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Deregulation and Consumption--Saving Dynamics in the Nordic Countries

Prepared by Olli-Pekka Lehmussaari 1/

Authorized for Distribution by Adalbert Knöbl

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Abstract

This paper examines the changes in savings behavior brought about by financial liberalization in the Nordic countries. The paper suggests that there have been changes in the economic relationships in Finland and Norway since the deregulation, while the evidence from Denmark is less clearcut. Data do not reveal any structural change in Sweden. The results also indicate that the wealth effect has played an increasing role in household saving decisions. Since the present tax rules are biased against saving, cuts in marginal tax rates and reductions in the tax value of interest payments would be expected to increase household saving.

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Summary

The institutional characteristics of financial markets have to some extent differed among Nordic countries. Until recently, Finland, Norway, and Sweden had broad-based credit controls, while Denmark had a relatively liberal credit system. For many years real after-tax interest rates were negative for the large majority of households as a result of a combination of tax deductible interest payments and high personal tax rates.

By the end of 1985, the liberalization of financial markets was largely completed in all Nordic countries. This opened new opportunities for household borrowing, giving rise to a surge in household demand for credit. As a result saving rates dropped sharply. This paper attempts to determine whether the structural changes brought about by financial reform were so large that consumption models estimated using data from the period prior to the liberalization cannot be used to predict accurately the developments in the post-sample period. Common factors that contributed to the decline in the saving rate are also analyzed and compared on a cross-country basis.

The analytical framework of the study is based on the life-cycle hypothesis, which implies that individuals save more during their years of high earnings and dissave during their years of low earnings. Moreover, the error correction model, which reproduces long-run properties of the life-cycle model, is used. The empirical results suggest that the financial reforms have contributed to structural changes in the economic relationships in Finland and Norway. The evidence regarding structural change is less clearcut in Denmark, while the findings do not reveal changes in Sweden. Furthermore, the results suggest that the wealth effect has played an increasing role in saving decisions on household consumption in recent years.

These findings should be assessed in the light of the high personal tax rates and the favorable tax deductibility rules regarding interest payments for both mortgage and consumer loans. Prior to deregulation, low after-tax interest rates were mitigated by credit rationing. After deregulation, however, the surge in household credit demand was not fully countered by an increase in nominal interest rates; since fixed exchange rates implied that nominal domestic interest rates were largely determined by foreign interest rates. Because increases in nominal interest rates were limited, the logical alternative to depressing credit demand would have been to reduce the tax value of interest payments. Since the present tax rules are still biased against saving, cuts in marginal tax rates and reductions in the tax value of interest payments would be expected to increase private savings.

Deregulation and Consumption--Saving Dynamics in the Nordic Countries

I. Introduction

This paper examines household saving and consumption behavior in the Nordic countries. 1/ The research is motivated by the sharp drop in household saving rates which took place in all Nordic countries between 1984-1987. The decline in household saving and the associated widening of the Nordic countries' external current account deficits has led the national authorities to search for the reasons for the weak savings behavior and, inter alia, contributed to tax reforms aimed at enhancing private saving.

Aggregate consumption and savings behavior is one of the most intensely researched areas in macroeconomics. Nevertheless, the empirical literature studying the effects of a number of economic and institutional factors is inconclusive, despite numerous efforts at modeling savings behavior. When formulating a consumption-saving model for the Nordic countries, the developments in savings behavior need be viewed against the background of high marginal income tax rates, the tax deductibility of interest payments, and, more recently, the liberalization of financial markets. For many years real after-tax interest rates were negative for the large majority of households, and real after-tax interest rates became generally positive only recently. In the past, the effects of the negative real after-tax interest rates on consumer borrowing were mitigated by financial market regulation which limited an individual's ability to borrow through credit rationing. This implied that consumption could be shifted into the future through saving but it could not freely be moved forward through borrowing. Therefore consumption was more sensitive to income than it would have been under perfect capital markets. Several empirical studies have confirmed that credit rationing had a negative influence on consumer expenditure in the Nordic countries. 2/ The deregulation of credit markets has relaxed households' borrowing constraints causing many to adjust their financial portfolios.

A complete empirical assessment of the effects of financial liberalization on consumption and saving decisions in the Nordic countries is hampered by the small number of observations since the financial deregulation took place. Nevertheless, it appears that many of the consumption function relationships utilized in economic modeling have performed poorly in the post-deregulation period. This paper attempts to determine whether the structural changes brought about by financial reform were so large that consumption models estimated using

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1/ In this paper Nordic countries refer to Denmark, Finland, Norway, and Sweden.

2/ See for instance Hamalainen (1981), Koskela and Viren (1982, 1984), and Palmer (1981). See also Flemming (1973) and Hayashi (1985).

data from the period prior to the liberalization cannot be used to accurately predict the developments in the post-sample period. In addition, the factors that may have led to any predictive failure are analyzed and compared on a cross-country basis for the Nordic countries.

The analytical framework is based on the life-cycle hypothesis which implies that individuals tend to save more during their years of high earnings and dissave during their years of low earnings, i.e., the working population tends to be the savers, while retirees and the young are the dissavers. 1/ The forward looking characteristic of the life-cycle model and the considerable body of evidence supporting the hypothesis has made it a standard starting point for consumption analysis, even though the principal implication of the model, namely the separation of income and consumption profiles is open to some dispute. The paper is organized as follows: Section II reviews the recent financial reforms in the Nordic countries and discusses developments in saving rates. In Section III, the basic theoretical framework is derived, which is then used in empirical work in Section IV. Section V presents the conclusions.

II. Financial Deregulation and Developments in the Saving Rate

1. Financial reform

The institutional characteristics of financial markets have to some extent differed among the Nordic countries. Until recently, Finland, Norway, and Sweden had broad-based credit controls combined with low interest rate policies, whereas Denmark has experienced relatively high domestic interest rates compared with many other countries. Credit rationing was perhaps the most extensive in Norway, where credit policy had been based on a credit budget covering all sectors of the economy. Nevertheless, recent developments in the household saving rate have been strikingly similar in all the Nordic countries with saving ratios declining sharply throughout (Chart 1 and Table 2 in Appendix). This decline has been associated with greater access by households to credit because of financial deregulation and the removal of capital controls.

Denmark has traditionally had fewer credit controls than the other Nordic countries. In the 1970s, the main instruments used by the monetary authorities to manage domestic liquidity were direct controls on bank lending and regulation of the terms of bank borrowing at the Nationalbank. In March 1979, bank lending rates, which were traditionally linked to the discount rate, were deregulated. 2/ In

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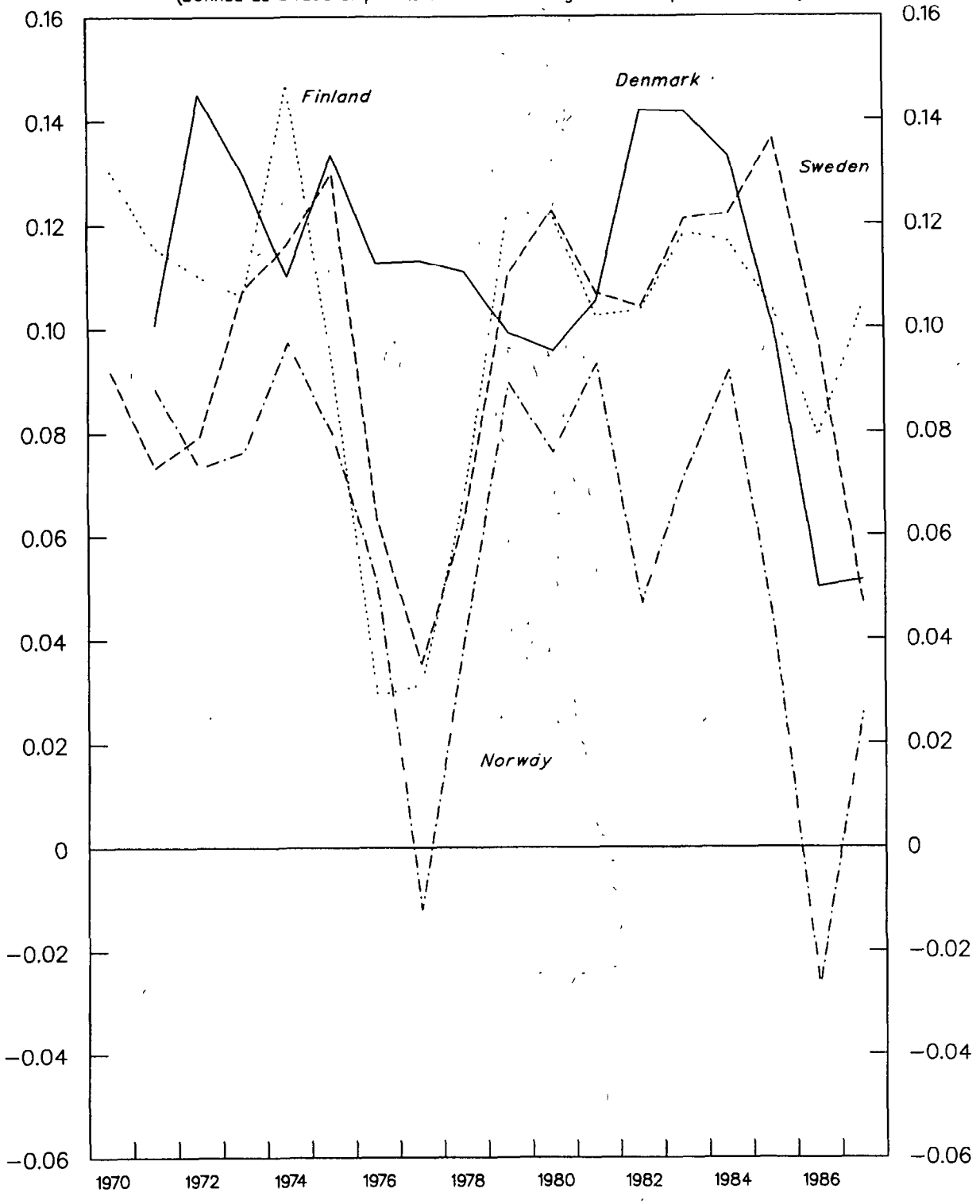
1/ For origins of these models see Modigliani and Brumberg (1955), Ando and Modigliani (1963), and Modigliani (1980).

2/ For a detailed description of Danish monetary policy, see Danish Monetary Policy in Transition (1985).

CHART 1

PRIVATE SECTOR'S SAVING RATE IN THE NORDIC COUNTRIES [1]

(Defined as a ratio of private sector net savings to net disposable income)



Source: National Accounts, various issues.

[1] Danish statistics do not allow a split into household and business saving.

1980, the ceilings on bank lending were abolished and replaced by a system of overall guidelines. In 1985, the guidelines were dropped when it became apparent that they were being circumvented by the banks.

In the Danish case, the removal of exchange controls was perhaps the most important institutional factor affecting financial decision making in the late 1970s and early 1980s. In 1978, Danish residents were allowed to buy exchange-listed bonds issued by international organizations, and in 1983, Danes have been permitted to freely acquire bonds listed on foreign exchanges with a maturity exceeding two years, and nonresidents were allowed to buy all types of Danish bonds and shares. 1/ In addition, the restriction that linked company foreign borrowing to fixed investment was removed in 1983, while the required minimum maturity of such loans was reduced from five years to one year in 1985. Furthermore, in 1984, Danish residents were allowed to buy shares listed in foreign exchanges and Danish bonds denominated in foreign currency. In October 1988, the Danes were allowed freely to deposit and borrow abroad in foreign currency.

