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Do after tax interest rates affect private consumption and savings ? Empirical evidence for 8 industrial countries : 1970-1983 *

Giuseppe Tullio Francesco Contesso

Internal Paper

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1. Introduction

The question of whether interest rates affect private consumption and savings has attracted considerable attention in theoretical and empirical work. Recent contributions include, among others, Beck (1986), Boskin (1978), Howrey and Hymans (1978), Gylfason (1981), Summers (1981, 1982, 1984) and Tanzi and Sheshinski (1985). The reasons why the elasticities of consumption and savings with respect to the interest rate attract considerable attention are manifold. First, the 1970s and early 1980s have witnessed increasing public sector deficits worldwide. Although in the early 1980s most European governments have managed to check and even reverse the growth of public sector deficits, they have worsened in the United States. The interest elasticity of private savings has an important bearing on the possibility of financing aggregated world fiscal deficits by non inflationary means. Secondly the efficacy of monetary and fiscal policy in influencing the business cycle depends among other things on the interest elasticity of consumption and savings. Similarly, the adjustment of external current account positions can be smoother if the elasticity of private consumption with respect to the interest rate is high. Thirdly, according to neoclassical growth models, economic growth is affected in the transition from one steady state to the other by the rate of capital accumulation which in turn depends, among other things, on the amount of private savings forthcoming. Furthermore in the steady state an increase in the savings rate leads to a higher stock of capital per capita, and provided the latter is initially below the golden rule position, also to a higher sustainable level of private consumption and welfare. Thus assuming that the capital stock per capita is initally below the optimum level, as is generally believed to be the case in all except perhaps the most mature industrial countries, there may be large long run welfare losses involved in a low private savings rate. Taxation of capital and interest income, which has increased in many countries in the last two decades or so may have led to a reduction in the after tax rate of return and possibly to a reduction in private savings, if its elasticity with respect to the after tax rate of return is positive.

Thus the sign and size of the elasticity of private consumption has important implications for both shorter run questions such as the control of the business cycles and the cyclical adjustment of the current account balance as well as for long run questions like the analysis of the long run implications for economic growth of the increase in taxation.

This paper estimates consumption functions for 8 industrial countries with the purpose of testing the hypothesis that the after tax interest rate influences private consumption negatively: the eight countries are Germany, the USA, Italy, France, the UK, Japan, Belgium and Sweden. The presumption that the after tax interest elasticity of consumption is negative has been forcefully established on theoretical grounds by Summers (1981, 1982) within a life cycle model of consumption. His empirical estimates performed on annual data for the United States from 1950 to 1978 confirm this hypothesis. The data used in this study is also annual and the sample period is 1970-1983, although for the countries for which the data are available the tests are also performed for the longer period 1961-1983.

Despite a large body of existing empirical literature on the subject there are several reasons to take up the issue again. Firstly, it is still highly controversial whether interest rates affect private savings. Secondly, most of the empirical work refers to the US and the UK and it is important to extend the analysis to other industrial countries using the same specification of the consumption function in order to facilitate comparisons. Many country specific econometric models include an interest rate in the consumption function, but comparisons across countries are very difficult due to very different specifications of the equations or differnt ways of defining the same variables. Thirdly, and most importantly, the level of the nominal and especially the real interest rate has increased sharply in virtually all industrial countries in the 1980s and large fluctuations have occurred, while before and especially in the 1960s real interest rates were relatively low and stable. Empirical work trying to isolate the effect of the after tax interest rate on consumption or savings relying largely on a sample period during which the

interest rate varied very little, or if it did was expected to be reversed soon, is likely to yield interest rate elasticities which are biased towards zero, simply because there is not enough variability in the independent variable and/or because households do not change their long term savings behaviour significantly when interest rates deviate temporarily from a "norm". To check the validity of this hypothesis, the empirical tests of the consumption function have been extended whenever possible in this study back to the 1960's.

Fourthly, the year to year variability of the tax correction factor in the calculation of the after tax interest rate is relatively low; the use of annual data, and even more of quarterly data, might bias the coefficient of the tax correction factor towards zero, leading to the unwarranted conclusion that tax considerations are irrelevant. However, a sharply rising secular trend in taxation, as has been observed especially in European countries, substantially reduces the real after tax interest rate and possibly also savings, assuming an unchanged real before tax interest rate. In this study particular attention is devoted to the estimation of the effect of this secular trend in taxation on consumption by complementing the tests of the consumption function which use annual data with tests which use five year averages. The use of five-year averages should also yield better estimates of the response of consumption to permanent changes in its explanatory variables, the annual changes of which might have a large temporary component; and it is clearly the response to permanent changes that is of primary concern to the policy maker.

Fifthly, most studies do not include exogenous variables reflecting changes in the structure of the population; they also define disposable income inclusive of interest and capital income. This leads to double counting, if non-human wealth is also included among the explanatory variables, as suggested by the life-cycle hypothesis; in addition the method of estimation used is generally the ordinary least square method, which is unsatisfactory if some explanatory variables are really endogenous(1).

(1) See also Summers (1982, 1984) for a criticism of the empirical work on the consumption function.

The paper is structured as follows: Section 2 presents the consumption function derived from the life cycles hypothesis and defines the variables used. The consumption function used includes household disposable income from labour, wealth and the after tax interest rate, consistently with the life cycle hypothesis. It also takes into account changes in the structure of the population. Private consumption includes expenditures on durable goods, rather than the services from them. Consumption, disposable income from labour and wealth are all expressed in per capita terms. Section 3 presents the parameter estimates of the consumption function for 8 industrial countries from 1970 to 1983. Section 3.1 discusses the results of the regressions run on annual data for each country individually (Tables 1 to 3). Section 3.2 discusses the results of the pooled cross-country tests performed using annual data (Table 4 and 5). Section 3.3 summarises the after tax interest rate elasticities obtained (Table 6) and compares them with those obtained by other authors. Section 4 focuses on the long run implications of the secular increase in marginal and average tax rates for private consumption and savings. It estimates the consumption function using 5 year averages and pooling the data for seven countries (Table 7). The 5 year averaging yields a more reliable estimate of the response of consumption to changes in the tax factor correcting the interest rate. This section also contains the results of simulations showing the long run effects of the secular growth of taxation on consumption and savings in each country (Tables 8 to 10). The channels through which, in the consumption function specified, the growth in taxation can affect consumption are two: via the after tax interest rate and via the reduction in households disposable income.

The results of Section 3 indicate unambiguously that after tax interest rates, either real or nominal depending on the country, have a very significant negative effect on private coonsumption and that the coefficient of the tax correction factor is also highly significantly different from zero. As to the simulation of Section 4, given the estimated parameters and the actual growth of taxation which occurred in each country from 1970 to 1983, it is shown that the negative effect of the growth of taxation on private savings has been considerable in all countries except the United Kingdom, France and the United States.

