 s_{gt} + a_4 u_t + a_5 c_{t-1} + \sum_{j=1}^{12} d_j D_j + e_t$$

where c_t refers to real private consumption expenditure at constant prices, y_t to households´ real disposable income, s_c to corporate real savings, s_g to government (public sector) real savings, and u_t to first difference in unemployment rate. D_j´s describe country dummies used with pooled cross country data and e_t is the error term.[1,2)]

The additional variable, u_t, can be interpreted in various ways. First, it can be loosely justified by referring to the 'uncertainty' hypothesis, according to which a rise in real income uncertainty affects household consumption negatively.[3)] Second, it can be regarded as reflecting the labour supply rationing under the circumstances where leisure is not separable from consumption (see Deaton and Muellbauer (1980), p. 313-314). Finally, the unemployment variable can be regarded as a proxy for future income expectations (as in Ando and Modigliani (1963), and in Barro and MacDonald (1979)). It lies beyond the scope of this paper to try to distinguish between these interpretations of the unemployment variable in the consumption function.

As it is well-known, we can arrive at (1) via various routes, for instance by using the standard "partial adjustment" hypothesis. Perhaps the "permanent income" hypothesis is, however, the most appealing one in this context. If one uses the Koyck transformation as a frame of reference in proxying the permanent income, then equation (1) can be expressed as follows

$$(2) \qquad c_t = b_1 y_t^p + b_2 s_{ct}^p + b_3 s_{gt}^p + b_4 u_t^e + \sum_{j=1}^{12} f_j D_j + v_t$$

where the "permanent income" proxies y_t^p, s_{ct}^p and s_{gt}^p as well as the expected value of u_t are assumed to follow the standard adaptive expectations scheme

$$(3) \qquad x_t^e - x_{t-1}^e = (1-\lambda)(x_t - x_{t-1}^e), \quad 0 \leqq \lambda \leqq 1$$

In (1) we have $a_i = b_i(1-\lambda)$ for $i = 1,\ldots,4$, $a_5 = \lambda$, $d_j = f_j(1-\lambda)$ and $e_t = v_t - \lambda v_{t-1}$.

If, however, the "permanent income" hypothesis (2) is specified not in terms of u_t^e, but in terms of u_t suggesting that u_t will only have a short-term effect, then we wind up with the following consumption specification which is slightly different from (1)

$$(4) \qquad c_t = a_1 y_t + a_2 s_{ct} + a_3 s_{gt} + a_4 u_t + a_5 u_{t-1} + a_6 c_{t-1} + \sum_{j=1}^{12} d_j D_j + e_t$$

A still further possibility is to specify the consumption function in terms of the "permanent disposable income", y_t^p, and add the corporate and public sector savings as well as the difference in unemployment rate as

additional explanatory variables. According to this specification (used e.g. in Feldstein and Fane (1973))

$$(5) \qquad c_t = b_1 y_t^p + b_2 s_{ct} + b_3 s_{gt} + b_4 u_t + \sum_{j=1}^{12} f_j D_j + v_t$$

all the additional explanatory variables have only short-term effects. Applying now the adaptive expectations scheme (3) to y_t^p in (5) yields the following consumption function specification

$$(6) \qquad c_t = a_1 y_t + a_2 s_{ct} + a_3 s_{ct-1} + a_4 s_{gt} + a_5 s_{gt-1} + a_6 u_t + a_7 u_{t-1}$$
$$+ a_8 c_{t-1} + \sum_{j=1}^{12} d_j D_j + e_t$$

where $a_1 = (1-\lambda)b_1$, $a_2 = b_2$, $a_4 = b_3$, $a_6 = b_4$, $a_3 = -\lambda b_2$, $a_5 = -\lambda b_3$, $a_7 = -\lambda b_4$, $a_8 = \lambda$, $d_j = f_j(1-\lambda)$ and $e_t = v_t - \lambda v_{t-1}$, b_i's being the coefficients of equation (5).

Finally, we could allow for different planning horizons with respect to various "income" components. In this context this would necessitate the estimation of at least three weight parameters. Given our data the resulting specification would give rise to formidable estimation problems, which is why it is not applied here.

