BIS

Working paper No. 20

HOUSEHOLD SAVING AND REAL HOUSE PRICES: AN INTERNATIONAL PERSPECTIVE

by

Neale Kennedy and Palle Andersen

January 1994

BANK FOR INTERNATIONAL SETTLEMENTS
Monetary and Economic Department
BASLE

HOUSEHOLD SAVING AND REAL HOUSE PRICES:

AN INTERNATIONAL PERSPECTIVE

by

Neale Kennedy and Palle Andersen

January 1994

We wish to thank S. Arthur, A. Donaubauer and G. Randecker for assistance with the graphs and tables and H. Bockelmann, R. Filosa, J. Bisignano, C. Borio, P. Dittus, J. Muellbauer, J. Poterba and F. Smets for comments and suggestions made on an earlier draft.

Contents

Tables

Annex Tables

Graphs

I. Introduction*

The principal aim of this study is to provide some empirical evidence, from an international perspective, on the influence of developments in house prices on the aggregate consumption or saving behaviour of households. The observation that housing wealth constitutes a significant proportion of total wealth for households without exception suggests that household expenditure patterns are likely to reflect housing market developments. Nevertheless, the structure of housing markets varies widely across countries, and differences in institutional features, as well as in other characteristics of national housing markets, imply that the impact is likely to vary considerably. In a number of countries, financial liberalisation during the course of the last decade has improved households' ability to borrow funds for house purchase, leading to a rise in house prices and thus in the net wealth of the owner-occupier sector. Moreover, enhanced access to accumulated wealth through secondary mortgages may have increased the sensitivity of household saving to changes in housing wealth.

Recent attention to the macroeconomic importance of changes in housing wealth has been, in part, based on the experience of house price movements, notably in several Nordic countries, Japan and the United Kingdom. Section II describes developments in house prices in fifteen industrialised countries over the period 1970-92. A comparison is made between house price movements in nominal and real terms and the experience of various countries in Europe is compared with that elsewhere. In order to analyse the recent cycle in residential real estate prices in a broader context it is of particular interest to examine those periods in which house prices rose, or fell, very sharply. Some discussion is also undertaken at this point of the importance of fundamentals in the determination of house prices and the possible existence of speculative bubbles in the housing market.

On the theoretical level a consensus seems to be emerging that house price movements, leading to shifts in housing wealth for the household sector, may have an impact, albeit of uncertain sign and magnitude, on decisions about aggregate saving and spending. A useful framework for analysing this impact is the life-cycle model. Section III provides a brief review of the theoretical literature, with special emphasis on various distributional considerations. It is concluded that while it is possible to envisage circumstances in which there are clear incentives for current owner-occupiers to reduce saving during periods of rising house prices, the overall impact may be small, or even perverse, because current renters are likely to save more. The impact of financial liberalisation on the time profile of consumption is also considered, in terms of both the ability of current owner-occupiers to extract the equity stored in housing and the borrowing conditions for house purchase.

---

* Throughout the paper references to Germany exclude eastern Germany.

Drawing on the developments in house prices and housing wealth and taking account of the special features of housing in individual countries, the role of house prices in the determination of saving behaviour is considered in Section IV. The empirical results of estimating saving ratio equations incorporating house price variables on annual data from 1970 are presented for fifteen countries. Of particular interest is the significance of housing relative to non-housing wealth and the contribution of house price movements and financial liberalisation to changes in household saving during the 1980s. In eight of the fifteen countries a rise in real house prices is found to lower household saving, while in seven the effect is positive. Nonetheless, in most countries changes in house prices during the 1980s have been associated with marked declines in household saving ratios and in several cases house prices can explain a significant part of the fall in saving. Changes in household debt have reduced household saving even more and there is some evidence that in a few countries households have been able to obtain more credit (in real terms) on the basis of rising *nominal* house prices, even though *real* house prices declined. It also appears that during the adjustment phase following deregulation, saving may be reduced below its long-run level.

Section V contains some concluding remarks.

II. House price developments: some cross-country comparisons

II.1 Introduction

This section provides a brief overview of some of the general characteristics of national housing markets for the fifteen countries under consideration. For this purpose several measures of the relative importance of housing wealth in the household sector are presented, together with estimates of owner-occupation rates. However, the main focus of the section is on developments in house prices. Some evidence on the comparative levels of house prices is shown both in absolute terms and relative to per capita income. Longer-term trends in house prices are also summarised by describing the average growth rates of house prices in nominal and real terms over the period 1970-92 as a whole, together with a summary measure of the volatility of house prices in each country, where the 1970s and 1980s are distinguished. Finally, we turn to the identification and description of the largest movements in house prices over the whole period and an attempt is made to assess whether these fluctuations can be accounted for by changes in the underlying fundamentals, by expectations, or by speculative activity in housing markets.

II.2 The significance of housing to the household sector

Before examining trends in house prices in closer detail some evidence on the relative importance of housing wealth in various countries is presented (Table 1). The figures confirm that, at least in those countries where data are available, housing wealth is a significant proportion of total wealth for the household sector, but they also provide

Table 1

The importance of housing wealth: selected indicators

Country	% change in real net housing wealth		Owner-occupation rates (%)		Ratio of net housing wealth to combined net housing and financial wealth (%)		Ratio of net housing wealth to annual household income		Ratio of house prices to annual GDP per capita [1]
	1980-92[2]		1980	1990	1980	1990	1980	1990	1990
Australia	+66	-	65	72[3]	66	67	2.5	2.9	6.1
Belgium	0	-	61	49[4]	53	35	1.8	1.3	2.7
Canada	+27	*-6*	62	63	36	34	0.5	0.6	5.9
Denmark	-67	*-64*	52	52	-	-	1.2	0.4	3.6[5]
Finland	+54	*-46*	61	75	74	76	1.2	2.3	6.2[6]
France	+24	-	47	54	61	52	1.8	1.9	5.3[5]
Germany	+51	-	-	40	59	55	2.0	2.2	10.6[7]
Ireland	-		76	81	-	-	-	-	6.8[5]
Italy	-		59	67	-	-	-	-	5.7[8]
Japan [9, 10]	+125	*-9*	62	60	64	65	2.6	4.9	9.2
Netherlands	-		42	48	-	-	-	-	4.8
Norway	-		77	78	-	-	-	-	3.9
Sweden	-		53	49	-	-	-	-	4.1
United Kingdom	+44	*-31*	55	67	50	47	1.8	2.3	6.6
United States	-2	*-12*	64	64	29	21	1.2	0.8	5.4

[1] Based on prices of existing dwellings. [2] Figures in italics refer to the percentage decline in real net housing wealth from the peak year. Peak years are as follows: 1986 (Denmark), 1987 (United States), 1988 (Canada, United Kingdom), 1989 (Finland), 1990 (Japan). [3] June 1991 census. [4] Fiscal year 1991. [5] All dwellings. [6] All apartments (assuming 72m^2 average dwelling size). [7] Mittlerer Wohnwert. [8] Estimated. [9] Gross housing wealth is calculated as the sum of household sector net fixed assets plus sector land underlying buildings. Based on household survey data; Takayama and Kitamura (1993) estimate the proportion of housing assets in household net worth at 58% in 1979 and 72% in 1979. [10] Balance sheet data are only available to 1991.

Sources: For wealth data: Australia: Callen (1991), Australian Bureau of Statistics and Reserve Bank of Australia; Canada: Statistics Canada; Germany: Deutsche Bundesbank; Japan: EPA National Accounts; United Kingdom: Central Statistical Office and Bank of England; United States: Board of Governors of the Federal Reserve System; for other countries: information made available to the BIS by various national institutions and organisations. For actual house prices, see Annex 1.

strong support for the presumption that there are major differences between countries in the importance of housing wealth relative to both financial wealth and annual household disposable income. Moreover, the past decade has seen quite substantial differences in movements in net housing wealth in the countries analysed.

Net housing wealth, defined as the market value of the owner-occupied housing stock less the mortgage debt outstanding, has risen dramatically in several countries over the past decade. However, increases in net housing wealth have not been universal. Countries which stand out as having experienced substantial cumulative increases over the period 1980-92 include Australia, Finland, Japan and the United Kingdom. The greatest increases were recorded in Japan, where in real terms the value of net housing equity more than doubled, and in Australia, where the increase was 66%. In Denmark, by contrast, wealth embodied in the form of housing actually fell over the same period, in both real and nominal terms, with net equity more than halving in real terms over the decade.[1] Net housing equity also fell in real terms in the United States and remained constant in Belgium, while increases were muted in several other countries, including France. Several of the countries which have experienced large increases in net housing wealth also seem to have seen rapid house price movements in part as a consequence of financial deregulation. Since changes in net housing wealth reflect changes in the value of the stock of dwellings as well as changes in mortgage debt, this suggests that the direct impact on demand of financial liberalisation has more than offset the dampening effect of households' greater access to secondary mortgages and the growth of credit for house purchases. In some countries, in particular those where net housing equity has fallen, the decline is due to both a rise in mortgage debt and the fall in house prices. Graph 1 shows the housing capital gearing of households, defined as the ratio of mortgage debt to the value of the owner-occupied stock of dwellings. Almost without exception, the ratio was higher at the end of 1992 than in previous years. The increases in Denmark, Finland, the United Kingdom and the United States appear to have been particularly sharp.[2]

As regards the importance of housing wealth relative to that of households' financial wealth, a prominent feature of Table 1 is the variation in the proportion of total wealth maintained in the form of housing around an average of 50% in 1990. In Finland, for instance, almost 80% of the total is held in the form of housing and in Japan and Australia the figure is around 65%. At the opposite extreme, in Belgium and Canada it is estimated to be only around 35%, and in the United States the figure is even lower, at just over 20%. With the exception of Australia, Finland and Japan, a notable feature of the period 1980-90 was that household wealth appeared to become less

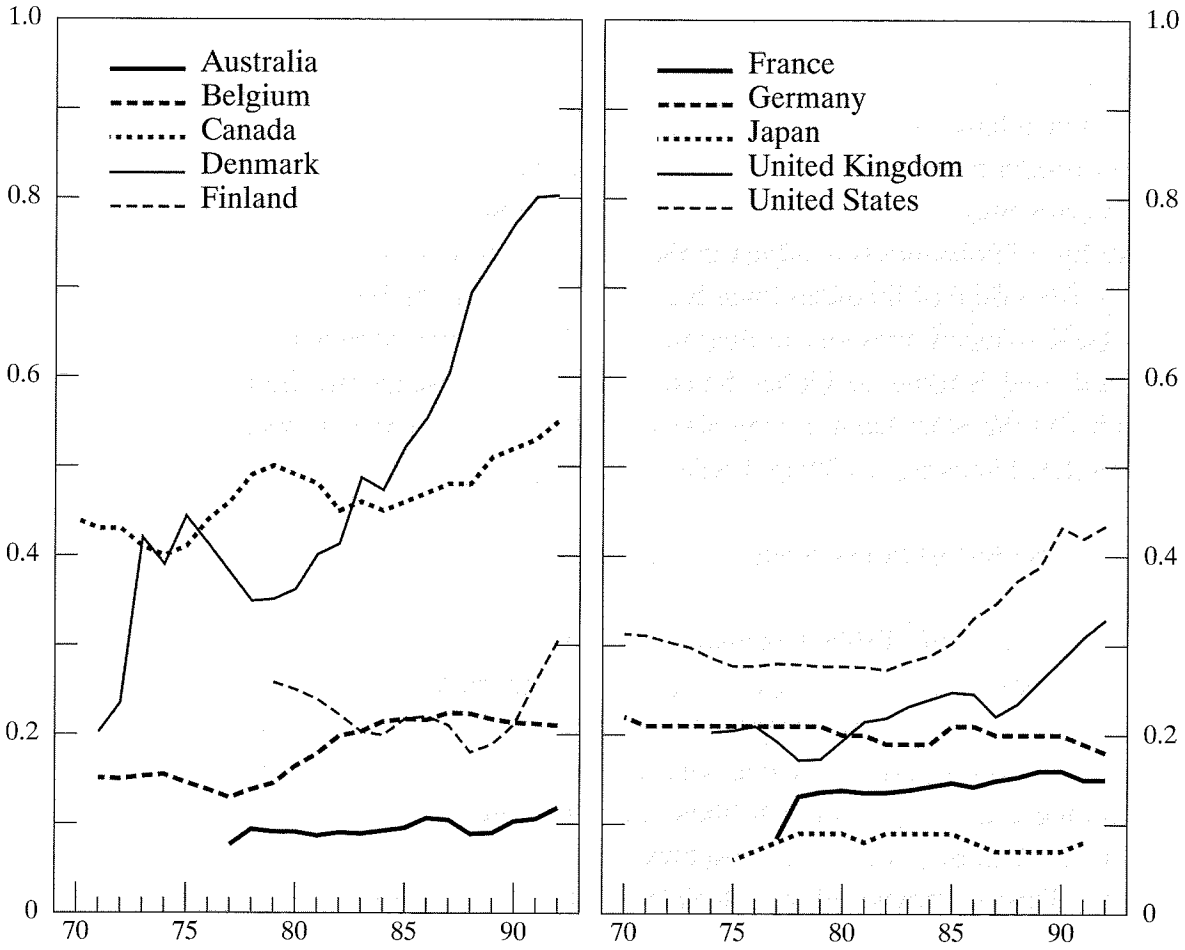
---

1 The sharp decline in Denmark is more apparent than real as it owes much to the replacement of private mortgages (not included in the debt figures) by loans from mortgage institutions.

2 The charts reveal wide disparities in the levels of capital gearing in housing across countries. However, it is necessary to be cautious about interpreting these estimates as published national balance sheet data are available for only a few of the countries analysed. Capital gearing for the remaining countries has been estimated using other and probably less precise sources.

Graph 1

Housing capital gearing



Source: As in Table 1.

concentrated in housing. For instance, the proportion declined from 29 to 21% in the United States and from 53 to 35% in Belgium.

There are also significant variations across countries when net housing wealth is scaled by annual household disposable income. Moreover, there appears, if anything, to have been a divergence in these ratios. Japan again stands out, because of the comparatively high and rising land prices, and the ratio of net housing wealth to income increased during the period 1980-90, from 2.6 to 4.9. Relatively high ratios are also seen in Australia, France, Finland, Germany and the United Kingdom. Increases occurred during the period in Australia, Finland and the United Kingdom, whereas the ratio fell in Belgium, Denmark, Norway, Sweden and the United States.

Perhaps surprisingly, there is little evidence of a relationship between owner-occupation rates, which vary between 40 and 80%, and the proportion of household wealth stored in housing. In some countries where the proportion is comparatively high, such as Australia and Finland, owner-occupation rates also tend to be high. However, in other countries, such as the United States and Canada, where owner-occupation rates

are also relatively high, there is comparatively little housing equity. It might be anticipated that any explanation for these differences would involve looking at variations between countries in the expected rate of return on housing relative to the return that could be expected if the funds were to be invested in alternative assets (bearing in mind differences in risk).[3] That said, in countries where house prices are very high relative to income, relatively few households can afford buying their own house, producing a negative relation between wealth stored in housing and the owner occupation rates. In addition, high moving costs relative to property prices could restrict the ability of households to adjust in the short term to new and desired levels of housing equity The effect of financial liberalisation is somewhat ambiguous. On the one hand, it may have reduced rationing in the mortgage loan market, stimulating effective housing demand, and leading to higher house prices and consequently higher gross housing wealth. On the other hand, it may also in some countries have allowed greater access to accumulated housing wealth and reduced net housing equity.

II.3 A review of house price movements in real and nominal terms

The last column of Table 1 compares the ratio of house prices[4] with GDP per capita. On this basis, house prices appear relatively high in Germany and Japan. The actual levels of house prices are compared in Graph 2, where the figures are converted using purchasing power parity exchange rates and scaled relative to the average house price in the United States. According to these estimates, house prices in Japan are more than double those in the United States (admittedly before the subsequent fall in land prices in Japan). This is supported by Horioka (1988), who found that after adjusting for differences in floor space, house prices in Japan were 2.5-2.7 times higher than in the United States.

Table 2 provides a longer-term perspective on the annual growth rates of house prices and some evidence on the volatility of house prices over the period 1970-92.[5] With just two exceptions (Denmark and Sweden) real growth rates have been positive since 1970, thus providing strong support for the contention that house prices tend to outpace the rate of consumer price inflation in the long run. There are, however, some significant differences to be observed between the pattern of real and nominal house price movements. In nominal terms, the highest rate of growth occurred in the

---

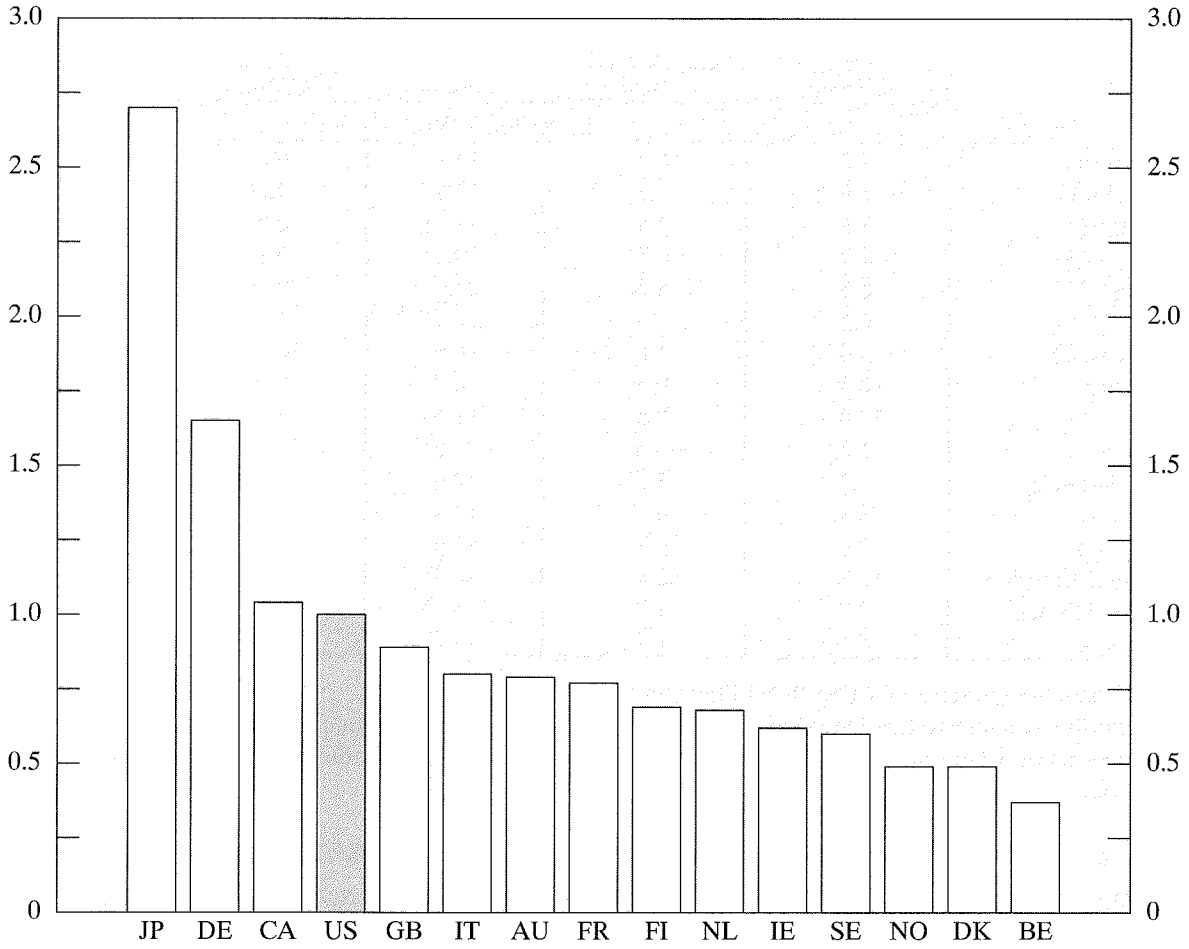
[3] A simple cross-country regression of the ratio of net housing wealth to total combined housing and financial wealth on the historic average real rate of return on housing over the period 1970-90 showed a correctly signed coefficient, with a t-statistic of around 1.8.

