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To what extent is capital really internationally mobile? Assessments from a Norwegian perspective

by

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Abstract

While evidence of smooth international interest rate arbitrage suggests that financial centers in various industrial countries are well integrated, it is still not clear whether investment and consumption patterns as well as portfolio compositions reflect a high degree of "real" capital mobility. This paper attempts to assess the degree of real capital mobility between Norway and the rest of the world by means of i) saving-investment balances, ii) the portfolio composition of private Norwegian investors and iii) consumption correlations between Norway and the other Nordic countries. We argue that the degree of capital mobility has gradually increased to fairly high levels. This implies that Norwegian economic policy (tax policy, wealth management) should not be reformulated based on the idea, which recently has received a lot of attention in the Norwegian wealth management debate, that "capital is not that mobile after all".

JEL classification: F32, F36

Keywords: International financial integration, capital mobility

1. Introduction

During the last decades all OECD economies have deregulated their domestic capital and credit markets and abolished cross-border capital controls. Hence, the idea of one global financial market seems more realistic than ever before, at least among industrialized countries. We should therefore expect a potentially more efficient allocation of capital and improved opportunities to smooth consumption over time and across states of nature. This should lead to realization of welfare gains and various simulation studies do indeed suggest that these gains may be substantial (see for example van Wincoop, 1999, and Obstfeld, 1994a). Moreover, the existence of a "perfect" global financial market has important policy implications, which are well known from the public debate in most economies. For example, mobility of capital obviously restricts the opportunity to tax capital income at higher rates than in other countries because tax increases may lead to immediate capital flight. This potential effect makes it hard to implement tax reforms, which according to the intention of many politicians are designed to harmonize tax rates on labor and capital income.

Another policy implication is related to the well known result that a small open economy may separate its optimal investment and consumption profiles by utilizing the global financial market. This clearly implies that all profitable projects in the private sector of a small open economy will be realized independently of the government's debt or wealth management policies. Adopting a Norwegian perspective in this paper, this implication has strong bearings for the optimal wealth management of the oil rich Norwegian state. So far the government has assumed implicitly that the small open economy framework is valid and correspondingly chosen to invest the large oil revenues in foreign financial assets (in a state petroleum fund). Recently, this strategy has come under fierce attack not only from politicians and business leaders potentially engaged in unproductive rent-seeking but also from recognized academic economists, see Roland et al. (2001). Assuming that the global capital market is characterized by major imperfections, Roland et al. argue that reallocation of some of the amounts in the state petroleums fund from investments in foreign financial assets to domestic investments (in the private sector) would lead to substantial gains.[1] Thus, Roland et al. in effect claim that there exist a series of profitable investment projects in the market-

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[1] Roland et al. (2001) argue that public wealth should be transferred to the private sector by means of a pension reform, which introduces real individual accounts. These accounts are assumed to be managed by private capital market institutions, which in turn are expected to allocate capital into the domestic capital market.

exposed sector of the Norwegian economy, which do not manage to attract financing from abroad.

It follows that the crucial question is to what extent capital is really internationally mobile. This question is valid even if all formal obstacles to international capital mobility in the OECD area are now gone. An excellent survey of the extensive international literature testing the capital mobility issue is given by Obstfeld (1995) (see also Obstfeld and Rogoff, 2000). Obstfeld discusses four different implications of capital mobility and the related test approaches:

i) Asset price arbitrage should ensure that individuals in different countries face identical prices for a given asset. Thus, are observed international interest rate differentials consistent with perfect capital mobility?

ii) Individuals may utilize international financial markets to diversify idiosyncratic consumption risks. This should lead to highly synchronized consumption growth patterns in various countries – but to what extent is this consistent with observed consumption growth correlations?

iii) International financial markets provide additional opportunities for diversification of risks in investors' stock market portfolios. Consequently, do we observe a rationally high degree of international diversification or a surprisingly strong "home bias"?

iv) In a perfect integrated international financial market additional saving should be allocated to the most profitable investment opportunities. To what extent is this consistent with observed saving-investment correlations in various countries?

A common problem underlying most of the capital mobility tests related to the four approaches above is that they rely on strong auxiliary assumptions. Severe data limitations are problematic as well. Admitting that it is doubtful that capital will ever be as mobile between countries as it can be within them, Obstfeld's overall conclusion is that "among industrial countries the approximation (to perfect capital mobility) has become better and better in recent years, but it still has some ways to go". Moreover, there is a distinction between the first approaches above, which yields strong support to a high degree of capital mobility through "smooth international interest rate arbitrage" according to Obstfeld, and the three latter approaches, which yield more ambiguous results.

The present paper discusses the degree of capital mobility between the Norwegian economy and the rest of the industrialized world. Interpreting Obstfeld's conclusions, we believe that the very high degree of international interest rate arbitrage shows that financial

centers in various economies are (almost) perfectly integrated. Thus, the interesting question is whether a high degree of "real" capital mobility influences Norwegian saving and investment patterns, portfolio allocation and consumption patterns. Consequently, we focus exclusively on the three latter approaches mentioned above. At the outset our hypothesis is that the degree of real capital mobility is indeed increasing over time and that data from the last couple of years may in fact alter the conclusions from previous studies significantly.

The next section considers Norwegian time series data on saving and investment rates. It turns out that the correlation between annual saving and investment rates are close to zero both at the national level and when we look at private saving versus investment in the market-exposed part of the Norwegian mainland economy. These aggregate observations support the view that the degree of capital mobility is fairly high – and contrast the high correlations underlying the "Feldstein-Horioka puzzle" proposed in a seminal paper by Feldstein and Horioka (1980) and later confirmed by for example Feldstein and Bacchetta (1991). Section 3 looks at the mutual fund composition of Norwegian investors. These data reveal a dramatic decrease in the home bias during the last 5-7 years. This indicates that the home-bias puzzle initially documented by French and Poterba (1991) and Tesar and Werner (1995) may not survive very long into the current millennium. Turning to consumption correlations, section 4 offers a formal test of capital mobility in a model framework proposed by Bayoumi and MacDonald (1995), which permits myopic consumption behaviour. Based on data from the Nordic countries, this test suggests a high degree of capital mobility. Section 5 offers some final remarks, arguing that Norwegian economic policy should not be reformulated based on the idea of still rather low real capital mobility.

2. Saving-investment correlations

The literature on saving-investment correlations was initiated by Feldstein and Horioka (1980) and has been followed up by numerous papers; see the survey by Obstfeld (1995). Most of the basic contributions to this literature utilized cross-sectional data for a sample of industrialized countries and considered the correlation between domestic saving and investment rates calculated as average values over pretty long horizons (15 years in the original paper by Feldstein and Horioka). It generally turned out that this correlation was close to unity and the usual interpretation was that such a high correlation could not be in accordance with a high degree of capital mobility.