Various 'direct substitution' hypotheses can be distinguished in versions (2) and (5) of the "permanent income" hypothesis. The direct corporate substitution hypothesis implies that $b_1 = b_2$, the direct government substitution hypothesis that $b_1 = b_3$ and the hypothesis that both corporate and government saving are perfect substitutes for house-

hold saving in the sense that they should be included into the relevant concept of income for households implies that $b_1 = b_2 = b_3$. The other specifications imply analogous parameter restrictions. Besides these coefficient restriction tests we also carry out 'weaker' tests by checking whether b_2 and/or b_3 are equal to zero as it has been typically assumed. Provided that $0 < \lambda < 1$ these imply the corresponding restrictions on a_i's in (1), (4) and (6).

Before turning to estimation results we should comment the definition of saving variables. It has been argued (see e.g. Arak (1982)) that the loss in real value of previously outstanding government debt should be taken into account when defining saving and deficits for government sector. Obviously, however, the inflation adjustment should be made to all monetary assets and liabilities by evaluating the corresponding losses and gains from holding them (see e.g. Deaton (1980)). Due to data problems, however, we do not try to carry out a systematic inflation adjustment to saving concepts across sectors.

3. EMPIRICAL RESULTS

Empirical analyses use annual cross country data from 12 OECD countries with some exceptions over the period 1961-1980. With Australia, Netherlands and Norway only net saving figures were available (see appendix for data and data sources). The sample size is 193.

First, equations (1) and (4) (in an unrestricted form) were fitted into the pooled cross-country data. The corresponding OLS estimates with net

saving figures are presented in Table 1. In the case of pooled data the consumption functions (1) and (4) were estimated in several forms using aggregate and per capita data as well as observations measured both in local currencies and in US dollars. To test for first-order autocorrelation in residuals Durbin´s m-statistic was computed by accounting for the break in sequence in going from one country to the next.

The results with pooled cross country data in Table 1 are generally rather favourable in terms of the specifications (1) and (4): First, the coefficient estimates of conventional variables are typically of right sign and reasonable magnitude as well as rather precisely estimated (see footnote 3). Durbin´s m-statistics, however, indicate that there is some amount of first-order autocorrelation in residuals, particularly when the data is measured in US dollars. Thus the t- and F-tests should be considered with some care, even though re-estimation by the Cochrane-Orcutt and the Hatanaka two-step procedures did not indicate that the corresponding bias would be of great significance. This can be seen from the following coefficient estimates which correspond to the column (1) in Table 1,

	OLS	Cochrane-Orcutt	Hatanaka two-step
$\dot{y}$	.397 (13.40)	.511 (15.08)	.499 (14.39)
s_c	.429 (7.90)	.384 (6.39)	.387 (6.42)
s_g	.049 (1.35)	.111 (3.00)	.100 (2.77)
u	-1.559 (3.55)	-1.094 (2.64)	-1.138 (2.80)
c_{-1}	.577 (17.62)	.444 (12.04)	.458 (11.88)
$\hat{\rho}$	-	.496 (7.62)	.464 (5.82)