[4] The principal sources for house price statistics are cited in Annex I. As there are wide variations between countries in measures and definitions the price/income ratios only provide a broad order of magnitude. Further details are available from the authors on request.

[5] This study focuses on house price developments at a national level, and thus abstracts from regional house price movements which may be very large but are not evident at a national level. This is true for instance in the United States, where pronounced regional but mutually offsetting cycles could be observed during the last decade.

Graph 2

Relative house prices (1990) *



JP = Japan; DE = Germany; CA = Canada; US = United States; GB = United Kingdom; IT = Italy; AU = Australia; FR = France; FI = Finland; NL = Netherlands; IE = Ireland; SE = Sweden; NO = Norway; DK = Denmark; BE = Belgium.

* House price comparison based on sales of all or existing single-family dwellings, converted to US dollars using OECD PPP exchange rates and scaled to US house prices equal to one. Japan is the average price in Tokyo, Osaka and Nagoya. Italy is estimated.

Source: See Annex 1.

United Kingdom, at an annual rate of 12¼%, and the lowest in Germany at 5½%. House price increases exceeding 10% per annum were also seen in Ireland and Italy. After adjusting for the pace of consumer price inflation, the United Kingdom remains at the top of the table, but the growth rate of 2½% is matched by that of Japan, even though the nominal growth rate in Japan was below the average for the sample of countries analysed. In real terms, the increases in Canada, France, the United States and Germany follow, with Ireland and Italy relatively low down the table. In fact, a simple regression of real and nominal house prices revealed no significant relationship between the two.

In the majority of cases volatility appears to have increased in the 1980s, the clearest exception being the Netherlands, which witnessed a marked cycle in house

Table 2

The growth and volatility of house prices in long-term perspective

Country	Average Growth Rates (1970-92)		Volatility[1]		
	Nominal	Real	1970-92	1970-80	1981-92
	in percentages				
Australia	9.3	0.7	11.4	6.7	8.9*
Belgium	6.9	1.2	12.3	6.8*	8.2
Canada	8.8	2.0	11.5*	6.9*	10.9*
Denmark	6.9	-0.3	10.8	6.2*	12.2
Finland	8.6	0.2	24.2	9.1*	26.7*
France	9.3	1.7	12.5*	1.9*	13.6*
Germany[2]	5.4	1.6	10.0	10.7	10.3
Ireland	10.5	0.6	6.7	6.9*	6.2
Italy	12.0	0.6	11.6	9.4*	11.4
Japan	7.8	2.6	21.9*	15.8	15.4*
Netherlands	6.3	1.5	19.6	13.7*	5.2*
Norway	8.1	0.7	11.7*	7.0*	11.0
Sweden	7.7	-0.3	11.0	5.2*	8.8*
United Kingdom	12.3	2.6	18.3*	14.4	18.1*
United States	7.7	1.7	3.4*	3.0*	3.5*
Average	*8.5*	*1.1*	*13.1*	*8.2*	*11.4*

* Indicates the presence of a significant time trend.
[1] Volatility is expressed as the standard error (in percentages) from an equation incorporating a constant and time trend, where the house price index deflated by consumer prices is the dependent variable. [2] From 1971 only.

prices between the mid-1970s and the early 1980s but comparatively stable house prices thereafter. In real terms, Finland, Japan and the United Kingdom show the greatest volatility both for the period as a whole and for the 1980s. In the Netherlands, house prices were only slightly less volatile than in Japan and the United Kingdom in the 1970s. An attempt to identify a relationship between the growth rate and volatility was unsuccessful, suggesting that high growth rates are not necessarily associated with high or low volatility.

It might be presumed that the marked variations in house price volatility observed in these countries can, at least partially, be attributed to differences in owner-occupation rates, and in particular that the existence of a sizeable and uncontrolled rented sector might contribute towards greater house price stability. There is certainly scope, most clearly on the supply side, for significant interactions between developments in rental markets and the owner-occupied sector. Changes in the new supply of rented dwellings may have spillover effects on demand for house purchase. Buckley and Ermisch (1982), among others, provide some support for this in their examination of the impact of government policy on house prices in the United Kingdom during the 1970s.[6] On the demand side, the argument is less clear-cut. If there are no

[6] Holmans (1990) suggests that the transfer of dwellings from the rented sector (with vacant possession) to the owner-occupied sector was a major cause of the decline in nominal house prices in the United Kingdom in the early 1950s.

Table 3

Boom and bust in nominal house prices: an international comparison

Rank		Country	Period	Magnitude*
Booms	1	United Kingdom	1972	48.2
	2	Netherlands	1977	39.7
	3	Australia	1988	38.1
	4	Finland	1988	36.3
	5	Japan	1973	34.7
	6	Japan	1972	33.3
	7	United Kingdom	1988	33.0
	8	Germany	1972	32.0
	9	United Kingdom	1979	30.1
	10	Netherlands	1976	28.6
Busts	1	Finland	1992	- 16.9
	2	Finland	1991	- 14.7
	3	Netherlands	1981	- 10.3
	4	Netherlands	1982	- 10.0
	5	Norway	1990	- 9.3
	6	Sweden	1992	-9.2
	7	Japan	1974	-9.0
	8	Japan	1992	-8.7
	9	Netherlands	1980	-8.7
	10	Denmark	1987	-8.2

* Percentage change from previous year.

obstacles to transferring dwellings between the two alternative tenure forms, factors that mainly affect household tenure choices might be expected to have little overall impact on price, while changes in housing demand or price adjustments induced by governments more generally would tend to affect house prices and rents in similar ways.[7] It is possible, given the wide range of owner-occupation rates, to test this proposition but a simple regression of house price volatility on owner-occupation rates failed to detect any statistically significant relationship, suggesting that encouraging the development of a rented sector *per se* is probably not sufficient to bring about greater stability in house prices. Of greater interest, perhaps, is the scale of house price movements in the short term. The evidence from a number of countries is that house prices may move rapidly in the space of only a few years. Table 3 shows the ten largest house price increases, and decreases, in any single year over the period 1970-92.[8] As is

---

[7] The recent increase in house prices in the Netherlands may, in part, be attributed to government induced rent increases (of 5.5% in 1991 and again in 1992) spurring demand for owner-occupied dwellings.

[8] Estimates of the magnitude of residential property price movements based on comparisons of year-on-year movements tend to understate the magnitude of changes. For instance, based on yearly averages, the fall in house prices in Finland between 1989 and 1992 was 32.4%. However, if the quarterly peak to trough is chosen, the decline is 39.5%. Unfortunately, higher frequency data are not available for all countries.

Table 4

Nominal and real house price declines

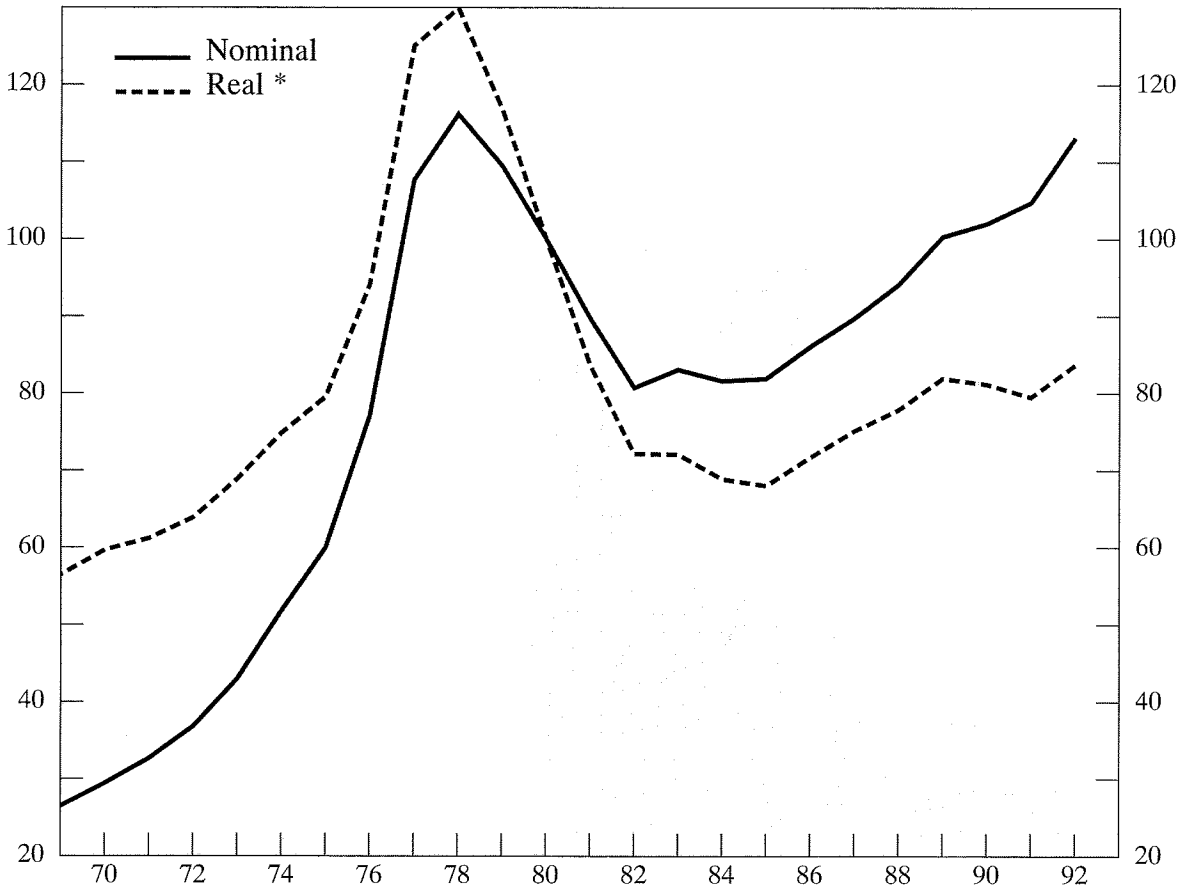
Rank	Nominal house price falls					Real house price falls				
	Country	Amount	Period	Years to trough	Years to recover*	Country	Amount	Period	Years to trough	Years to recover*
1	Finland	- 33.4	1989-92	3	-	Netherlands	- 47.7	1978-85	7	(7)
2	Netherlands	- 30.5	1978-82	4	(10)	Finland	- 40.3	1989-92	3	-
3	Norway	- 22.5	1988-92	4	-	Belgium	- 36.8	1979-85	6	(7)
4	Germany	- 16.9	1983-87	4	3	Japan	- 36.7	1973-77	4	10
5	Japan	- 13.8	1990-92	2	-	Sweden	- 35.1	1979-85	6	(7)
6	Germany	- 12.3	1974-76	2	2	Norway	- 33.6	1987-92	5	-
7	United Kingdom	- 10.7	1989-92	3	-	Denmark	- 33.3	1978-82	4	4
8	Belgium	- 9.4	1980-83	3	5	United Kingdom	- 31.4	1973-77	4	9
9	Sweden	- 9.2	1991-92	1	-	Denmark	- 27.8	1986-92	6	-
10	Japan	- 9.0	1973-74	1	4	Finland	- 27.2	1974-79	5	8
11	Denmark	- 8.2	1986-87	1	(5)	Germany	- 24.5	1973-76	3	16
12	Denmark	- 8.1	1988-90	2	(2)	United Kingdom	- 23.8	1988-92	4	-
13	Denmark	- 7.9	1979-82	3	1	Ireland	- 21.9	1979-87	8	(5)
14	Canada	- 7.2	1981-82	1	3	Germany	- 20.4	1982-87	5	4
15	Norway	- 7.0	1974-75	1	1	Canada	- 17.6	1981-84	3	3
	Average		-	*2.3*	*3.6*	*Average*		-	*4.9*	*7.3*

* Parentheses indicate incomplete recovery.

Graph 3

Nominal and real house prices in the Netherlands

1980 = 100



* Deflated by consumer prices.

Source: See Annex 1.

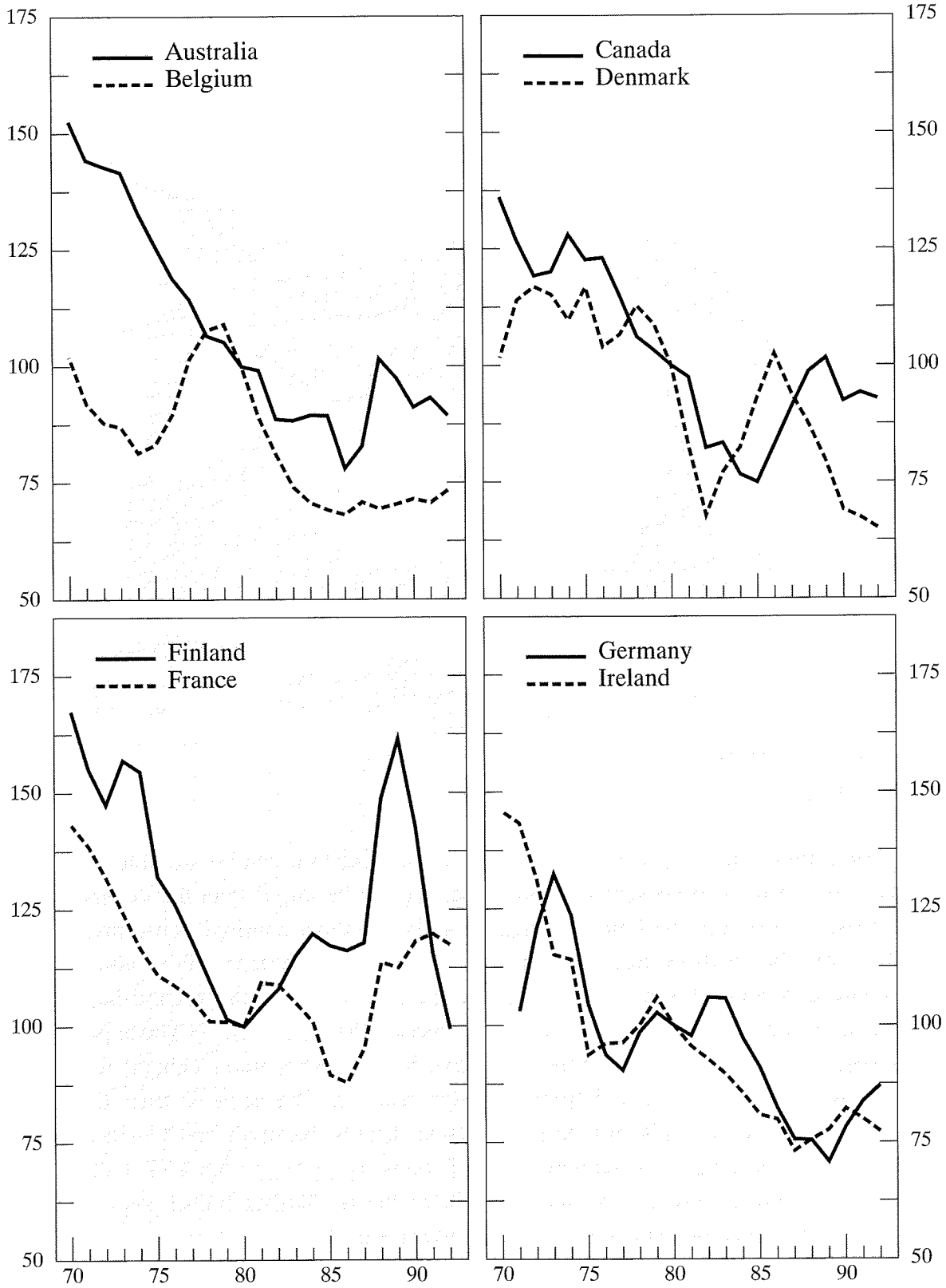
apparent, nominal house price movements in either direction can be sizeable even in a single year and in absolute terms the increases tend to be larger than the declines. The largest rise occurred in the United Kingdom in 1972, when nominal house prices rose by 48%, and the sharpest decline in Finland in 1992, when prices fell by almost 17% (following a decline of almost 15% in the previous year, itself the second-largest fall among the countries analysed). The table also reveals that large rises in house prices are not restricted to only a few countries, but have been a rather more general feature of national housing markets than is perhaps often realised. The same is true of falls in nominal house prices. While this to some extent dispels the myth that recent nominal price movements have been without parallel, there is some evidence that the latent downturn has been more severe, with six out of the ten largest house price declines occurring in the most recent residential property price cycle.