2. The consumption function and the definition of the variables

Summers (1981, 1982) formulates the life-cycle consumption hypothesis in continuous time by assuming that individuals maximise a constant elasticity of substitution utility function with a fixed discount rate, subject to the constraint that the present value of future lifetime consumption equals the sum of assets and the present value of future labour income. He derives from these assumptions a consumption function of the following type:

$$C = \alpha + \left[\beta_1 + \beta_2 (R - \bar{\pi})\right]\left[W + \frac{Y_{dis}^{e}}{R - \bar{\pi}}\right] \qquad (1)$$

where C is private consumption, R is the after tax nominal interest rate, $\bar{\pi}$ is the expected rate of inflation, W is non-human wealth, and Y_{dis}^{e} is expected income from labour. Equation (1) implies that an increase in the real after tax interest rate increases the marginal propensity to consume out of total wealth if β_2 is positive, but it reduces the present value of income from labour. Summers (1982) shows that under plausible assumptions about the parameters of the utility function, the net effect of an increase in $(R - \bar{\pi})$ is negative, with the human wealth effect being particularly strong for young workers since their labour income lies furthest in the future. He also shows that in the case of a Cobb-Douglas utility function β_2 is equal to zero and the propensity to consume is independent of the real interest rate. This implies that an increase in the rate of interest has an unambiguously negative effect on consumption.

As the interest rate enters equation (1) in a non-linear way, the equation should be estimated by a non-linear estimation technique which is what Summers does. To keep the analysis as simple as possible and above all to facilitate comparisons with previous estimates of the structural

consumption functions, it was decided to estimate the following equation in which consumption depends on non-human wealth, disposable labour income and the after tax interest rate, with the addition of a variable reflecting changes in the structure of the population:

$$\ln C = a_0 + a_1 \ln W + a_2 \ln Y_{dis} + a_3 R + a_4 \pi + a_5 \ln L \qquad (2)$$

where ln stands for the natural logarithm of a variable and the precise definition of the variables is:

$C = \frac{HC}{CPY.TP}$ is real household consumption per capita

where HC is household consumption in current prices, CPY is the consumer price index and TP is total population. More details on the variables used and their sources for each country are given in the Appendix.

$Y_{dis} = \frac{DIL}{CPY.TP}$ is real per capita household disposable labour income

in the current year. DIL is household disposable labour income in current prices. Summers (1982) uses Y_{dis}^e as an independent variable which he estimates by computing a three year distributed lag on Y_{dis}. While a simpler solution is adopted here, the 5 year averages used in Section 4 should be a good approximation of Y_{dis}^e.

W = real wealth per capita defined as the sum of three components: the real net stock of capital of the whole economy, net foreign assets and general government debt. More precisely W was computed for all countries as follows:

$$W_t = \frac{NK}{TP} + \frac{PD}{CPM.TP} + \frac{ERM}{CPM.TP} \cdot \sum_{i=1950}^{t} CB_i \qquad (3)$$

where NK is the real stock of capital of the whole economy, PD is general government debt in current prices (end of period), CB is the current account balance expressed in dollars and $\sum$ is the summation operator. The cumulated current account balance up to year t has been converted into the domestic currency at the exchange rate of December and deflated by the consumer price index of December. 1950 was chosen as the starting year for the cumulation.(2) The measure of non human wealth adopted here has two drawbacks. First it does not measure wealth at market value and second it includes the government capital stock. However, given the data limitations, this is the best approximation of private non-human wealth one could construct in a consistent way for all countries considered here.(3) Government bonds are considered to be part of net wealth, in line with David Ricardo's opinion and contrary to Barro's (1974) and Bailey's (1962) hypothesis. It is assumed that the public is just not sophisticated and long-sighted enough to take into account future tax liabilities arising from larger public debts. This assumption is supported by the empirical work of Feldstein (1974, 1982)(4). Wealth as defined in

(2) However, due to the unavailability of CB on a homogeneous basis, the starting year of the cumulation is 1950 only for Germany. It is 1951 for Italy, 1952 for the UK, 1953 for the US, 1956 for Japan, Belgium and Sweden and 1967 for France. Similarly, NK is available only from 1961 for Belgium and PD only from 1969 for France and the UK. Finally, for Sweden, NK is not available so that the Swedish wealth series does not include the stock of capital.

(3) For a well behaved consumption function estimated for Germany from 1880 to 1979 which uses the same definition of wealth and yields a significantly negative coefficient of the real interest rate, see Sommariva and Tullio (1987).

(4) Feldstein (1982) refers to the assumption that government bonds ar not net wealth as the Pre-Ricardian hypothesis, since Ricardo strongly attacked it. For empirical evidence for Germany that government bonds are net wealth, see Sommariva and Tullio (1987), Appendix to Chapter 1.

equation (3) does not include financial debt of banks and enterprises because the latter is assumed to cancel out within the private sector. In this respect W incorporates only "outside wealth" with the government sector considered to be an external entity with respect to the private sector, a widely held view in public finance theory.

R = IL(1-t) where IL is the long term interest rate and 1-t is the tax correction factor. t has been proxied by the ratio of direct taxes on households (TD) to total personal income (DI + TD). In principle the average marginal tax rate on capital and interest income would be needed, but it is very difficult to construct a series of the relevant average marginal tax rate in a study involving several countries(5). However in most countries marginal tax rates have increased with average tax rates and taxation of interest income and of income from capital have grown hand in hand with taxation of labour income. Above all, for the self employed, who reinvest their savings in their firm it is difficult to say whether the tax rate on capital, or on labour income should be used to construct the after tax rate of return on savings. As an alternative to the long term rate the short term rate was also used (IS), but the results were always inferior.

π = $100 \cdot \frac{CPM}{CPM(-1)} - 100$ is the rate of inflation during the year.

In principle it would be preferable to use in equation (2) expected inflation rather than actual inflation. Reliable measures of expected inflation based on surveys are not available for all countries in the sample and for the countries for which they are

(5) Tanzi (1980) also uses an average tax rate in his study on interest rate determination for the US. He uses the ratio of taxes on interest income to interest income, but the focus of his analysis is on interest rate determination rather than savings behaviour of households.

available the data are not always consistent across country. The addition to equation (2) of a model or of various alternative models of formation of expectations of inflation would have made the econometric analysis very cumbersome and empirical results more difficult to interpret. Therefore it was decided to use actual inflation as a proxy for expected inflation.

$L = \frac{LF}{TP}$ is the ratio of the labour force to total population, a proxy for the changing structure of the population. However, this variable could also reflect uncertainty related to cyclical or structural changes in unemployment.