The simple approach in this literature has received a lot of criticism over the years and a basic insight is that there are several potential reasons for a high correlation between saving and investment rates even in a world where capital is indeed perfectly mobile. Obstfeld and Rogoff (1996: 162-163) discuss four such reasons including the possibility that shocks in for example productivity and population growth may lead to high saving-investment correlations. In a recent study of saving-investment correlations Hussein (1998) utilizes modern time series techniques and attempts to take this endogeneity problem into account. He demonstrates that this approach leads to fairly low "corrected" saving-investment correlations in a sample of OECD countries including Norway and concludes: "capital has been remarkably mobile over the last three decades".

Another interesting study by Vikøren (1991) argues convincingly that the original Feldstein-Horioka approach captures long-run saving-investment correlations, which will approach unity due to the influence of intertemporal budget constraints. He claims that the capital mobility issue depends on the short-run saving-investment correlation and suggest a technique, which disentangle short and long run correlations. Based on Norwegian data from 1954 to 1988 he then shows that the short-run (i.e. annual) saving-investment correlation has gradually dropped to levels very close to zero, indicating that the capital mobility between Norway and abroad has grown to high levels.

Adopting Vikøren's focus on the annual saving-investment correlation as the relevant indicator for capital mobility, we utilize a data set extended with observations until year 2000. Chart 1 shows the gross national saving and investment rates (i.e. gross national saving and investment as shares of mainland GDP) as well as the current account balance (also measured as a share of GDP). We immediately observe that the annual saving and investment rate seem to fluctuate independently over time. Straightforward OLS-estimation of the simple regression equation

(1) $\quad IR_t = \alpha + \beta SR_t,$

where IR_t is the investment rate and SR_t the saving rate in a given period t, yields the results depicted in Table 1 for various sample periods.

Chart 1: Norwegian gross national saving investment balance 1970-2000
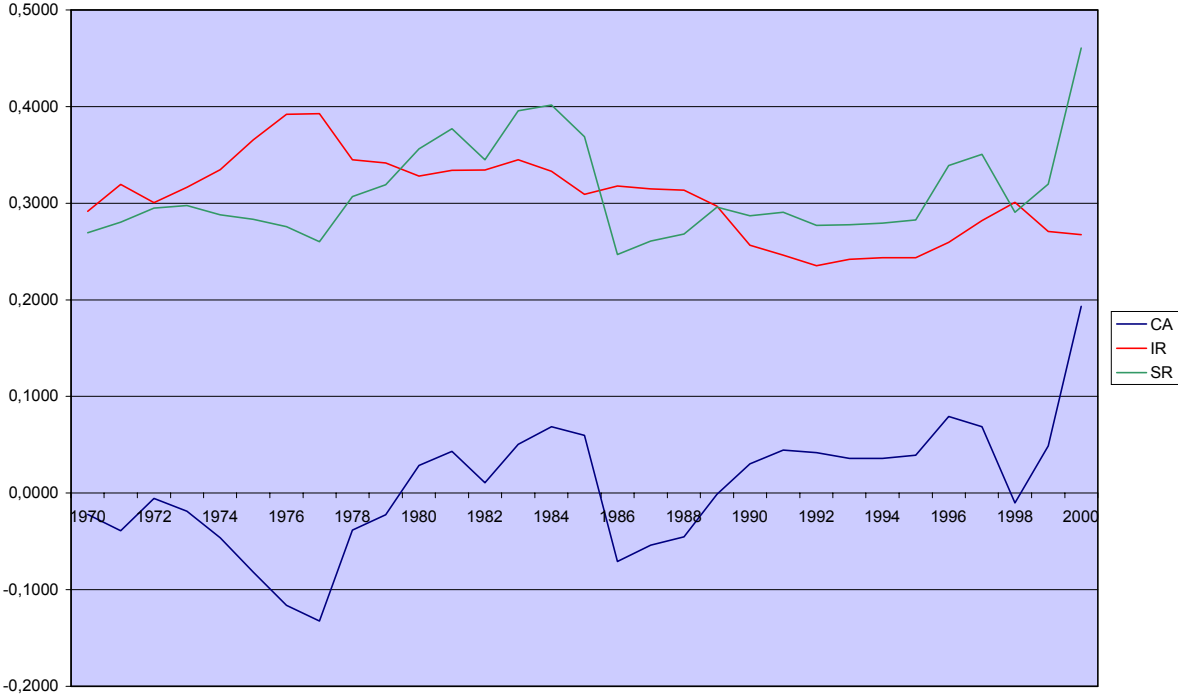
IRP: Gross national investment rate, SRP: Gross saving rate, CA: Current account
IRP, SRP and CA are all calculated as shares of mainland GDP.

Source: National accounts

**Table 1: OLS regressions of equation (1) – Norwegian gross national saving and investment rates**

Period:	n:	β	St.dev. of β	R^2
1970-2000	31	0.02	0.16	0.00
1970-1985	16	-0.12	0.16	0.04
1985-2000	15	-0.09	0.16	0.03

The results of these simple regressions show that the Norwegian short-run saving-investment correlation remained low during the last decade.

A potential problem related to the interpretation of these results is the fact that the huge investments in the large Norwegian petroleum sector are very volatile. Thus, we might suspect that saving-investment correlations are still high if we consider the market-exposed part of the Norwegian mainland economy. In order to investigate this possibility we considered the saving and investment rates for this sector separately. Chart 2 indicates that the

saving-investment correlation remained low in this case as well. Running simple OLS regressions of equation (1) for this sector, does indeed verify this impression, see Table 2.