Table 4 examines the peak-to-trough movements, in both nominal and real terms. The real declines in house prices are, as one would expect, larger than the nominal declines, and tend to be more protracted. Again, Finland heads the table with the largest

Graph 4

House price to income ratios *

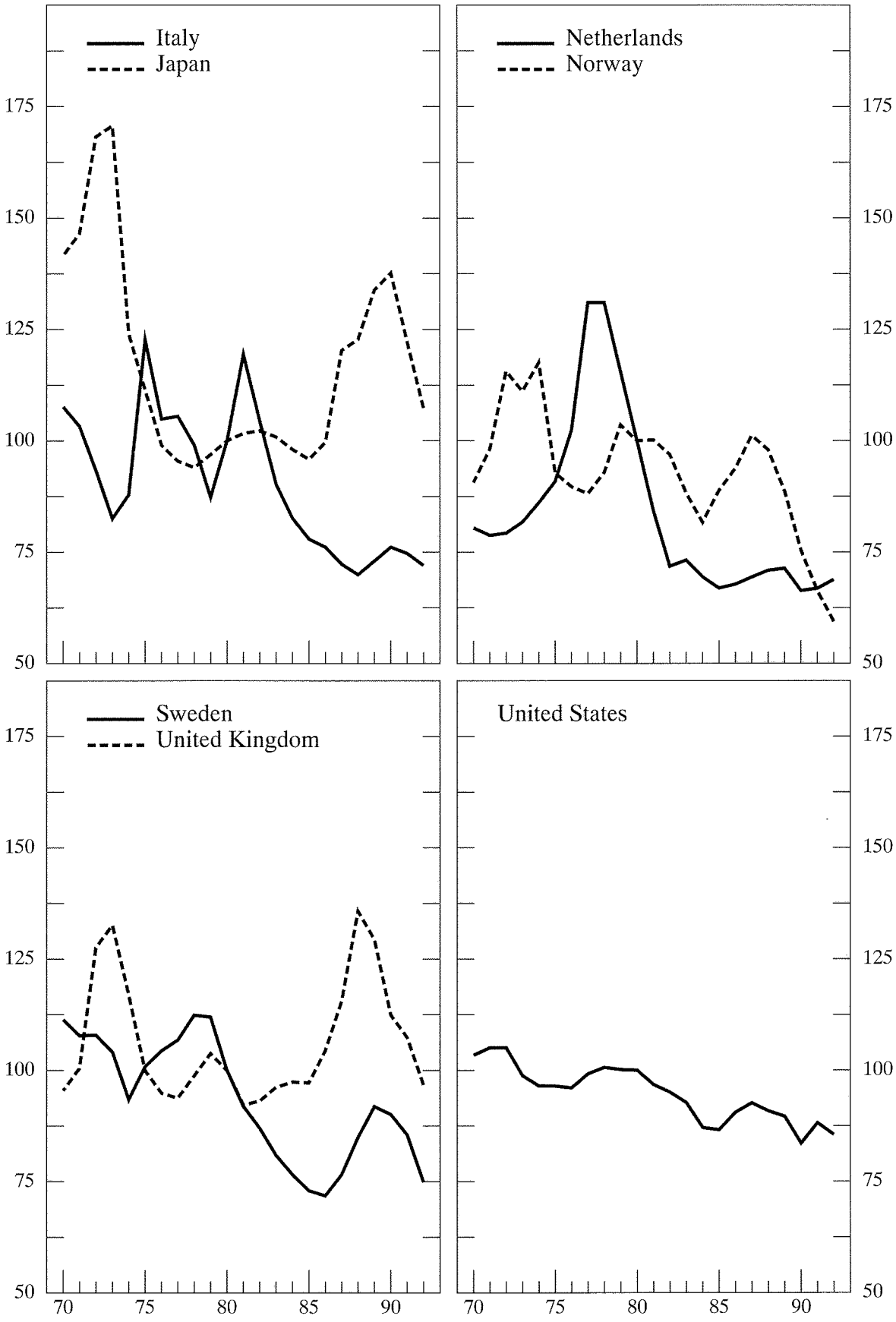
1980 = 100



* House prices scaled by household disposable income.

Sources: See Annex 1 and OECD National Accounts and national data.

Graph 4 (cont.)



Sources: See Annex 1 and OECD National Accounts and national data.

cumulative nominal decline, at 33% over the period 1989-92. In real terms, however, this is exceeded by the decline in the Netherlands between 1978 and 1985, when house prices fell by almost 48%. Altogether, there are seven instances of nominal price falls in excess of 10%. By comparison, the seven largest declines in real terms all exceeded 30%, and on average real house price declines last around twice as long as the fall in nominal prices, with the longest declines over the period occurring in Ireland and the Netherlands.

The evidence from past episodes of house price declines is that the recovery has generally taken longer than the initial fall. Indeed, in three cases the nominal house price falls had still to be fully reversed by the end of the period under consideration. Perhaps the most striking example is the Netherlands, where house prices peaked in 1978 (Graph 3) and in nominal terms reached a trough four years later, but continued to fall in real terms for a further three years. However, the recovery has taken even longer as nominal house prices passed their previous peak only at the end of 1992. In real terms, even at the end of the period house prices remained around 35% lower than in 1978. If the relative scale of recent house price declines is considered, Table 4 further supports the proposition that the proportion of real declines accounted for by nominal falls has been larger in the recent house price cycle and that most of the countries studied have experienced significant declines in either nominal or real terms.

When house prices are scaled by household sector income the large upward and downward movements are still observable. The ratio of house prices to household disposable income is shown in Graph 4, using an index, scaled to 1980 = 100. Particularly large cycles in the ratio of house prices to income are discernible in Belgium, Denmark, Finland, Japan, the Netherlands and the United Kingdom during the period 1970-92, although the remaining countries are by no means exempt from broad movements in this ratio. One notable and perhaps surprising feature of these graphs is that, with the exception of the United Kingdom, housing appears to have become more affordable over the period under consideration.

II.4 Fundamentals versus speculative bubbles

It is tempting to view the sharp movements in nominal and real house prices described above as periods of speculative activity. Large increases in house prices over several years, which are subsequently fully or largely reversed, at first glance appear to fit the common notion of a speculative bubble.[9] Certainly, some of the instances above have been popularly characterised in this manner. Moreover, several studies, including Poterba (1992), have stressed the importance of expectations formation for an

[9] According to Kindleberger (1992), a bubble may be described "loosely as a sharp rise in price of an asset or a range of assets in a continuous process with the initial rise generating expectations of further rises and attracting new buyers - generally speculators interested in profits from trading in the asset rather than its use or earning capacity. The rise is usually followed by a reversal of expectations and a sharp decline in price often resulting in financial crisis" (p 243).

understanding of house price developments.[10] By contrast, Garber (1990) has cast doubt on whether some early examples of bubbles were really due to speculative activity at all. At the heart of this question is the possibility that some neglected underlying fundamentals may have changed which would justify a shift in the price level, or that investor perceptions of fundamentals (which could later be falsified) may have changed. Indeed, while it is frequently asserted that speculation has occurred in certain countries, particularly during the latter stages of the housing cycle, it is not difficult to find reasons why house prices should have moved at least in the initial stages of the cycle.

In fact, there appear to have been a number of features common to the various house price booms. Among these, a relaxation of monetary conditions has been cited as an important factor in several studies. In Japan, following the economic growth recession associated with the 1985 Plaza Agreement, the official discount rate was reduced by 2.5 percentage points between January 1986 and February 1987. In other countries, including the United Kingdom and Finland, monetary policy was eased following the stock market crash in 1987. In addition, tax factors have generally encouraged household investment in dwellings due to tax deductibility of interest payments. Only Australia, Canada and Germany have provided little or no incentive to house purchase as a result of the fiscal treatment of housing loans. In Japan, a further tax factor has been that land was valued at around half the market value for the purposes of assessing inheritance tax liability. Moreover, the exemption from capital gains tax of exchanges of real estate of equivalent value during 1984-88 has been cited as having possibly stimulated house prices. Many of the countries which experienced house price booms also underwent a process of financial liberalisation, including Finland, the United Kingdom and the Netherlands (in the mid to late 1970s). In the Netherlands, for example, in 1975 it became possible for households to obtain mortgage loan guarantees from municipal governments for the purchase of existing dwellings (for new dwellings this was already available). In addition, banks had developed new mortgage structures with low initial payments and adopted a more flexible attitude with regard to downpayment requirements.

A simple approach to modelling the booms and busts in house prices is to analyse movements in the ratio of house prices to income. Such an approach has been followed in several studies, including Muellbauer and Murphy (1991), Muellbauer (1992) and Koskela et al. (1992). Consideration of housing as both a consumption and an investment good suggests that, in addition to household income, the user cost of housing (which might be viewed as the real return on housing with the sign reversed) might be a significant determinant of house prices. The user cost is constructed as the mortgage interest rate after adjusting for taxation and the rate of consumer price

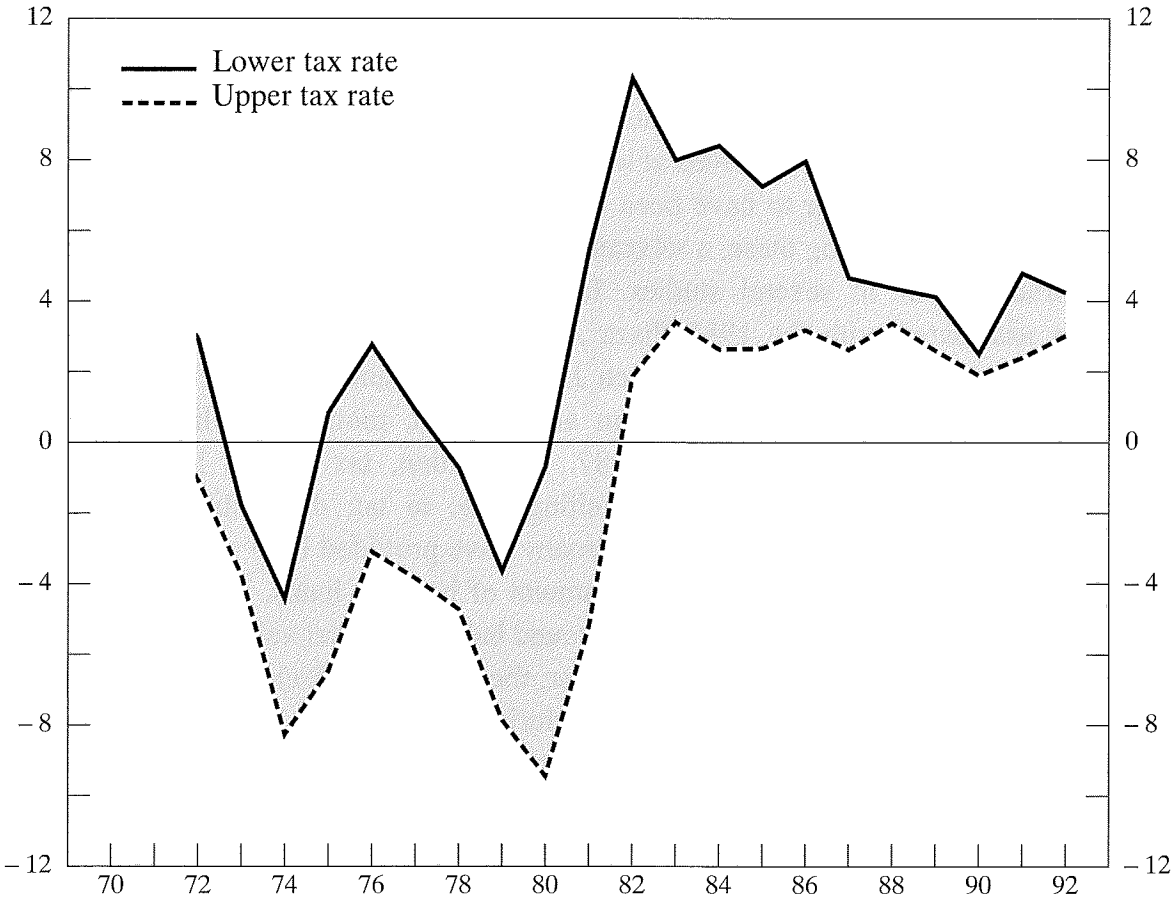
---

[10] Poterba (1992) examines three potential explanations for US house price movements over the last three decades; changes in construction costs, user cost and demography. He concludes that none of these appears to provide a satisfactory explanation and points to misperceptions of future house price changes as a reason why house prices did not fall further in the 1980s.

Graph 5

User cost of housing in the United States

In percentages



inflation less the (lagged) capital gain or loss on owner-occupation arising from house price movements.[11]

Tax deductibility of mortgage interest payments has effectively lowered the user cost of housing. Throughout the period 1970-92 the most generous in this regard were the Nordic countries, the United Kingdom and the United States. More recently, there has been a fairly widespread tendency for the tax benefit to be eroded, both through lower marginal tax rates and through the proportion of the loan or the interest payments that is eligible for tax relief. Graph 5 shows, as an example, the user cost in the United States on the assumption that income tax is paid either at the lowest or highest marginal rate of income tax. The user cost of housing has fallen significantly for low income tax payers as mortgage interest rates have fallen during the 1980s, but has remained broadly

[11] The user cost of housing as defined in the text abstracts from several relevant components of the user cost, including the depreciation rate of housing structures, costs of normal repairs and maintenance, regular property tax and the risk premium. It may be argued that, while these components of the user cost are likely to vary across countries, they probably change only gradually in individual countries (the exception being property taxes). A further explanation of the user cost, as typically estimated, is given in Annex II.

Table 5

Joint estimation results of simple regression

Dependent variable [PH/Y]	Lagged dependent variable $[PH/Y]_{-1}$	User cost of housing UC
-	0.77 (26.8)	-0.003 (7.01)

A country-specific constant was included in the regression.

t-statistics in parentheses.

Individual country R^2 and SE (%) were as follows:

Australia: 0.865; 7.15. Belgium: 0.911; 6.13. Canada: 0.864; 6.25. Denmark: 0.773; 9.46. Finland: 0.753; 7.95. France: 0.727; 5.63. Germany: 0.858; 6.57. Ireland: 0.897; 5.28. Italy: 0.570; 11.85. Japan: 0.693; 10.72. Netherlands: 0.878; 7.95. Norway: 0.713; 9.37. Sweden: 0.850; 5.84. United Kingdom: 0.524; 9.04. United States: 0.716; 3.50.

constant for those facing the upper marginal income tax rate, as the top marginal rate of income tax has been progressively reduced from 70% in 1980 to just 28% in 1992. In several other countries, including the United Kingdom and Sweden, tax deductibility has been restricted to lower marginal rates of income tax, while in Finland and Denmark this has been combined with restrictions on the proportion of the loan or mortgage payments eligible for relief. The net result is that in many countries the tax changes have tended to increase the user cost, and the timing of this may have significantly affected house prices. For instance, in the United Kingdom the abolition of multiple mortgage interest tax relief was announced several months in advance of August 1988, the date from which the new rules were to be effective. There was a rush of applications from home buyers to beat the deadline, and a sharp downturn afterwards in the number of applicants. In retrospect this period may be regarded as a watershed for the UK housing market.[12] Similarly, the 1986 tax reform in Denmark may have contributed to the slump in the housing market in the second half of the 1980s.

As a first step towards accounting for the shifts in the price to income ratios described above, Table 5 reports the results of a simple regression in which the house price to income ratio is regressed on the lagged dependent variable and the user cost variable described above. First, the coefficients on the lagged dependent variable and the user cost variable were constrained to be the same for all countries (only the constant was allowed to vary) and both right-hand side variables were found to be highly significant and the user cost term correctly signed. Secondly, the same equation was estimated for each country separately, in view of the fact that the standard errors

[12] During the same period the earlier easing of monetary policy was reversed, and base rates doubled from 7½% in May to 15% by October of the following year, significantly raising mortgage costs to households.

Table 6

The significance for house prices of the user cost of housing[1]

Country	Constant	depv_1	UC[2]	$\bar{R}^2$	SE (%)	DW
Australia	- 1.42 (1.4)	0.88 (10.2) ***	0.6 (0.1)	0.88	6.54	1.99
Belgium	- 2.20 (2.7)	0.86 (15.6) ***	- 0.6 (3.4) ***	0.92	5.42	1.63
Canada	- 2.67 (2.2)	0.79 (8.2) ***	- 0.3 (1.8) *	0.85	6.23	2.41
Germany	- 3.33 (2.7)	0.76 (8.6) ***	- 0.6 (3.3) ***	0.86	6.20	1.94
Denmark	- 2.63 (1.5)	0.79 (5.7) ***	- 0.4 (1.8) *	0.75	9.34	2.16
Finland	- 3.73 (2.7)	0.69 (6.0) ***	- 0.4 (3.5) ***	0.76	7.62	1.48
France	- 3.20 (2.9)	0.68 (6.0) ***	- 0.3 (1.9) **	0.72	5.41	1.99
Ireland	- 2.69 (3.3)	0.73 (8.6) ***	- 0.4 (1.7) *	0.89	5.24	2.72
Italy	- 5.99 (1.7)	0.71 (4.1) ***	- 0.2 (0.8)	0.53	11.74	2.07
Japan	- 4.93 (1.7)	0.74 (4.7) ***	- 0.1 (0.7)	0.69	10.27	1.45
Netherlands	- 2.39 (2.6)	0.81 (10.8) ***	- 0.6 (4.3) ***	0.90	6.88	1.88
Norway	- 1.97 (1.6)	0.64 (2.9) ***	- 0.6 (2.3) **	0.70	9.08	2.50
Sweden	- 2.85 (2.2)	0.79 (7.9) ***	- 0.5 (2.3) **	0.84	5.73	1.89
United Kingdom	- 6.15 (3.0)	0.50 (3.0) ***	- 0.3 (2.3) **	0.55	8.21	1.34
United States	- 2.95 (1.5)	0.80 (5.9) ***	- 0.1 (0.7)	0.73	3.26	2.15

t-statistics in parentheses.

Asterisks denote level of statistical significance: * 10%, ** 5%, *** 1%.