In Finland, Norway, and Sweden, deregulation advanced rapidly in domestic financial markets while the liberalization of exchange control advanced more slowly. The deregulation process had several common features in these countries, but the timing of the liberalization was somewhat different.

In Finland, the financial markets were tightly controlled with rigid lending rates and an extensive use of foreign exchange regulations which resulted in credit rationing. 2/ The Bank of Finland started gradually to open the domestic banking system in 1982, after the gray market, which had begun to develop in the late 1970s, had reduced the effectiveness of both monetary policy and credit restrictions. Perhaps the most important elements in the Finnish financial reform were the elimination of interest rate ceilings and the creation of an active money market. Average bank lending rates were subject to ceilings until May 1983, when control was partially relaxed, allowing banks to pass on part of the costs of their unregulated funding to their lending rates. In 1986, the ceilings on average lending rates were abolished. At the same time, the Bank of Finland assisted in the development of the domestic money market, and in late 1986 the Bank of Finland and the commercial banks worked together to develop a domestic CD market.

In Norway and Sweden, prior to 1984, most interest rates were regulated and credit growth was limited through lending ceilings. As in Finland, the system of direct credit controls resulted in an inefficient

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1/ Nonresident purchases of exchange-listed kroner bonds and sales of exchange-listed shares abroad were already deregulated in the early 1970s, though sales of Danish government bonds abroad were prohibited between February 1979 and May 1983.

2/ See Richard Abrams, "The Financial Reform in Finland," IMF, Working Paper 88/89.

allocation of credit. In Norway, ceilings on bank lending were repealed in 1984, and the regulation of bank interest rates was discontinued in September 1985. Since then, monetary policy has been largely implemented through market-oriented instruments which indirectly influence interest rates in the money and capital markets. In Sweden, regulation of bank lending rates was repealed in May 1985, and quantitative restrictions on lending were removed in November 1985. Unlike Finland, an efficient money market had already developed in Sweden by 1982-83. Treasury discount notes for financing the Government borrowing requirement were introduced in 1982, and a market for business and local government certificates developed in 1983.

2. Developments in the saving rate

Although the financial liberalization in the Nordic countries increased the efficiency of the use of credit and improved the transparency of the functioning of the markets, serious problems emerged as a result of a surge in the growth of money and credit. The deregulation of financial markets opened new opportunities for household borrowing. This led to a surge in household demand for credit, as pent-up demands were freed and households sought to rearrange their portfolios. Although the private saving rate fluctuated in all Nordic countries in the 1970s, there was no clear trend until the 1980s (Chart 1). 1/ The drop in the private saving rate was most pronounced in Denmark and Norway. In Denmark it declined from 13.3 percent in 1984 to 5.1 percent in 1986. 2/ In Norway, the private saving rate declined from 9.4 percent in 1984 to -3.7 percent in 1986, while the household saving rate dropped from 5.2 percent to -7.3 percent. In Finland, the household saving rate started to decline in 1984, while in Sweden, the saving rate started to decline in 1985 (Table 2 in the Appendix).

A part of the borrowed funds was used by households to purchase real and financial assets. This, among other things, resulted in an increase in demand for equities. In Norway, industrial share prices increased by 32 percent in 1985 (period average) and in Finland and Sweden share prices advanced more than 50 percent in 1986 (Chart 2). In addition, since the requirement for saving in advance of housing purchases was reduced because of deregulation, demand for housing increased. This resulted in rapid increases in housing prices particularly in Finland and Norway, where pent-up demand for housing was strongest. In Norway, for instance, urban housing prices increased by some 80 percent from the first quarter of 1984 to the first quarter of 1987.

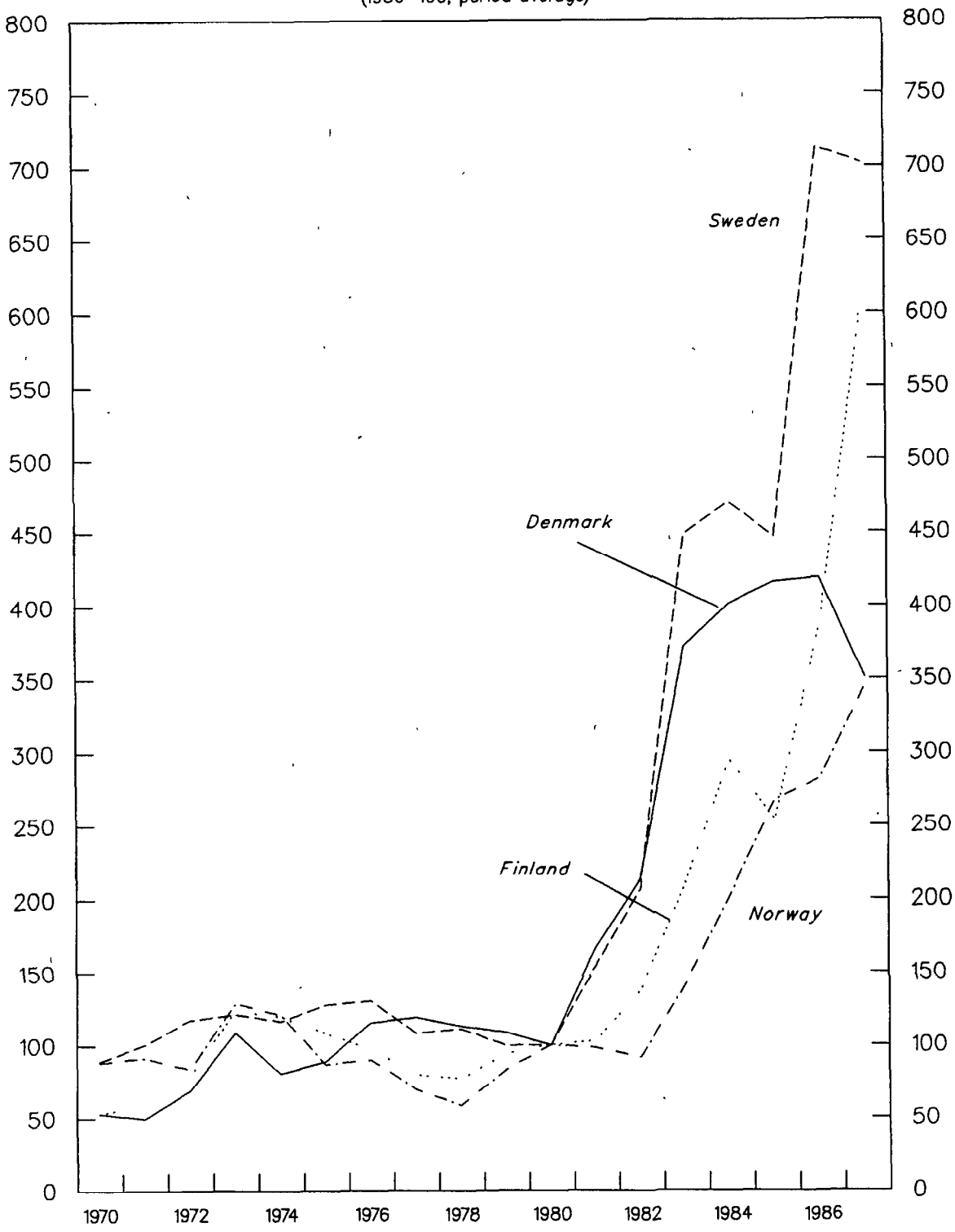
1/ The saving rate is defined as the ratio of net savings to net disposable income.

2/ Danish statistics do not allow a split into household and business saving.

CHART 2

STOCK MARKET INDEXES IN THE NORDIC COUNTRIES

(1980=100; period average) [1]



Source: IMF, *International Financial Statistics.*

[1] Industrial share prices, except Sweden: Engineering industries share prices.

The surge in household borrowing was facilitated by the tax deductibility of interest payments coupled with high marginal personal tax rates. 1/ In Denmark, the 1985 tax reform reduced the tax value of interest deductions to 51-57 percent. 2/ In Finland, interest payments on housing loans are now deductible up to Fmk 24,400 and on consumer loans up to Fmk 9,400. In Norway, interest payments are fully deductible. However, since 1986, tax reform has reduced the tax value of deductions by lowering the top marginal tax rate for interest deductions from over 66 percent in 1986 to some 45 percent in 1988. In Sweden, household interest payments remain fully deductible. However, the reform that was implemented in 1983-85 reduced the tax value of interest payments to 50 percent for many households. 3/

Developments in real after-tax interest rates in Nordic countries are illustrated in Chart 3. In the first half of the 1980s, real after-tax interest rates were strongly negative as the result of the deductibility of interest payments and high inflation, and they became positive only recently. Low real after-tax interest rates coupled with increased access to credit boosted consumer debt. Furthermore, higher housing and other real asset prices appear to have increased consumer expenditure not only through increased collateral values but also through wealth effects.

The fall in the household saving rate has attracted much discussion among policy makers in all the Nordic countries because its importance for current account developments and the accumulation of external debt. In particular, in Denmark and Norway, the decline in the private saving rate has been associated with a deterioration in the current account (Chart 4). In Finland and Sweden, the outlook for the current account has also become problematic due to the fall in private saving.

A number of other factors, other than the deregulation of financial markets and after-tax interest rates, also influence household savings decisions. Traditionally, saving for retirement, bequest, or for some specific target, and precautionary saving have been seen as major

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1/ In 1986, top marginal income tax rates for individuals in the Nordic countries stood between 70-80 percent.

2/ The so-called "Potato diet" which was introduced in 1986 further reduced the tax value of interest payments on consumer loans to 31-37 percent.

3/ In Sweden, income is divided into six sources. A deficit in one source of income can be used to offset net income from other sources. New tax rules allow a person to fully deduct interest payment against positive capital income. In this case, the tax value of interest payments is equal to an individual's marginal tax rate. The tax value of interest payments is limited to 50 percent only if interest payments exceed dividends, etc. (Andersson 1988).

motives for saving. 1/ Rather than trying to examine all the potential determinants of saving in the Nordic countries, this paper attempts to shed some light on whether there was a fundamental "structural break" because of the deregulation in the 1980s or whether the predictive failure of traditional consumption functions was attributable to a mis-specification of the econometric formulation. In this way, it is hoped to assess the impact of the deregulation on saving behavior. Common factors that contributed to the decline in the saving rate in the Nordic countries are also examined.

III. The Model

As shown in Chart 1, the saving rate can fluctuate considerably in the short run, while remaining relatively stable in the long-run. Ideally then, any consumption-saving model should capture both the short-run and long-run properties of the consumption-income relationship. If one uses consumption or saving functions which include only differenced variables, all information of long-run properties from economic theory would be lost. Davidson et al. (1978), and Hendry and von Ungern-Sternberg (1981) have, however, introduced models which ensure that the dynamic equation has appropriate long-run steady-state properties postulated by economic theory, while allowing for short-run divergences from these properties.