Chart 2: Saving- investment balance 1983-2000, Market exposed part of Norwegian mainland economy
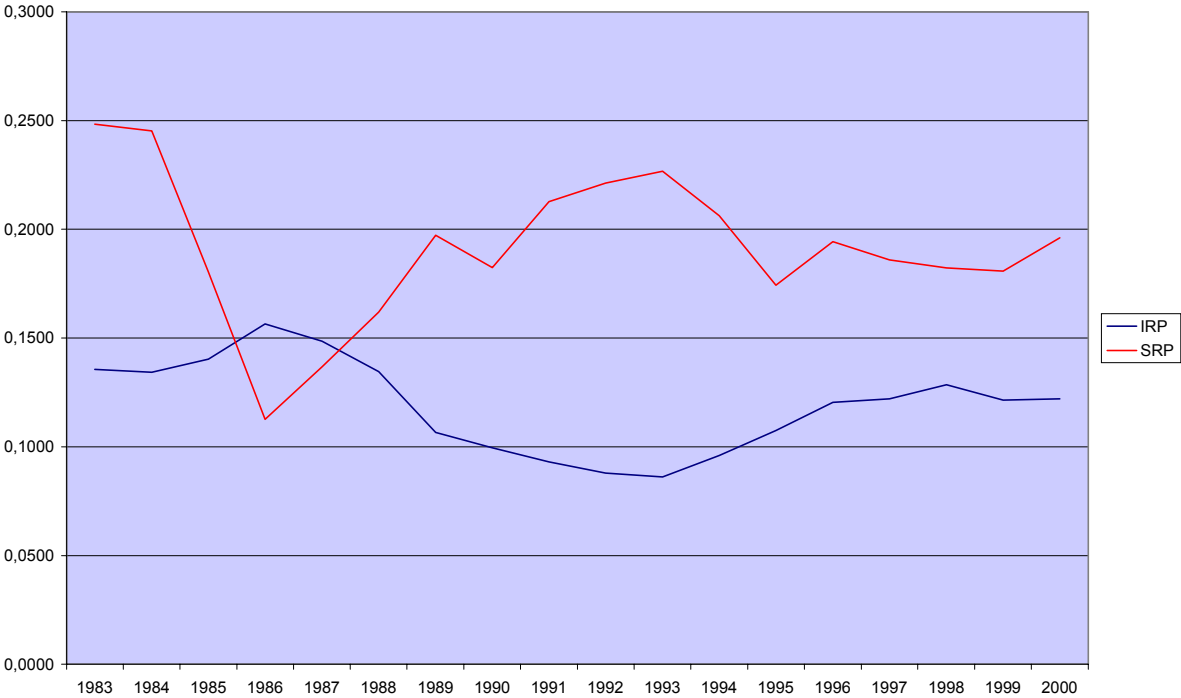
IRP: Gross investment rate in the market exposed part of the Norwegian mainland economy
SRP: Gross saving rate in the market exposed part of the Norwegian mainland economy
Both IRP and SRP are calculated as shares of mainland GDP.

Source: National Accounts, OECD

Table 2: OLS regressions of equation (1) – Gross saving and investment rates in the market-exposed part of the Norwegian mainland economy

Period:	n:	β	St.dev. of β	R^2
1983-2000	18	-0.32	0.13	0.27

3. Portfolio composition

A second approach to analyze international capital mobility is to directly examine international portfolio positions. In the section, we attempt to shed some light on the portfolio behaviour of Norwegian households and institutional investors over the last few years. Unfortunately, there is little reliable data available on 'aggregate portfolios' (i.e., data on holdings of all financial assets), but we do have detailed and up to date data on mutual fund allocations. These reveal several distinct patterns in recent allocation trends.

Table 3 reports the market value of all Norwegian registered mutual funds from 1995 to 2001. We treat these funds as owned by Norwegians only.[2]

Table 3: Market value of Norwegian registered mutual funds as of December 31, 2001.
Billions of kroner.

	1995	1996	1997	1998	1999	2000	2001
Total market value	44.553	66.097	96.157	84.968	121.094	142.286	131.946
of which in							
Norwegian equity funds	14.929	27.124	45.892	32.635	37.223	34.905	27.280
International equity funds	1.321	4.310	11.411	15.841	40.391	50.069	41.351
Sector equity funds	:	:	:	:	3.524	6.148	5.062
Norwegian bond funds	10.516	12.020	13.588	13.595	11.906	10.870	10.009
International bond funds	:	:	:	:	1.737	2.268	2.098
Norwegian money-market funds	17.064	19.576	20.529	19.607	22.367	33.980	42.282
International money-market funds	:	:	:	:	0.091	0.010	0
Norwegian mixed (stocks/bonds) funds	0.723	3.066	4.737	3.288	4.122	3.991	1.658
International mixed funds	:	:	:	:	:	:	2.203

Note: Data are from Norges Bank, (financial statistics) and the Norwegian Mutual Fund Association (market statistics). The symbol : means that data are non-available. Definition of funds:
  a. Norwegian equity funds; invests at least 80 % of their capital in the Norwegian stocks.
  b. International equity funds; invests at least 80 % of their capital in foreign stocks.
  c. Sector equity funds; invests at least 80 % of their capital in certain sectors.
The distinction between domestic and foreign bond, money-market and mixed funds is as for equity funds.

The value of equity fund investments has increased sharply over the sample period. In 1995 36 per cent of mutual fund investments were in equity funds, compared to 58 per cent in 2001

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[2] Our data for 1999 and 2000 allow us to identify foreign ownership in Norwegian registered funds for these years. In both years, foreigners owned less than 2 per cent of the funds. Counteracting this, Norwegian citizens may own shares in foreign registered mutual funds. We do not have data on such holdings, but we suspect that they more than outweigh foreign holdings in Norwegian registered funds.

(these numbers are excluding mixed funds). This increase reflects partly the run-up in share prices in the 90's and partly a reallocation of mutual fund investments toward equity funds.

It is also apparent from Table 3 that international funds have increased their market share dramatically over the sample period. Chart 3 displays the fraction of mutual fund holdings invested in international funds.[3] The trend is unambiguous; in 1995, less than 3 per cent of investments were in international funds. Only five years later, this share had risen to more than 41 per cent.

***Chart 3: Percentage of total mutual fund holdings invested in international funds.***
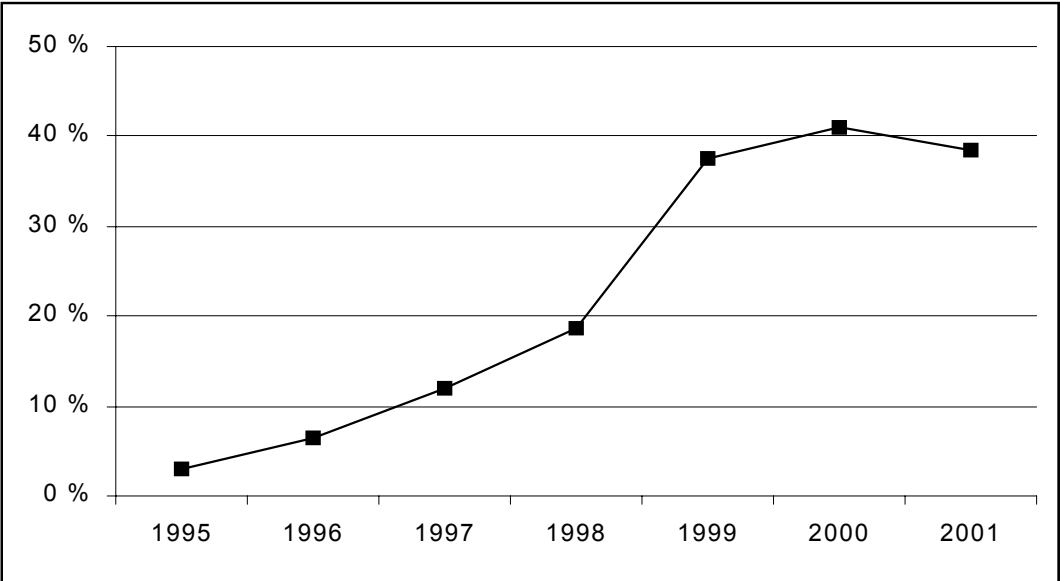
The slight reversal of the trend in 2001 is partly due to the setback in stock markets during that year and partly due to a reallocation towards money-market funds (which are invested solely at home).