[1] Equation estimated with the ratio of house prices to household income as the dependent variable (depv).
[2] The user cost (UC) is calculated as the interest cost after adjusting for the tax treatment of mortgage interest and inflation less the lagged change in the real house price.

varied significantly in the constrained estimates. As can be seen (Table 6), the lagged dependent variable remains highly significant in each case, and the $\bar{R}^2$ of the equations always exceeds 0.5. The user cost is statistically significant in all but four of the countries, the exceptions being Australia, Italy, Japan and the United States, with the results for Canada, Denmark and Ireland only significant at the 10% level.

While these results suggest that it is correct to treat housing both as a consumption and as an investment good, a further examination of the booms and busts in housing can only be carried out in the context of a properly specified house price equation. If it is accepted that the supply of housing services is a constant proportion of the stock of dwellings and that this is comparatively fixed in the short term, movements in house prices are likely to be dominated by the influence of demand-side variables. The demand for owner-occupied housing itself may be regarded as dependent on real incomes, the user cost of housing, changes in the demographic structure of the population[13] and financial liberalisation.[14] Following previous studies, a general house price equation was specified as:

$$\left[\frac{PH}{Y}\right] = a + b\left[\frac{PH}{Y}\right]_{-1} + cY + dUR + eUC + fT + g\,DEMOG + h\,DEBT_{-1}$$

The level of real household disposable income (Y) is included as a separate term, allowing for the possibility that the coefficient on income should not be constrained. The unemployment rate (UR) captures distributional factors, but may also be considered a proxy for income uncertainty, and is likely to have a negative impact on house prices. The user cost of housing (UC) enters negatively, as in the simple regressions previously described. In those cases where the term was not significant, other measures of the cost of owner-occupation were tested, in particular the real or nominal mortgage rate (MR). In the absence of comprehensive data on the stock of dwellings, a time trend (T) was

---

[13] It might seem surprising that demographic changes should be included in the list of possible explanatory variables. The demographic structure of the population tends to move rather slowly over time, and is predictable. Thus supply should be able to respond to this. Nevertheless, several studies, including Mankiw and Weil (1989) and Muellbauer (1992), have found a role for demography in the United States, the United Kingdom and Germany, and Mankiw and Weil find the 20-34 age cohort to be an important determinant of US house prices. In fact, a recent study by Fisher (1993) suggested that, at least for the United Kingdom, the effects of demography and financial liberalisation might be difficult to disentangle, since demographic booms have occurred at the same time as deregulation in both the early 1970s and the mid-1980s. Fisher interprets this as deregulation facilitating the expansion of housing demand that would otherwise have been rationed. The choice of demographic variable in these studies is open to criticism. As Dicks (1990) notes, the real measure that one wants to capture is the net formation of households. While changes in certain age groups comprise one aspect of this there are other elements that should also be taken into consideration, notably marital separation and divorce rates. Altogether, Dicks found that, in the United Kingdom, the combined effect of these factors has been to cause household growth to outstrip population growth since the Second World War.

[14] In the wake of an unprecedented rise in mortgage arrears and repossessions in the United Kingdom, Breedon and Joyce (1993) suggested that nominal house price declines might have had a reinforcing downward impact on house prices via increasing repossessions, which reduces the effective demand for housing while leaving the stock unchanged.

used as a proxy, with a negative sign expected.[15] The ratio of 15 to 64-year-olds as a proportion of the total population was included as a measure of demographic change (DEMOG).[16] Unfortunately, data availability in this case restricted the sample to 1990. An alternative measure of demographic change, the total population (POP), was also tried. Finally, the change in and the level of the lagged ratio of household debt to income (DEBT) was used as a proxy for financial liberalisation, with the expected coefficient signs being positive.

The results are reported in Table 7. The equations appear to fit reasonably well and to be a modest improvement over the earlier results. With the exception of the United Kingdom, the lagged dependent variable remains statistically very significant while the separate income term is not found to be important, although it is retained for five countries. In most cases the sign is negative, but in Sweden it is positive, implying that the long-run income elasticity of house prices is greater than unity. The unemployment rate is significant and correctly signed in Australia, Canada, Italy and Sweden. As in Table 6 above, the user cost is statistically significant in most countries and now appears to be statistically significant also in the United States. In the remaining countries the nominal mortgage rate alone was significant, while the presence of an inflation term was tested, but not accepted by the data.[17] In Italy, no significant interest rate term was found. The time trend appears to be weakly significant in several countries, but enters with a positive coefficient in Australia. To some extent, the interpretation of this term should be treated with caution. It may also pick up trends in the quality of dwellings, not adjusted for in the house price data, and in the accuracy of real household disposable income as a measure of households' ability to buy (where, for example, there have been trend changes in headship rates, perhaps due to increased divorce rates or more elderly people living alone). As mentioned above, the impact of financial liberalisation and changes in demography can be difficult to identify separately, but in the United Kingdom the debt term was correctly signed and statistically significant. The variable also appeared in the equations for Japan and Norway. In France and the United States the presence of the demographic term was accepted by the data.

The equations appear to capture much of the movement in the ratio of house prices to incomes over the period under consideration, although the inclusion of the lagged ratio of house prices to income clearly accounts for a large part of the

---

[15] Actual dwelling stock estimates for the whole period were available for few countries. More prevalent are occasional census figures and these together with housebuilding starts and completions can be used to estimate the dwelling stock (assuming a depreciation rate). However, in practice such estimates appear little different to using a time trend.

[16] The data are readily available from the OECD Labour Force Survey. An alternative approach would be to collect national data and test the significance of different age cohorts in each country.

[17] The rejection of the real mortgage rate in favour of the nominal interest rate suggests that the phenomenon of "tilting" is important, that is, as inflation rises, nominal and real interest payments also rise, causing problems for borrowers whose nominal income may be constrained. This is discussed in Kearl (1978, 1979).

Table 7

Estimated house price equations*

Determinants	AU	BE	CA	DE	DK	FI	FR	IR	IT	JP	NL	NO	SE	UK	US
log $(PH/Y)_{-1}$	0.41	0.86	0.56	0.57	0.57	0.69	0.92	0.50	0.48	0.79	0.81	0.44	0.79	-	0.45
	(2.6)	(15.64)	(6.9)	(3.6)	(3.1)	(6.0)	(24.1)	(3.0)	(2.8)	(5.7)	(10.8)	(2.5)	(10.7)		(2.2)
log Y	-	-	-	-	-	-	- 0.204	- 0.246	-	- 1.313	-	-	0.267	-	- 0.262
							(3.0)	(1.5)		(2.5)			(1.7)		(2.9)
UR	- 0.04	-	- 0.031	-	-	-	-	-	- 0.033	-	-	-	- 0.052	-	-
	(3.6)		(4.2)						(2.6)				(4.7)		
UC	-	-0.6	-	-0.6	-0.4	-0.4	-0.8	-0.4	-	-	-0.6	-	-	-0.5	-0.3
		(3.4)		(3.5)	(1.7)	(3.5)	(17.0)	(2.0)			(4.3)			(4.6)	(2.1)
MR	-0.025	-	-0.012	-	-	-	-	-	-	-0.116	-	-	-0.013	-	-
	(3.2)		(2.9)							(2.5)			(3.7)		
T	0.008	-	-	-0.007	-0.009	-	-	-	-	-	-	-0.015	-	-0.018	-
	(1.8)	-		(1.4)	(1.7)							(4.0)		(3.8)	
$DEBT_{-1}$	-	-	-	-	-	-	-	-	-	0.61	-	-	-	0.55	-
										(1.8)				(5.7)	
d $DEBT_{-1}$	-	-	-	-	-	-	-	-	-	-	-	0.84	-	-	-
												(3.7)			
log DEMOG	-	-	-	-	-	-	1.95	-	-	-	-	-	-	-	1.216
		-					(5.7)								(2.1)
$\bar{R}^2$	0.94	0.92	0.94	0.87	0.78	0.76	0.99	0.90	0.66	0.79	0.90	0.82	0.92	0.78	0.82
SE (%)	5.04	5.42	4.20	6.01	8.88	7.62	1.41	5.05	10.02	8.69	6.88	7.08	4.10	5.80	2.57
DW	1.78	1.63	1.93	1.80	2.06	1.48	1.96	2.38	1.71	2.13	1.88	2.13	1.86	1.97	1.65

t-statistics in parentheses.

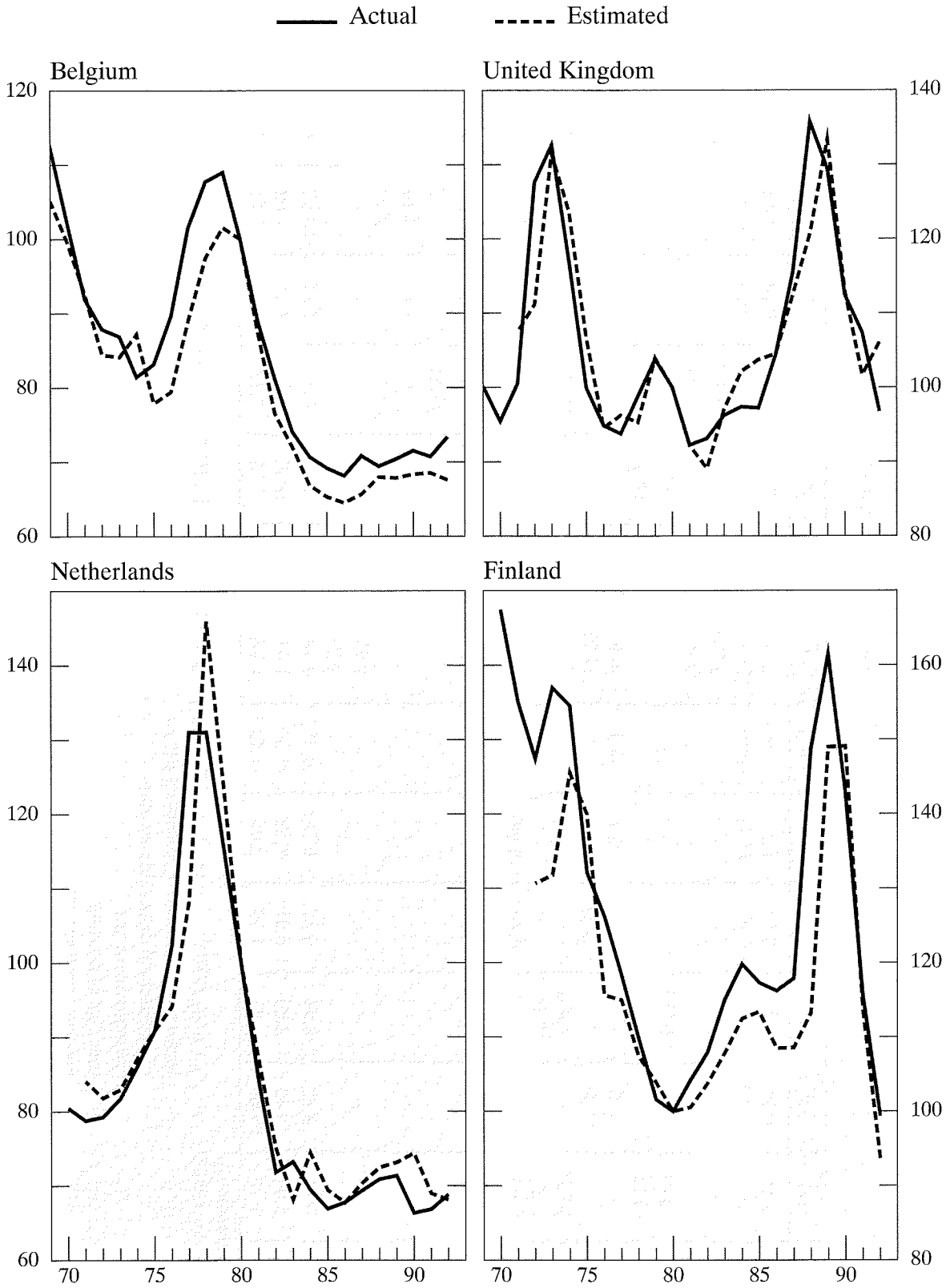
* Estimated as: log (PH/Y) = a + b log $(PH/Y)_{-1}$ + c log Y + e UR + f UC + g T + h $DEBT_{-1}$ + j d $DEBT_{-1}$ + k log DEMOG + m POP

with PH = house prices deflated by consumer prices
Y = real household disposable income
UR = unemployment rate
UC = user cost of housing
MR = nominal mortgage rate
T = time trend
DEBT = gross household debt as a percentage of household income
DEMOG = ratio of 16 to 64-year-olds to total population.

Graph 6

Actual and estimated house price to income ratios *

1980 = 100



* Equation estimates derived from equations reported in Table 7.

Source: See Annex 1.

Table 8

Predictability of excess returns
Dependent variable: XR[1]

Country	Constant		XR_{-1}		$\bar{R}^2$	SE (%)	DW	ARCH
Australia	-0.72	(0.25)	0.13	(0.58)	-0.03	13.35	1.91	0.04
Belgium [2]	-0.38	(0.38)	0.83	(6.55)***	0.66	4.00	0.94	5.69**
Canada	-0.93	(0.43)	0.34	(1.60)	0.07	9.78	2.00	0.01
Denmark	-4.46	(1.72)	0.31	(1.43)	0.05	10.32	1.96	0.20
Finland	-2.48	(0.46)	0.67	(3.24)***	0.32	24.65	1.17	0.11
France	-3.82	(2.44)	0.46	(2.26)**	0.17	3.27	2.01	0.36
Germany	-1.88	(1.04)	0.39	(1.74)	0.10	7.28	1.69	0.00
Ireland	-1.80	(1.18)	0.23	(1.01)	0.00	6.66	2.04	0.01
Italy [2]	-1.78	(0.73)	0.36	(1.68)	0.08	10.91	1.76	4.51**
Japan	0.06	(0.02)	0.41	(1.74)*	0.09	12.52	1.73	0.21
Netherlands [2]	-1.10	(0.62)	0.64	(3.80)***	0.38	7.91	1.43	6.75**
Norway	-1.15	(0.52)	0.76	(4.06)***	0.49	8.95	1.13	0.00
Sweden	-1.75	(0.86)	0.70	(2.81)**	0.26	9.20	0.93	0.13
United Kingdom	-0.94	(0.31)	0.54	(2.62)**	0.21	14.60	1.63	1.85
United States	-0.44	(0.51)	0.34	(1.61)	0.07	3.98	1.93	0.42

t-statistics in parentheses.

Asterisks indicate 10%(*), 5%(**) and 1%(***) levels of statistical significance.

[1] The excess return (XR) is constructed as the nominal one-period (annual) capital gain in house prices less the short-term interest rate. [2] For Belgium, Italy and the Netherlands, the reported ARCH test implies the presence of significant heteroscedasticity in the disturbances, invalidating the reported standard errors and t-statistics. These equations were therefore re-estimated by a method that yields corrected standard errors and t-statistics. For Belgium, the lagged excess return remains statistically significant at the 1% level, while in the Netherlands the excess return is still significant at the 5% level.

explanation in most countries. The fitted values of the equations for four of the countries which have experienced particularly large changes in the ratio during the sample period are shown in Graph 6. That these equations, which are relatively straightforward, are able to capture much of the movement in house prices over the period tends to undermine the notion that the house price changes have been driven by bubbles. However, the incorporation of a relative rate of return on housing variable does suggest that expectations of house price movements are important.

It is clear that if speculative bubbles are to exist, there must be non-fundamentalist traders in the market. A number of studies, including Case (1986), Case and Shiller (1988, 1989) and Cutler, Poterba and Summers (1990), provide some persuasive evidence for the likelihood of this in the housing market.[18] First, accurate

[18] For instance, Case and Shiller (1988) conducted a survey in May 1988 of four local housing markets in the United States which were at various stages of boom/bust: Anaheim (Orange County), San Francisco, Boston, and Milwaukee. They found that house buyers in that month (investors) had little knowledge of fundamentals, rather "hearsay, clichés and casual observations" appeared to underpin their perceptions of price movements. Moreover, expectations of future price rises were deemed a very important consideration. In particular, potential buyers were concerned that they would not in the future be able to

price information is difficult to ascertain for the typical buyer or seller. Housing is a heterogeneous good, and fundamental yields may be difficult to assess. Second, property transactions are frequently intermediated by "experts", real estate brokers, who may play a significant role in assessing property values as well as receiving emoluments based on them. This, it is argued, could enhance property price fluctuations.

While not conclusive proof of the existence of bubbles (since the analysis ignores risk premia and transactions costs), a simple test, such as that shown in Table 8, generally rejects market efficiency for housing markets in the countries studied. In Table 8, the lagged excess return on housing, calculated as the nominal capital gain on housing over a year less the short-term interest rate, is found to be a statistically significant determinant of the current excess return. If house prices rise over a prolonged period of time, the resulting positive serial autocorrelation would suggest that there were predictable profit opportunities to be derived from investing in housing, while if the market is efficient, the current excess return ought to reflect all currently available information and not be predictable using lagged data, including the excess return itself. A statistically significant and positively signed coefficient on the lagged excess return was found for over half of the countries in the sample, with particularly strong results for Belgium, Finland, the Netherlands and Norway.[19]

An alternative approach to identifying periods of speculative activity is to compare the development of housing market rents and house prices over a longer time horizon. The true capital value of an asset (the property price) may be considered as the present discounted value of the anticipated future stream of income (rent) derived from the asset. Deviations of the two may occur for several reasons, for instance if expectations regarding future rents change, or changes in real interest rates. Nevertheless, they may also be indicative of periods when house prices, due to speculative activity, are temporarily driven away from values consistent with the underlying earnings potential. Further difficulties are likely to be encountered using this approach if the rental market is a small fraction of the total housing market or is subject to severe regulation. In either case, the rent data may not accurately reflect the value to homeowners of owner-occupation. Graph 7 shows rents and house prices for the period 1970-92 for the Netherlands (both indices are rebased for 1970 = 100), where the rental market constitutes over 50% of the total (Table 1). In this case, the rapid rise in house prices, followed by a sharp decline in the mid-1970s, was not matched by any distinct

---

afford to buy. Some further evidence is cited in a Bank of Japan (1990) study. According to a 1988 "Survey of Land Price Issues" conducted by the Coordination Agency of the Prime Minister's office, there was a strong desire among respondents to own houses (around 70%). More than half the respondents voicing such a preference stated that their most important reason for doing so was the profitability of holding real estate. Moreover, about two-thirds of all respondents believed that investment in land was more profitable than either stocks or deposits.