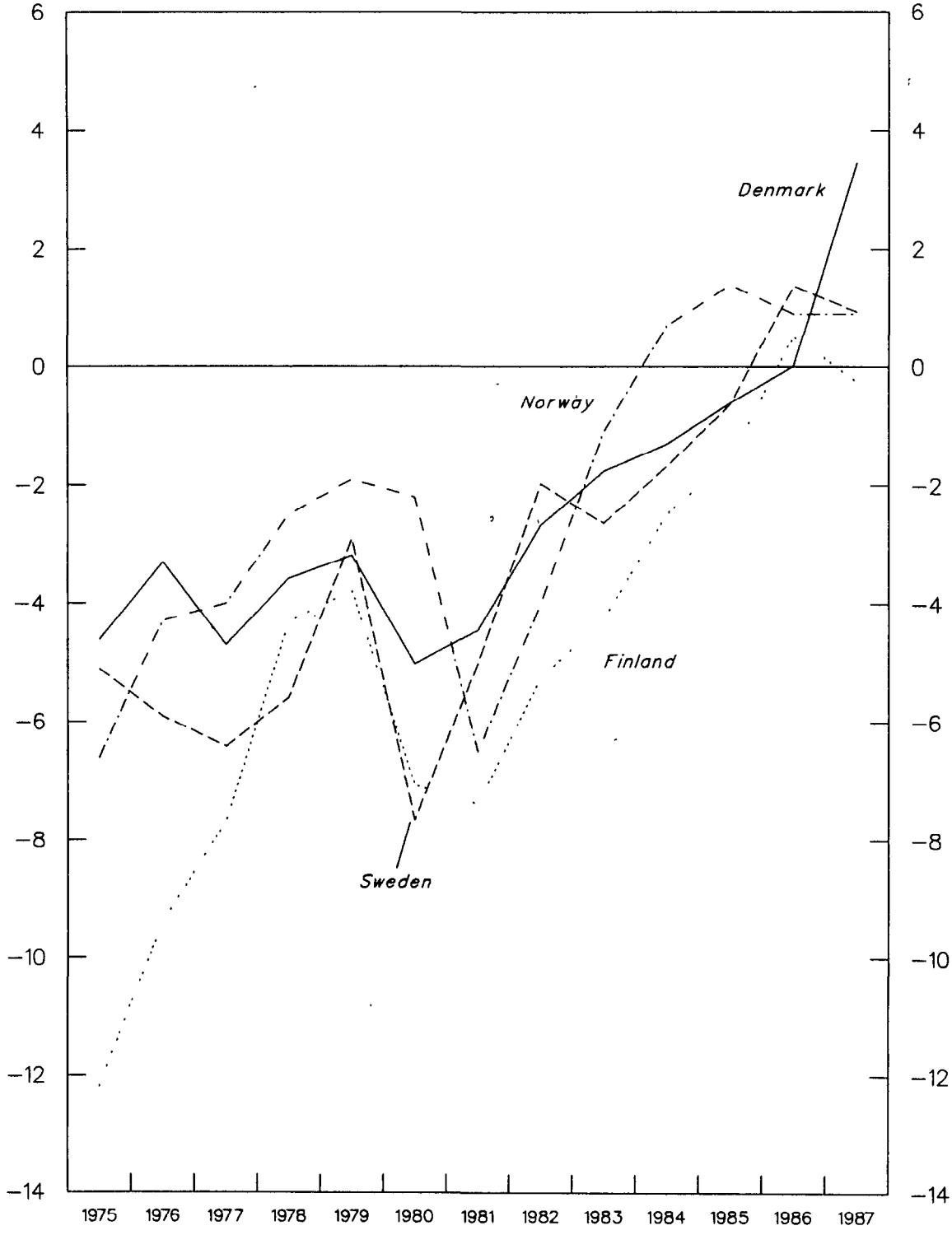
The analytical framework of this paper is based on the standard life-cycle hypothesis, which implies that the saving rate and the ratio of wealth to income remain constant on any given growth path, but vary with the growth rate. The familiar life-cycle hypothesis emphasizes that individuals save during working years for consumption during retirement. The life-cycle model of saving behavior follows from a more general model in which rational consumers maximize their life-time utility by allocating a life-time stream of earnings to an optimal life-time pattern of consumption. This behavior can be formalized as follows: let us define life-time utility in the current period as a function of utilities over the T remaining periods of the consumer's expected life. In any period, utility is a function of real consumption C_t and the discounted value of future consumption. 2/ Assuming that

1/ Recent surveys of the economics of saving can be found in Blinder and Deaton (1985), King (1985), and Sturm (1983).

2/ We assume that consumer preferences fulfill certain axioms that are needed to ensure the existence of a utility function. See Varian (1984), pp. 111-115.

CHART 3

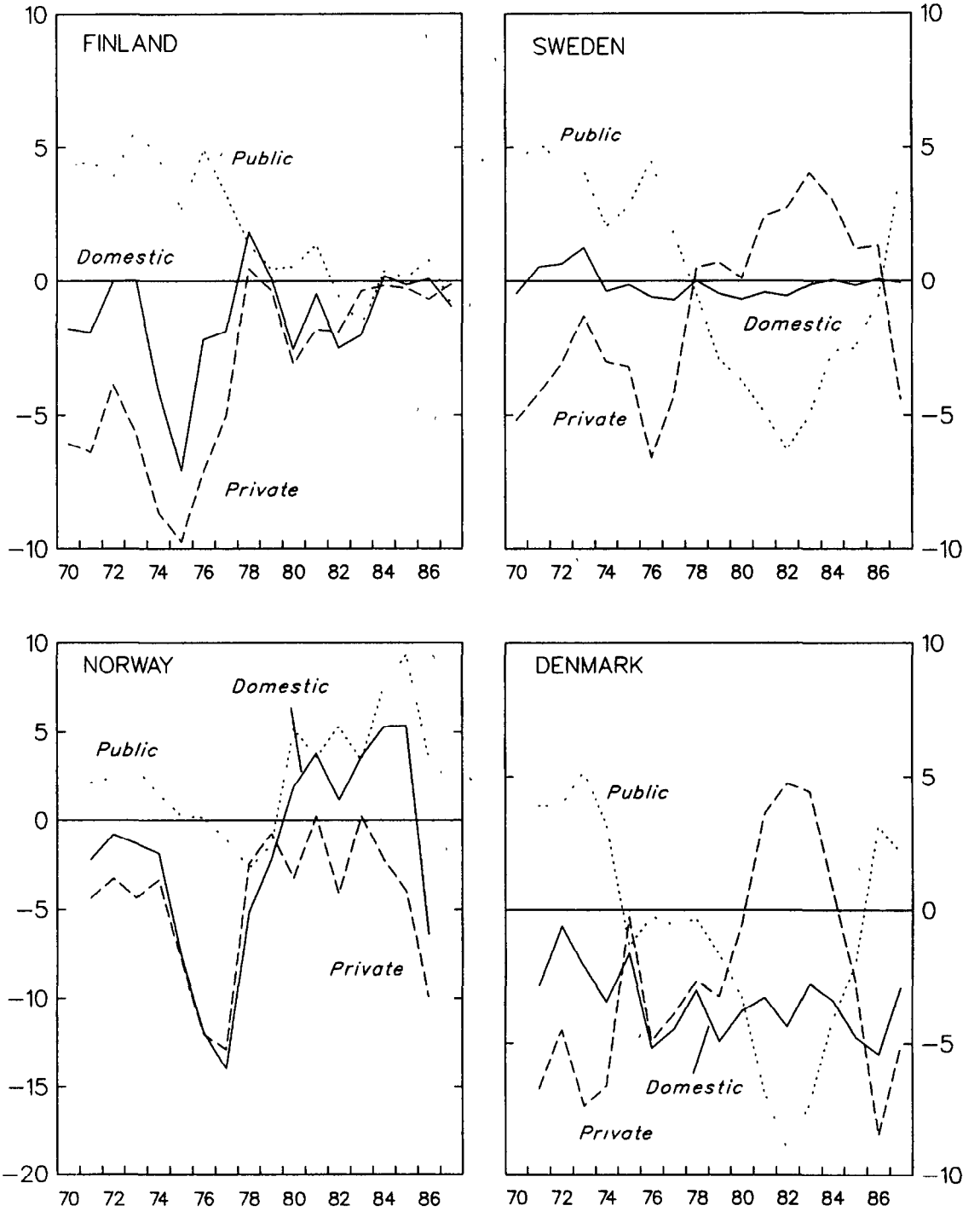
REAL AFTER–TAX INTEREST RATES IN THE NORDIC COUNTRIES



Sources. Staff calculations; and data provided by the authorities.

CHART 4

FINANCIAL BALANCES



Source. National Accounts.

consumers derive less utility from more distant consumption and that preferences are additively separable the life-time utility takes the form: 1/

$$(1) \quad U_o = \sum_{t=o}^{T} u\,(C_t)\left(\frac{1}{1+\delta}\right)^t, \quad \delta \geq 0$$

where δ refers to the time preference for consumption. The consumer's budget constraint can be defined as the sum of the stock of his real net wealth (A_o) and the present value of his future real income.

$$(2) \quad R_o = A_o + \sum_{t=o}^{T} Y_t \left(\frac{1}{1+r}\right)^t,$$

where r is the real after-tax interest rate, Y_t is real income and T denotes the consumer's remaining years of life. Assuming a homogenous utility function and ensuring that the consumer's discounted consumption over T periods have to be less or equal to his total resources, the consumer's life-time utility (1) can be maximized subject to the budget constraint (2). 2/ To obtain an aggregate consumption function it is necessary to aggregate first within each age group and then over the age groups. This leads to a consumption function in the current period which depends on current and expected future labor income and current wealth.

$$(3) \quad C_o = \alpha_1 Y_o + \alpha_2 Y_o^e + \alpha_3 A_o$$

where C_o, Y_o, Y_o^e and A_o represent real consumption, current real income, real expected income, and real net wealth. 3/

One of the main problems in empirical work using the life-cycle model, is how to relate expected income to observable variables. One solution is to assume that there is an average expected income in the current period, such that

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1/ In the present framework, it is assumed that consumption and labor supply decisions are separable. In other words, we do not include labor supply in the consumers' utility function, and therefore we assume that there is no trade-off between leisure and consumption. In addition, the model assumes zero bequests.

2/ The homogenous utility function implies that if the consumer receives additional resources, he will allocate them to consumption in different time periods in the same proportion in which he allocated his resources before the increase.

3/ See Modigliani and Brumberg (1955), Ando and Modigliani (1963), and Modigliani (1980). In the original life-cycle models the income variable, Y_t, represented only labor income. In empirical applications real income net of tax, is often replaced by real disposable income because the tax on income is based on total income, not on labor and capital income separately.

$$(4) \quad Y_o^e = \frac{1}{T} \sum_{t=1}^{T} Y_t \left(\frac{1}{1+r}\right)^t$$

In other words, the term 1/T averages the present value of expected income over T years. Then the present value of expected income can be written:

$$(5) \quad \sum_{t=1}^{T} Y_t \left(\frac{1}{1+r}\right)^t = (T)\, Y_o^e$$

Furthermore, if the average expected income in the current period is assumed to be a multiple of present income;

$$(6) \quad Y_o^e = \beta Y_o \; ; \; \beta > 0$$

then the basic consumption function can be written as

$$(7) \quad C_t = \beta_1 Y_t + \beta_2 A_t$$

where $\beta_1 = \alpha_1 + \alpha_2 T\beta$ and $\beta_2 = \alpha_3$

Because α_1, α_2, and α_3 are derived as weighted averages of the corresponding coefficients within each age group of consumers, the coefficients depend on the characteristics of individual utility functions and the age structure of the population. Therefore, the coefficients depend on tastes, consumers' remaining life-time, the rate of time preference, the rate of return on assets, etc. In the steady-state, where income, consumption, and wealth are moving together at the same constant rate and with a constant rate of return on assets, both of the coefficients in (7) can be taken as time independent (see Modigliani 1980).