Inspection of Table 3 reveals that equity investments in particular are responsible for this trend. Chart 4 plots the share of equity mutual fund holdings allocated to international funds. (We continue to treat sector funds as international and mixed funds as national.) During our sample period of seven years, this share has increased from less than 8 per cent to more than 62 per cent. It appears that Norwegian equity investors seriously began to take advantage of international diversification opportunities in the latter half of the 90's.

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[3] In Chart 3 we count sector funds as international, bond funds as domestic (prior to 1999), and mixed funds as domestic (prior to 2001).

Chart 4: Percentage of equity mutual fund holdings invested in international funds.
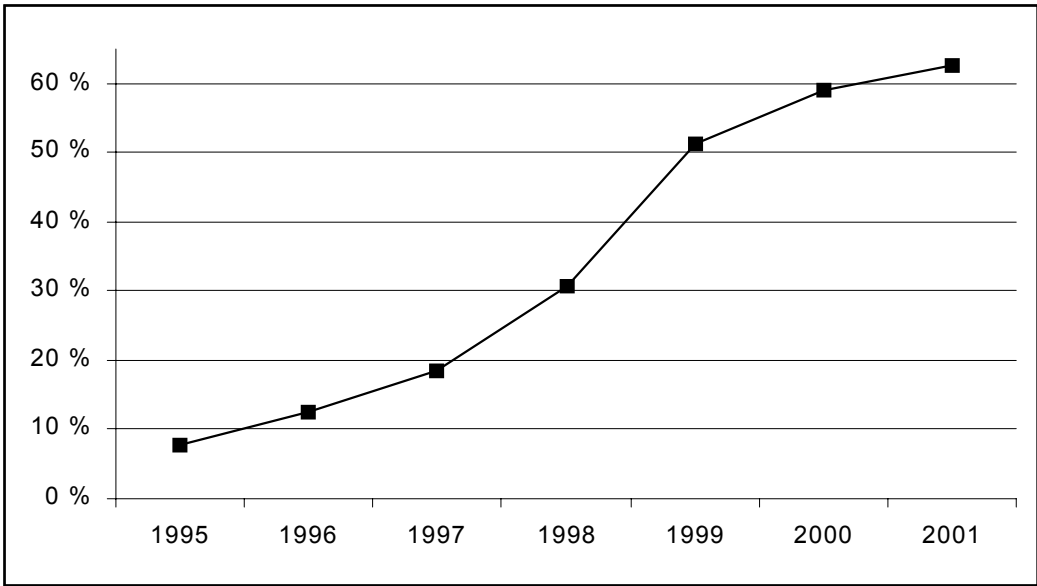

To consider the extent of international diversification, it is also of interest to study how the international portfolio is composed. Chart 5 and Chart 6 show the market value of funds dedicated to investments in specific geographical areas, relative to the total market value of international equity funds in Table 3, for 2000 and 2001 respectively. A standard international CAPM would predict that all equity investments should be in a global (value weighted) fund. Relative to such a benchmark, Chart 5 reveals that Norwegian equity investors are heavily overexposed in European, especially Nordic, shares. Less than 40 per cent of international equity mutual fund investments were in global funds in 2000, compared to 53 per cent combined in European and Nordic funds. As figure 6 shows, this pattern is only slightly less pronounced in the 2001 numbers.

This is roughly consistent with a simple gravity model for cross-border equity investments (see e.g. Portes and Rey, 2000). The longer the distance between the investor and the origin of the investment project, the less will be invested. To some extent this counteracts our interpretation of Chart 4. Norwegian equity mutual fund investor have moved their holdings out of the country to a significant degree, but primarily to neighbouring countries.

To offer further evidence, we split our sample in to equity mutual fund investments by households and by institutional investors. Chart 7 plots the fraction of adult (17 years and older) Norwegians that own equity mutual fund shares from 1995 to 2000. This fraction has more than doubled in five years. Like in many other countries, there thus seems to be an
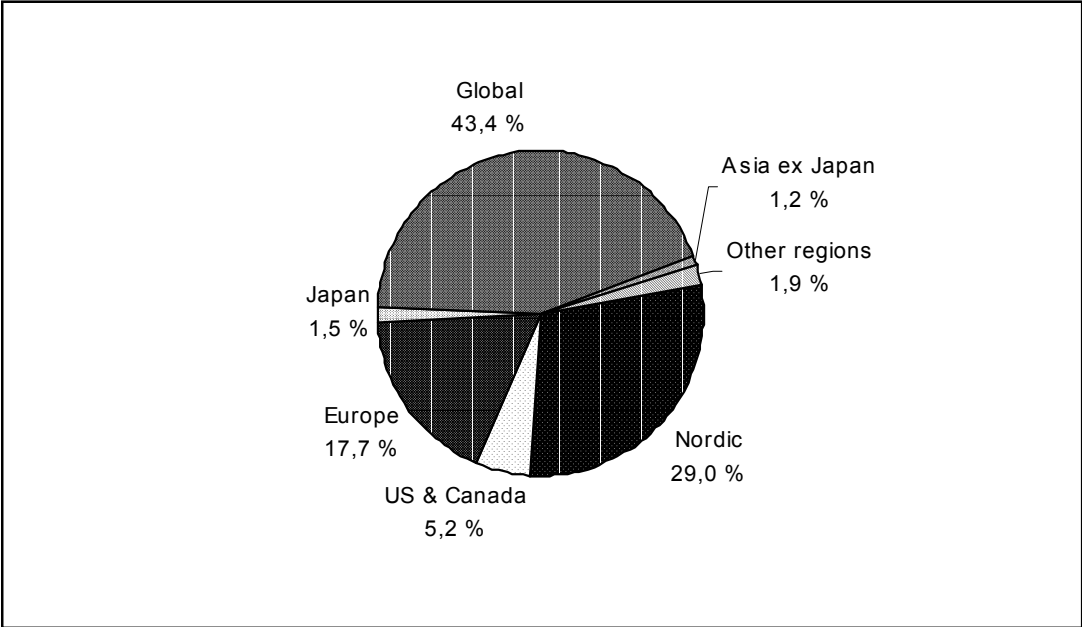
emerging 'equity culture', where households are more willing to participate in the stock market.