All variables except the after tax rate of interest and inflation have been expressed in natural logarithms. Using the natural logarithm for R and π would have implied the assumption of a constant elasticity of consumption with respect to R and π. It follows that the estimated parameters are all elasticities except for the parameters of R and π which are semi-elasticities. All scale variables have been divided by total population since the sample period stretches over 14 or 22 years, depending on the regressions, and population changes can be substantial over such long time spans. Similarly over such long periods changes in the structure of population can affect consumption per capita. If L, the participation rate, increases, consumption per capita can be expected to increase, due to a longer average work life, higher participation of women in the work force, or simply the presence of more adults of working age in the population. The expected signs of the coefficients are:

$a_1, a_2, a_4, a_5 > 0$
and
$a_3 < 0$

If $a_3 = -a_4$ then the nominal interest rate and the rate of inflation can be combined to form one independent variable in the equation.

Since this study focuses mainly on the estimates of the coefficients of the interest rate, a few more comments about the effects of the interest rates on consumption are in order. Summers argues that the most important effect is the one on the present value of future labour income (see equation 1). In the neoclassical theory, the main effect of the increase in the rate of interest on consumption arises from the fact that (1 + R) is the price of present consumption in terms of future consumption. This effect has two components: a pure substitution and an income effect. The first effect is always negative, the second is positive if present consumption is a normal good; thus the net effect is in general uncertain.

Recently Tanzi and Sheshinski (1985) have argued that the age distribution of wealth holders influences the relative strength of the two effects. They argue that if the old generation holds most of the wealth, the income effect is more likely to outweigh the substitution effect, because the shorter time horizon of older consumers implies limited substitution possibilities for them while the income effect operates fully. They maintain that this could explain why the private propensity to save has failed to increase as expected in the US in 1982-1985 after the large increase in the real interest rate(6). A further observation arises from the fact that an increase in the interest rate leads to a fall in the market value of financial wealth and hence to a fall in consumption. If financial wealth at market value appears as an independent variable in the consumption function along with R, then the estimated coefficient of R should not incorporate this effect, but if financial wealth appears at face value as in the present study or does not appear at all, then the coefficient of R will incorporate this effect. Furthermore, particularly in those economies in which consumers rely heavily on consumer credit to finance their purchases,

(6) This argument however, does not take into account the bequest motive of older generations. As interest receipts increase the older generations may decide to leave more bequests to their heirs. Furthermore, if older people hold most of the wealth their consumption pattern should not be income constrained in the first place, so that increases in their interest receipts could have very little effect on their consumption. Finally it is reasonable to assume that consumption possibilities of wealthy old people are more limited than for younger generations and that the consumption habits of the former change more slowly.

an increase in the rate of interest increases the cost of financing and leads to a reduction in consumption. However, this last effect is conceptually related to the pure substitution effect of the neoclassical theory of consumption. Finally, if the after tax interest rate falls as a result of the secular growth in taxation, the income redistribution which accompanies the growth in progressive taxation and the increase in subsidies to lower income groups are likely to lead to a fall in savings. The coefficient of R may thus capture some of these secular effects also.

3. Estimates of the after tax interest rate elasticity of consumption

3.1 Yearly data; each country individually: 1970-1983

Tables 1 to 3 contain estimates of the parameters of equation (2) for 8 industrial countries: Germany, the U.S,. Italy, France, the UK, Japan, Belgium and Sweden. The sample period is 1970 to 1983 and the data used is annual. Non human wealth has always been introduced lagged by one year i.e. it refers to the end of the previous period, for a better matching of stocks and flows. In order to test whether other variables influenced consumption with significant lags they have been lagged, but retained only if their coefficients were significantly different from zero. Since current income from labour and the after tax interest rate may not be truly exogenous all equations were estimated by two stage least square as well as by ordinary least square. In general the results were not very different except for the United States. Table 1 contains the estimates of the consumption function obtained by ordinary least squares and Table 2 those obtained by two stage least squares with only income from labour considered as endogenous.(7) In Table 1 the coefficient of the nominal or the real after tax interest rate has the expected negative sign and is significantly different from zero in all countries considered, with t statistics ranging from a minimum of 2.09 for Sweden to 3.71 for the United Kingdom. The significance of the interest rate coefficients falls slightly in Table 2;

(7) Estimates with the interest rate also endogenous, for the 3 countries for which the current after tax interest rate appears in the regression (Germany, Italy and Sweden) are not shown here.

Table 1: Consumption function with disposable income from labour.
Annual data, 1970-1983.

Country	Intercept	ln Y_{dis}	ln W(-1)	R	R(-1)	$R-\dot{P}$	$R(-1)-\dot{P}(-1)$	$\dot{P}(-1)$	ln L	R^2	DW
Belgium	-0.46	0.27	0.75	-	-0.006	-	-	-	-	0.99	2.35
	(10.64)	(4.23)	(7.52)		(2.16)						
France	-1.72	0.20	0.49	-	-0.003	-	-	-	-	0.99	1.83
	(9.44)	(2.00)	(6.12)		(2.21)						
Germany	-0.43	0.74	0.18	-0.007	-	-	-	-	-	0.99	1.87
	(1.59)	(8.28)	(3.24)	(2.93)							
Italy	0.74	0.23	0.37	-	-	-0.002	-	-	1.14	0.99	1.60
	(1.33)	(2.09)	(2.72)			(3.58)			(3.33)		
Japan	-0.64	0.37	0.32	-	-0.012	-	-	-	-	0.98	2.32
	(4.03)	(5.35)	(4.85)		(2.64)						
Sweden(1)	-0.84	0.64	0.08	-0.012	-	-	-	-	-	0.97	1.90
	(2.82)	(8.79)	(2.56)	(2.09)							
United	-1.25	0.64	0.20	-	-0.008	-	-	-	-	0.98	1.66
Kingdom	(3.67)	(7.81)	(2.32)		(3.71)						
U.S.A.	-2.19	0.37	0.11	-	-	-	-0.007	-0.010	0.84	0.99	1.30
	(4.85)	(3.48)	(0.55)				(3.55)	(4.77)	(5.99)		

- Numbers in parenthesis are t-statistics.

- For some countries the following dummies have been used. The coefficients of each dummy variable and their t-statistics are reported below.
  Belgium, Year 1983, -0.04 (3.86).
  France, Year 1970, -0.02 (2.23).
  Japan, Year 1973, 0.04 (2.69).
  Sweden, Year 1982, 0.03 (1.50).
  United Kingdom, Year 1980, -0.02 (2.05).

(1) For Sweden wealth does not include the real stock of capital because the series was unavailable.

Table 2: Consumption function with disposable income from labour, estimated by two stage least squares(1). Annual data, 1970 - 1983.