Table 1. Estimation results with pooled cross-country data

	Aggregate Local currency		Per capita Local currency		Aggregate US dollars		Per capita US dollars	
y	.415	.436	.453	.449	.708	.615	.761	.755
	(14.02)	(14.68)	(13.99)	(14.84)	(33.39)	(21.26)	(47.36)	(39.29)
s_c	.622	.690	.305	.113	.615	.741	.254	.141
	(15.64)	(12.58)	(7.82)	(3.07)	(7.18)	(10.65)	(3.22)	(1.77)
s_g	-.049	.078	.056	.068	.041	.103	.080	.094
	(1.37)	(2.12)	(1.71)	(2.41)	(0.75)	(2.48)	(1.39)	(1.71)
u	-3.492	-2.623	-.027	-.038	-1.610	-1.536	-.015	-.023
	(4.73)	(3.93)	(3.38)	(6.13)	(1.66)	(2.13)	(2.17)	(3.71)
u_{-1}		3.500		.018		2.276		.002
		(6.20)		(2.99)		(3.88)		(0.46)
c_{-1}	.564	.556	.499	.511	.256	.373	.144	.163
	(17.88)	(6.20)	(13.35)	(15.03)	(11.28)	(12.48)	(7.63)	(7.49)
Australia	-.086	-3.044	-.079	-.042	-3.270	-5.019	-.266	-.139
	(0.02)	(1.30)	(1.76)	(1.18)	(0.44)	(2.03)	(4.44)	(3.52)
Canada	-2.210	-3.744	-.038	.032	-4.064	-5.336	-.158	.001
	(0.85)	(2.19)	(1.06)	(1.12)	(0.58)	(2.98)	(2.70)	(0.02)
Finland	1.024	-2.212	.230	.325	.090	-1.021	-.041	.102
	(0.21)	(0.65)	(2.22)	(3.41)	(0.01)	(0.28)	(0.61)	(2.18)
France	-14.189	-30.699	-.141	-.067	-7.704	-10.115	-.210	-.067
	(3.60)	(7.26)	(1.87)	(0.93)	(1.13)	(6.54)	(3.68)	(3.19)
Germany	-17.080	-29.903	-.155	-.078	-10.771	-13.350	-.219	-.074
	(5.46)	(8.91)	(3.11)	(1.62)	(1.58)	(7.98)	(3.92)	(3.33)
Italy	-36.188	-4.932	-.523	-.047	-9.627	-.422	-.290	.002
	(8.61)	(3.22)	(7.26)	(2.37)	(1.39)	(0.26)	(4.54)	(0.14)
Japan	-70.969	-10.164	-.557	-.050	-50.278	-.193	-.479	.001
	(8.31)	(7.28)	(7.72)	(3.37)	(6.67)	(0.17)	(8.54)	(0.091)
Netherlands	-5.324	-10.944	-.296	-.174	-3.978	-5.684	-.281	-.140
	(1.28)	(3.41)	(3.51)	(2.28)	(0.50)	(1.76)	(4.35)	(2.91)
Norway	.316	-2.480	.387	.621	-.091	-.365	.165	.150
	(0.05)	(0.58)	(2.14)	(3.71)	(33.39)	(0.08)	(2.65)	(2.66)
Sweden	-1.015	-6.453	.186	.383	-.678	-1.718	-0.18	.128
	(0.24)	(2.09)	(1.12)	(2.49)	(0.08)	(0.57)	(0.28)	(2.47)
U.K.	-.470	-2.878	.015	.022	-5.409	-9.491	-.096	.044
	(0.32)	(2.54)	(0.76)	(1.47)	(0.79)	(6.42)	(1.71)	(1.94)
USA	-15.338	-34.058	.028	.086	-34.516	-52.158	-.053	.081
	(3.20)	(6.52)	(0.91)	(2.98)	(3.86)	(9.45)	(0.93)	(2.62)
R^2	.9999	.9999	.9999	.9999	.9997	.9999	.9998	.9998
m	.287	.335	.250	.182	.513	.418	.678	.730
	(3.41)	(4.32)	(2.77)	(1.99)	(7.18)	(4.99)	(10.91)	(10.76)
$F_{1,176}$	18.924*	17.400*	9.760*	49.714*	1.143	2.262	37.727*	52.927*
$F_{2,176}$	90.354*	64.010*	40.366*	44.133*	78.985*	76.889*	82.343*	72.292*

All observations are weighted by population. t-ratios are presented inside parentheses. F_1 indicates a test statistic for the equality of the coefficient of y and s_c and F_2 a corresponding statistic for y, s_c and s_g. Stars indicate significant values at the 5 percent level of significance.

where, to save space, country dummies are not reported and, to make the data samples comparable, the re-estimation by OLS has been carried out. Clearly, the autocorrelation adjustment does not seem to change the general flavour of results. Second, corporate saving has a significant positive effect while the sign and significance of government saving seems to be sensitive to the question of whether the lagged u-term is introduced or not into the consumption function and whether the autocorrelation adjustment is made or not. Introducing the lagged u-term or the autocorrelation adjustment has the effect of making government saving variable just positive and significant. While the lagged u-term is significant thus favouring (4) over (1), on the other hand the OLS estimates does not satisfy the coefficient restriction implied by (4).