Chart 5: Regional allocation of international equity mutual funds, 2000.
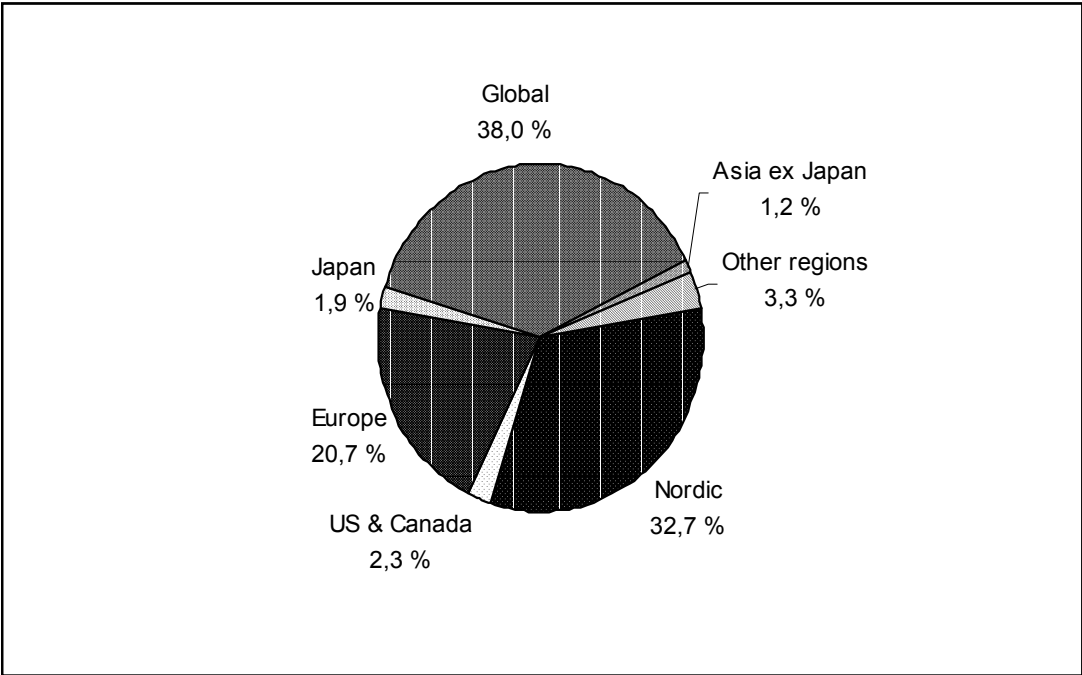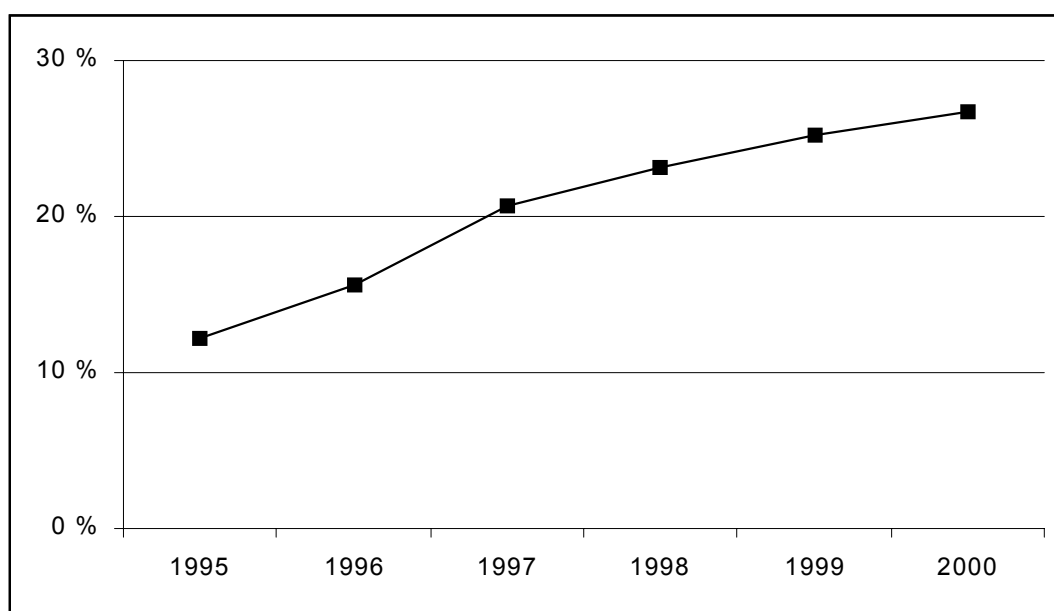

Source: Data from the Norwegian Mutual Fund Association.

Chart 6: Regional allocation of international equity mutual funds, 2001.

Source: Data from the Norwegian Mutual Fund Association.

Chart 7: Percentage of adult population owning equity mutual fund shares.

Source: Data from Statistics Norway, tax statistics.

Here, we want to highlight the extent of international diversification among these households. In Chart 8 we display the percentage of equity- and mixed mutual fund holdings invested abroad for households and institutional investors, covering the years 1999 and 2000 (which are the only years our data allow us to do the split).

Chart 8: Percentage of equity mutual fund investments in international funds.

Sources: Data from Norges Bank and Norwegian Mutual Fund Association.

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In 2000, institutional investors had ⅔ of their equity mutual fund investments in international funds. Although households appear to be less diversified, the difference in allocation to international funds is less than 10 percentage points for both 1999 and 2000. This indicates that the trend spotted in Charts 3 and 4 is valid for both investor groups.

To summarize, the home bias in mutual fund investments among Norwegian investors is dramatically reduced during the last seven years. It is noteworthy that this trend has occurred parallel to a substantial public accumulation of foreign financial assets (stocks and bonds), through the Norwegian Petroleum Fund. The data presented in this section certainly does not support a view that public financial investments crowd out private. That said, our equity mutual fund data indicate that when Norwegian private investors go international, they mainly go to other European nations.

4. Consumption patterns

Principles

The existence of a fully integrated international financial market implies that representative individuals in different countries may diversify consumption risks that appear to be systematic at a domestic level but are idiosyncratic in a global setting. This implies that consumption growth should tend to be more synchronized across countries. In fact, the cross-country consumption correlations should be equal to unity under a set of restrictive but nevertheless standard assumptions, see for example Tesar (1995). Looking at the rather large amount of recent empirical consumption-based studies of international financial integration, we do find that the consumption correlations have increased over time, but they are still far below unity.[4]

Possible explanations to these findings include the incompleteness of markets for contingent assets (Obstfeld, 1994b) and behavioral explanations in the sense that investors find investments abroad more risky because they are less familiar with foreign markets, institutions and firms. Other explanations may be transaction costs and the existence of non-traded goods, see Tesar (1993, 1995).[5] Further, the forward-looking consumption model

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[4] The literature on consumption-based studies of international financial integration includes Backus et al. (1992, 1993), Obstfeld (1994b, 1995), Stockman and Tesar (1995) and Tesar (1995).
[5] Tesar and Werner (1995) deem the effect of transaction costs as insignificant. The effect of non-traded goods is also controversial. Baxter et al. (1998) find that a home bias with respect to domestic traded-goods equities is never optimal. On the other hand, Lewis (1996) concludes that international risk sharing can not be rejected when non-separabilities between tradeables and non-tradeable leisure and goods are taken into account in countries facing no capital market restrictions.

underlying most of the international financial integration literature may be criticized. Myopic consumption behavior caused, for example, by liquidity constraints, may explain part of the observed low consumption correlations (Bayoumi and MacDonald, 1995).