Country	Intercept	ln Y_{dis}	ln W(-1)	R	R(-1)	R-π	R(-1)-π(-1)	$\dot{\pi}$(-1)	ln L	R^2	DW
Belgium	-0.46	0.27	0.76	-	-0.006	-	-	-	-	0.99	2.21
	(8.56)	(3.00)	(5.59)		(1.71)						
France	-1.75	0.17	0.51	-	-0.003	-	-	-	-	0.99	2.05
	(7.75)	(1.40)	(4.95)		(2.01)						
Germany	-0.04	0.88	0.10	-0.005	-	-	-	-	-	0.99	1.31
	(0.14)	(9.10)	(1.73)	(2.55)							
Italy	0.40	0.16	0.47	-	-	-0.002	-	-	0.96	0.99	1.75
	(0.57)	(1.00)	(2.50)			(2.86)			(2.30)		
Japan	-0.74	0.33	0.36	-	-0.010	-	-	-	-	0.98	2.42
	(3.57)	(3.59)	(4.14)		(1.79)						
Sweden(2)	-0.41	0.69	0.11	-0.020	-	-	-	-	-	0.95	1.71
	(0.91)	(6.86)	(2.80)	(2.49)							
United	-1.12	0.68	0.16	-	-0.008	-	-	-	-	0.90	1.57
Kingdom	(1.13)	(2.26)	(0.58)		(1.65)						
U.S.A.	-4.15	-0.73	1.13				-0.024	-0.029	1.25	0.99	2.58
	(2.72)	(1.12)	(1.94)				(2.20)	(2.58)	(3.45)		

- Numbers in parenthesis are t-statistics.
- The same dummies as in Table 1 have been used:
  Belgium, Year 1983, -0.04 (3.12).
  France, 1970, -0.02 (2.21).
  Japan, 1973, 0.05 (2.76).
  Sweden, 1982, 0.03 (1.40).
  United Kingdom, Year 1980, -0.03 (1.02).

(1) The two stage least squares has been performed using Y_{dis} (-1), W(-1), R(-1), and L as preliminary regressors of Y_{dis}.

(2) The period covered for Sweden is 1971-1983.
For Sweden wealth does not include the real stock of capital because the series was unavailable.

however, except for the United States the coefficients themselves do not change much. The estimated elasticities of private consumption with respect to the interest rate will be discussed below in Section 3.3. The coefficient of inflation turns out to be significantly greater than zero only for Italy. In addition for Italy the coefficient of inflation satisfies the hypothesis that $a_3 = -a_4$, justifying the merging of R and π into one single variable. The formal high indexation of wages which existed in Italy from 1975 to 1984 might have contributed to this absence of money illusion. For Germany, France, Japan and Belgium the coefficient of the rate of inflation is never significantly different from zero. It is possible that the positive effect produced by the theory was dwarfed by the fact that yearly deviations of inflation from a "norm" were low and considered to be temporary and hence not a major factor to take into account in forming consumption decisions. Especially the German and the Japanese experience contrast sharply with that of Italy where inflation was high and very volatile forcing consumers to form consumption decisions on the basis of inflation adjusted variables. Alternatively, the positive effect predicted by the theory might be rendered statistically insignificant by the positive correlation between uncertainty and inflation. Even though for all countries other than Italy the hypothesis that $a_3 = -a_4$ is not confirmed by the data, imposing the constraint that $a_3 = -a_4$ on the US data, yielded a more precise estimate of the coefficient of the after tax interest rate.

The coefficient of disposable labour income is very significantly different from zero for all countries, ranging from a low of 0.20 for France to a high of 0.74 for Germany (Table 1). This implies a short run marginal propensity to consume well below unity for all countries. However, the coefficient becomes insignificantly different from zero for France, Italy and the US when the two stage least square method is used (Table 2). The coefficient of real non-human wealth is significantly different from zero for all countries except for the US in Table 1 and for Germany and the United Kingdom in Table 2. The elasticity is quite high and ranges from a low of 0.08 for Sweden (8) to a high of 0.75 in Belgium.

(8) However, it should be recalled that for Sweden non human wealth does not include the stock of capital.

The variable reflecting the changing structure of the population, L, has a coefficient which is significantly different from zero and has the expected positive sign only for Italy and the U.S. This makes sense since this variable is intended to capture also very long term changes in the structure and in the working habits of the population. For Italy and the US the coefficients of this variable is not significantly different from unity. A coefficient of unity implies that a 1 per cent increase in the participation rate leads to a 1 per cent increase in household consumption per capita.

Table 3 contains the same regressions of Table 1, with total disposable income substituted for disposable labour income. Many estimates of the structural consumption function include total disposable income rather than disposable labour income and it is instructive to see how the coefficients of the equation change with this substitution. First the coefficient of total disposable income is higher than that of disposable labour income for all countries. This may however be due to the greater endogeneity of total disposable income. The coefficient of wealth does not change significantly except for Italy and the U.S.; more importantly, the interest rate coefficient is significantly smaller in absolute value for Germany, Sweden and the United Kingdom. For all other countries the coefficient also falls in absolute value, but to a non significant degree. Thus Table 3 suggests that the inclusion of total disposable income rather than labour income as an explanatory variable imparts a downward bias to the absolute value of the interest rate coefficient. This finding may contribute to the explanation of why the previous estimates of structural consumption functions, which include total disposable income as an explanatory variable, did not yield interest rate elasticities which were significantly different from zero.

3.2 Yearly data; pooled cross country and time series analysis: 1970-1983

Tables 4 and 5 contain pooled cross country estimates of equation (2). In Table 4 the sample period is again 1970-1983 and the countries considered are seven, the eight of the previous section excluding Sweden because

Table 3: Consumption function with total disposable income - Annual Data, 1970-1983.

Country	Intercept	ln Y_{dis}	ln W(-1)	R	R(-1)	R-π	R(-1)-π(-1)	π(-1)	ln L	R^2	DW
Belgium	-0.36	0.47	0.63	-	-0.005	-	-	-	-	0.99	2.48
	(6.79)	(4.65)	(5.51)		(1.97)						
France	-1.33	0.35	0.44	-	-0.002	-	-	-	-	0.99	1.72
	(5.64)	(3.18)	(6.48)		(1.96)						
Germany	-0.06	0.87	0.22	-0.001	-	-	-	-	-	0.99	1.25
	(0.21)	(0.61)	(5.00)	(0.69)							
Italy	0.47	0.52	0.21	-	-	-0.002	-	-	0.84	0.99	1.69
	(1.70)	(4.39)	(2.02)			(3.63)			(4.61)		
Japan	-0.84	0.50	0.35	-	-0.009	-	-	-	-	0.98	2.22
	(6.76)	(5.35)	(5.71)		(2.11)						
Sweden(1)	-0.42	0.83	0.05	-0.002	-	-	-	-	-	0.96	1.59
	(1.10)	(7.73)	(1.37)	(0.28)							
United	-1.27	0.67	0.18	-	-0.003	-	-	-	-	0.98	1.53
Kingdom	(3.98)	(8.36)	(2.25)		(1.67)						
U.S.A.	-1.48	0.41	0.31	-	-	-	-0.007	-0.010	0.63	0.99	1.87
	(3.01)	(3.96)	(2.01)				(3.94)	(5.10)	(4.34)		

- Number in parenthesis are t-statistics.