Since the present study uses annual data one should be cautious about the possibility of simultaneity bias (at least) between c and y and its effect on estimation results. In order to check this we resorted to the following procedures: first, equations were also estimated by two-stage least squares method. The results made no qualitative difference to those obtained by using OLS.[4)] Second, in the case of individual country data we computed the Hausman-Wu test statistic (analogously to the Davidson-McKinnon J-statistic) with respect to y. In conformity with the two-stage least squares results this did not indicate the presence of simultaneity bias (for instance, for the column (1) of Table 1 the corresponding t-values was .73).

Thus in the light of these results we are tempted to conclude that households do consider corporate saving (corporate retained earnings) as a part of their income, while the role of government saving is a bit unclear from the point of view of the 'weak form' of direct substitution hypothesis. While the estimation results

reject the 'strong form' of direct substitution hypothesis between household and government saving, the situation is not so clear-cut between household and corporate saving. Very much seems to depend on the question of whether aggregate or per capita data are used in estimation. This in turn indicates that there are some clear differences between countries, particularly in terms of the role of corporate saving variable s_c. This can be seen from Table 2, which reports individual country results for the consumption function specification (1). The corporate substitution hypothesis does not get support in the case of Canada, Finland, Germany and Norway, while the opposite is true for the remaining countries of the sample in the sense that the coefficient restriction $a_1 = a_2$ in (1) cannot be rejected. For instance, for USA the results are well in accordance with the strong form of the direct corporate substitution hypothesis.[5)] As far as the direct government and the direct corporate and government subsitution hypotheses are concerned the individual country evidence against them is a bit stronger than that against the direct corporate substitution hypothesis.[6)]

Next we turn to consider the estimation results of equation (6). As stated earlier, the idea is now that the current values of s_c and s_g, not the "permanent" ones, might or might not affect current consumption.[7)] The equation (6) was estimated both in an unrestricted form by OLS and in a restricted form by imposing identifying restrictions on parameters. In the latter case the values of λ were chosen by a search method in such a way that the residual sum of squares were minimized. The corresponding unrestricted and restricted estimates in various forms are presented in Table 3. According to the restricted estimates all the coefficient estimates are of 'right' sign and with one exception highly significant.

Table 2. Estimation results with individual country data

	Constant	y	s_c	s_g	u	c_{-1}	R^2	m	F_1	F_2
Australia	.154	.311	.644	-.090	-.009	.571	.9994	.006	1.162	3.410
	(1.16)	(2.15)	(2.04)	(0.40)	(0.64)	(2.82)		(0.50)		
Canada	.069	.589	-.382	.179	-.012	.368	.9987	.011	30.829*	15.415*
	(0.97)	(6.42)	(2.18)	(2.04)	(1.17)	(2.87)		(0.25)		
Finland	.422	.687	-.147	.141	-.097	.243	.9985	.249	28.082*	22.387*
	(3.66)	(9.29)	(1.08)	(1.96)	(2.43)	(3.14)		(0.77)		
France	.058	.352	.067	.054	-.076	.610	.9989	.030	3.393	3.073
	(0.36)	(4.24)	(0.54)	(0.35)	(0.92)	(6.24)		(0.67)		
Germany	.219	.543	.146	-.110	-.078	.355	.9992	-.009	9.283*	25.558*
	(1.63)	(8.79)	(1.18)	(1.79)	(3.93)	(4.64)		(0.66)		
Italy	-1.121	.500	.615	.462	.019	.543	.9909	-.063	0.093	0.052
	(1.48)	(3.33)	(2.35)	(1.64)	(0.32)	(2.47)		(0.54)		
Japan	.395	.445	.512	-.311	-.086	.404	.9912	.017	0.061	8.077*
	(0.44)	(2.75)	(2.88)	(1.58)	(0.29)	(1.68)		(0.19)		
Netherlands	1.380	.426	-.158	-.563	-.165	.405	.9969	.060	3.068	8.997*
	(2.21)	(3.00)	(0.47)	(2.66)	(2.53)	(2.68)		(0.61)		
Norway	.937	.810	-.190	.300	-.039	.091	.9937	.138	23.094*	12.927*
	(0.98)	(3.79)	(0.78)	(1.47)	(0.18)	(0.45)		(0.25)		
Sweden	-1.811	.739	.071	.188	-.077	.307	.9934	-.415	3.425	1.832
	(1.75)	(2.44)	(0.67)	(2.98)	(0.40)	(1.12)		(1.16)		
UK	.040	.599	.373	.218	.006	.300	.9953	-.000	1.708	11.536*
	(1.05)	(7.53)	(2.86)	(3.29)	(1.26)	(2.82)		(0.05)		
USA	-.246	.635	.527	-.036	-.022	.357	.9970	-.008	0.161	10.985*
	(1.74)	(5.36)	(1.96)	(0.22)	(1.23)	(3.11)		(0.94)		