Adopting a model framework suggested by Bayoumi and MacDonald, which captures the potential effects of myopic consumption behavior, we attempt to investigate the degree of financial integration between Norway and the Nordic countries Denmark, Finland, Norway and Sweden. To our best knowledge a coherent study of consumption comovements in these countries has not yet been undertaken.[6] We believe that this sample of countries may be of particular general interest. A common cultural background and very similar languages (Finland is an exception in the latter respect) imply that the Nordic countries are closely related. The political climate is also stable compared to most other regions. We therefore conjecture that the suggested effects of investors' non-familiarities with foreign markets, institutions and firms are minimized within the Nordic countries.

A reference model

Following Obstfeld (1994b), we consider a reference model based on complete asset markets, perfect capital mobility and forward-looking consumption behavior. In the initial period 0, a representative infinitely-lived individual in country i, $i = 1,2,...,N$ maximizes

$$(2) \qquad U_0 = E\left[\sum_{t=0}^{\infty} (\beta_i)^t u(C_{i,t}, \theta_{i,t}) \big| s_0 \right],$$

where β_i is a time preference factor, $C_{i,t}$ is consumption of a single tradable consumption good, $\theta_{i,t}$ is a preference shock and the period utility function satisfies $u' > 0$ and $u'' < 0$. For each period there is a set of possible states of nature, and s_t is the realised state in period t. The probability that a given state is realized in period $t+1$ depends only on the value of s_t and possibly on time (i.e. a Markov structure). Hence, $E[\bullet | s_t]$ is expectation conditional on information observed up to period t. The maximization of (2) is subject to feasibility constraints for each period and each state. National income in each country follows a stochastic process known by all individuals.

Assuming that the representative individual in country i and country j have rational expectations and face identical asset prices, we obtain first-order conditions which can be written as

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[6] An analysis of the bilateral consumption co-movements between Denmark and Norway is included in the study of Thøgersen (1997).

$$(3) \quad \frac{\beta_i u'[C_i(s_{t+1}),\theta_{i,t+1}]}{u'[C_i(s_t),\theta_{i,t}]} = \frac{\beta_j u'[C_j(s_{t+1}),\theta_{j,t+1}]}{u'[C_j(s_t),\theta_{j,t}]}.$$

Here $C_i(s_t)$ is the period t consumption per capita in country i provided that state s_t occurs. This condition means that for all states of nature the ex-post marginal rate of intertemporal substitution is equalized between country i and country j.

We assume an isoelastic period utility function,

$$(4) \quad u(C_{i,t},\theta_{i,t}) = \frac{1}{1-\gamma}(C_{i,t})^{1-\gamma} \cdot \exp(\theta_{i,t}),$$

where γ is a common coefficient of constant relative risk aversion. Defining $t = 0$ as the initial period and normalizing θ_i so that $\theta_{i,0} = 0$, this specification implies that the following time-series model can be derived from (3):

$$(5) \quad logC_{i,t} = a + logC_{j,t} + \frac{t}{\gamma} \cdot log\left(\frac{\beta_i}{\beta_j}\right) + \frac{1}{\gamma}(\theta_{i,t} - \theta_{j,t}).$$

Here $a = log(C_{i,0}/C_{j,0})$ is a constant term. We see from (5) that equal time preference factors ($\beta_i = \beta_j$) and identical preference shock ($\theta_{i,t} = \theta_{j,t}$) imply equal ex-post comovements in $logC_{i,t}$ and $logC_{j,t}$. We will, however, take into account that country specific preference shocks and differences in the time preference rates break this complete ex-post synchronization of $logC_{i,t}$ and $logC_{j,t}$.

Since we consider financial integration within a certain region, equation (5) should hold for all combinations of the four countries. Consequently, we may define "country j" as the aggregate of these countries minus country i. This procedure is common in the literature, and as explained in the appendix, it limits a potential endogenous regressor problem in the empirical application. The appendix also demonstrates that we, based on (5), may derive the following link between the change in the log of per capita consumption in country i and in the rest of the countries in the Nordic region:

$$(6) \quad \Delta logC_{i,t} = b + \Delta logC_{No-i,t} + \varepsilon_{i,t}.$$

Here $\Delta logC_{i,t} \equiv logC_{i,t} - logC_{i,t-1}$, $b = \frac{1}{\gamma}[log\beta_i - log(\Sigma_j\beta_j)]$ is a constant, $C_{No-i,t}$ is the per capita consumption in the Nordic region except country i in period t and $\varepsilon_{i,t}$ is a stationary disturbance term which reflects preference shocks.

The representative individual in each country smoothes consumption over time and across future states of nature. As we see from (6), this leads to proportionality between per capita consumption growth in country i and in the rest of the Nordic region. The only effect of

idiosyncratic income shocks is through their impact on the total Nordic consumption possibility set. In order to test these predictions, we may estimate the equations

(7) $\Delta logC_{i,t} = b + \alpha_i \Delta logC_{No-i,t} + \varepsilon_{i,t} , \quad \forall i.$

The joint hypothesis of perfect financial integration and complete markets implies $\alpha_i = 1$. Correspondingly, we interpret α_i-values close to 0 as an indication of a low degree of financial integration.[7]

Allowing myopic consumption behavior

So far we have relied on forward-looking consumption behavior and perfect domestic credit markets. This may be criticized because available empirical evidence indicates that the consumption behavior of a significant share of the population in many OECD countries has been myopic during the period we analyze (1973-1996), see for example Campbell and Mankiw (1991). As a final modification of the model framework, we will therefore include the consumption set-up of Campbell and Mankiw which assumes that a proportion λ_i of aggregate consumption is associated with myopic current income consumers and a proportion $1 - \lambda_i$ with forward-looking consumers. Basically, this means that we combine the reference model above with Campbell and Mankiw's model along similar lines as in Bayoumi and MacDonald (1995). We may interpret the current income consumers as consumers who face liquidity constraints in an imperfect domestic credit market.