- The same dummies as in Table 1 have been used:
  Belgium, Year 1983, -0.04 (3.45).
  France, Year 1970, -0.01 (1.26).
  Japan, Year 1973, 0.02 (1.37).
  Sweden, Year 1982, 0.02 (0.86).
  United Kingdom, Year 1980, -0.02 (2.15).

(1) For Sweden wealth does not include the real stock of capital because the series was unavailable.

Table 4: Consumption function: pooled cross-country and time series analysis - 7 industrial countries, annual data. 1970-1983

Regr.No.	Intercept	ln Y_{dis}	ln W(-1)	R(-1)	R-π	lnL	R^2	DW	ρ
1	-1.10	0.48	0.32	-0.006	-	0.53	1.00	1.87	0.75
	(6.80)	(9.79)	(7.50)	(5.03)		(5.00)			(10.90)
2	-1.41	0.48	0.27	-	-0.0008	0.46	1.00	1.69	0.62
	(8.67)	(9.17)	(6.13)		(1.93)	(4.53)			(7.74)

- Numbers in parenthesis are t-statistics
- The countries are: Belgium, France, Germany, Italy, Japan, United Kingdom, U.S.A.
- Y_{dis} is disposable income from labour only.
- For the first six countries, country dummies have been used whose coefficients are: 1.10 (11.69), 0.58 (11.91), 0.22 (9.23), 1.37 (10.14), 0.83 (7.14), -0.24 (6.05) in the first regression and 1.23 (13.13), 0.59 (11.93), 0.27 (12.07), 1.66 (12.95), 1.60 (11.47); -0.33 (10.10) in the second regression.

Table 5: Consumption function: pooled cross-country and times series analysis - 4 industrial countries, annual data

Regr. No.	Estimation Period	Intercept	ln Y_{dis}	ln W(-1)	R(-1)	R- π	ln L	R^2	DW	ρ
1	1962-1972	-0.69 (3.22)	0.60 (7.64)	0.30 (3.12)	-0.011 (3.09)	-	0.28 (1.78)	1.00	1.58	0.69 (6.93)
2	"	-0.96 (4.24)	0.52 (6.25)	0.36 (3.32)	-	-0.001 (0.70)	0.31 (1.71)	1.00	1.52	0.65 (5.91)
3	1973-1983	-0.94 (2.59)	0.47 (5.35)	0.34 (5.95)	-0.006 (3.63)	-	0.69 (4.31)	1.00	0.91	0.58 4.72
4	"	-0.72 (1.92)	0.60 (6.82)	0.26 (4.53)	-	-0.001 (2.38)	0.49 (3.54)	1.00	1.54	0.44 (3.34)

- Numbers in parenthesis are t-statistics

- The countries are: Belgium, Germany, Italy, U.S.A.

- Y_{dis} is disposable income from labour only.

- Country dummies have been used whose coefficients are respectively:
  0.73 (9.43), 0.16 (6.23), 0.77 (4.98), in the first regression
  0.85 (11.61), 0.17 (5.98), 0.91 (5.40), in the second regression
  1.09 (4.66), 0.24 (4.90), 1.34 (3.64) in the third regression
  0.82 (3.61), 0.19 (4.11), 0.98 (2.73) in the fourth regression.

of the unavailability of the stock of capital for this country. The elasticity of consumption with respect to disposable labour income is about 0.48, significantly higher than the average in the countries taken individually. The coefficient of the after tax interest rate is highly significantly different from zero. So is the coefficient of the real interest rate. The elasticity of the participation rate is also highly significantly different from zero. In Table 5 the sample period is extended back to the 1960's. However homogeneous data for this longer period are available only for 4 countries: Belgium, Germany, Italy and the U.S. The sample period was split into two sub-periods 1962-1972 and 1973-1983 to check whether structural changes in the parameter values and especially in the coefficient of the interest rate have occurred. The coefficients of the nominal after-tax rate of interest are significantly different from each other; however if one takes into account the higher average value of nominal interest rates in the second period, the interest rate elasticities are very similar (-0.057 in the period 1962-72 and -0.049 in the period 1973-83). The coefficient of the real rate of interest becomes significantly different from zero only in the second period. The insignificance of this coefficient in the 1960's is certainly due to the very low variability of the real interest rate during this period. Another interesting difference between the two periods is the increased significance in the second period of the coefficient of the variable reflecting changes in the structure of the population, suggesting that uncertainty may have increased and/or that the higher participation rate of women has raised consumption per capita.

3.3 Summary of interest rate elasticities obtained and comparisons with other studies

Table 6 summarises the after tax interest elasticities of consumption evaluated at sample means derived from the semi elasticities of Tables 1 to 5. This calculation facilitates comparisons of the elasticities for different countries and periods and also allows comparisons with other studies. Focusing first on individual country elasticities (Quadrant A of Table 6), the elasticities with respect to the long term after tax nominal interest

Table 6: After tax interest elasticities of household consumption, (evaluated at sample means).

A. Individual country estimates

Nominal interest rate - 1970-1983 (Table 1)

Country	Regression Coefficient	Mean of R or R(-1)	ε
Belgium	- 0.006	7.850	- 0.047
France	-0.003	9.311	-0.028
Germany	-0.007	7.074	-0.050
Japan	-0.012	7.298	-0.088
Sweden	-0.012	7.088	-0.085
United Kingdom	-0.008	10.263	-0.082

Real interest rate - 1970-1983 (Table 1)

Country	Regression Coefficient	Mean of absolute value of $R - \pi$	ε
Italy	-0.002	4.262	-0.009
United States	-0.007	2.473	-0.017

B. Pooled estimates

Nominal interest rate

Sample period	No. of countries	Regression number	Regression coefficient	Mean of R(-1)	ε
1970-83	7	1 of Table 4	-0.006	8.146	-0.049
1970-83	4	3 of Table 5	-0.006	8.201	-0.049
1962-72	4	1 of Table 5	-0.011	5.211	-0.057

Real interest rate

Sample period	No. of countries	Regression number	Regression coefficient	Mean of absolute value of $R - \pi$	ε
1970-83	7	2 of Table 4	-0.0008	2.984	-0.0024
1973-83	4	4 of Table 5	-0.0010	3.301	-0.0033

rate range from a high of -0.088 for Japan, to a low of -0.028 for France. The elasticities with respect to the after tax nominal interest rate obtained from the pooled regressions are -0.049 for the period 1970-1983. The elasticities with respect to the real after tax interest rates are -0.009 for Italy and -0.017 for the United States. These elasticities might seem small at first sight. In reality they imply enormous effects of even small changes in interest rates on household consumption and savings. This can be shown as follows. Making use of the well known property of logarithms that $\ln(1+R) \approx R$ for R sufficiently small, equation (2) can be rewritten as:

$$\ln C = a_0 + a_1 \ln Y_{dis} + a_2 \ln W + a_3 \ln(1+R) + a_4 \pi + a_5 \ln L \quad (4)$$

It follows that $a_3 * 100$ measures the elasticity of consumption with respect to (1+R), the relative price of present consumption with respect to future consumption. The multiplication with 100 results from the fact that R is expressed in this study in per cent. i.e. an interest rate of 8 per cent is expressed as 8.0 and not as 0.08. Thus for an increase in the after tax interest from 6 to 8 per cent (an increase in (1+R) of about 1.9 per cent), the estimated coefficient of -0.006 obtained from Regression 1 of Table 4 implies a fall in consumption of 1.14 per cent (-0.6 x 1.9). The percentage change in household savings would be four times as large assuming an average propensity to consume of 0.80.(9) The elasticities with respect to the real interest rate are substantially smaller (Table 6).