From (7) and the identity S = Y-C = gA, where g is the constant rate of growth in the steady state, the long-run wealth and saving ratios implied by the life-cycle model can be derived:

$$(8) \quad \frac{A}{Y} = \frac{1-\beta_1}{g+\beta_2} \; ; \; \frac{S}{Y} = g\,\frac{A}{Y}$$

Because g is constant in the steady state these ratios (and C/Y) are also constant.

As mentioned above, the attractive feature of the error correction model is that it reproduces conditions like in (8) in the steady-state. A simple error correction model can be formulated from a first order autoregressive--distributed lag model which specifies the consumption-income relationship as:

$$(9) \quad c_t = \beta_o + \beta_1 y_t + \beta_2 y_{t-1} + \beta_3 c_{t-1} + \varepsilon_t$$

where c and y are logarithms of the corresponding variables. The lags in (9) may arise due to some adjustment, transaction, or search costs, or because consumers react slowly to changes in the economic environment.

To ensure that all estimated coefficients of (9) reproduce the steady-state solution for income and consumption implied by the general life-cycle model, we impose the coefficient restriction $\beta_1 + \beta_2 + \beta_3 = 1$ which yields an error correction model:

$$(10) \quad \Delta c_t = \beta_o + \beta_1 \Delta y_t + (1-\beta_3)(y_{t-1} - c_{t-1}) + \varepsilon_t$$

The steady-state solution of (10) for $\Delta c_t = \Delta y_t = g$ is

$$(11) \quad c = \frac{\beta_o - g(1-\beta_1)}{1-\beta_3} + y = k(g) + y$$

and hence

$$(12) \quad \frac{C}{Y} = \exp\left[\frac{\beta_o - g(1-\beta_1)}{1-\beta_3}\right]$$

Thus the long run consumption income ratio (savings ratio) is decreasing (increasing) with the growth rate g as long as $\beta_1<1$, $\beta_3<1$.

Equation (10) implies that consumers on the one hand adjust consumption in response to short-run changes in income, as well as to previous disequilibria $(y_{t-1}-c_{t-1})$ which can be interpreted as a feedback response to obtain a desired long-run condition. The model also has a unitarity elasticity of consumption to income at growth rate, g. Moreover, if g varies, the observed C/Y ratio may have trendlike movements, but this does not rule out long-run unit elasticity for any constant growth rate. Furthermore, although economic theory would suggest that the constant term in the equation (9) is zero, the empirical models include an intercept term to help capture potential errors of measurement. The unit elasticity restriction can be tested by rewriting (10) as

$$(13) \quad \Delta c_t = \beta_o + \beta_1 \Delta y_t + (1-\beta_3)(y_{t-1} - c_{t-1}) + \delta y_{t-1} + \varepsilon_t$$

and testing if δ is significantly different from zero. From the point of view of this study, the obvious shortcoming of the simple error correction model is that it does not include wealth as an explicit variable. There are, of course, many ways to incorporate wealth variables in consumption functions and Hendry and von Ungern-Sternberg (1981) have presented one solution. 1/ They extended the simple error-correction model to include a so-called "integral control mechanism" which is consistent with the life-cycle models. This extension is perhaps best understood by examining the identity $A_t = A_{t-1} + Y_t - C_t$. This identity implies that A_t (wealth) is the integral of past discrepancies between total income and consumption expenditure. The simple generalization of (10) which incorporates an integral control and ensures the steady-state solution of (8) for $\Delta c = \Delta y = g$ is:

$$(14) \quad \Delta c_t = \theta_o + \theta_1 \Delta y_t + \theta_2(y_{t-1} - c_{t-1}) + \theta_3(a_{t-1} - y_{t-1}) + \varepsilon_t$$

where a = log A. In other words, in (14) consumers adjust their expenditure not only because of changes in income but also by reacting to "disequilibrium" conditions to ensure constant steady-state equilibrium ratios of C to Y and A to Y.

While the two models discussed above are consistent with long term equilibrium (steady-state) conditions implied by the life-cycle hypothesis and allow short-run changes in income to affect consumption expenditure, there are other potential determinants of saving and consumption which are short-term or cyclical in nature. One of these seems to be the rate of inflation. 2/ There are, of course, numerous channels through which inflation may influence saving-consumption behavior, but perhaps one of the most important channels is the effects of inflation on financial wealth. If households have a target (constant) income-wealth ratio, unexpected and/or accelerating inflation would reduce the real value of financial assets and therefore increase households saving to re-establish the target ratio. In addition, as Hendry and von Ungern-Sternberg (1981) have noted, inflation tends to distort the conventional measure of personal disposable income in the National Accounts since capital losses on monetary assets generated by inflation are not deducted from net interest receipts included in personal disposable income. Therefore, in an inflationary period, the "real income" perceived by consumers may be lower than reported in the National Accounts and often used in empirical studies. For these reasons, and with the thought that the rate of inflation may also capture the effect of income uncertainty on consumption, inflation was also included in the model of consumption in the Nordic countries.

As described above, the deregulation of financial markets in the Nordic countries resulted in adjustments of households' portfolios which

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1/ Also see Nickell (1985).
2/ See for instance Davidson et al. (1978), Deaton (1977), Koskela-Viren (1985).

drove up relative asset prices. This is assumed to have affected consumption through wealth effects, and through easier access to credit through the increased value of households' collateral. To capture these effects, the change in real wealth was also included in the extended model. These modifications would not, however, influence the steady-state properties of the model. Taking into account these factors, the modified consumption function can be written:

$$(15) \quad \Delta c_t = \theta_0 + \theta_1 \Delta y_t + \theta_2 (y_{t-1} - c_{t-1}) + \theta_3 (a_{t-1} - y_{t-1}) + \theta_4 \Delta p_t + \theta_5 \Delta a_t + \varepsilon_t$$

where p = log P and P is consumer price index.

IV. Empirical Results

1. Data issues

It was not possible to obtain comparable data for all Nordic countries. First, Danish statistics did not allow the separation of household and business saving. As a result, private disposable income was used as a proxy for personal income for Denmark. 1/ Second, it was not possible to construct a wealth variable which would be consistent with the life-cycle hypothesis and identical for all Nordic countries. Therefore, different proxies had to be used for household wealth in the calculations.

Although in the models, C_t stands for consumption rather than consumer expenditure, consumer expenditure was used as a proxy for consumption in all countries. For Denmark, private nominal disposable income was deflated by the consumer price index. For Finland and Norway, household disposable income was deflated by the consumer price index. Since Swedish statistics did not allow a split between consumption by households and non-profit institutions, real private consumption expenditure was used as a proxy for household consumption. Moreover, households and non-profit institutions' disposable income deflated by the consumer price index was used as a proxy for real household income. For all countries, inflation was measured as the change in the consumer price index.

Due to a lack of data, the wealth variable was constructed differently for different countries. For Denmark, nominal wealth was

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1/ It should be pointed out that this may create the risk of a potential misinterpretation of empirical results. For instance, in the United Kingdom the steep fall in personal saving in the course of the 1980s was largely matched by a rise in industrial and commercial sector saving. Norwegian National Accounts have provided information on households disposable income only since 1975. Unpublished data provided by Norges Bank was used for 1970-75.

measured as the sum of net financial assets of the private nonbanking sector including assets of pension funds and life insurance companies, the housing stock, and the stock of personal transport equipment. Real wealth was calculated by deflating nominal wealth by the consumer price index. The real capital equipment of firms was not included in the wealth variable due to a lack of data. Nominal wealth was measured at the beginning of the year and valued at previous year's prices. 1/ Since residential housing constitutes the major part of household wealth, we used the real value of dwellings as a proxy for household wealth for Finland. For Norway, we used relative housing prices measured as the housing price index divided by the consumer price index as a proxy for household wealth. Finally, for Sweden, real wealth was proxied by household net financial wealth deflated by the consumer price index. 2/

2. Estimation results

In this section, the factors that may have contributed to the decline in private saving in the Nordic countries are analyzed empirically. Of crucial importance is whether the sharp increase in consumption can be explained through the models discussed above, or whether savings behavior changed because of the structural changes in the financial markets. To focus on these questions, OLS was used to estimate consumption function equations, (10), (14), and (15), and a few empirical variants of these equations for all Nordic countries. The models were estimated using annual data with estimation period for each country running from 1970 to the year the major deregulation measures were introduced in the country in question. 3/ This procedure saved a few observations to evaluate the performance of the consumption functions outside the sample period. The results of the estimated equations are presented in Table 1.

The results of the simple error correction model (Equation 1 in Table 1) were mixed. In the cases of Denmark and Finland, the error correction model appeared to fit the data. In the cases of Norway and Sweden, the coefficient of the lagged consumption income ratio was insignificant. As described above, one way of testing the error correction model is to test whether δ in equation (13) is significantly different from zero, i.e., $\Sigma\beta_i - 1 = \delta = 0$. For Denmark, Finland, Norway, and Sweden, t-values of δ were -0.44, -1.51, -2.18, and -2.94, respectively. Therefore, in the cases of Norway and Sweden the error correction model was rejected.

The short-run elasticity of consumption to income is highest in Finland, which may reflect the high degree of credit rationing during

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1/ See Heinesen (1987).
2/ See Palmer (1985).
3/ For Denmark the estimation period started in 1971 due to lack of data.

Table 1a: Estimation Results 1/

Coefficients of	Denmark (Dependent variable is first difference of logarithm of real private consumption expenditure) (1)	(2)	(3)	(4)	(5)	(6)	Finland (Dependent variable is first difference of logarithm of real household consumption expenditure) (1)	(2)	(3)	(4)	(5)	(6)
	(Sample size 1972-83)						(Sample size 1971-85)					
Constant	-0.1592	-0.1502	-0.1735	-0.1989	-0.1643	-0.1579	-0.0530	-0.0062	-0.1600	-0.1886	0.0299	-0.0980
	(-3.97)	(-4.09)	(-7.77)	(-6.36)	(-7.29)	(-2.82)	(-2.67)	(-0.20)	(-0.95)	(-1.19)	(0.63)	(-3.27)
Rate of growth of real private disposable income	0.7234	0.6546	0.7705	0.8649	0.7191	0.7191	0.9678	0.9811	0.9017	0.7969	0.9361	0.9330
	(7.54)	(6.81)	(12.21)	(8.41)	(13.35)	(4.49)	(9.46)	(10.16)	(6.97)	(5.78)	(9.04)	(9.85)
Lagged consumption income ratio	-0.6511	-0.6674	-0.6391	-0.6453	-0.6515	-0.6505	-0.8430	-1.0908	-1.1977	-1.1981	-1.0512	-1.1756
	(-3.98)	(4.47)	(-7.30)	(-7.52)	(-7.09)	(-3.73)	(-2.95)	(-3.51)	(-3.60)	(-3.86)	(-3.40)	(-3.74)
Lagged wealth income ratio		-0.3689	0.2843	0.0384				-0.0585	0.0432	0.0669	-0.0796	
		(-1.70)	(1.38)	(1.76)				(-1.60)	(0.38)	(0.61)	(-1.95)	
Change in real wealth			0.1603	0.1789	0.1172				0.8929	1.3615		0.5518
			(4.05)	(4.26)	(4.53)				(0.98)	(1.44)		(1.89)
Rate of inflation				0.1897		-0.0107				-0.1493	-0.1060	
				(1.15)		(-0.03)				(-1.57)	(-1.12)	
Summary statistics												
R-squared	0.87	0.91	0.97	0.98	0.97	0.87	0.88	0.91	0.91	0.93	0.92	0.91
Square root of residual variance	0.0127	0.0115	0.0067	0.0066	0.0071	0.0134	0.0103	0.0097	0.0097	0.0091	0.0096	0.0093
Sum of squared residuals	0.0014	0.0011	0.0003	0.0003	0.0004	0.0014	0.0013	0.0010	0.0009	0.0007	0.0009	0.0001
F	31.40	26.29	61.75	51.88	73.29	18.61	45.58	35.9	26.29	24.63	27.31	37.97
D-W	1.22	1.53	1.50	2.14	1.56	1.21	1.78	1.90	1.83	1.80	1.85	1.86
CHOW				8.6	13.4			5.8				6.2

1/ Figures within parenthesis under coefficients are t-values.