The consumption of the current income consumers is given by $\lambda_i Y_{i,t}$ where $Y_{i,t}$ is real disposable income. This implies that

(8) $logC_{i,t} = \lambda_i logY_{i,t} + (1 - \lambda_i)logC_{i,t}^{FL} \quad \forall i,$

where $logC_{i,t}^{FL}$ is the consumption of the forward-looking consumers. As before, we want to consider each individual country i versus the rest of the Nordic countries. Hence, we follow the procedure outlined in the appendix and substitute equation (A-2) (in the appendix) for $logC_{i,t}^{FL}$ in (8). We may then derive the following estimation equation:

(9) $\Delta logC_{i,t} = b + \lambda_i \Delta logY_{i,t} + \omega_i \Delta logC_{No-i,t} - \phi_i \Delta logY_{No-i,t} + \varepsilon_{i,t} \quad \forall i.$

Here $\omega_i = \frac{1-\lambda_i}{1-\lambda_{No-i}}$ and $\phi_i = \lambda_{No-i} \cdot \omega_i$. Estimates of λ_i which are significantly larger than 0, indicate that parts of the population is characterized by myopic consumption behavior,

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[7] If the hypothesis $\alpha_i = 0$ can not be rejected, this indicates no financial integration. A rejection of the $\alpha_i = 0$ hypothesis does not, however, exclude the possibility of no financial integration since common shocks (for example global technology shocks) may imply $\alpha_i>0$ even if there is no integration of financial markets.

possibly caused by liquidity constraints. Furthermore, ω_i-coefficients significantly larger than 0 indicate financial integration between the Nordic countries after we have controlled for myopic behavior in parts of the population. We observe that $\lambda_{No\text{-}i} = \lambda_j$ implies $\omega_i = 1$ if the financial markets are completely integrated in the region.

Estimation issues and empirical evidence

Turning to our empirical analyses, we use data from the Penn World Table data base in order to facilitate comparisons. As our point of departure, we first consider the estimation of (6), i.e. the reference model, which includes preference shocks but disregards the possibility of myopic consumption behavior. Table 4 reports the results.

As mentioned above and explained further in the appendix, there is a potential endogenous regressor problem in the reference model, but this is mitigated by using aggregate consumption growth for the whole region minus country *i* as the regressor (see the appendix for details). The LM test for cross-country correlation in the error terms, which is reported in Table 4, implies that the hypothesis of uncorrelated error terms is rejected at the 5 per cent level. Accordingly, we choose to estimate the reference model using Zellner's seemingly unrelated regression (SUR) estimation. The Durbin-Watson (DW) tests (see Table 4) indicate a first-order autocorrelation problem for the Danish equation. Employing a Cochrane-Orcutt procedure changes the results very little, however. Consequently, we report only the SUR results.

Table 4: Reference model - SURE estimation of equation (7), 1973-1996.

Country i:	Denmark	Finland	Norway	Sweden
α_i	**0.84**	**1.54**	**0.75**	**0.52**[*]
	(0.21)	(0.39)	(0.33)	(0.14)
R^2	0.27	0.23	0.03	0.20
LM het. test	0.71	1.95	0.10	0.52
DW	0.94	1.55	1.41	1.42

LM test for contemporaneous correlation across equations = 19.60

Note: Standard errors of coefficients are shown in parantheses. **Boldface entries** indicate coefficients that are significantly larger than 0 at the 5% level, Asterisks indicate coefficients that are significantly different from 1 at the 5% level.

We can reject the hypothesis that $\alpha_i = 1$ in the case of Sweden only. Further, the α_i-coefficients are significantly larger than 0 for all countries. These results indicate that the private consumption patterns of Denmark, Finland and Norway are consistent with full

financial integration. In addition, the consumption pattern of Sweden also indicates a significant degree of synchronization with the rest of the region. We must admit, however, that the estimates are not very precise.

Compared to Obstfeld's (1994b) results for the G-7 countries, which are obtained from a similar model specification, our results at this stage indicate that the degree of financial integration within the Nordic area is approximately at the same level as between the G-7 countries.

The results in Table 4 may be explained by other economic mechanism than forward-looking consumption behavior and a high degree of financial integration. For example, the results may simply be the consequences of myopic consumption behavior and common income shock in economies which are not highly financially integrated. Based on regression equation (9), we therefore investigate simultaneously the relevance of the forward-looking consumption model and the degree of financial integration.

Equation (9) was estimated by the Generalized Methods of Moments (GMM) procedure for the 1973-1996 period. Bayoumi and MacDonald (1995) discuss why GMM is appropriate in these models. The main argument is that the disturbances to domestic income contain information about permanent income and may be correlated with consumption. An instrumental variable technique, such as GMM, should therefore be applied. In addition, GMM is robust to heteroscedastisity and autocorrelation, and it provides a direct test of orthogonality of the errors to the instruments.

As instruments, we use the second lag of the level of real consumption per capita and real disposable income per capita for both the home country and the rest of the region.[8] We have also experimented with lagged growth rates of consumption and disposable income as instruments. Based on the Wu-Hausman test for evaluation of instruments, it followed that the level variables generally performed better. Thus, we only report the parameter estimates where the level variables are used as instruments. These results are given in Table 5.[9]

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[8] We use the second lag because both the inclusion of nondurables in the consumption measure and the time averaging of consumption data can induce a correlation between the error term and the first lag of consumption (see Campbell and Mankiw, 1989).

[9] For Finland, Norway and Sweden, we collected the data for per capita real private disposable income from the OECD national accounts. The full series is not available for Denmark. Consequently, we used real GDP as a proxy for Danish disposable income.

Table 5: GMM estimation of equation (9), 1973-96.

Country i:	Denmark	Finland	Norway	Sweden
λ_i	0.39[#]	**0.89**	0.79	0.37[#]
	(0.23)	(0.22)	(0.71)	(0.21)
ω_i	**0.82**	**0.86**	**1.18**	0.49[#]
	(0.36)	(0.50)	(0.45)	(0.29)
ϕ_i	0.58	-1.11	-0.47	0.45
	(0.41)	(0.62)	(0.32)	(0.62)
Overidentif. restrictions (Sargan)	0.05	0.05	1.91	1.40

Note: Standard errors (robust to heteroscedasticity and 1 order autocorrelation) are shown in parentheses. **Boldface** (#) entries indicate coefficients that are significantly larger than 0 at the 5% (10%) level. The instruments were the second lags of (per capita) domestic and external consumption, and domestic and external disposable income. Critical value of the Sargan test at the 5% level is 3.84 from $\chi_{(1)}$.

The last row in Table 5 reports a Sargan test of whether the errors in equation (9) are orthogonal to the instruments. The reported values all imply that we can not reject the orthogonality hypothesis. This indicates that the model in equation (9) can be regarded as a valid description of the data.

All coefficients on domestic disposable income (λ_i) have the expected positive sign. The λ-coefficient is significant at the 5 per cent level for Finland only. In the Swedish case the λ-coefficient is significant at the 10 per cent level. The ω-coefficient is significant at the 5 per cent level for Denmark and Norway, and at the 10 per cent level for Finland and Sweden. None of the coefficients on external income (ϕ_i) are significantly different from 0 at the 5 per cent level.