[19] Poterba (1992) showed that there was a significant coefficient on the lagged excess return in the case of panel data consisting of thirty-nine cities in the United States over the period 1980-90, while Ito and Hirono (1993) also rejected the weak-form efficiency of excess returns on housing for the case of Tokyo over the period 1980-92.

Graph 7

Nominal house prices and rents in the Netherlands

1970 = 100

Source: See Annex 1.

movements in rents which, with the benefit of hindsight, provides some further evidence for the presence of speculative activity during this period.

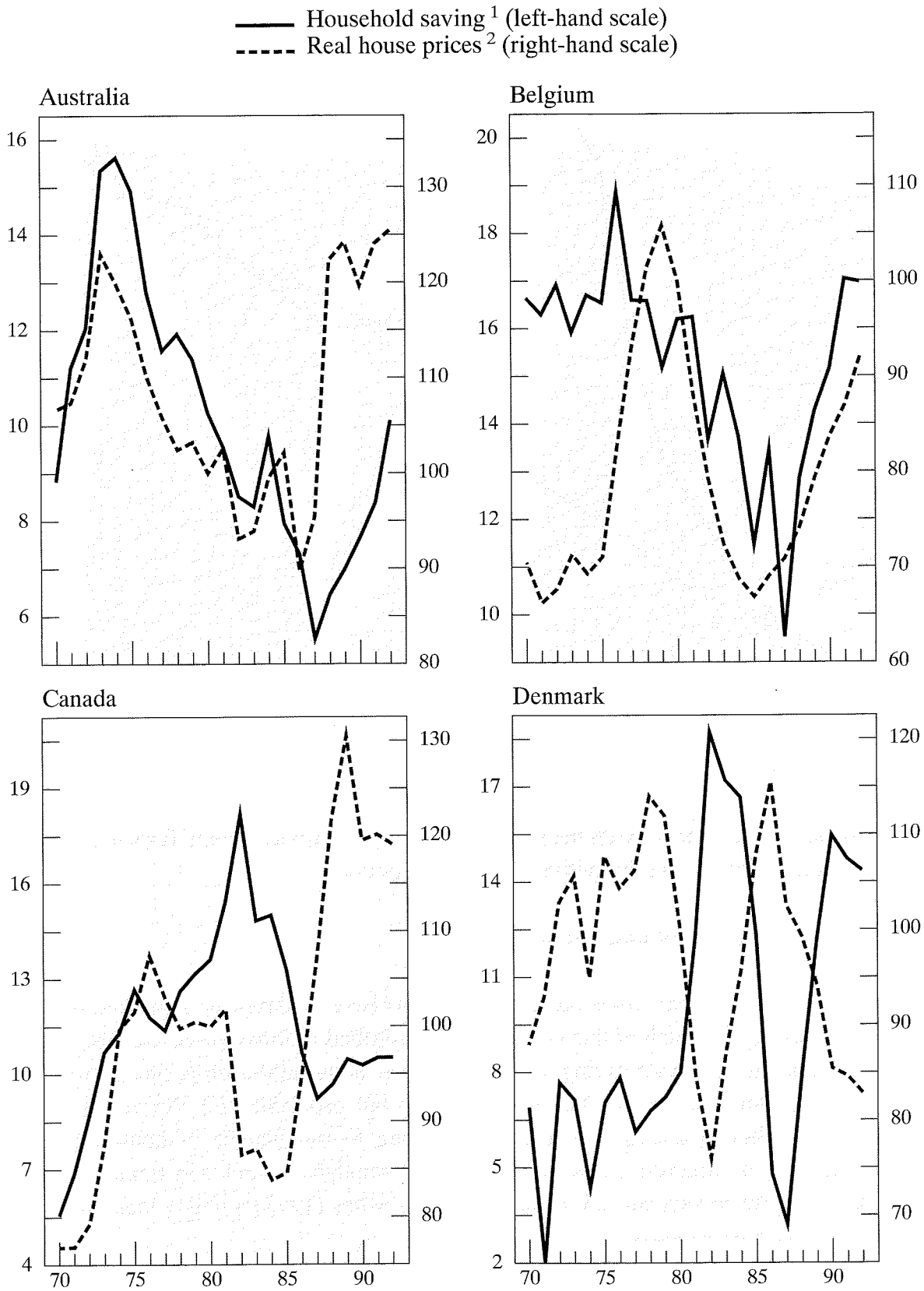
III. House prices and household saving

Over the last twenty years most industrial countries have experienced a marked decline in national saving.[20] Much of this decline can be ascribed to lower public sector saving, but in several cases private saving, and in particular household saving, has also fallen. There are several reasons for this development, but especially for the 1980s many analysts have linked changes in household saving to movements in household real assets and the progressive removal of financial regulations and constraints. In this context, there are several special features (see also Miles (1992a)) which make housing

[20] The concepts of income and saving employed throughout this paper correspond to standard national income accounting definitions rather than to a broader measure, such as that proposed by Hicks (1939), which would include either *ex ante* or *ex post* estimates of capital gains and losses made on household sector holdings of real and financial assets.

Graph 8

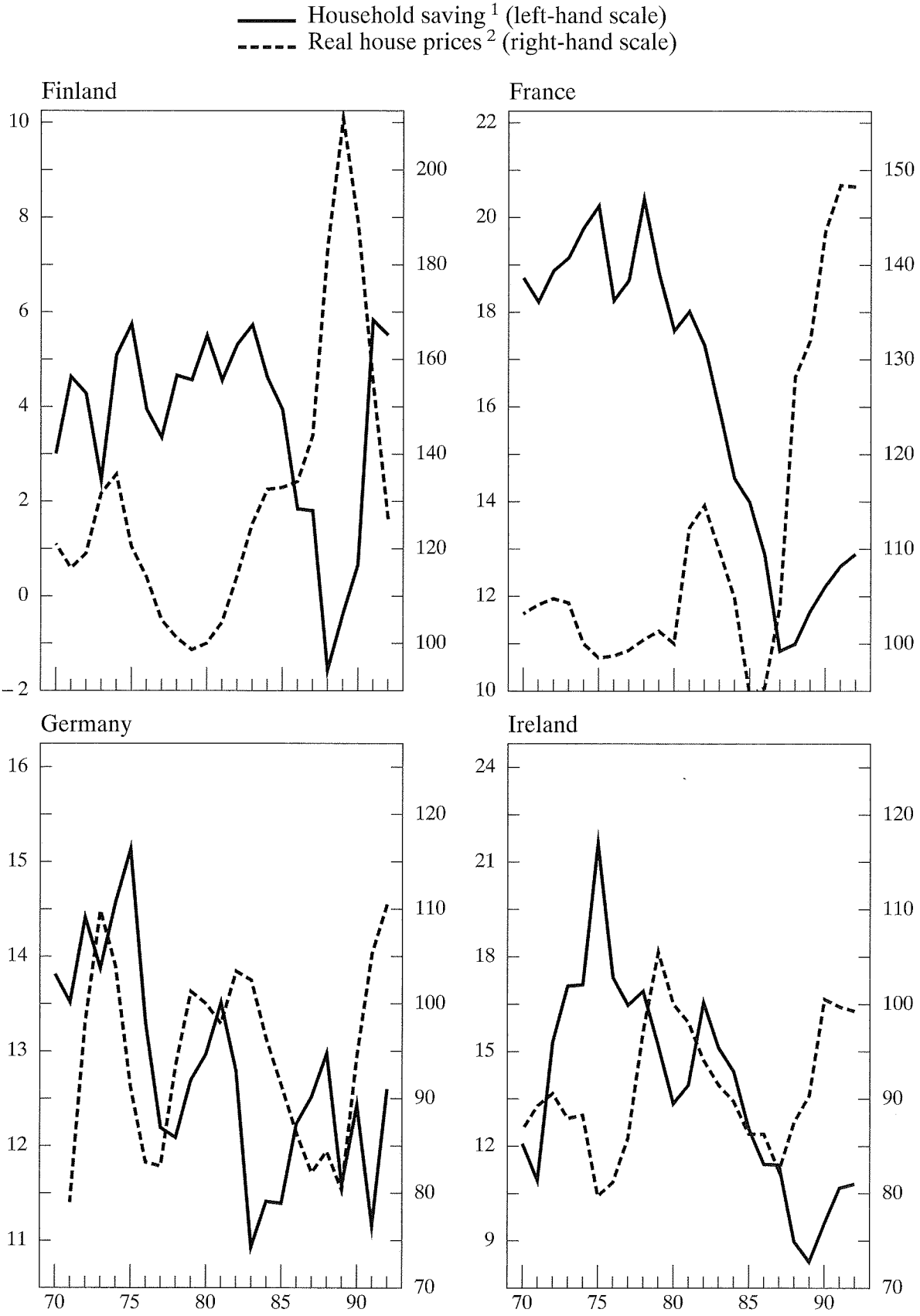
Household saving and real house prices



[1] As a percentage of disposable income. [2] House prices deflated by consumer prices, 1980 = 100.

Sources: OECD National Accounts and national data.

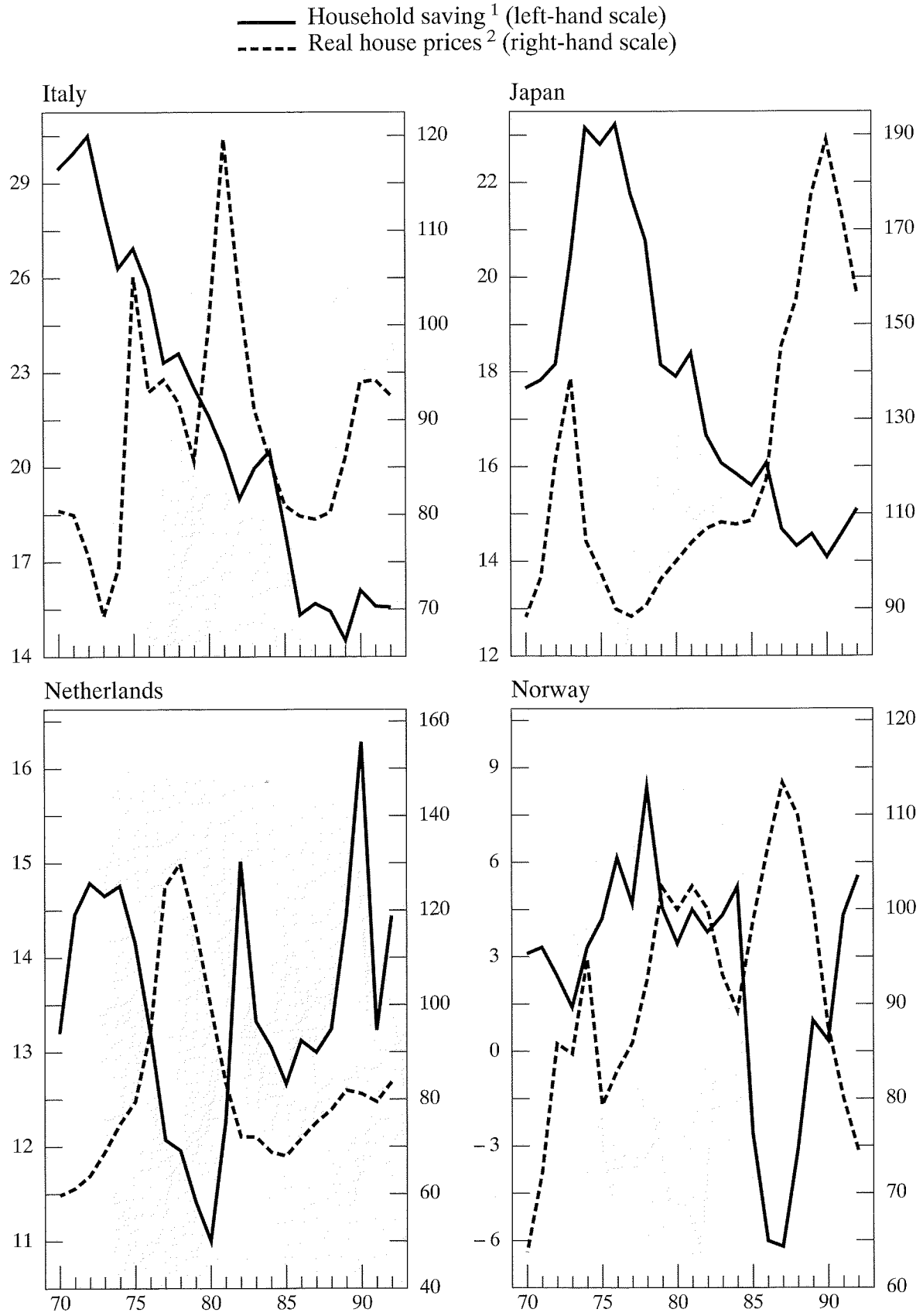
Graph 8 (cont.)



[1] As a percentage of disposable income. [2] House prices deflated by consumer prices, 1980 = 100.

Sources: OECD National Accounts and national data.

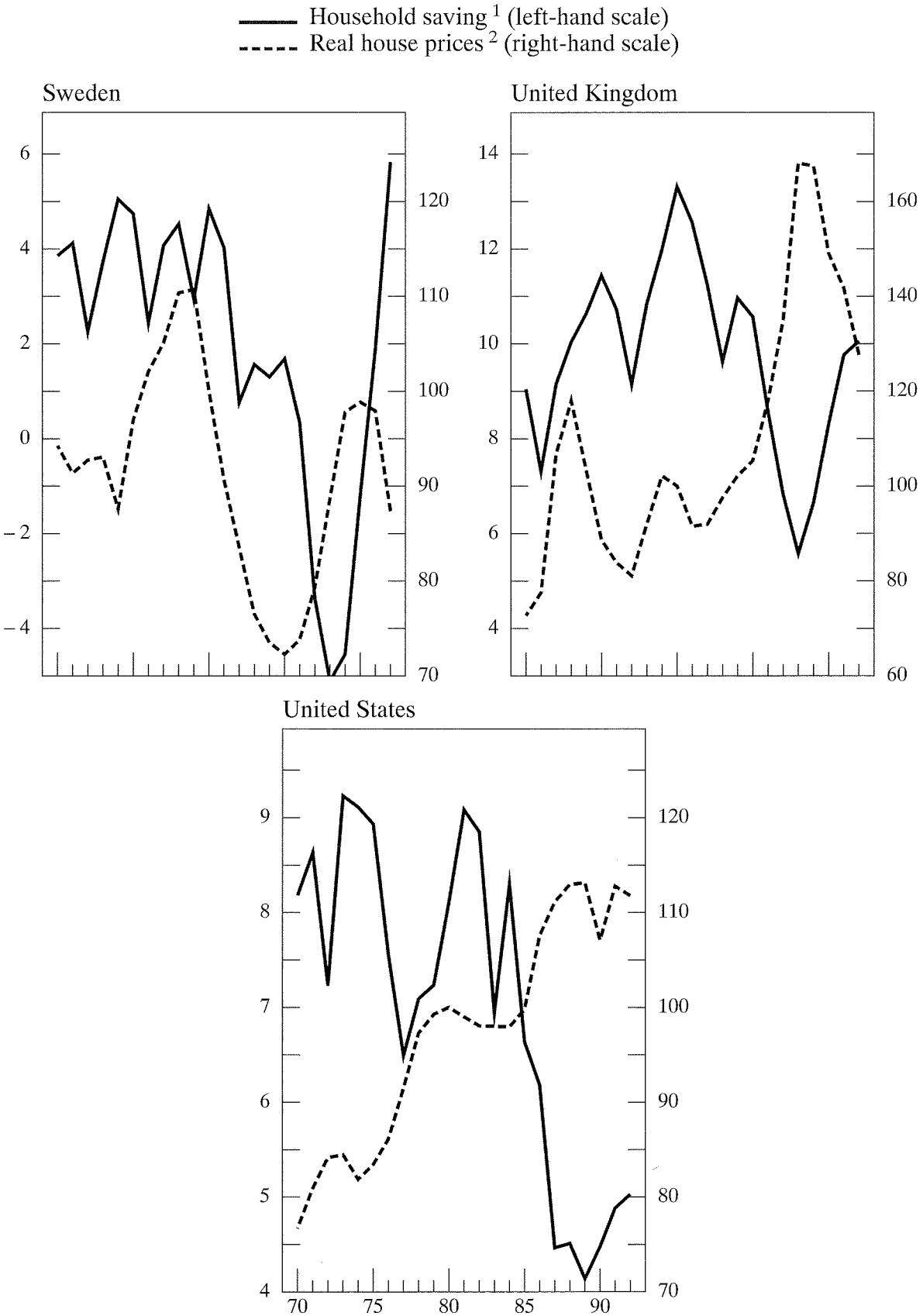
Graph 8 (cont.)



[1] As a percentage of disposable income. [2] House prices deflated by consumer prices, 1980 = 100.

Sources: OECD National Accounts and national data.

Graph 8 (cont.)



[1] As a percentage of disposable income. [2] House prices deflated by consumer prices, 1980 = 100.

Sources: OECD National Accounts and national data.

wealth particularly relevant to analysing developments in saving (see Graph 8). In the first place, the proportion of total household wealth held as housing equity is much larger than the proportion held in financial assets such as equities and bonds (see Table 1). Secondly, housing wealth has become more fungible than other forms of wealth such as pensions and life insurance policies. Thirdly, to the extent that restrictions on housing loans have made households save more than they would have in the absence of such constraints, financial deregulation and liberalisation could generate large portfolio adjustments, significantly reducing saving. In addition, because a house is a durable asset, the period of adjustment could be very long and might involve some overshooting of the long-run consumption path.[21] At the same time, it should be recalled that owner-occupied houses constitute an asset as well as a consumption good and because neither rental nor financial markets are perfect, most households are unable to separate the investment decisions regarding housing from the consumption decisions. In some instances this may lead to partially offsetting effects. Thus an elevation in house price increases will raise the return to housing and, therefore, also the user cost of housing relative to the price of other consumer goods, reducing the demand for housing. On the other hand, the household's total wealth increases in step with the price, thereby enabling homeowners to increase their demand for housing services.