The data are in a per capita form and expressed in local currencies. t-ratios are presented inside parentheses. Stared F-statistics are significant at the 5 percent level of significance.

Table 3. Unrestricted and restricted estimates of equation (6)

	Aggregate local currency	Per capita local currency	Aggregate US dollars	Per capita US dollars
	unrestricted estimates			
y	.333	.448	.568	.735
	(11.44)	(14.39)	(17.89)	(39.69)
s_c	.748	.370	.731	.361
	(13.66)	(8.38)	(9.49)	(4.03)
$s_{c,-1}$	-.304	-.174	-.151	-.382
	(4.27)	(3.63)	(1.47)	(3.89)
s_g	.259	.226	.211	.273
	(6.90)	(5.01)	(4.49)	(3.58)
$s_{g,-1}$	-.266	-.163	-.187	-.209
	(6.36)	(3.57)	(3.52)	(2.54)
u	-.255	-.016	-.032	-.010
	(0.34)	(1.97)	(0.03)	(1.15)
u_{-1}	1.310	.014	.785	-.012
	(2.40)	(1.79)	(1.19)	(2.02)
c_{-1}	.657	.505	.417	.187
	(21.10)	(14.06)	(12.77)	(8.84)
s^2	15.814	5.473-3	22.517	2.241-3
	restricted estimates			
$\hat{b}_1$	.971	.909	.977	.905
	(130.30)	(87.99)	(174.35)	(133.29)
$\hat{b}_2$	.764	.383	.734	.239
	(15.15)	(9.17)	(10.31)	(2.84
$\hat{b}_3$	.260	.202	.183	.156
	(8.68)	(5.25)	(4.73)	(2.79)
$\hat{b}_4$	-1.613	-.023	-.987	-.019
	(3.22)	(3.22)	(1.50)	(3.04)
λ	0.6	0.5	0.3	0.2
s^2	17.383	5.438-3	25.035	2.474-3

All observations are weighted by population. t-ratios are presented inside parentheses. All equations were estimated with country intercepts, to save space the corresponding estimates are not presented above. The values of λ are determined by a search method, where the (desimal) value of λ, $0 < \lambda < 1$, which minimizes the residual sum of squares, s^2, is chosen.

Altogether these estimation results are quite similar to those obtained with equations (1) and (4). The major difference lies in the magnitude and significance of the government saving - variable. So for instance in Table 3 all t-values of the corresponding parameter estimates exceed the 5 % level of significance. Even though this might seem somewhat puzzling at first sight, it is not necessarily so. Comparing the unrestricted coefficient estimates of $s_{g,t}$ and $s_{g,t-1}$ namely suggests that the implied parameter restrictions are not valid. In fact, the sum of these coefficient estimates is zero. Thus we can (at most) conclude that government saving has only a (temporary) short-run effect while its long-run effect is zero. This, in turn, is compatible with the estimation results of equation (1).