Table 1b. Estimation Results 1/

Coefficients of	Norway (Dependent variable is first difference of logarithm of real household consumption expenditure) (1)	(2)	(3)	(4)	(5)	(6)	Sweden (Dependent variable is first difference of logarithm of real private consumption expenditure) (1)	(2)	(3)	(4)	(5)	(6)
	(Sample size 1971-84)						(Sample size 1971-85)					
Constant	-0.0058	0.2693	0.3662	0.4595	0.0087	-0.0049	-0.0085	0.0145	0.0145	0.0284	0.0278	0.0222
	(-0.4041)	(1.56)	(2.13)	(2.23)	(0.35)	(-0.33)	(-0.99)	(1.36)	(1.27)	(1.73)	(1.79)	(1.27)
Rate of growth of real private disposable income	0.6509	0.5344	0.4009	0.2941	0.6679	0.6020	0.8137	0.6444	0.6428	0.6090	0.6251	0.7244
	(3.17)	(2.60)	(1.92)	(1.20)	(3.17)	(2.75)	(4.03)	(3.73)	(3.47)	(3.30)	(3.65)	(3.86)
Lagged consumption income ratio	-0.3684	-0.5427	-0.6314	-0.7641	-0.3308	-0.3833	-0.3414	-0.7758	-0.7732	-0.7582	-0.7808	-0.4926
	(-1.47)	(-2.10)	(-2.56)	(-2.60)	(-1.27)	(-1.50)	(-1.51)	(-3.24)	(-2.99)	(-2.97)	(-3.31)	(-2.26)
Lagged wealth income ratio		0.0548	0.0738	0.0961				0.0468	0.0466	0.0351	0.0380	
		(1.60)	(2.16)	(2.22)				(2.78)	(2.50)	(1.68)	(2.08)	
Change in real wealth			0.2339	0.3253		0.1227			-0.0009	-0.0083		
			(1.59)	(1.78)		(0.76)			(-0.04)	(-0.36)		
Rate of inflation				0.2145	-0.1596					-0.2385	-0.2181	-0.3812
				(0.86)	(-0.74)					(-1.16)	(-1.16)	(-1.95)
Summary statistics												
R-squared	0.48	0.58	0.68	0.70	0.50	0.51	0.58	0.75	0.75	0.78	0.78	0.69
Square root of residual variance	0.0161	0.0151	0.0018	0.0143	0.0165	0.0164	0.0137	0.011	0.1151	0.0113	0.0108	0.0123
Sum of squared residuals	0.0029	0.0022	0.0141	0.0016	0.0027	0.0027	0.0022	0.0013	0.0013	0.0012	0.0012	0.0017
F	5.09	4.72	4.71	3.81	3.44	3.46	8.15	11.05	7.58	6.51	8.88	7.97
D-W	2.55	2.61	2.30	2.14	2.65	2.31	2.28	2.19	2.19	1.79	1.77	1.81
CHOW	10.3					1.4		0.2				0.1

1/ Figures within parenthesis under coefficients are t-values.

the period under study. This interpretation, however, does not shed light on the low values of the short-run elasticity of consumption to income in Norway. It should also be noted that the short-run elasticity of consumption to income remains relatively stable across the different consumption function specifications with lowest variation in Finland (0.93-0.98) and highest in Norway (0.49-0.67).

As described above, in the steady-state where income, consumption, and wealth are increasing at the constant rate, the long-run consumption (saving) income ratio is a function of growth rate. Therefore, for instance, in a steady-state with zero growth the error correction models yield solution (Equation (12)) C=KY where

$$K_{DEN} = \exp\,[-0.244];\ K_{FIN} = \exp\,[-0.063];$$

$$K_{NOR} = \exp\,[-0.016];\ K_{SWE} = \exp\,[-0.025]$$

The computed long-run income elasticities are 0.78 for Denmark, 0.93 for Finland, 0.98 for Norway, and 0.97 for Sweden.

It is interesting to note that if the wealth-income variable suggested by Hendry and von Ungern-Sternberg (1981) (Equation (2), Table 1) was included in the model, the error correction model improved markedly and the overall goodness of fit increased. However, in some cases, residuals in the equations were autocorrelated.

Although the models that include the wealth-income ratio should capture the wealth effects on consumption through the feedback mechanism, attempts were made to test some other modifications of the error correction models (Equations (3)-(6) in Table 1). This was not only to test "short-run" wealth effects but also because it was difficult to obtain reliable data on household net wealth, and therefore, it was hoped to capture these effects through the extended models. To confront these problems, the rate of change in real wealth and inflation was added as explanatory variables. It was hoped that the inflation variable would capture the effect of the erosion of the real value of the monetary component of total wealth on consumption. The most noticeable feature of these results was that the change in real wealth or inflation appeared to be an important determinant of consumption in all Nordic countries.

In the case of Denmark, the coefficient for the rate of change in household real net wealth was highly significant but that of the inflation variable was not. This was interesting because the variable used as a proxy for household wealth in Denmark covered the major part of household wealth, making the proxy a more reliable variable than

those used for other Nordic countries. 1/ Moreover, the estimation results suggest a multicollinearity problem between the lagged wealth-income ratio and the change in real wealth, and if the lagged wealth income ratio is included in the consumption function along with the change in wealth, its coefficient becomes less significant, because its effect is partly captured by the wealth variable. It should also be noted that the coefficient of the inflation variable (Equation (4) in Table 1a) has the "wrong" sign.

In the case of Finland, extending the Hendry and von Ungern-Sternberg model with an additional wealth variable did not prove to be successful (Equation (3) in Table 1a). However, if inflation was added to this model, its coefficient implies a positive effect of inflation on saving as indicated by the theory. The coefficient's t-value was not, however, highly significant. On the other hand, in the simple error correction model, the wealth variable gave better results than the inflation variable. In the case of Norway, the wealth variable appeared to have played some role as a determinant of consumption in the subsample, but the coefficient's t-value was low. In the case of Sweden, the coefficient of inflation implied a positive effect of inflation on saving and the coefficient's t-value was significant (Equation (6) in Table 1b).

Tests were then made exploring the out-of-sample properties of the models in Table 1. For that purpose, equations (4) and (5) were used for Denmark, equations (2) and (6) for Finland, equations (1) and (6) for Norway, and equations (2) and (6) for Sweden. The results are presented in Charts 5-8. The charts show that the chosen models differ only marginally in terms of their out-of-sample performance. In most cases, the models underestimated the actual increase in consumption. The predictive accuracy was particularly poor for Finland and Norway. In both cases, the models did not predict the direction of the future consumption developments. In the case of Denmark, the models first overpredicted and then underpredicted the actual development. Only in the case of Sweden did the consumption models predict developments in consumption with a relatively high degree of accuracy.

If it is assumed that the consumption models are correctly specified then the predictive failure of the equations for Finland and Norway indicates that there has been a structural change in the economy. 2/ The Chow test for parameter constancy generally rejected

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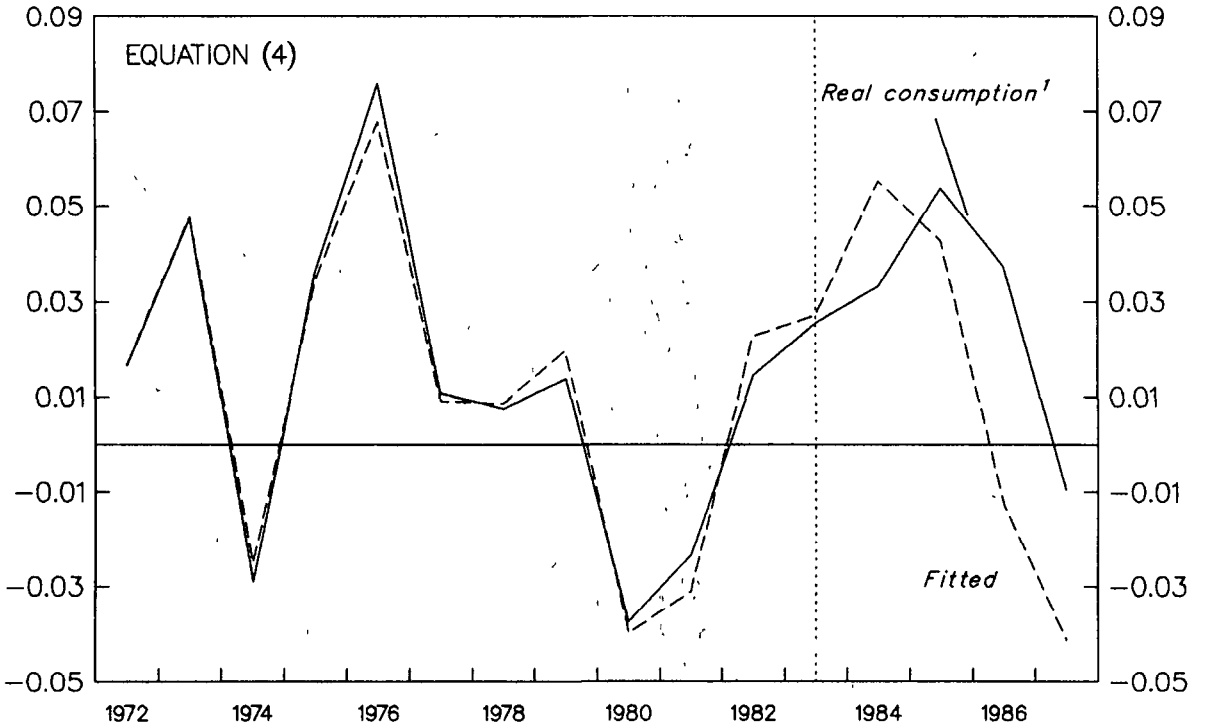
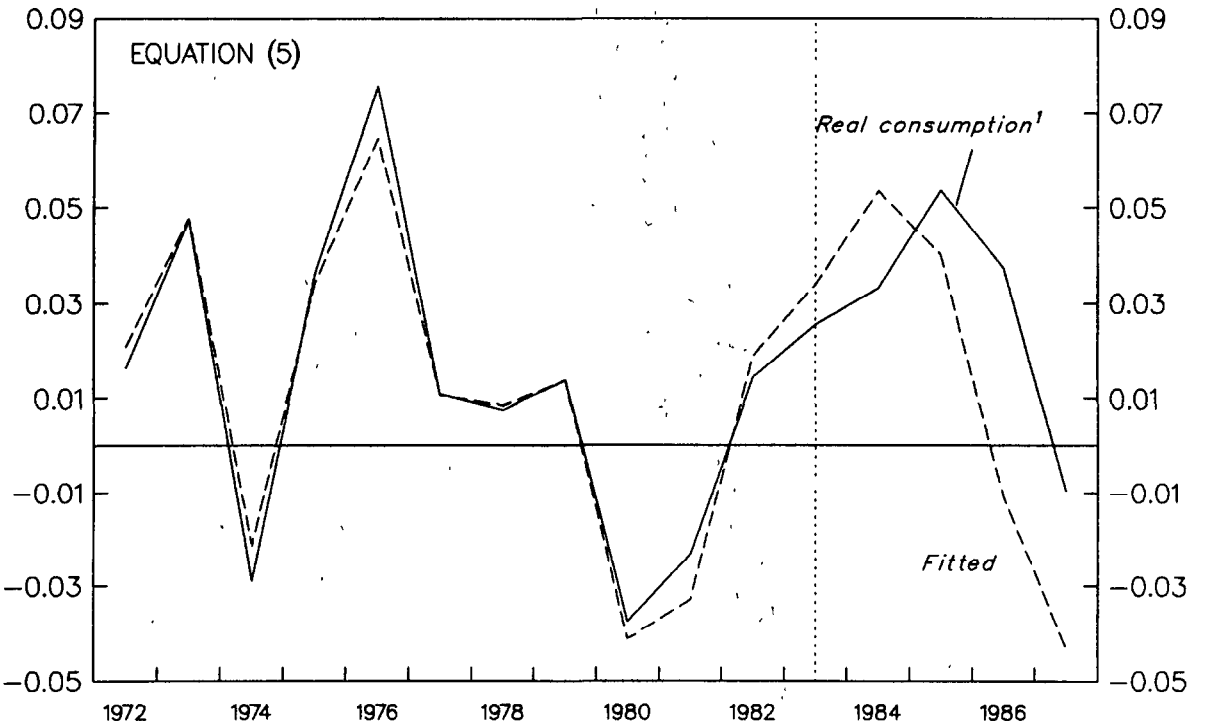
1/ When wealth and inflation variables were added to the error correction model, the coefficient for the wealth variable was strongly significant whereas the coefficient for inflation was insignificant. Moreover, when inflation was added to the Hendry-von Ungern-Sternberg model its coefficient was insignificant.