Two reasons why many previous studies did not find significant interest rate coefficients have already been suggested above: first the use of total disposable income rather than of income from labour seems to bias the estimate of the interest elasticity towards zero (cf. Table 1 and 3) and

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(9) More precisely $\frac{\partial C}{\partial (1+R)} = - \frac{\partial S}{\partial (1+R)}$ where ∂ is the partial derivative and S is household savings. From the above formula it follows that: $\varepsilon_{S,(1+R)} = - \frac{C}{S} \cdot \varepsilon_{C,(1+R)}$ where $\varepsilon_{S,(1+R)}$ is the elasticity of household savings with respect to (1+R). Hence, if the average propensity to consume is 0.80, C/S = 4 and $\varepsilon_{S,(1+R)} = -4 . \varepsilon_{C,(1+R)}$.

secondly the lack of variability of the real interest rate in the 1960's also biases the coefficient towards zero (cf. Regressions 2 and 4 in Table 5). The other main reasons why many previous studies do not find significant interest elasticities are the lack of important variables in the consumption function, like population or variables reflecting changes in the structure of the population, (this is especially true for studies encompassing a very long time span), incomplete definition of some important variables such as wealth (most studies which consider wealth include only total financial wealth, a large part of which cancels out within the private sector) and the interest rate (neglect of the tax correction factor). Furthermore, it has been suggested that if an increase in consumption influences positively the interest rate, not taking into account the simultaneity between the two variables might lead to estimates of the interest rate coefficients which are biased towards zero. This simultaneous equation bias does not seem to be important, however at least for countries other than the U.S., as suggested by the two stage least squares estimates performed in this study (cfr. Tables 1 and 2). When financial markets are highly integrated, the interest rate is largely determined in world financial markets(10), and not so much influenced by consumption in the domestic country, with the exception of the dominant economy, the U.S. Finally, many studies for the United States including Wright (1967, 1969), Howrey and Hymans (1978), Boskin (1978) and Friend and Hasenbrock (1983), include the war years, when consumption behaviour and interest rate determination were altered by the war effort.

Despite the fact that most studies on the subject, have one or the other of the above-mentioned shortcomings, studies which find plausible and significant elasticities are not rare in the literature. Tables summarizing the evidence are contained in Gylfason (1981) and OECD (1983). Most of the evidence relates to the United States: Wright (1967, 1969) finds an elasticity with respect to the nominal interest rate of -0.02 in two studies covering the period from 1905 to 1949 and from 1929 to 1959. Hamburger (1967) finds an elasticity of demand for automobiles of -0.85 and of other durables of -0.17 for the period 1953-64. Taylor (1971) finds

(10)This hypothesis is advanced by Blanchard and Summers (1984), Tanzi (1985) and Mortensen and Currie (1985).

an elasticity of -0.08 for the period 1953-69 and Juster and Wachtel (1972) and elasticity of -0.03 for the period 1954-72. Heien (1972) finds -0.16 (1948-65) and Mishking (1976) -0.20 (1952-74). Boskin (1978) finds -0.04 (1929-69). However, Howrey and Hymans (1978) using the same specification as Boskin show that if 1934 is eliminated from the sample period, the elasticity becomes insignificant. Furthermore, by estimating savings functions they find insignificant interest elasticities of saving. King (1980) correctly points out that Howrey and Hymans use a very narrow loanable funds concept of savings corresponding to about 14 per cent of private savings. Finally, Gylfason (1981) finds an elasticity of consumption of -0.03 (1952-1978). As to the real interest rate elasticity, Blinder (1975) finds a real interest rate elasticity of consumption of -0.003 (1947-1972) and Friend and Hasbrock (1983) an elasticity of consumption with respect to the real rate of return to capital obtained from Christiansen and Jorgenson (1973) of around -0.07 (1932-1969), but by using various definitions of the real financial interest rate they do not obtain significant results.

For other countries also there are significant estimates of the interest elasticity. Because of their greater reliability, due to the elimination of the possible simultaneous equation bias between consumption and disposable income and the interest rate, only the estimates obtained by simultaneous estimation methods within medium-sized econometric models will be reviewed. Sommariva and Tullio (1987) find an elasticity of consumption with respect to the real interest rate of -0.02 for Germany (1880-1979), Tullio (1981) finds an elasticity of -0.01 for Italy (1961-1978), Sommariva (1981) of -0.02 for Sweden (1961-79). Jonson, Moses and Wymer (1977) find an elasticity with respect to the nominal interest rate of -0.0113 for the period from the third quarter of 1959 to the last quarter of 1974 and of -0.0098 for the period from the third quarter of 1959 to the end of 1971. (11) Finally, Tullio (1983) finds a positive real interest rate elasticity elasticity of savings of 0.07 for Germany (1973-1979). All these estimates

(11)Thus they obtain an elasticity which is smaller for the former period, albeit not significantly so.

are free of the simultaneous equation bias(12) but do not correct the real or nominal interest rate for taxation unlike in the present study. Also they use total disposable income or gross or net domestic product as a scale variable, rather than disposable income from labour.

4. The longer run effects of the secular growth of taxation on household consumption and savings

In the regressions presented in the Tables 1-5 the tax correction factor (1-t) never appears separately from the nominal or the real interest rate. Attempts to find a significant effect of (1-t) failed systematically when yearly data were used. In order to test whether this negative result is due to the very low year to year variability of (1-t), regression (2) has been tested by taking 5 year averages of the variables and by entering separately the before tax nominal rate of interest (IL) and (1-t). The sample periods considered are 1961-83 and 1970-83. The countries for which the 5 year averages have been pooled are only four owing to data limitations. They are Belgium, Germany, Italy and the US. The results are presented in Table 7. The significance of the semi-elasticity of IL drops with respect to the semi-elasticity of the after tax interest rate in the regression using annual data and the value of the coefficient is halved (cfr. Table 5 and 7). The coefficient of (1-t) is instead very significantly different from zero and has a very high elasticity of about 0.90 evaluated at sample means. This is a much higher elasticity than that with respect to IL. The income redistribution involved in the secular growth of progressive taxation and of subsidies to lower income groups may contribute to this finding. The loss of significance of the variable IL is at least in part due to the averaging of the data which highly reduces its variability. Interestingly, the elasticity of consumption with respect to household disposable income from labour falls considerably, while that of wealth increases (cf.Tables 7 and 5). This is in accordance with the permanent income and the life-cycle consumption hypotheses.