An obvious explanation for this kind of behaviour may lie in the difficulty on the part of households to distinguish between the disposable and before-tax income and in the cyclical behaviour of government tax revenues and saving.[8)]

4. CONCLUDING REMARKS

By using a large international cross-country data from 12 OECD-countries we have tested for various forms of direct substitution hypotheses between household, corporate and government saving.

On the whole findings suggest that the hypothesis according to which households pierce (partly) through the 'corporate veil' cannot be rejected, while the hypothesis that households subsume government behaviour under its own behaviour does not get clear support. We have, however, to make

some reservations about the latter result owing among others to the rather restrictive assumptions which have been made for instance about the short-run and long-run effects of government expenditures and revenues.

FOOTNOTES:

1) The rate of inflation and the real rate of interest (measured as $R_t - \Delta \log P_t$ where R_t is the interest rate for long-term bonds) were also experimented as additional explanatory variables. The corresponding coefficient estimates were, however, rather imprecise and therefore these variables were excluded from the final specifications. As far as our estimation results are concerned, these extra variables did not make any qualitative difference.

2) With the variable s_c we try to take into account the direct substitution effect of corporate saving. We should, of course, try to account also for the capital gains effect, which is not, however, possible given our data base. There are only very few countries, from which one can obtain data of household wealth or accured capital gains (to speak nothing about the reliability of the existing wealth series). Thus, in what follows only the pure retained earnings variable is used in the subsequent empirical analyses, and the significance of this variable is interpreted as lending support to the direct substitution effect of corporate savings
One should notice that the direct government substitution hypothesis as presented above implicitly assumes that an increase in taxes with given government expenditures has the same effect as a decrease in government expenditures with given taxes.

3) See e.g. de Salvo and Eeckhoudt (1982), in which it is demonstrated how an increased risk about employment will decrease consumption. Sticking to this interpretation of the unemployment variable can be critisized. Obviously, using u as a proxy for income uncertainty is somewhat ad hoc and one may wonder if the income uncertainty variable is desired, why not try to model it directly. Unfortunately, the data do not allow for much more sophisticated proxies. Nevertheless we computed an alternative measure of income uncertainty from a lagged moving standard deviation of y_t. The sign of this variable, however, turned out to be fairly sensitive to the specification of leads and lags: when only the lagged standard deviation terms were included, its sign was positive, while in the case of both lagged and leaded terms it became negative. We should stress, however, that irrespective of the way the income uncertainty proxy was constructed, the relative magnitudes of y, s_c and s_g remained practically unchanged. Hence, the results are not reported. A complete set of results is available from the authors upon request.

4) E.g. the following set of coefficient estimates were obtained for the column (1) of Table 1

$$c = \underset{(10.48)}{.665y} + \underset{(18.75)}{.534s_c} - \underset{(4.83)}{.169s_g} - \underset{(0.63)}{17.066u} + \underset{(2.41)}{.186c_{-1}} + \text{country dummies}$$

5) Results with aggregate data and gross saving figures were practically identical, as the following F-statistics indicate:

	F_1	F_2	F_1	F_2
Australia	7.168*	4.687*	..	..
Canada	35.737*	19.219*	43.079*	21.550*
Finland	29.267*	23.335*	28.414*	19.889*
France	3.428	3.088	0.324	1.460
Germany	11.918*	25.436*	10.111*	12.687*
Italy	0.098	0.552	2.000	1.125
Japan	0.003	6.248*	0.000	7.115*
Netherlands	3.588	9.475*	..	..
Norway	24.850*	13.793*	..	..
Sweden	3.139	1.632	3.088	1.544
UK	1.587	12.569*	3.193	4.675*
USA	0.101	10.528*	0.000	9.205*

F_1 (F_2) indicates a test statistic for the equality of the coefficients of y and s_c (y, s_c and s_g). Two first columns correspond to net measures of saving and two last columns to gross measures of saving. Again, stared values exceed the 5 percent level of significance.