2/ For discussion on predictive behavior of econometric equations see Hendry (1979).

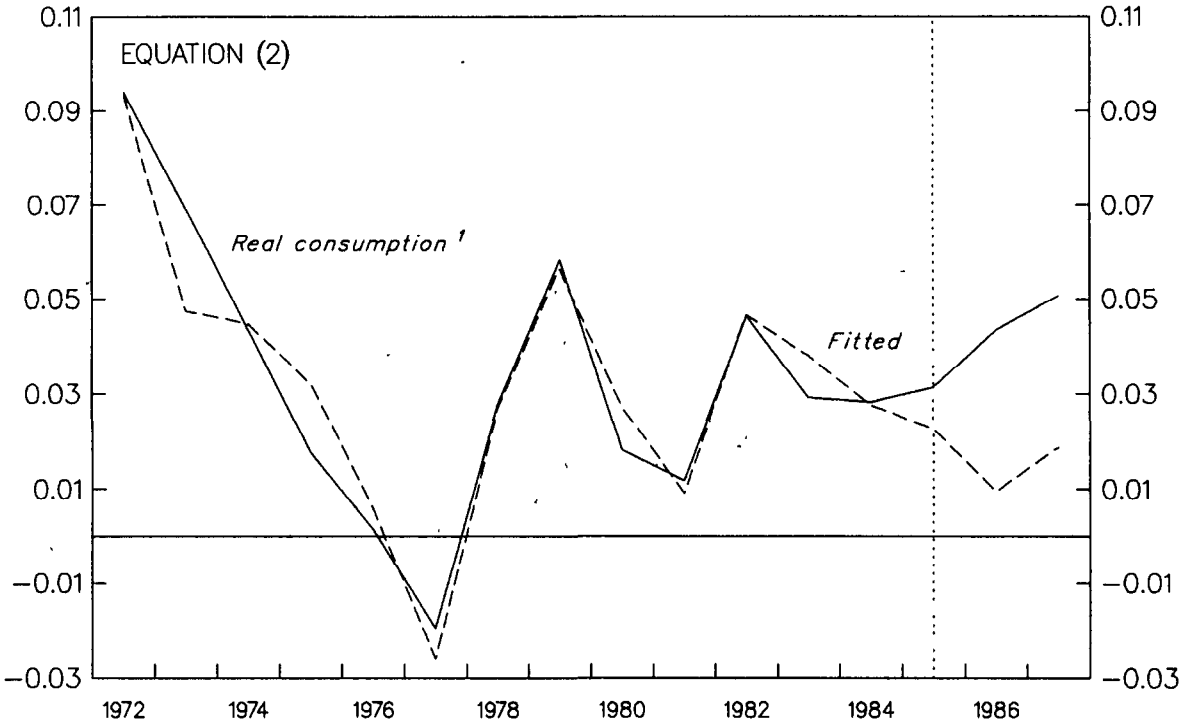
CHART 5
DENMARK

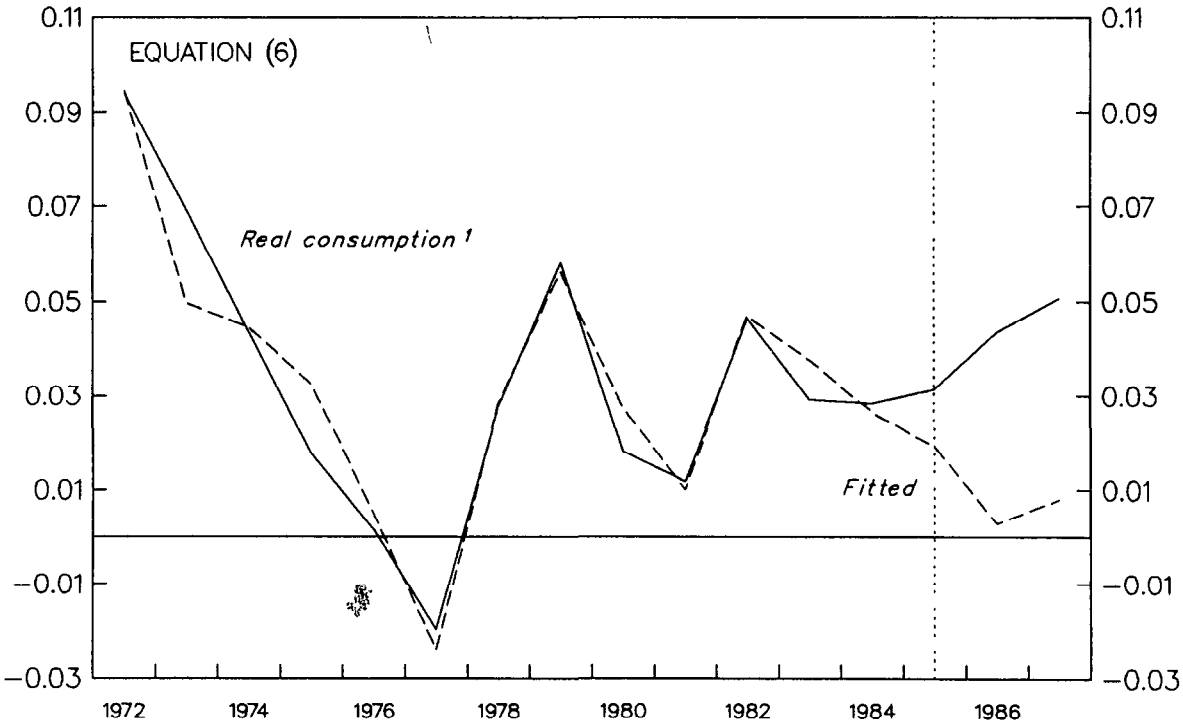




Source: Staff calculations.
[1]In log changes.