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(12)The models from which the above elasticities are obtained are all disequilibrium models specified in continuous time and estimated by a full information maximum likelihood method, developed by Wymer (1972, 1976).

Table 7: Consumption function: pooled cross-country and time series analysis - five year averages(1)

Regr. No.	Estimation Period	Intercept	ln Y_{dis}	ln W	IL	(1-t)	ln L	R^2	DW	ρ
1	1961-1983	-0.52 (1.72)	0.43 (6.29)	0.41 (5.38)	-0.004 (1.73)	-0.73 (2.21)	0.36 (3.04)	1.00	2.20	0.45 (3.44)
2	1970-1983	-1.60 (3.76)	0.15 (1.64)	0.48 (6.46)	-0.003 (1.58)	-1.03 (3.80)	0.41 (3.22)	1.00	2.92	-0.72 (4.50)

- Numbers in parenthesis are t-statistics

- In the first regression the countries are: Belgium, Germany, Italy, U.S.A.
  Country dummies have been used, whose coefficients were: 0.97 (10.06), 0.20 (7.86), 1.10 (6.68).

- In the second regression, the countries are: Belgium, France, Germany, Italy, Japan, United Kingdom, U.S.A.
  Country dummies habe been used, whose coefficients were:
  1.80 (13.24), 0.94 (12.93), 0.36 (15.01), 2.42 (15.04), 1.75 (12.86), -0.48 (13.17).

(1)The variables are 5 year averages, except for the last period (1980-1983) when they are 4 year averages.

The remainder of this section is devoted to the analysis of the sensitivity of consumption and savings to the secular growth of taxation(13).

Table 8 shows how much t has increased from 1970 to 1983 in the eight industrial countries considered in this study, thus leading to a fall in the after tax nominal interest rate, for a given before tax interest rate. (14) Through this channel the growth of government expenditure and tax receipts has encouraged household consumption and discouraged savings. A second channel results from the fact that the growth of tax receipts has reduced the growth of household disposable income per capita below what one would have otherwise observed by a percentage reported in the last column of Table 8. This also has had a negative effect on household savings. Table 9 summarises the effects of these two channels on household consumption and savings per capita, obtained by multiplying the percentage change of the relevant exogenous variables with the elasticities obtained from the pooled regressions. The calculations show that the joint effect of the above two factors has caused by 1983 a shortfall of real consumption per capita below the level one would otherwise have observed in all countries except Italy. However, the negative effect of higher tax receipts on private consumption is limited as the two effects operate in opposite directions. More substantial are the negative effects on savings, which falls short of the level one would otherwise have observed by about 50 per cent in Italy and 35 per cent in Belgium. Only in the U.K. is the net effect positive because the U.K. is the only country where direct taxes on household income have fallen during the period.

These calculations have to be taken with great caution for several reasons. First the correction factor used to compute the after tax rate of return on savings is very crude. An average tax rate rather than a marginal rate was used and no attempt was made to treat the taxation of different types of savings separately. Secondly, in the simulations a fourth negative channel through which the growth of fiscal variables

(13)For a study analysing the channels through which the increase in tax receipts may have affected capital accumulation, economic growth and employment in Europe, see Tullio (1986).

(14)The assumption the the growth of government expenditure, taxation and deficits has not affected the before tax interest rate will be relaxed later.

Table 8: Growth of fiscal variables in individual countries, 1970 to 1983(1)

Country	t			$\frac{Y_{dis}\ (1983)^2}{Y^*_{dis}(1983)} \cdot 100$
	1970	1983	percentage change from 1970-1983	
Belgium	0.1065	0.1701	59.72	-10.28
France	0.0650	0.0882	35.69	-4.53
Germany	0.1193	0.1414	18.52	-5.01
Italy	0.0516	0.1497	190.12	-11.99
Japan	0.0586	0.0869	48.29	-4.88
Sweden	0.2537	0.2864	12.89	-9.56
United Kingdom	0.1559	0.1460	-6.35	-2.25
U.S.A.	0.1330	0.1343	0.98	-2.12

(1) The variables which appear in this table are the same as those used as independent variables in the regressions of Tables 1 to 7.

(2) Y^*_{dis} (1983) is the level of per capital real total disposable income in 1983 if real direct taxation per capita had remained unchanged at the 1970 levels.

Table 9: Effects of the growth of taxation since 1970 on the level of 1983 household consumption and savings.

	Consumption			Savings		
Country	A	B	Total	A	B	Total
Belgium	4.56	-4.93	-0.37	-31.33	-5.35	-36.68
France	1.58	-2.17	-0.59	-10.87	-2.36	-13.23
Germany	1.61	-2.40	-0.79	-11.04	-2.61	-13.65
Italy	6.62	-5.76	0.86	-45.50	-6.23	-51.73
Japan	1.93	-2.34	-0.41	-13.24	-2.54	-15.78
Sweden	2.81	-4.59	-1.78	-19.32	-4.97	-24.29
United Kingdom	-0.94	-1.08	-2.02	6.47	-1.17	5.3
U.S.A.	0.10	-1.02	-0,92	-0.66	-1.10	-1.76

A : Effect due to fall of (1-t). The elasticity used, evaluated at sample means, is obtained from Table 7: -0.73 . (1-t) = -0.64.

B : Effect due to smaller growth of disposable income. The same elasticity of 0.48 has been used for all countries, it has been obtained from Table 4.

affects savings has been neglected, namely the effect of government bond issues on outside wealth and consumption. This channel was neglected in the simulation because of the complicated definition of wealth used in this study which would have made the computations more cumbersome but mainly because the growth of public debt is believed to influence interest rates positively as shown by Blanchard and Summers (1984), Tanzi (1985) and Mortensen and Currie (1985) and the two forces tend to compensate each other.

Be that as it may, for completeness, Table 10 shows the effect on consumption and savings of the rise in the long term nominal interest rate in 1981-83 with respect to 1971-73, using the elasticity with respect to (1+R) estimated from the pooled regression of Table 4 (Regression 1). Table 10 shows that the increase in interest rates has led, other things being equal, to a lower level on household consumption of 7.0 percentage points in Italy, of 3.7 percentage points in the US, 4.0 in France and 3.2 in Sweden and Belgium. The effect has been smaller in the other countries. The rise in interest rates has raised savings correspondingly in all countries. Adding the last column of Table 10 to the last column of Table 9 one observes that the joint effect on household savings of the fall in 1-t, the reduction in disposable income and of the increase in the level of interest rates would still have been significantly negative for Belgium, Japan and Germany, slightly negative for Italy and Sweden, and positive for France, the UK and the United States.