6) We also estimated the consumption function (4) for individual countries. The results were not too dissimilar from those presented in Table 2, which is why they are not reported. Particularly, the individual country estimates (of Table 2) may be plagued by the problem of multicollinearity. In order to find out how sensitive the coefficient estimates are in this respect all equations were also estimated with the ridge estimation technique The following coefficient estimates were then obtained for y, s_c and s_g, when the ridge parameter was determined on the basis of the Hoerl-Kennard-Baldwin procedure (for ridge estimation see e.g. Judge and Griffiths and Hill and Lee (1980), ch. 12).

	y	s_c	s_g
Australia	.265 (2.80)	.841 (4.11)	.028 (0.17)
Canada	.582 (2.41)	-.285 (2.41)	.190 (2.40)
Finland	.720 (9.68)	-.041 (0.37)	.106 (1.49)
France	.354 (4.34)	.087 (0.70)	.133 (1.01)
Germany	.537 (8.82)	.157 (1.43)	-.071 (1.32)
Italy	.476 (5.33)	.544 (3.41)	.317 (1.90)
Japan	.462 (3.19)	.537 (3.79)	-.244 (1.37)
Netherlands	.461 (2.95)	.057 (0.17)	-.624 (2.67)
Norway	.832 (3.96)	-.189 (1.50)	.315 (1.50)
Sweden	.834 (3.84)	.057 (0.53)	.176 (2.79)
U.K.	.571 (7.47)	.327 (2.92)	.200 (3.36)
U.S.A.	.600 (4.54)	.762 (3.59)	.037 (0.30)

Comparing these estimates with those of Table 2 suggests neither great nor systematic differences.

7) Clearly, equation (1) is nested in (6). Testing the coefficient restrictions $a_3 = a_5 = a_7 = 0$ in the context of equation (1) gives the following values of F-statistics: Aggregate local currency 41.648, Per capita local currency 12.006, Aggregate US dollars 12.357 and Per capita US dollars 8.284. All of these statistics clearly exceed the 1 percent level of significance. Thus, the restrictions implied by (1) can rejected.

8) An explanation for the relatively high coefficient estimates for saving variables is the possibility of spurious correlation so that e.g. s_c might serve as a proxy for disposable income rate change. This variable, in turn, has been found to be an important explanatory variable for cross-country differences in household savings ratios. In order to check this spurious correlation possibility the consumption functions (1) and (4) were re-estimated by introducing the first difference in households' disposable income, Δy_t, as an additional explanatory variable. This had, however, no substantial effect on the coefficient estimates. Hence, the corresponding estimates are not reported.

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APPENDIX

Variables and Data Sources

c	Private consumption expenditure in constant prices
C	Private consumption expenditure in current prices
P	The implicit deflator of private consumption expenditure
S	Household, including non-profit institutions, saving
S_c	Corporate and quasi-corporate enterprise saving
S_g	General government saving
Y	Households' disposable income $Y = C + S$
D_h	Consumption of fixed capital by households and non-profit institutions
D_c	Consumption of fixed capital by corporate and quasi-corporate enterprises
D_g	Consumption of fixed capital by general government
Y^b	Households' gross income, $Y^b = Y + D_h$
S_c^b	Corporate and quasi-corporate enterprise gross saving, $S_c^b = S_c + D_c$
S_g^b	General government gross saving, $S_g^b = S_g + D_g$
U	The rate of unemployment
E	The US dollar exchange rate
POP	The mid-year estimate of population

The data source for U and POP is OECD Labor Force Statistics, various publications, the data source for E is OECD Historical Statistics 1960-1980 while the data source for all the other variables is National Accounts of OECD Countries, various publications. The Norwegian data come from Cappelen: Inntеksfordelning og konsum 1962-1978, Statistisk sentralbyrå artikler Nr. 123 and the Finnish data for years 1960-1964 come from the Statistical Central Office (Helsinki).

The data sample covers the period 1961-1980 for Canada, Finland and Germany, 1962-1989 for United Kingdom, 1963-1980 for France, 1963-1978 for Norway, 1964-1980 for Sweden and United States, 1965-1980 for Australia, 1970-1979 for Netherlands, and finally 1971-1980 for Italy and Japan.

The lower-case letters indicate variables deflated by P, however, u indicates the difference in the unemployment rate.

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