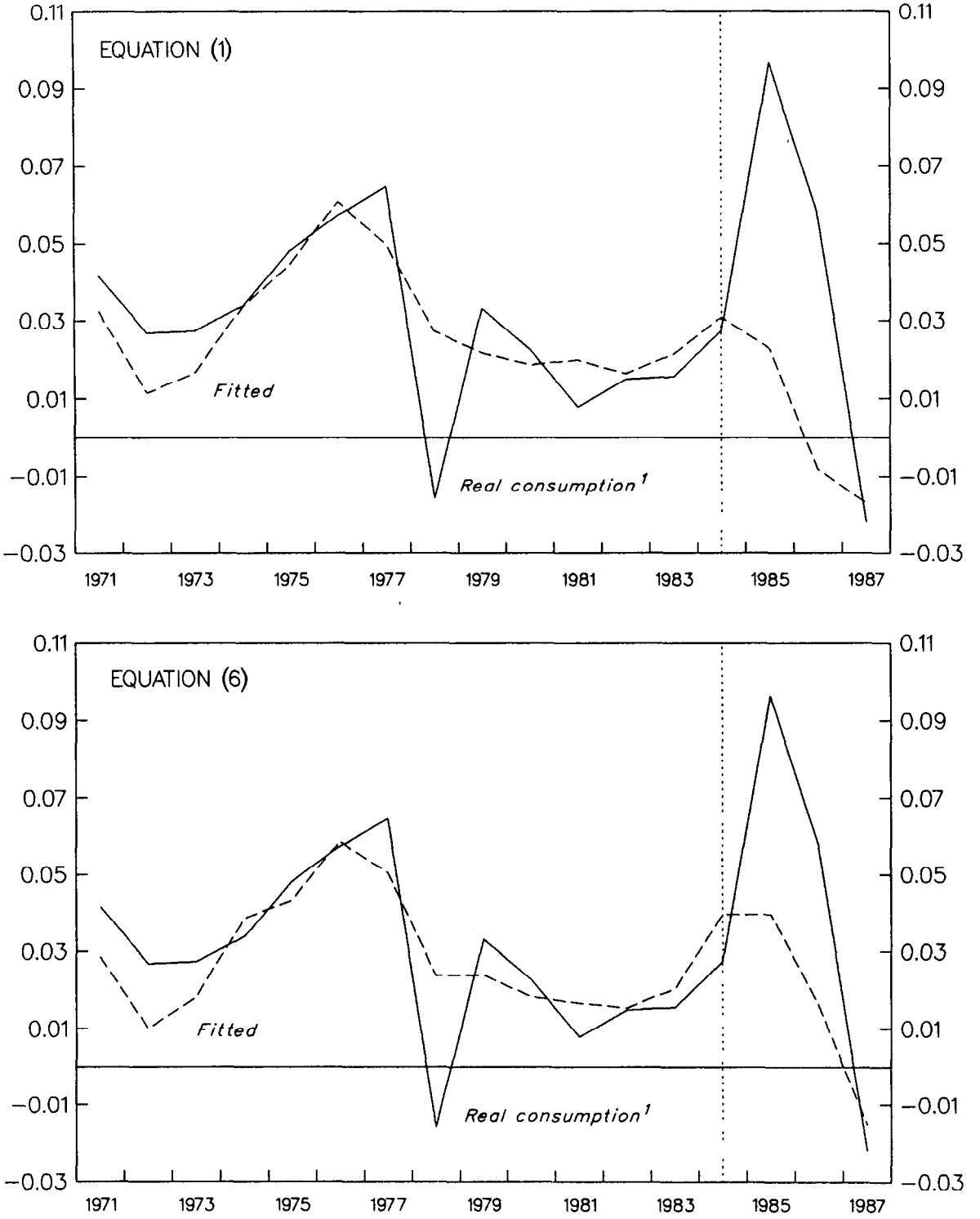
CHART 6
FINLAND





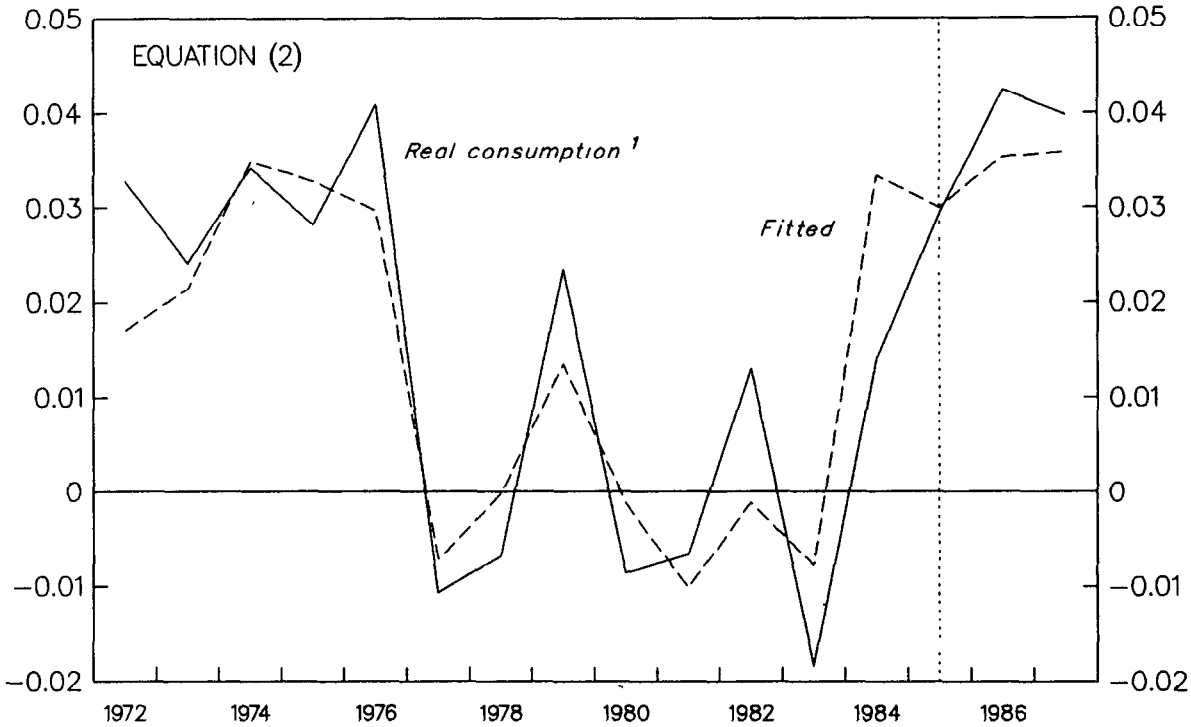
Source: Staff calculations.
[1] In log changes.

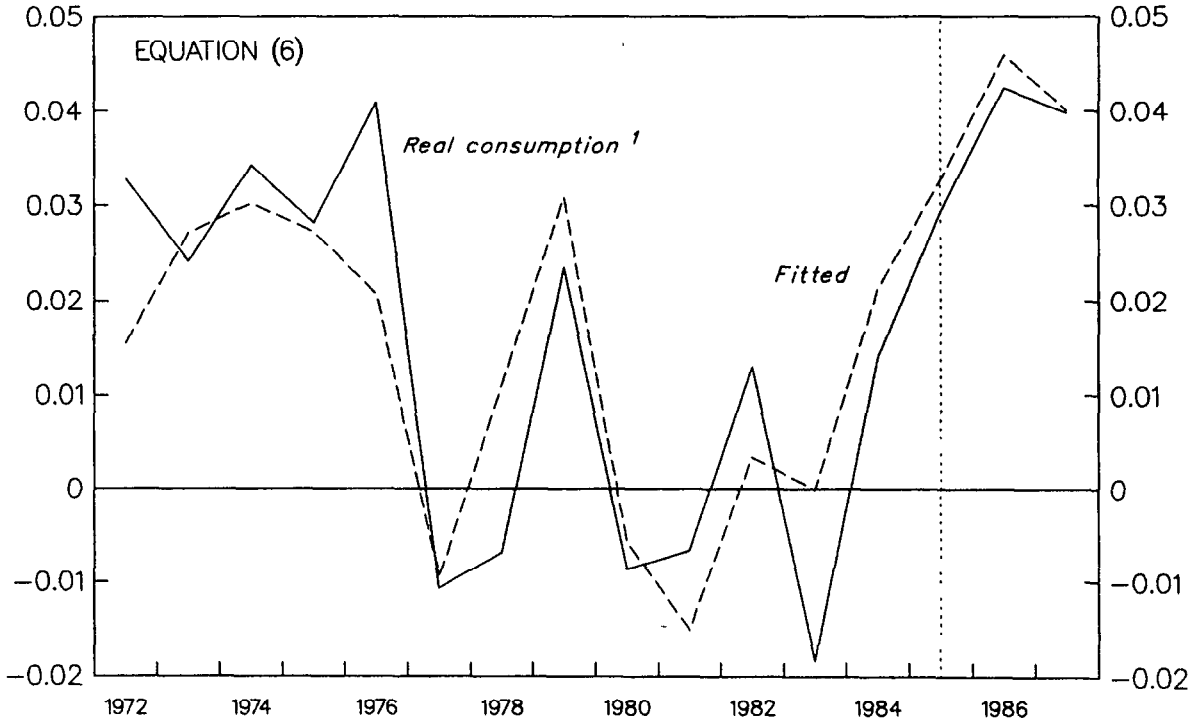
CHART 7
NORWAY



Source: Staff calculations
[1]In log changes.

CHART 8
SWEDEN





Source: Staff calculations.
[1] In log changes.

the hypothesis of parameter stability except in the case of Sweden. Due to lack of observations, it is difficult however, to assess whether the apparent changes in behavior were only short-term in nature.

All in all, the results support the argument that it has been difficult, a priori, to assess the effects of the financial reforms on consumption in the Nordic countries. In particular, in Finland and Norway, where credit rationing was traditionally more stringent than in the other Nordic countries, it appears that there have been fundamental changes in the economic relationships. The evidence regarding structural change is less clear cut in Denmark. This may be explained by the fact that Danish financial market regulation has for some time been relatively free compared with the other Nordic countries. Only in the case of Sweden, do the findings not support the view that structural changes have taken place since the deregulation. This may perhaps be explained by the fact that the grey market had already developed in the second half of 1970s in Sweden.

In order to assess what factors contributed to the predictive failure of the models, the consumption functions were re-estimated using observations from the whole period. The results of the models that performed well in the whole sample are presented in Table 3 and Charts 1-2 in the Appendix. It was not surprising that the models used in the sub-sample produced relatively good results also in the whole sample in the cases of Denmark and Sweden (Equation (3) for Denmark and equation (6) for Sweden in Table 1). In the case of Denmark, the Hendry and von Ungern-Sternberg model, extended to include the wealth variable, fitted the data relatively well in the whole sample period. It is worth noting that the coefficient on the wealth variable changes markedly when the sample is extended, supporting the view that the elasticity of consumption (saving) to changes in wealth has increased in Denmark in recent years. The results based on full sample estimation for Sweden tend to confirm our earlier finding that inflation has played an important role in consumption and saving decisions. When the simple error correction model was extended to include inflation, the coefficient of the inflation variable became very significant and the model fit the data well (Equation (4) in Table 3, in the Appendix). 1/ Coefficients of this model are virtually the same in the subsample and in the whole period.

In the case of Finland, the wealth variable, and the lagged wealth-income ratio variable tended to be insignificant in the whole sample period. On the other hand, a simple error correction model,

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1/ If inflation was added to the Hendry and von Ungern Sternberg model this variable tended to become insignificant. This may be the result of multicollinearity, since in the case of Sweden we used real net financial assets as the proxy for wealth and therefore it is strongly related to inflation.

modified to include inflation, fitted the data well. 1/ This suggested that changes in households' real financial wealth, which was not included in the wealth variable because of a lack of data, may have been an important determinant of Finnish saving behavior in recent years. To shed more light on this argument, another proxy for household wealth was constructed to partly capture the changes in households' real financial wealth, namely, real stock market prices. Due to the insignificant intercept, the model was estimated without a constant. As shown in equation (2) in Table 3 and Chart 2 in the Appendix, the model performed remarkably well over the whole sample period.

Finally, in the case of Norway, the predictive failure of the models in the subsample appears to have been the result of a sharp rise in the elasticity of consumption to changes in wealth. In the longer sample period, the coefficient of the wealth variable not only became strongly significant but its value increased threefold (Equation (6) in Table 1b and Equation (3) in Table 3 in the Appendix). Because the inflation variable tended to be insignificant in the longer sample period, the estimation results for Norway suggest that it was the changes in real assets rather than the changes financial assets which contributed to the developments in consumption in Norway.

In sum, the results indicate that the wealth effect has played a major role in household consumption-saving decisions in recent years in the Nordic countries. Although it was not possible to construct a wealth variable that would include all elements of household real net wealth because of lack of data, the findings support the view that consumer response to changes in wealth has become stronger since the deregulation of financial markets took place, and are consistent with the view that freer access to credit increased consumption expenditure not only directly, but also only indirectly through higher asset values.

V. Conclusions

This paper examined household saving behavior in the Nordic countries. A standard life-cycle model was used, based on a more general model of intertemporal consumption and saving as an analytical starting point. The empirical work was carried out in three stages. First, the models were estimated using data up to the year when the major deregulation measures took place. Second, some specifications were used to explore the out of sample properties of the models. Third, the models were estimated using the whole sample period to shed some light on the factors which contributed to altered saving behavior.

1/ In the whole sample period, the t-value of the inflation variable was significant while R-squared was 0.85, and the Durbin-Watson statistic 1.7.

The findings support the hypothesis that household consumption and saving behavior have changed since the financial deregulation. In the cases of Finland and Norway, where credit rationing was perhaps more stringent, the results indicate that earlier economic relationships appeared to have "broken down." It is thus not surprising that the authorities have had difficulties anticipating the effects of the deregulation on consumption and saving behavior with any degree of accuracy. This problem was somewhat less severe in the case of Denmark. Only in the case of Sweden do the data not support the view that structural changes have taken place since deregulation. Furthermore, the results indicate that wealth effects have played an important role in determining consumption with consumers' response to changes in real wealth apparently increasing since deregulation.

These developments in the Nordic countries should be assessed in the light of the the generous tax deductions allowed on household interest payments. Generous tax deductions were allowed not only on mortgage loans but on consumer loans as well. Prior to deregulation low after-tax interest rates were mitigated by credit rationing. However, after deregulation a surge in household demand for credit was not fully countered by an increase in nominal interest rates; since the fixed exchange rate policy implied that nominal domestic interest rates were largely determined by foreign interest rates. Because increases in nominal interest rates were limited, the logical alternative to depressing the demand for credit would have been to reduce the tax value of interest payments. The recent decline in the saving ratios has encouraged tax reform in the Nordic countries. The reforms have focused on the need to increase saving in the household sector, which with unchanged public savings would imply a stronger current account balance. At this point, it is, of course, difficult to assess whether the household saving ratio will ultimately return to its level prior to the financial deregulation after the stock adjustments of household portfolios are fully completed. Since the present tax rules still are biased against saving, cuts in marginal tax rates and reductions in the tax value of interest payments would be expected to increase private savings.