The results of the calculations of Tables 9 and 10 indicate that the growth of taxes on household disposable income has most likely had a very negative effect on household savings in continental Europe. However, they also indicate that the increase in nominal (and real) interest rates in the early 1980's has to a large extent compensated in many countries for the above negative effect. In some countries one even observes an overcompensation. However, the negative effect of the growth of public debt on savings has been neglected in these computations.

Table 10: Effect of rise in nominal interest rates in 1981-1983 with respect to 1971-1973 on consumption and savings.

Country	Consumption	Savings
Belgium	-3.23	22.20
France	-3.99	27.45
Germany	-0.39	2.67
Italy	-7.00	48.15
Japan	-0.54	3.73
Sweden	-3.15	21.71
United Kingdom	-1.81	12.45
U.S.A.	-3.67	27.27

The elasticities of consumption and savings with respect to the price of present consumption with respect to future consumption (1+R) have been obtained from Table 4 (-0.60 for consumption).

APPENDIX
Definition and sources of data used
(in alphabetical order)

Notation used for Sources

AR = Annual Report of the Deutsche Bundesbank, of the Bank of Italy or the Bank of Belgium, various issues.

AS = Annuaire Statistique de la Belgique (1964, 1971).

BJ = Economic Statistics Monthly of the Bank of Japan, various issues.

BF = Bulletin Trimestriel de la Banque de France, No.2, Paris, février 1972.

CEM = Commission of the European Communities, Annual Economic Review 1984-85, Brussels (1984).

CR = Data Bank of the European Commission (CRONOS).

CSO = Financial Statistics, No.273 (January, 1985), Central Statistical Office of the United Kingdom

EE = European Economy, No.20, July 1984: Jorgen Mortensen, "Profitability, relative factor prices and capital/labour substitution". Published by the Commission of the European Communities, Brussels.

FED = Federal Reserve Bulletin, (Washington, June 1963, December 1970, 1976, 1984, January 1980, 1982).

HS = Deutsches Geld- und Bankwesen in Zahlen 1876-1975, Deutsche Bundesbank, (1976).

IMF = International Financial Statistics, Yearbook (1979, 1982, 1984); International Monetary Fund.

INSEE = Rapport sur les comptes de la nation de l'année 1983, Paris (1984).

MB = Monthly Report of the Deutsche Bundesbank, various issues.

OECD = National Accounts, 1950-1968, (Paris, 1970);
National Accounts, Statistics, Vol. II, 1960-1977, Paris, (1979), 1970-1982, Paris, (1984), Economic Surveys, 1983-1984, Germany, Paris, (1984A);
Quarterly National Accounts Bulletin, No.3, Paris (1984B) Labour Force Statistics 1956-1967, Paris, (1969).

SCB = Survey of current business, (January 1981, 1982, 1984, November 1982, 1984).

SECT = Data Bank of the European Commission (SECTOR).

SC = Statistical Abstract of Sweden, Yearbook (1979, 1984), Monthly (various issues).

SHA = OECD Data Bank (SHARP)

VG = Volkswirtschafliche Gesamtrechnungen Fachserie 18; Reihe S.R, Revidierte Ergebnisse 1960 bis 1981 (1982) and Reihe 1, I Konten und Standardtabellen, 1983 (1984) Statistiches Bundesamt Wiesbaden.

VARIABLES

CB = Current account of balance of payments, in billions of current U.S. dollars
Source: for Germany HS from 1950 to 1955; IMF (1984) from 1956 to 1983. For all other countries IMF (1979, 1984).

CE = Civilian employment, in thousands.
Source: CR. For the US: CR from 1958 to 1979, and SCB (January 1982, 1984, November 1984) from 1980 to 1983. For Japan: CR and OECD (1984B) from 1958 to 1982, and BJ for 1983. For Sweden OECD (1972, 1984C) from 1962 to 1982, and SC (1985) for 1983.

CPM = Consumer price index, 1975 = 100, December average.
Source: CR for all countries, except Sweden for which the source is IMF (various issues) from 1961 to 1974, and CR from 1975 to 1983.

CPY = Yearly consumer price index, 1975 = 100, period average, Source: CR.

DI = Household disposable income, in current billions.
Source: OECD (1970, 1979, 1984, 1984A). For the updating to 1982 and 1983 Sources: SCB(1984), CSO(1985), AR(1984), SHA(1984) and SC(1984).

DIL = Household disposable income from labour. Source: OECD (1970, 1979, 1984). The national sources used for the updating to 1983 are the same as for TD.

EER US Dollar effective exchange rate, 1975=100.
Source: IMF (1982, 1984).

ERM = Domestic currency units per US Dollars, December average.
Source: CR. For Belgium the source is IMF (1984), line de from 1960 to 1971. For Sweden it is IMF (1984), line de for the whole period.

ERY = Deutsche Marks per US Dollars, Yearly average.
Source: CR. For Belgium the source is IMF(1984), line rf from 1960 to 1971 and for Sweden the source is IMF(1984), line rf for the whole period.

HC = Households consumption, in current billions.
Source: OECD (1979, 1979, 1984, 1984B).

IL = Yield on long term government bonds, period average.
Source: IMF(1979, 1982, 1984).

IS = Call money rate, or Treasury Bill rate, period average.
Source: IMF (1979, 1982, 1984).

LF = Civilian labour force, in thousands.
Source: CR. For the US the source for the updating was SCB (January 1982, November and December 1984) from 1979 to 1983. For Japan the source was: OECD (1972, 1984B) from 1959 to 1982, and BJ for the 1983 figure. For Sweden it was OECD (1972, 1984C) from 1962 to 1982, and SC(1985) for the 1983 figure.

NK = Whole economy net capital stock in constant bilions.
Sources: For Germany VG (1982, 1984). For Japan and the US the source was EE and for all other countries SECT. For Sweden the series is unavailable.

PD = General government debt, in current billions.
Sources: for Germany HS from 1960 to 1970, and MB from 1971 to 1983. For the US the source is FED, various issues. For the UK the sources is CEM. For France the Source is BF (1972) for 1969 and CEM(1984) from 1970 to 1983. For Italy the source is AR, various issues from 1960 to 1969 and CEM from 1970 to 1983. For Japan the source is BJ. For Belgium it is AS (1964, 1971) from 1960 to 1969 and CEM from 1970 to 1983. For Sweden the source, is SC various issues.

TD = Direct taxes on households in current billions.
Sources: OECD (1970, 1979, 1983). For the updating to 1983 the sources are: for Germany: VG (1984), for the US: SCB (November 1984). For the UK: CSO (1985). For France: INSEE (1984). For Japan SHA. For Belgium AR (1983). For Sweden SC (1985).

TP = Total population, in thousands.
Source: CR and IMF (1985); For Sweden the source is: OECD (1972, 1984C) from 1959 to 1982, and SC(1985) for 1983.

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