III.1 Preliminary evidence and theoretical links and issues

Table 9 explores these possible links by regressing the household saving ratio (SR) on an index for real house prices (PH). To allow for permanent as well as transitory effects PH was entered both as the lagged level and the current rate of change. Moreover, as a preliminary test of the combined influence of financial deregulation and changes in house prices, the equation was first estimated for the period 1970-92 and then for 1980-92 only.

For the whole period a significant and negative level effect is found for eight of the fifteen countries and in two cases the change in house prices has a negative influence. For three countries the correlation is close to zero, while only Australia and Belgium show signs of a positive correlation. When the estimates are confined to the 1980s, the correlation coefficients generally increase, though with Australia, France and the Netherlands as notable exceptions. For seven countries the negative level effect is more pronounced than for the whole period and for Ireland there is a significant rate of change effect. On the other hand, for Belgium and Italy a positive and significant level effect is evident, whereas the estimates for Germany remain insignificant.

Even though the evidence presented in Table 9 is quite suggestive the results should, for both empirical and analytical reasons, be interpreted with caution. A high and negative correlation could be due to "third factors" which influence saving and

---

[21] There is yet another, but purely statistical, reason for expecting house prices to reduce saving. In most countries, the national accounts data for disposable income (YD) and consumption (C) include imputed income for housing. Consequently, a rise in the real price of housing will tend to reduce the saving ratio (S/YD = (YD-C)/YD).

Table 9

Results of simple regression analysis[1]

Country	1970-92				1980-92			
	PH_{-1}	dPH	$\bar{R}^2$	DW	PH_{-1}	dPH	$\bar{R}^2$	DW
Australia	0.11 (1.9)	-0.13 (1.6)	0.10	0.34	0.01 (0.4)	-0.05 (1.0)	-0.09	0.83
Belgium	0.06 (1.5)	0.05 (0.7)	0.07	0.83	0.16 (3.8)	-0.01 (0.2)	0.51	1.99
Canada	-0.03 (1.0)	-0.10 (3.6)	0.33	0.83	-0.10 (3.4)	-0.14 (2.4)	0.66	1.34
Denmark	-0.36 (5.0)	0.19 (2.1)	0.52	0.81	-0.41 (8.1)	0.29 (4.8)	0.85	1.54
Finland	-0.05 (5.2)	-0.02 (2.2)	0.59	1.38	-0.05 (4.8)	-0.05 (2.5)	0.74	1.85
France[2]	-0.10 (2.5)	-0.08 (0.8)	0.31	0.39	-0.04 (1.0)	-0.06 (0.7)	0.03	0.34
Germany[2]	0.01 (0.4)	0.01 (0.6)	-0.01	0.76	-0.01 (0.3)	0.02 (0.4)	-0.18	1.41
Italy	-0.10 (0.9)	0.07 (0.6)	-0.05	0.10	0.13 (2.2)	-0.05 (0.7)	0.20	0.74
Ireland	-0.13 (1.3)	-0.03 (0.9)	0.02	0.46	0.07 (0.8)	-0.42 (3.3)	0.42	1.29
Japan	-0.06 (3.9)	-0.05 (1.5)	0.48	0.47	-0.03 (4.7)	-0.01 (0.4)	0.63	0.83
Netherlands	-0.04 (3.5)	0.03 (1.5)	0.34	1.45	-0.02 (0.3)	0.06 (1.1)	0.00	1.62
Norway	-0.20 (3.1)	0.01 (0.1)	0.28	0.70	-0.20 (2.1)	-0.16 (1.0)	0.44	0.61
Sweden	0.12 (2.5)	-0.32 (3.6)	0.40	0.69	0.00 (0.0)	-0.45 (8.8)	0.86	1.15
United Kingdom	-0.04 (3.0)	-0.05 (1.9)	0.37	0.95	-0.06 (6.0)	-0.06 (2.8)	0.81	1.63
United States	-0.13 (6.2)	-0.06 (0.8)	0.63	1.14	-0.26 (7.1)	0.08 (1.1)	0.80	1.85

[1] Regression equation (t-ratios in parentheses) estimated as:
$SR = a + b\ PH_{-1} + c\ dPH$
with SR = household saving ratio
PH = index of real house prices.

[2] Series starts in 1971 only.

house prices in opposite directions. As discussed in the previous section, financial deregulation and liberalisation have had a positive effect on house prices and are likely to have lowered household saving as less binding credit and liquidity constraints reduce households' saving needs and incentives. Secondly, a lower rate of inflation could, by "tilting" the time profile of real mortgage interest and amortisation payments, increase the demand for houses and, at the same time, reduce saving, though taxation effects might moderate and even reverse both effects. Thirdly, higher nominal and real interest rates tend to lower house prices but, according to most theories, increase saving, though the empirical evidence regarding the saving-interest rate link is ambiguous. Fourthly, demographic changes such as a rise in the proportion of the population in the 20 to 35-year-old age group would tend to reduce the aggregate saving ratio, but might increase the demand for houses and thus house prices. Other developments may affect saving and house prices in the same direction. Higher income growth has had a positive effect on housing demand and is also likely to have strengthened saving. Similarly, increases in the value of non-house components of wealth tend to reduce the demand for houses as well as the need to save. Institutional factors, such as rules concerning the deduction of interest payments from taxable income, the taxation of imputed income and capital gains and restrictions in the rental sector, will also affect house prices and saving, though their effects are more clearly visible across countries than in the developments over time for individual countries.[22]

The theoretical links are also tenuous and the mechanism by which house prices affect spending and saving is not a simple one. In particular, one needs to take into account the response to house price movements not only of current homeowners, but also of future home buyers. The presence of financial constraints and the extent to which deregulation and liberalisation during the 1980s have loosened such constraints are of crucial importance in this respect. Previous studies have analysed various aspects of financial deregulation and there seems to be a general consensus that this process has weakened saving incentives, at least during the period of adjustment of spending patterns to the new regime. One aspect of special interest in this context is whether financial liberalisation has increased the opportunity for homeowners to access accumulated housing wealth and/or relaxed downpayment requirements, as such changes would considerably raise the probability of finding a negative response of household saving to higher house prices.

For both homeowners and potential home buyers the life-cycle model of saving provides a useful framework for analysing household decisions about saving and

---

[22] See for instance Hayashi, Ito and Slemrod (1988), who analyse the influence of such differences on saving ratios in the United States and Japan. Using a simulation model, they find that different downpayment requirements (35% in Japan, compared with 25% in the United States) account for part of the higher saving ratio recorded for Japan, but the influence is rather small, as a high downpayment requirement has two partially offsetting effects: a boost to saving because a higher amount of own funds is required to purchase a given house but an overall lower demand for housing, which reduces saving. Using the same model they also demonstrate that differences in the deductibility of mortgage interest payments and in the taxation of interest income account for another part of the higher saving ratio for Japan, but again the influence is relatively small.

spending. According to this hypothesis current consumption is conditional on expectations of life-time income (or wealth) and on the stage of the life-cycle which the household has reached. In some versions of the life-cycle model[23] an increase in expected lifetime wealth leads to a rise in the consumption/income ratio, although it might be expected that this is spread out over the household's remaining lifetime, so that the short-run effect will be rather muted. The response might also depend on whether the increase in wealth is anticipated by households and whether it is seen as temporary or permanent. Higher real interest rates, on the other hand, tend to reduce consumption and increase saving and the same applies to higher expected income growth, though mainly because of aggregation effects and not as a result of actions by individual households.

Investigating the role of housing on the basis of the life-cycle hypothesis requires, however, some modifications to the traditional model framework. In the first place, the assumption that households can plan their consumption and saving without being constrained by credit and liquidity restrictions is in most countries not satisfied[24] and such constraints can have a crucial impact on the timing of house purchases and on the nature and composition of housing consumption. Secondly, the model needs to be modified to allow for the characteristics of the housing stock and the consumption of housing services. Because in most countries the cost of an average house is a multiple of average annual income (see Table 1), the purchase of a house and the time profile of consumption are highly sensitive to credit market conditions and constraints. Moreover, the close link between housing investment and housing consumption needs to be taken into account, especially as regards expected house price movements which affect the demand for houses as an investment good as well as the user cost of housing consumption.

For potential future home buyers a rise in house prices is likely to have a positive effect on saving, in particular in countries with high downpayment requirements. In a study based on US survey data Sheiner (1993) provides convincing evidence of this effect and further shows that this may have a significant influence on aggregate saving. Nonetheless, two factors may attenuate the positive effect. First, some renters might give up earlier plans to purchase a house and instead consume the share of income previously set aside to meet downpayment requirements. Secondly, given the rise in house prices and in the user cost of housing, some households may "scale down" earlier plans and use their savings to purchase a house of a smaller size.

For homeowners, on the other hand, the effect on saving is more likely to be negative, especially in those cases where a rise in house prices has coincided with financial liberalisation and a higher fungibility of housing wealth. Moreover, to the

---

[23] See Brodin and Nymoen (1991).

[24] This has been demonstrated in several recent studies; see in particular Fuhrer (1992), Jappelli and Pagano (1989) and Vaidyanathan (1993). The latter extends earlier studies on industrial countries to include several developing countries, finding - not surprisingly - that liquidity constraints vary inversely with the level of economic development and the degree of financial deepening (measured by the ratio of M_2 to GDP).

extent that homeowners regard the higher price as permanent the corresponding rise in wealth and in the wealth/income ratio will weaken saving incentives. There are, however, also factors which could attenuate - or even reverse - the expected negative effect. First, if home-owners wish to leave for future generations an unchanged ability to acquire housing, all of the capital gain would be saved. Secondly, while the wealth effect of a higher rate of house price increases reduces saving, the substitution effect due to the rise in the relative user cost of housing consumption could stimulate saving. The ultimate influence would depend on expected future house prices, the extent to which the relative price shift favours saving or consumption of non-housing goods and services and whether homeowners had acquired their desired amount of housing services prior to the price rise. Thirdly, in those countries where financial regulation and credit policies do not allow the taking-up of second mortgages, homeowners may find it difficult to convert their capital gains into higher consumption. Moving to a smaller house or to rented accommodation is subject to transactions costs and suitable facilities may not be available in the region preferred by the homeowner.

Because of the distributional effects several recent studies (for instance Hayashi (1989), Skinner (1991 and 1993) and Miles (1992a and b)) have tended to draw the conclusion that while a rise in house prices will increase household net worth considerably, the effect of this on aggregate consumption expenditure may be rather modest. Homeowners benefit from a rise, but they can only realise their capital gains by trading down or exiting the owner-occupied sector and thus need to find a "matching" household wishing to trade up or a first-time buyer entering the housing market. It is possible that either buyers or existing homeowners are subject to illusions regarding the redistribution that has taken place between the two groups. Such illusions are likely to generate a negative influence on aggregate saving because homeowners are more conscious of their gain (or tend to overestimate their property values, see Goodman and Ittner (1993)), while renters probably have only a dim notion of the type of property they wish to acquire and of when they will be able to buy. Moreover, renters may be less concerned about redistribution, because they expect to make a capital gain after they purchase property. A net negative effect on aggregate household saving will also occur if homeowners sell to the corporate sector or to non-residents. As Miles (1992b) argues, the latter option is especially important when analysing changes in the aggregate economy:

"the only way that housing equity for the aggregate economy can be reduced is via trade deficits (or a reduction in surpluses) which are the means by which housing units are transformed into consumer goods. Financial intermediaries facilitate this transformation of assets by allowing the overseas sector to indirectly build up its stake in the housing sector by financing the increased demand for mortgages of domestic residents" (pp. 1109-10).

Summarising the above, it appears that the net effect on saving of higher house prices is most likely to be negative when one or more of the following conditions is met: (i) the proportion of households owning their own home is substantially higher than one-half; (ii) potential home buyers have only a vague notion of the price rise while

homeowners have a clear idea of their notional capital gains; (iii) the authorities have no balance-of-payments target and there are no constraints on capital movements or on the acquisition by non-residents of residential property; and (iv) financial liberalisation has meant easier access to second mortgages and/or substantially reduced downpayment requirements and liquidity constraints.

Against this background we would expect that a rise in house prices reduces household saving in the United States, the United Kingdom, Finland, Norway and Sweden, which all have high owner-occupation rates and have liberalised or deregulated their financial systems during the 1980s. A negative effect might also be expected for Japan, Canada, Australia and Ireland, though in the case of Japan downpayment requirements have remained comparatively high and in the other three countries the rise in private sector debt mainly reflects developments in the commercial property markets or in the corporate sector. In Germany, Italy, Belgium and France, higher house prices are more likely to increase household saving, since downpayment requirements are still relatively high and, except for France, changes in the financial system have been moderate. For Denmark and the Netherlands it is more difficult to evaluate the likely effects. In Denmark saving figures are only available for the aggregate private sector (i.e. households as well as enterprises) and house prices in the Netherlands have been relatively stable during the 1980s.

III.2 Earlier empirical estimates

Earlier empirical studies in this area have applied rather divergent methods and specifications and the number of countries covered is relatively limited. Bosworth et al. (1991) attempt to identify the determinants of the fall in US household saving by comparing survey data for two separate periods. By first splitting the sample into households owning equities and bonds and those without such assets, they found that the fall in saving between the 1970s and the 1980s had been virtually the same for both groups. By contrast, when distinguishing between homeowners and potential future home buyers they detected a significantly larger decline for the former group than for the latter. The decline in saving was particularly steep for the 45 to 64-year-old age group, which, according to Manchester and Poterba (1989), is also the group which has most frequently taken up second mortgages. Skinner's (1991) review of the US evidence is less conclusive: time series data on developments in aggregate saving point to a significant negative influence of changes in housing wealth, whereas his own analysis based on microeconomic data shows only a very weak effect. In the aforementioned study Bosworth et al. also applied their method to survey data for Canada, but found virtually no difference between homeowners and households in rented accommodation. At the same time, they identified a "spike" in the overall saving ratio around 1982 which is seen as the combined effect of the severe credit constraint and the deep recession.

A number of empirical studies have analysed the contribution of the housing sector to the comparatively high level of household saving in Japan (see in particular Takayama (1988), Horioka (1988) and Takayama and Kitamura (1993) and the

references cited therein). Because of high land and house prices, mortgage loan restrictions and relatively short repayment periods, it appears that a significant part of total household saving is accounted for by potential future buyers and homeowners who recently acquired their property.[25] Saving ratios for these two groups tend to exceed the national average by 5-30%, depending on the number of years until (after) the planned (realised) purchase and on the location of the property.[26] Possibilities for realising capital gains through second mortgages are also rather limited in Japan, suggesting that the net effect on saving of a rise in house and land prices could well be positive unless a large number of households give up earlier plans and increase consumption [27, 28].

For the United Kingdom, Muellbauer and Murphy (1990) found a very significant and positive effect when including a weighted wealth/income ratio in their aggregate consumption function. Housing equity enters this ratio with a weight that progressively rises during the 1980s in step with the removal of administrative guidance on building societies and the entry of clearing banks into the mortgage market. In a more recent study Muellbauer and Murphy (1993) apply a fixed-weight index for aggregate wealth combined with a separate variable measuring financial liberalisation and find both variables to have a positive effect on consumption. Equity withdrawal through second mortgages and allowing home loan to value ratios to become a choice variable for households also play a major role in Miles' (1992a and b) analysis of developments in UK saving. Like Muellbauer and Murphy he sees financial deregulation combined with booming house prices as a major cause of the deterioration in the external position of the United Kingdom. Defining equity withdrawal as net housing loans minus net housing investment[29] he estimates that about 80% of equity

---

[25] According to Horioka (1988) the average house price is 4.5 - 9 times average household income, so that if potential home buyers plan a downpayment of about 50% they would have to save 2 - 4 times their annual income before buying and a similar amount during the years immediately after the purchase. Over time the relative importance of *ex ante* and *ex post* saving for housing has shifted towards the latter as the availability of mortgage loans has increased but the contribution of housing-related saving to total *gross* saving has tended to rise. At the same time, the contribution of housing-related saving to *net* saving has remained negative because depreciation of the housing stock is calculated on the assumption of an average life for a house of only 10-12 years.

[26] When regressing average saving ratios on the ratios of house prices to per capita GDP shown in Table 1, a positive correlation is obtained, but the coefficient of the price/income ratio is only significant at 10%. Adding the proportion of homeowners to the cross-country regression hardly affects the previous estimates and yields a negative coefficient with a t-ratio of less than 1.6.

[27] This appears to have occurred during the house price boom of the 1980s and may explain the insignificant coefficient of land prices in the aggregate consumption equation reported by Kaku and Fukuda (1993). It may also be noted that house owners have a significantly higher saving propensity than tenants (Takayama and Kitamura (1993)).

[28] The poem cited by Yoshitomi (1988) might capture the reaction of potential home buyers to high and rising land prices: *"no matter how hard I work, my life never becomes rich"* (p. 280).

[29] Housing equity may be withdrawn through two types of loan: consumer credits backed by housing as collateral and second or "top-up" mortgages, which are usually of much longer duration than consumer credits.

withdrawal has been used for expanding consumption[30] and this factor alone fully accounts for the decline in UK household saving in the 1980s. Additional evidence of a negative effect on saving of the UK house price boom is found in the saving equation estimated by Bayoumi (1992) and it also appears that the negative influence became more pronounced during the liberalised financial regime of the late 1980s. The above implications and interpretations are, however, not shared by all analysts of the UK economy. Fisher (1993) points out that higher house prices leave total household wealth more or less constant so that changes in aggregate consumption would mainly reflect shifts in the distribution of wealth, together with the direct rise in durables consumption due to increased housing turnover during periods of rising house prices. Furthermore, King (1990) argues that the rise in house prices and household net wealth reported by Muellbauer and Murphy primarily serves as a proxy for income expectations and cannot be interpreted as a direct effect of changes in housing wealth on consumption or saving.