Comparing our results to earlier studies, we first consider the λ-estimates and note that Bayoumi and MacDonald (1995), based on the sample period 1973-1992, report an approximately similar estimate for Finland as that presented in Table 5. For Denmark, Bayoumi and MacDonald present a λ-estimate which is highly significant and larger than our estimate. One possible interpretation is that the fraction of rule-of-thumb consumers has been reduced over time in Denmark. Turning to Sweden, our λ–estimate is approximately similar to the estimate provided by Campbell and Mankiw (1991) for the period 1972:2-1988:1 (see table 2 of that paper) and also very close to the series of λ–estimates presented by Agell and Berg (1996). Finally, for Norway Boug et al. (1995) report insignificant λ-estimates for the period 1984:3-1994:4.

Bayoumi and MacDonald also estimate coefficients corresponding to our ω_i-coefficients. For Denmark, they report negative estimates both with respect to their broad

sample of selected OECD economies and with respect to other EU-countries (members in 1991). Our results (Table 5) suggest, however, that Denmark over the period 1973-1996 was financially well integrated with their Nordic neighbors once rule-of-thumb consumption behavior is taken into account. For Finland, Bayoumi and MacDonald's coefficient on external consumption is positive, but insignificant. Because our coefficient on external (Nordic-) consumption is significant at the 10 per cent level, this suggests that Finland's capital market is well integrated with the other Nordic countries, but not with the other OECD nations. We suspect that Finland's close economic ties to particularly Sweden might be responsible for this result (recall that Sweden is captured by our sample but not by Bayoumi and MacDonald's).

The overall impression from Table 5 is that once myopic consumer behavior is taken into account, the financial markets of the Nordic economies seem to be highly integrated. We can throw additional light on this issue by looking at similar regressions for the period 1951-72. Table 6 reports the estimation results from this period.

It turned out to be very hard to identify good instrument from our set of available candidates for 1951-72 (the same set as for the 1973-96 period). In all our attempts, the Wu-Hausman test was very far from rejecting that an endogeneity of Y_i had no effect on the consistency of the estimates. This indicates that OLS is more efficient than GMM in this case.[10] Consequently, we chose to employ a regular OLS procedure in this case. Because data on disposable income are not available for the 1951-72 period, we rely on real GDP per capita as a proxy.

Table 6: OLS estimation of equation (9), 1951-72.

Country i:	Denmark	Finland	Norway	Sweden
λ_i	**0.47**	**0.79**	**0.50**	**0.52**
	(0.14)	(0.16)	(0.22)	(0.17)
ω_i	-0.11	0.68	0.47	0.28
	(0.40)	(0.74)	(0.37)	(0.20)
ϕ_i	0.61	-0.01	-0.03	-0.27
	(0.41)	(0.66)	(0.31)	(0.21)
Adjusted R^2	0.51	0.64	0.35	0.44
LM het. test	1.71	0.06	0.22	1.25
DW	2.39	1.87	2.12	2.07

LM test for contemporaneous correlation across equations = 12.51

Note: Standard errors of coefficients are shown in parantheses. **Boldface entries** indicate coefficients that are significantly larger than 0 at the 5% level. # indicates

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[10] We did run GMM for 1951-72, using the same instruments as in Table 5. This exercise gives a significantly positive λ for Finland, while all other parameters are insignificant and extremely imprecise.

Table 6 shows significant λ_i-coefficients for all countries. In addition we observe that none of the ω_i-coefficients are significant at the 5 per cent level. Comparing Table 5 and 6, we safely conclude that the gradual reforms in domestic and global financial markets after 1970 have led to both increased consumption smoothing over time as well as increased real integration of financial markets in the Nordic region.

5. Final remarks

This paper has attempted to give a broad assessment of the degree of *real* capital mobility between Norway and abroad. We first considered annual gross national savings-investments correlations and they turned out to be extraordinary low during the full time span from 1970 to 2000. Admitting that the low correlations might reflect volatile investments in the big petroleum sector, we also looked at the saving-investment balance in the market-exposed part of the Norwegian mainland economy only. This did not alter the very low correlation. Next, we considered the portfolio compositions of Norwegian investors. Having the well known "home bias puzzle" in mind, we note with some surprise that a strong home bias observed some years ago has more or less vanished during the last 2-3 years. Finally, looking at consumption patterns within the Nordic countries, estimation of a model, which allows myopic consumption behavior, indicates that the Nordic countries are well financially integrated. Thus, approaching the capital mobility issue from three different angles, we obtain the same answer: The degree of real capital mobility between Norway and abroad seems fairly high, and it has increased during the last couple of years.

The policy implications are straightforward: Excessive capital income taxation may well lead to capital flight. Moreover, Norwegian firms in general are not capital constraint. This implies that attempts to allocate parts of the state petroleum fund to investments in the mainland economy will not in general trigger more profitable investment – but may well stimulate rent-seeking and unproductive investments. Recalling that several observers of the Norwegian economy advocate a pension reform based on real individual and privatized accounts as the mean to transfer amounts from the petroleum fund to domestic investments, we will argue that a well-designed pension reform is probably a very wise thing. The reason,

however, is not capital market imperfections but rather the fact that such a reform will improve the pension system.

Appendix

This appendix - which closely follows Obstfeld (1995) - briefly derives the relationship between equation (5) and equation (6) in the main text. If (5) is estimated directly for different combination of countries, it may cause econometric difficulties. A high realization of $\theta_{j,t}$ raises the marginal utility of country j's consumption in period t. Thus, country $j's$ consumption in (5) is likely to be positively correlated with $\theta_{j,t}$. This creates a potential endogenous-regressor problem. In order to reduce this problem, we define $n_{i,t}$ as country i's share of the total Nordic population and $C_{No,t}$ as Nordic consumption per capita. This means that

(A-1)
$$C_{No,t} \equiv \sum_{j=1}^{5} n_{j,t} C_{j,t}.$$

Using (A-1), we rewrite equation (4) in the main text as

(A-2)
$$logC_{i,t} = logC_{No,t} + logC_{i,0} + \frac{t}{\gamma} \cdot log\beta_i + \left\{ \frac{\theta_{i,t}}{\gamma} - log\left[\sum_j (\beta_j)^{\frac{t}{\gamma}} \cdot exp\left(\frac{\theta_{j,t}}{\gamma} \right) \cdot n_{j,t} \cdot C_{j,0} \right] \right\}.$$

Compared to the error term $\frac{1}{\gamma}(\theta_{i,t} - \theta_{j,t})$ in equation (5), it is more plausible that the composite error in the brackets in (A-2) is uncorrelated with $lnC_{No,t}$. This implies that the endogenous-regressor problem has been reduced. Differencing (A-2) yields equation (7) in the text when we remove country i from the aggregate consumption variabel. If country i is not removed from the aggregate, we would probably face another endogenous-regressor problem since positive realizations of $\theta_{i,t}$ in many cases would be correlated with $C_{No,t}$ (particularly if country i is large).

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