Table 2. Household Saving Rate 1/

	1980	1981	1982	1983	1984	1985	1986	1987
Denmark 2/	9.6	10.5	14.2	14.2	13.3	10.0	5.0	5.2
Finland	7.2	6.1	6.8	7.4	6.4	5.8	3.5	4.0
Norway	3.4	4.5	3.8	4.3	5.2	-2.6	-7.3	-2.9
Sweden	5.0	3.8	0.5	1.2	0.9	1.1	-1.0	-3.3

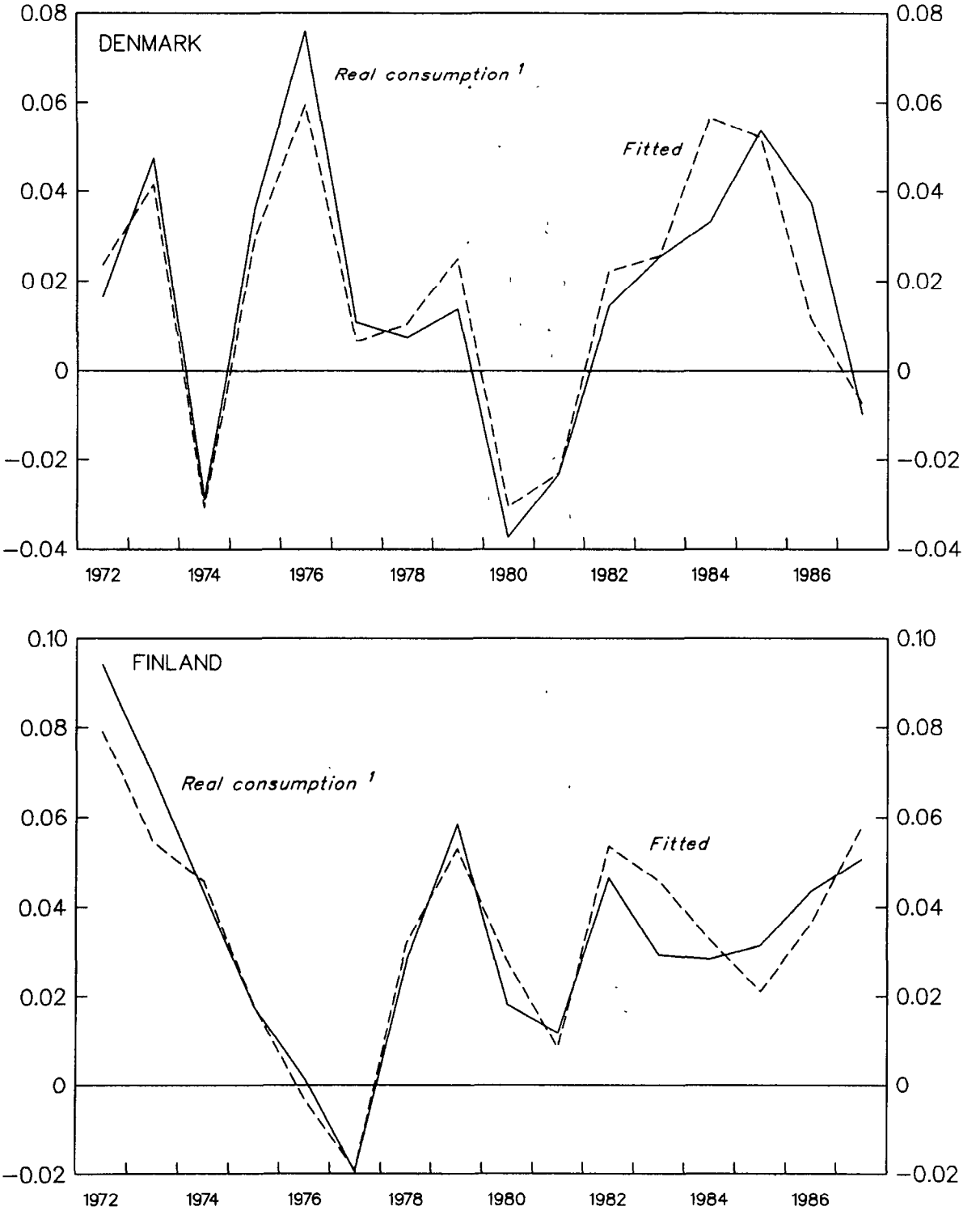
Source: National Accounts.

1/ Defined as a ratio net savings to net disposable income.
2/ Private sector saving rate.

APPENDIX

CHART 1

ESTIMATION RESULTS: FULL SAMPLE

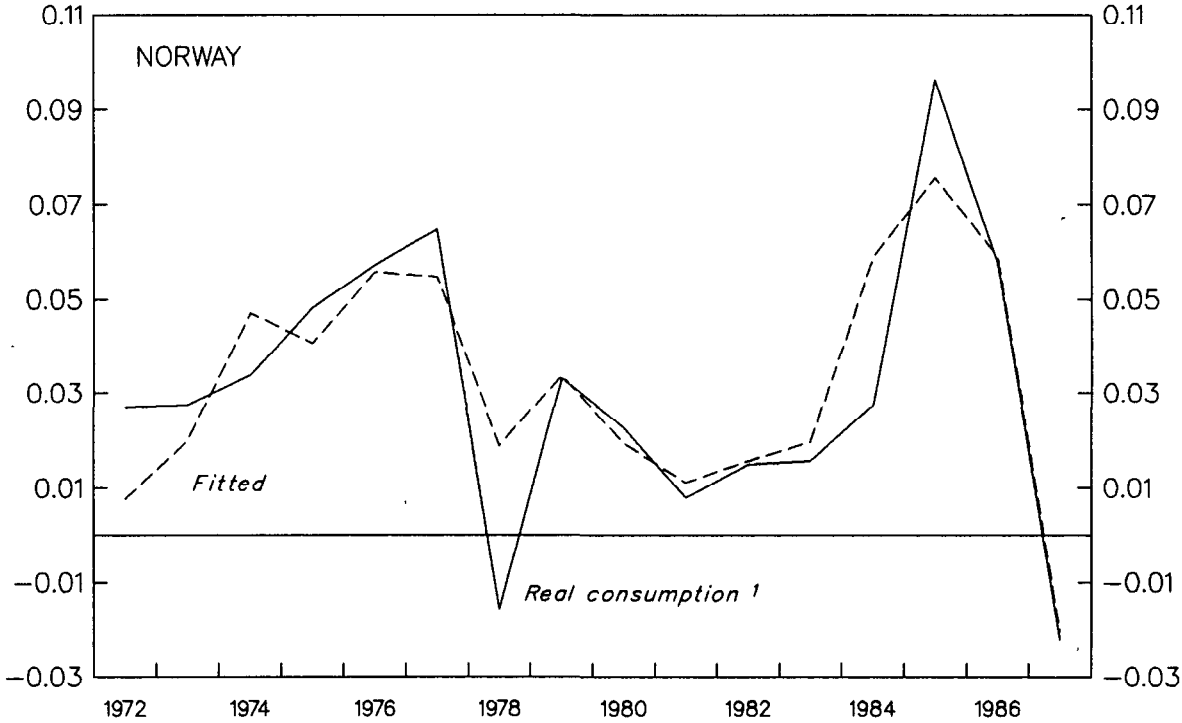


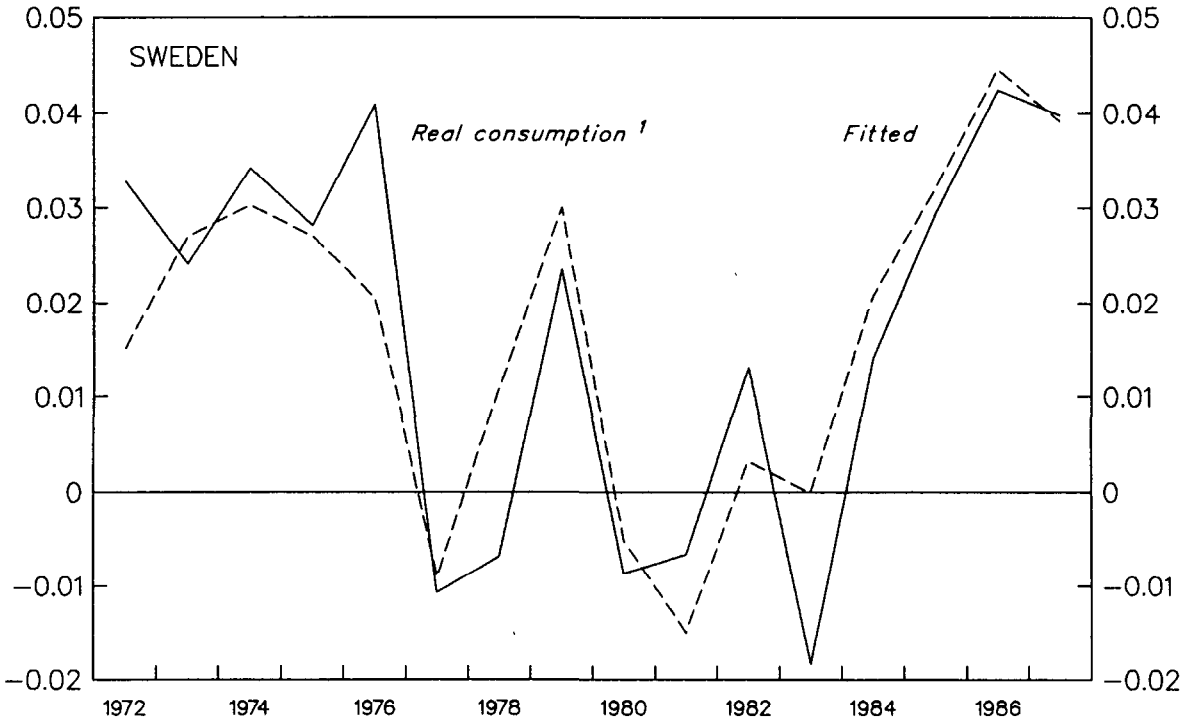
Source: Staff calculations.
[1] In log changes.

APPENDIX

CHART 2

ESTIMATION RESULTS: FULL SAMPLE





Source· Staff calculations.
[1] In log changes.

Table 3. Estimation Results; Full Sample 1/

(Dependent variable is first difference of logarithm of household consumption expenditure) 2/

Coefficients of	Denmark (1)	Finland (2)	Norway (3)	Sweden (4)
Constant	-0.1386 (-4.23)		-0.0054 (-0.61)	0.0209 (1.56)
Rate of growth of real private disposable income	0.7562 (6.84)	0.6753 (7.58)	0.4976 (2.51)	0.7209 (4.18)
Lagged consumption income ratio	-0.4527 (-3.68)	-0.1562 (-2.79)	-0.5044 (-3.95)	-0.4767 (-2.56)
Lagged wealth income ratio	0.0592 (2.66)			
Change in real wealth	0.1901 (4.08)	0.0354 (3.20)	0.3676 (4.89)	
Rate of inflation				-0.3621 (-2.65)
Summary statistics:				
R-squared	0.87	0.95	0.71	0.75
Square root of residual variance	0.0131	0.0101	0.1716	0.0114
Sum or squared residuals	0.0019	0.0014	0.0038	0.0017
F	18.25	93.84	10.80	13.07
D-W	1.75	1.81	2.15	1.85

1/ Figures in parentheses under coefficients are t-values.
2/ For Denmark and Sweden dependent variable is calculated by using private consumption expenditures.

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