For other countries, the empirical evidence is also mixed. Koskela and Viren (1992) and Koskela et al. (1992) analyse developments in household saving in the four Nordic countries. Using annual data for the period 1970-90 they estimate partial adjustment equations, where changes in real house prices are entered together with income changes, inflation and nominal interest rates. For Norway and Finland they find a negative coefficient for changes in house prices; the significance is, however, rather low so that even the transitory effect is relatively weak. For Denmark and Sweden, the coefficient on house price changes is positive but the t-ratios are well below unity. Brodin and Nymoen (1991) estimate a consumption function for Norway, using an unconstrained version of the Hendry-von Ungern-Sternberg model,[31] and find that a wealth measure defined as net financial wealth plus housing wealth has a significant and positive effect on the long-run level of consumption, whereas net financial wealth alone is insignificant. A further interesting result of their analysis is that without the wealth term, consumption and income are not co-integrated, suggesting that income alone cannot explain the rapid rise in consumption following financial deregulation. Lehmussaari (1990) also analyses saving in the Nordic countries, using an aggregate consumption function specified as an error-correction equation. Changes in real wealth are estimated to have increased consumption (and reduced saving) in all cases except for Sweden, but the estimates are difficult to compare with those discussed above and those to be reported below, because the sample period stops in 1987 and the definition of real wealth differs considerably between the four countries. In the case of Germany, for which the results given in Table 12 are rather poor, there are no estimates of the influence of house prices on saving. However, the rather high ratio of house prices to

---

[30] Manchester and Poterba (1989) estimate a very similar figure for US households. Holmes (1993) includes equity withdrawal in his estimates of UK consumption functions, finding a particularly strong and positive effect on consumption of durables.

[31] The constrained model assumes long-run equilibrium targets for both the consumption/income ratio and the wealth/income ratio and thus two co-integrating equations between consumption, income and wealth. By contrast, the unconstrained version assumes only one co-integrating equation. For further discussion see Brodin and Nymoen (1991).

per capita GDP (Table 1) combined with high downpayment requirements is likely to have stimulated household saving. In addition, Börsch-Supan and Stahl (1991) find a significant and positive effect on aggregate saving of the "Bausparkassen" system, a closed and self-financing kind of building society subsidised by the Government. Because the degree of subsidisation has been scaled back over time, the system may have influenced saving as well as house prices negatively, thus creating a positive, though probably weak, correlation between house prices and saving.

IV. A comparative analysis of the role of house prices in household saving

IV.1 Specification and principal results

In order to obtain comparable estimates for a larger number of countries a household saving equation was estimated for the countries shown in Table 10. To allow for long-run as well as well short-run effects, the equation was specified as Hendry and von Ungern-Sternberg's (1981) error-correction version of the life-cycle saving hypothesis but without restricting the coefficients on the income and wealth terms and modified to include a proxy for financial market liberalisation and a "buffer-stock" motive for saving.[32] The exact specification as well as details of the estimation results are presented in **Annex III**, while Table 10 shows the principal coefficients of the equations finally selected for each country.

With respect to the variables of most interest to the subject of this paper, changes in the debt/income ratio have a negative coefficient in twelve of the fifteen countries, suggesting that moving to more liberal or less regulated financial regimes reduces household saving during the period of transition. No effects were found for Italy, the Netherlands and Norway,[33] while for Denmark and Sweden the coefficients on both the lagged level and the change in debt were significant and negative. It should be stressed, however, that changes in the household debt/income ratio may not be an appropriate proxy for the effects of financial deregulation and liberalisation or might capture developments which are totally unrelated to the housing market.

Equity prices were found to stimulate household saving in the United States, Japan, Italy and Denmark. The result for Japan confirms the estimates given in Kaku and Fukuda (1993), who report a negative coefficient for the market value of households' equity holdings in an aggregate consumption function for Japan. Significant negative influences were estimated for France, Canada and Norway. The evidence for Canada is consistent with that reported by Longworth and Poloz (1993), who find that an index combining real house and equity prices has had a significant and positive effect

---

[32] Demographic variables, which play an important role in the life-cycle hypothesis, were included in initial estimates but were never significant.

[33] In the case of Norway, the large and negative coefficients found for real house prices may partly reflect changes in debt, which had a major influence on the instrumental variable used for house prices; see Annex III.

Table 10

Principal coefficients from multiple regression

Country	$Debt_{-1}$	dDebt	PQ_{-1}	dPQ	PH_{-1}	dPH	*Memo items:*	
							*S/Y**	*S/Y*
United States	-	-0.24	1.42	-	-2.93	11.25	*7.0*	*7.0*
Japan	-	-0.03	0.23	0.36	-0.53	-	*17.3*	*17.7*
Germany	-	-0.16	-	-	-	-1.68	*13.0*	*12.8*
France	-	-0.14	-0.67	-0.53	1.34	-	*16.2*	*16.4*
Italy	-	-	0.75	-	2.80	-	*21.8*	*21.5*
United Kingdom	-	-0.32	-	-	-6.90	-	*10.5*	*9.6*
Canada	-	-0.43	-4.39	-	1.17	-	*11.9*	*10.6*
Australia	-	-0.21	-	-	1.30	-	*10.8*	*9.3*
Belgium	-	-0.32	-	0.85	10.60	14.78	*15.8*	*15.3*
Denmark	-0.16	-0.15	4.00	2.85	-2.49	-11.60	*10.0*	*9.6*
Finland	-	-0.26	-	-	-2.09	-3.86	*4.4*	*3.6*
Ireland	-	-0.14	-	-	5.84	-	*12.6*	*13.8*
Netherlands	-	-	-	-	-1.51	-5.00	*13.6*	*13.5*
Norway	-	-	-5.63	-1.35	-3.50	-4.20	*2.7*	*2.4*
Sweden	-0.17	-0.17	-	-	4.70	-8.47	*1.6*	*2.0*

Debt = household debt (or bank lending to private sector) as a percentage of household income
PQ = real equity prices
PH = real house prices
S/Y* = long-run saving rate, estimated
S/Y = average saving rate, 1970-92.

For further details see Annex III.

on aggregate spending. It is also worth noting that the equity price effect on US household saving is considerably smaller than those found in earlier studies. As noted by Steindl (1993), previous saving equations for the United States included an equity price index as one of the key determinants, but when the equations are extended to include more recent data the index becomes less significant, probably mainly because of the shift of ownership influence and control away from households towards pension funds and insurance companies. A similar shift has taken place in the United Kingdom, where equity prices appear to have no effect on saving. By contrast, higher house prices have had a marked negative influence on household saving in both the United States and the United Kingdom, supporting the empirical estimates discussed above and our prior expectations. The boom in house prices also appears to have been partly responsible for the steep fall in the saving rates observed for Norway and Finland[34] and

[34] The analysis by Brunila and Takala (1993) of the banking crisis in Finland provides an instructive illustration of the interaction between financial deregulation and developments in real asset markets. Bank lending in Finland rose very sharply starting in the mid-1980s, mainly in response to four deregulatory measures: the abolition of interest rate ceilings; the removal of virtually all controls on foreign capital flows; the abolition of earlier requirements of saving prior to obtaining housing loans; and the revaluation of banks' equity capital enabling them to expand lending. Influenced by these measures the share of the domestic sectors in total investment and borrowing rose steeply and to a large extent the increase reflected loans in foreign currencies. Moreover, the rise in housing loans was mostly

negative coefficients were found for Denmark and the Netherlands as well, in the latter case probably reflecting developments in the late 1970s when the financing of housing was liberalised (see page 21). For Japan, a negative coefficient is also observed, but it is confined to the period 1980-92 and may indicate that during the period of steeply rising land and house prices a number of potential home buyers gave up their plans and increased current consumption. For Germany, only changes in house prices appear to affect saving and the coefficient is relatively low.

For the seven remaining countries a significant influence of house prices was also identified, but in all cases it appears to be positive. Particularly large coefficients were found for Belgium, which is consistent with the results of the bilateral regression and may reflect the relatively high downpayment requirement combined with a low and stable level of household debt. For Italy the positive coefficients are also consistent with the earlier results, whereas those obtained for Canada, Australia, France, Sweden and Ireland are more surprising and difficult to relate to specific economic developments or institutional features. Allowing for a shift in the coefficient on house prices clearly improves the estimates for Japan, Belgium and the Netherlands, while for Italy and Ireland the inclusion of an intercept shift produces a marginally better fit. A dummy variable technique does not, of course, identify the sources of the shift and they might be of a rather indirect nature. For instance, in some cases (see Wheeler and Chowdhury (1993)) financial liberalisation appears to have reduced the sensitivity of the residential sector to fluctuations in macroeconomic variables and interest rates and such changes could also influence the properties of the saving function.

IV.2 Long-run sensitivities and contributions

To provide a better indication of the influence of house prices on household saving, Table 11 shows the sensitivity of the long-run saving rate to both the level of and the change in house prices, with the countries ranked according to the size of the potential permanent impact. For those countries where a shift in the coefficient of PH was identified the potential influence is shown as a range, with the first value giving the influence before the shift. The negative influence appears to be largest in Norway, followed by the United States and the United Kingdom, whereas large positive effects are found for Italy and Belgium. Neither the sign nor the size of the sensitivities is very closely related to the proportion of households owning property. As can be seen from Table 1, the highest proportions of homeowners are found in Ireland, Norway, Finland and Australia and only two of these countries are in the group with negative

---

used for financing "trading up" by homeowners, whereas new residential investment rose only modestly, implying that an upward shift of the demand curve for housing took place along a virtually unchanged supply curve. The wealth effect on aggregate consumption also increased during this period in response to the removal of credit and liquidity constraints. All in all, therefore, the lending boom mostly benefited the domestic sectors and the consequences of this bias were clearly felt on the aggregate economy and on the banking sector, in particular when the period of excess demand came to an end in 1989-90.

Table 11

Sensitivity of the long-run saving rate to house prices *

Country	PH	dPH
Norway	-0.333	-0.400
United States	-0.065	0.250
United Kingdom	-0.049	-
Netherlands	-0.045 – -0.014	-0.149
Finland	-0.031	-0.058
Denmark	-0.030	-0.138
Japan	0 – -0.014	-
Germany	-	0.025
Canada	0.022	-
France	0.033	-
Sweden	0.047	-0.085
Australia	0.050	-
Ireland	0.106	-
Belgium	0.223 – 0.266	0.310
Italy	0.255	-

* The sensitivities are calculated as i/f and j/f respectively; see equation (ii) in Annex III and the estimates given in Table 1. With the saving rates measured in percentages and house prices as indices, the coefficients indicate percentage point changes in the saving rates for one index point change in house prices.

coefficients. At the same time, the ranking may in part reflect financing conditions and regulations in the housing sector. Downpayment requirements are very low in the Nordic countries and in the Netherlands (see Table 12)[35] and the wider scope for taking up second mortgages or consumer credits collateralised on housing very much influenced developments in the United States, the United Kingdom and some of the Nordic countries during the 1980s. On the other hand, downpayment requirements are relatively high in Italy and Belgium and the same applies to Germany and France. For Japan requirements are difficult to evaluate precisely. Horioka (1988) reports that many potential home buyers plan a downpayment of about 50%, but the ratio of actual downpayments to house prices is only 20%, and Hayashi et al. (1988) assume an intermediate value of 35%, corresponding to the range of 30-39% later given by Takayama and Kitamura (1993).

While Table 11 shows the *potential* impact of changes in house prices, Table 13 presents *contributions* of house prices to changes in saving, estimated from counter-factual simulations for selected periods during the 1980s. The estimated contributions of changes in household debt are also included because of the close correlation between

[35] Ceilings on the maximum loan amount relative to the property price are imposed in less than half of the countries surveyed. It should, however, be noted that downpayment requirements may not be the only, or even the most important, factor influencing the magnitude of the loan offered by financial institutions in some countries. In addition, the relative strictness or laxity of loan conditions also depends on the lending institutions' procedures for valuing the property. The EC Mortgage Federation (1989) compares the approaches taken in various EC countries.

Table 12

House purchase loan to value ratios
As a percentage

Country	Statutory ceilings on loan to value ratios	
Australia	-	*80*
Belgium	-	*80*
Canada	90 [1]	*75*
Denmark	80	*65*
Finland	-	*80*
France	60 [2]	*60*
Germany	60 [3]	*50*
Ireland	-	*65*
Italy	75 [4]	*50*
Japan	-	*75*
Netherlands	-	*75*
Norway	80	*64*
Sweden	-	*75*
United Kingdom	-	*70* [5]
United States	-	*75* [6]

Figures in italics indicate estimated actual loan to value ratios, in 1992, based on survey evidence and published data (for the United Kingdom and the United States).

[1] For existing buildings the loan must not exceed 90% of the first $180,000 and 80% of the balance of the lending value. Up to 95% for first-time buyers up to a ceiling that depends on location. [2] Statutory limit applies to mortgage credit institutions. [3] Funded by mortgage bonds. [4] For constructed buildings. [5] In 1992, loan to value ratios published by the Council of Mortgage Lenders show a distinctly higher rate for first-time buyers (83%) to that of loans taken out by previous owner-occupiers (64%). [6] Conventional mortgages.

Sources: EC Mortgage Federation, Association of Norwegian Mortgage Banks, Finnish Bankers' Association, US Federal Reserve Bulletin, Woolwich (Europe) Ltd.

such developments and changes in house prices. One striking feature of the table is that most of the estimated contributions for house prices are negative, even though for about half of the countries the long-run coefficients were positive. The selection of the periods may, of course, involve a certain bias regarding the likely sign but, as will be further discussed below, the negative contributions rather seem to reflect a certain degree of "illusion" regarding the house price boom. It is also worth noting that the actual contributions do not seem very closely related to the potential influences, confirming the earlier impression (see Section II) that the pattern of house price changes has differed considerably across countries. In particular, the contribution is rather small and positive for the United States even though the long-run sensitivity is negative. Contrary to popular opinion, real house prices (on a cumulative basis) rose by only 13% during a period when household saving declined by 5 percentage points (see also Steindl (1993)) and the rate of increase decelerated towards the end of the period. Three of the Nordic countries, in which the saving rate fell by 7 to over 15 percentage points, are found in the first four positions when the countries are ranked according to the size of the

Table 13

Contributions of changes in house prices and household debt to changes in household savings rates*

In percentage points

Country	Period	PH and dPH	Debt and dDebt	Change in SR
Denmark	1982-87	-6.7	-14.2	-15.5
Norway	1984-87	-10.3	-	-11.4
Sweden	1980-88	-0.5	-10.2	-10.0
Canada	1982-87	-0.9	-5.9	-9.2
Ireland	1982-89	-0.6	-0.2	-8.2
United Kingdom	1980-88	-1.5	-15.8	-7.7
Finland	1983-88	-4.3	-8.7	-7.3
France	1981-87	-0.6	-1.6	-7.2
Italy	1980-89	1.3	-	-7.1
Belgium	1981-87	-6.6	0.4	-6.7
United States	1981-89	0.6	-5.4	-5.0
Australia	1980-87	0.5	1.7	-4.8
Japan	1981-90	-1.3	-4.3	-4.3
Netherlands	1982-85	-0.0	-	-2.3
Germany	1988-91	-0.4	-0.7	-1.8
Average	-	*-2.1*	*-4.3*	*-7.2*

* The periods were chosen on the basis of peaks and troughs in household saving rates in the 1980s and the contributions were calculated by simulating the equations given in Annex III, keeping PH and Debt respectively unchanged during the periods chosen.

estimated contributions of house price changes. In Norway households' response to the house price boom accounts for all of the fall in saving and in Finland and Denmark the proportion is close to one-half, with part of the massive influence of changes in household debt in Finland probably capturing developments in the housing market as well. In Denmark, on the other hand, the very large and negative contribution of Debt and dDebt can be explained by a dominating influence of the corporate and non-corporate sectors as the period of falling saving coincided with a boom in business fixed investment while changes in residential investment were relatively small. Moreover, as for Sweden, the estimated impact of Debt and dDebt may be subject to a simultaneity bias. For both countries the two coefficients can be reduced to an expression with only the current level of debt, for which causality may run both ways. The rather moderate contribution of house prices calculated for the Netherlands is probably not very representative of their potential influence. House prices in the Netherlands changed only little during the 1980s, whereas in 1978 speculation had pushed them to an unprecedented level (see van Riet (1993)). During the four years preceding this peak, the saving ratio declined almost 3 percentage points while in the four years following the collapse of the housing market, the saving rate rose by 3 points and during both periods virtually all of the change can be accounted for by movements in house prices.

On average the saving ratios declined by almost eight percentage points during the periods selected and about 90% of this decline can be ascribed to changes in house

prices and household debt. About two-thirds of the joint contribution is accounted for by increased indebtedness,[36] but this figure is likely to overstate the effect of financial deregulation on saving. First, it is difficult to distinguish between the effects of house price changes and those due to financial deregulation and part of the estimated contribution assigned to changes in debt is not independent of developments in the housing markets. Secondly, in some cases (notably Denmark and Sweden) the estimated coefficients and the contributions are likely to reflect a two-way causality. Finally, for eleven of the countries the debt effect depends on *changes* in debt, implying that once the adjustment to higher debt/income targets has come to an end, saving ratios should rise towards their long-run values.

At the same time, the very significant contribution of changes in household debt seems to reflect a certain degree of illusion with respect to the size and nature of the house price boom combined with the relaxation of constraints and the release of pent-up demand. Thus in most of the countries where the contribution of house prices was negative due to falling house prices, debt/income ratios rose substantially, suggesting that households were able to increase borrowing based on the development in *nominal* and not *real* house prices. Sweden provides a particularly good illustration of this phenomenon as both the debt/income ratio and nominal house prices rose by some 30-35% during the period when the saving ratio fell by 10 percentage points. However, in real terms house prices actually declined by 30% during the same period and when incomes started to fall a few years later, many households were unable to service their debt.

V. Conclusions

In the past decade the household saving ratio has declined in a number of countries - while in several Nordic countries there was actual dissaving during the latter part of the 1980s. However, by the end of 1992, saving ratios had in general been restored. Indeed, in Finland, Norway and Sweden they were higher than at any time since 1980. Among the explanations that have been advanced to account for the pattern of household saving during this period, this study has focused especially on the interaction between household saving and the housing market. The 1980s witnessed a remarkable (if not entirely unprecedented) cycle in house prices in a number of countries that appears to correspond rather well with the movements in the saving ratio, making it seem plausible that household saving has responded to house price changes.

The results of an empirical analysis of the determination of saving behaviour based on an error-correction formulation of the life-cycle hypothesis suggests that, while house price movements have played a significant role in the 1980s, the magnitude

---

[36] Australia is one of only two countries with a positive, though small, contribution from changes in debt. Considering that financial control and regulation were largely abolished during the period when the saving ratio declined this, at first sight, appears rather surprising. However, household debt has remained rather stable at a relatively low level (see EPAC (1989)) and most of the recorded rise in credits is accounted for by the corporate sector and by lending for commercial and rental properties.

and even direction of their potential impact has varied considerably across countries. In eight of the countries studied, including Germany, Japan, the United Kingdom and the United States, the potential effect is negative. In the remaining countries, a positive response was found, that is, higher house price rises tend to increase saving. There is some evidence that, at least in some countries, the importance of house prices has changed in the 1980s. The reasons for such a diverse response are to be found in variations in the characteristics of national housing markets in the redistribution of wealth within the household sector and in changes in financial markets. Although the potential impact differs in sign as well as strength, the actual contribution has been mostly negative during the periods when saving ratios declined.

The fundamental determinants of both saving and house prices are comparatively well known. However, while reasonably good estimates were obtained for the saving equations the factors governing house price changes were more difficult to identify. Recent cycles in house prices have been accredited, at least in part, to the presence of speculative activity. A simple test of the predictability of the excess return to housing suggests (but does not prove) that profitable investment opportunities have existed in most countries during the period under consideration. Other evidence cited, such as survey data and time series studies, points to an important role of expectations in the determination of house prices. Despite the rapid and unsustained nature of recent house price changes they appear to have influenced household behaviour, suggesting that there may have been widespread misperceptions about the future course of house prices. In this sense, households clearly disregarded past experience: in the 1970s similar house price cycles occurred in several countries, including Belgium, the Netherlands, Japan and the United Kingdom. In addition there is evidence in some countries that banks and mortgage institutions have also disregarded past experience as household debt/income ratios have increased despite declining real house prices.

If the presence of speculation cannot be ruled out, a number of factors may have underpinned households' expectations of house price changes. Of these, the stance of monetary policy, the fiscal treatment of housing and financial deregulation appear to have been among the most important. The fiscal privileges accorded to housing have been progressively reduced, which in several cases dampened or even reversed the rise in nominal house prices. At the same time, a number of countries have made considerable progress with financial liberalisation, including greater access for households to first and second mortgages, lower downpayment requirements and the abolition of interest rate controls and ceilings. These changes, combined with the release of pent-up demand and certain illusions on the part of borrowers and lenders with respect to future house prices, have had significant macroeconomic implications and were among the principal reasons for the overheating experienced by several countries during the second half of the 1980s. Indeed, to quote Blundell-Wignall and Bullock (1983):

"The reduced constraints on the behaviour of financial intermediaries and the increased role of asset prices, therefore, seem to be important for understanding the changed characteristics of the business cycle in recent years" (p. 2).

Annex I

The construction of house price indices

The sources of house price statistics used in the text together with some brief comments are shown in Table 1. The data are based on a sample of transactions prices recorded by private real estate associations in the various countries, although in some cases this information has been collated and published by central statistical agencies.

While every attempt has been made to use the best indices available for each country, the choice of index (where a choice existed) has been guided by two basic criteria. First, broader indices were used where possible, in order to more accurately reflect the trends in average house prices. Thus, for example, national were preferred to regional or local house price data, with the exception of Germany, where the index is the average of four major cities. The sales prices of existing as well as (or instead of) those of new dwellings were used (since most transactions are dominated by existing dwellings), and, where a distinction is made, transactions prices refer to dwellings of medium quality. Secondly, to obtain a relatively long series of data for the empirical analysis we used only series which were available on an annual or quarterly basis, from 1970 onwards. In the case of France this requirement could only be met by combining data from different series.

Differences in the coverage of the data, and the construction of indices leads to some important qualifications to the accuracy and comparability of the house price measures both over time and across countries. Most published house price series are based on sales prices of dwellings. The exceptions are Finland and Germany, where prices are measured per square metre, and in Japan land prices are used in the absence of residential property prices. Houses differ greatly in their characteristics, and typically the mix of properties traded varies over time. Thus failure to adjust for price variations due to any change in the mix of properties traded may lead to inaccuracies in the measurement of house prices. Some attempts have been made to adjust for this, notably in the United Kingdom (see Economic Trends (1988)) where the published series takes account of four principal differentiating characteristics of properties: region, size, age and type. Fleming and Nellis (1984) discuss the problems inherent in measuring house prices and evaluate the alternative methods, which can give rise to very different estimates of changes in house prices. In general, it can be concluded that house price series that take more characteristics into consideration are to be preferred. However, this has to be balanced against the greater usefulness of series available over a longer time span. In the longer term house price indices are also likely to be influenced by quality changes to the dwelling stock. Thus the mix-adjusted index used for the United Kingdom does not pick up size changes other than in the number of habitable rooms. Nor does it consider other improvements in the quality of housing such as central

heating or double-glazing.[37] Nevertheless, the effect of mix-adjustment is to dampen the upward trend in house prices in the United Kingdom that would otherwise be apparent.

The problems of accurately measuring house price developments over time are compounded when attempting to draw international comparisons. The composition of the dwelling stock varies across countries, so that a typical dwelling in one country may vary in significant ways from that in another. No attempt was made to remove these differences; instead, the house price series used are those of actual transactions in the individual countries.

[37] Holmans (1990) estimates that such improvements might account for around 0.3% a year of the growth in house prices in the 1970s, and 0.5% a year in the 1980s.

Table I.1

House price statistics

Country	Spatial coverage	Description / comments	Available frequency	Sources
Australia	National	**Index:** weighted average of prices for all capital cities and other areas obtained from a quarterly census of home loan approvals; weighted according to the value of secured finance commitments to individuals by state for purchase of established and new houses; median prices for established dwellings in the capital cities and for first time buyers in other areas; no adjustment for the different types of properties traded; weights: 0.62 for capital cities; 0.38 for other areas.	Q	Commonwealth Bank of Australia and Housing Industry Association Real Estate Institute of Australia (REIA)
Belgium	National	**Index** of small and medium sized dwellings; all transactions excluding public auctions (10% of total). Basic data are collected from: a) report from the local notary's offices (valued by size, location and imputed yield) b) Statistical Office. Prices are reported for each 'arrondissement', after cutting off the 25% most and least expensive and a simple average is calculated for the country total.	A	ANHYP sa, Département Immobilier, Brussels, "Valeur immobilière"
Canada	National	Average transaction **prices** of existing homes (Can$ per unit) reported by the Multiple Listing Service (covers about 70% of all transactions); no weighting is done with respect to dwelling characteristics.	A, Q	Multiple Listing Service, Ottawa (Bank of Canada)
Denmark	National	**Index**: mean of the cash-value of sold one family houses (ordinary sales) compared with latest valuation of the same house, thus implicitly correcting for size, location, etc. Only sales by physical persons and by private corporations to physical persons; excluding sales between family members, forced sales and sales involving local or central government.	Q	Danmarks Statistik, "Statistisk manedsoversigt", Tab. 33

Table I.1 (cont.)

Country	Spatial coverage	Description / comments	Available frequency	Sources
Finland	National	**Index** of average price for existing flats and terraced houses, as average of prices per m^2 recorded in the individual transactions by real estate agencies (30% of all transactions); overall country index constructed as a weighted average of regional mean prices.	Q	Bank of Finland
France	National	**Index:** BIS estimates based on annual values for prices in the Paris region and four-year housing survey for the rest of France.	A	INSEE, Chambre Interdépartementale des Notaires de Paris
Germany	Average of four major cities: Berlin, Hamburg, Munich, Frankfurt	Transaction **prices** in DM per m^2 of owner-occupied flats medium residential locations (2½-3 rooms, 70m^2; 'average' area) actual market prices (median) obtained by local real estate agents, who are members of the RDM (around 40-50% of total number of agents in western Germany).	A	Ring Deutscher Makler, Hamburg "Immobilienpreisspiegel", Wohnimmobilien
Ireland	National	Average gross **prices** of second-hand houses for which loans were approved by all lending agencies (building societies, associated banks, local authorities, other agencies).	A, Q	Department of the Environment, Dublin Housing Section, "Housing Statistics Bulletin"
Italy	National	**Index** of average prices of new and completely reconstructed dwellings in large and middle sized cities and touristic places; collected by real estate agents and weighted by demographic criteria.	A	CENSIS, Rome

Table I.1 (cont.)

Country	Spatial coverage	Description / comments	Available frequency	Sources
Japan	National	**Prices** per m^2 of land transactions for land used for residential purposes and situated in residential zones; unweighted average of a survey of selected representative land (i.e. 20,555 sample points in the 1993 survey) together with licensed real estate appraisers; survey criteria: representative prices in the individual district; typical use, surroundings and size; the use of the land has to remain in the category 'residential' for a considerable period.	A	National Land Agency
Netherlands	National	Average selling **prices** of existing single- and multi-family houses; based on reports of the members of the Netherlands Association of Real Estate Agents (about 50-60% of the total transactions); weighted by number of sales.	A	Netherlands Association of Real Estate Agents, Nieuwegein
Norway	National	Average sales **prices** of houses weighted (by types of dwellings), based on the reports of the members of the NEF (covers about 50% of all transactions).	A	NEF (Norges Ejendoms Forbund), Oslo for the raw data ECOM (for the weighting) Norges Bank
Sweden	National	Price **index** of owner occupied one and two-dwelling buildings; weighted by the distribution of houses in the stock; based on reports of the Local Boards of Registrations of Title; all transactions except purchases made by relatives are covered.	A, Q	Central Statistical Office, "Monthly Digest", Table J 'Prices'
United Kingdom	National	**Index** of house prices (new and old dwellings) collected in a 5% sample survey of building society mortgages; weighted with respect to type, size, location and age of the dwelling.	A, Q	Department of the Environment, London
United States	National	Average sales **prices** of existing single-family homes, based on sales reports of 550 Boards of REALTORS and multiple listing systems; regional weights based on the regional distribution of owner-occupied single-family dwelling units and homeowner mobility (periodically revised to reflect shifts in regional demand).	A, M	National Association of Realtors

Annex II

Note on the user cost of housing

A clear exposition of the user cost formulation typically found in the literature appears in Poterba (1984).[38] In this paper, the user cost (denoted ω) is:

$$\omega = [\delta + \kappa + (1 - \theta)(i + \mu) - \pi_H]$$

which combines a constant depreciation rate (δ), regular repair and maintenance expenditures (κ), the after-tax interest burden (with interest payments based on the market interest rate (i) and assumed to be tax-deductible at the marginal income tax rate faced by households (θ)), the property tax liability (μ) (also assumed to be tax-deductible), less the nominal housing capital gains (π_H). Abstracting from the depreciation rate, maintenance and repair expenditures and property taxes, all of which may be assumed to vary comparatively little over time, a simplified measure of the user cost of housing may be estimated for each of the countries studied. The results for 1992 are shown in Table II.1. These estimates are not precise measures of user costs, but they are nevertheless of some interest. In particular, while there are significant variations across countries in terms of nominal (and real) interest rates and the degree of tax privileges accorded, the most important cause of variations in 1992 was the different pattern of house price movements.

The user cost measure described above could be extended in several ways. First, in some countries only a proportion of mortgage interest payments is tax-deductible, or tax deductibility is restricted to certain tax rates. There may also be some taxation of the imputed rental income arising from owner-occupation or of realised capital gains from housing. These issues and some cross-country evidence are discussed in greater detail in OECD (1988) and in Alworth and Borio (1992). Secondly, the user cost measure abstracts from the risk attached to investment in housing due to the uncertain nature of the expected capital gain. Miles (1992), for instance, adds a risk premium of 8% to the cost of funds, based on the average excess return on equity over a safe rate of interest for the period 1919-88. Thirdly, the opportunity cost of funds is generally lower than the cost of borrowing so that the loan to value ratio for home buyers could also enter the expression. The importance of this adjustment is likely to vary across countries, depending on the deposit typically required from households for dwellings purchase and the size of the spread between borrowing and lending rates.

---

[38] Similar descriptions of the user cost can be found in a number of studies, including Buckley and Ermisch (1982) and more recently Meen (1990) and Miles (1992).

Table II.1

The estimated user cost of housing in 1992

Country	Capital gain in housing (nominal) (%)	Mortgage rate (nominal) (%)	Tax treatment of mortgage interest payments		Estimated user cost (%)
			Deductibility	Marginal income tax rate (%)	
Australia	1.4	10.5	N [a]	n/a	9.1
Belgium	8.3	10.8	TA (L) [b]	n/a	2.5
Canada	1.3	9.5	N	n/a	8.2
Denmark	-0.7	10.6	TA[c]	52	5.8
Finland	16.9	12.1	TA (L) [d]	54	23.8
France	2.6	9.2	TC (L) [e]	n/a	4.3
Germany	8.9	10.1	N [f]	n/a	1.2
Ireland	1.1	11.7	TA (L) [g]	28	5.5
Italy	2.8	11.4	TA (L) [h]	26*	5.6
Japan	-8.7	5.9	TC (L) [i]	n/a	14.6
Netherlands	8.0	8.8	TA	50	-3.6
Norway	-4.9	13.6	TA	28	14.7
Sweden	-9.2	10.2	TA [j]	30	16.3
United Kingdom	-7.6	10.2	TA (L) [k]	25	16.0
United States	2.0	8.4	TA (L) [l]	15	5.1

(a) Tax credit (up to a ceiling) on mortgage interest payments for first-time buyers phased out from 1988.
(b) Deductibility of interest from tax liability limited to 12½% of assessed cadastral rental income. For new, owner-occupied dwellings for the first five years a further 80% of interest paid may be deducted from total income (for tax purposes), declining by 10% in each subsequent year.
(c) From 1987, marginal deductibility progressively reduced from around 68-69%.
(d) 80% of mortgage interest payments deductible up to a ceiling of F.mk. 27,500.
(e) A tax credit of 25% of interest payable up to a ceiling of Fr.fr. 40,000 for married couples for the first five years, or Fr.fr. 20,000 plus additional deductions depending on the number of adults and children in the household.
(f) From 1991, interest payments up to DM 12,000 can be deducted for three years.
(g) 80% of interest payments tax-deductible up to a ceiling of IR£ 3,200 for a married couple.
(h) Interest deductibility limited in 1990 to Lit. 4 million.
(i) The amount of credit limited to interest on the outstanding housing loan of ¥250,000 per household.
(j) Up to 1991 full tax relief.
(k) Limited to interest on debt of £30,000 per residence.
(l) Interest on debt up to $1 million.

(*) Average tax rate in 1991 calculated using revenue data reported by the OECD for a typical production worker.

TC - Tax Credit
TA - Tax Allowance
N - No relief
(L) - up to ceiling
n/a - marginal income tax rates not applicable to the construction of the user cost.

Sources: Alworth and Borio (1992), OECD (1988), and various submissions to the BIS by national organisations.

Annex III

The saving equations used for estimating the coefficients reported in Table 11 can be interpreted as an augmented version of the life-cycle saving hypothesis:

(i) $$S = A\ Y^b\ W^c$$

where S refers to household saving, Y to disposable income and W to financial and non-financial wealth while A captures the influence of other variables, such as demographic factors. For $b + c = 1$, (i) can be rewritten as:

(i') $$S/Y = A(W/Y)^c$$

whereby the long-run saving ratio is seen to be proportional to the long-run wealth/income ratio.

For many countries, however, the homogeneity restriction leading to (i') is not satisfied and another problem is that (i) and (i') are long-run relationships which cannot be expected to hold in the very short run. Hence, to ensure consistency with the data, (i) or (i') are usually estimated using an error-correction approach. Moreover, experience shows that household saving is influenced by a number of factors other than wealth and demographic developments, and to allow for some of these influences the equation actually used for the empirical work was specified as:

(ii) $d(S/Y) =$ $a + b\ dlogY + c\ dlogp_{-1} + e\ ddlogp + f\ log(S/Y)_{-1} + g\ RI_{-1} + h\ dRI + i\ PH_{-1} + j\ dPH + k\ PQ_{-1} + m\ dPQ + n\ Debt_{-1} + o\ dDebt + q\ U_{-1} + r\ dU,$

with

	S	=	household saving at constant prices
	Y	=	disposable income at constant prices
	p	=	consumer prices
	RI	=	nominal interest rate (short or long-term) less changes in consumer prices
	PH	=	index for house prices, deflated by consumer prices
	PQ	=	index for equity prices, deflated by consumer prices
	Debt	=	ratio of household debt to household disposable income or - when such data were not available - bank credit to the private sector relative to disposable income
	U	=	rate of unemployment.

dlogY and RI appear in most versions of the life-cycle hypothesis with the coefficients b and g expected to be positive.[39] The inclusion of dlogp and ddlogp is based on the "misconception hypothesis" proposed by Deaton (1977), according to which

[39] Carroll and Weil (1993) test the sign of b using both household survey and cross-country data. In all cases they find a significant and positive effect of income growth and ascribe this to habit formation in the consumption function. A positive effect may also arise in a life-cycle model with liquidity constraints due to downpayment requirements for home purchases and a positive relation between expected income growth and the value of house purchases.

inflationary surprises will have a positive short-run effect on saving.[40] PH and dPH and PQ and dPQ serve as proxies for changes in non-financial and financial wealth respectively and were included as both levels and rates of change to allow for permanent as well as transitory effects on the saving ratio. Debt and dDebt may be interpreted as correcting for the unrealistic assumption of the life-cycle model that households do not face any credit or liquidity constraints.[41] If a rise in Debt reflects a loosening of such constraints, the coefficient can be expected to be negative. It is more difficult to say whether both Debt and dDebt will have a negative effect. When, as argued by King (1990), financial deregulation should be seen as a regime shift the permanent effect (n) is close to zero, whereas the transitory effect (o) would be very large and continue to reduce saving as long as dDebt is positive. In practice, however, it may be difficult to separate the two effects, as the period during which households adjust their actual debt to the new and higher debt target is likely to be quite long. The inclusion of U_{-1} and dU attempts to capture the buffer stock motive for saving (Carroll (1992)), which can also be interpreted as a life-cycle model extended to allow for precautionary saving. In the standard model permanent income growth and wealth enter without uncertainty, but according to Carroll the wealth/income target is likely to depend on the certainty with which households' expectations of future developments are held. More specifically, when unemployment is high (or rising) households feel more uncertain about future income prospects and are likely to raise the targeted wealth/income ratio. Consequently, U or dU can be expected to have a positive effect on saving and Carroll finds some support for this hypothesis in US survey data and a positive coefficient is also found by Koskela and Viren (1991) on time series for saving in Finland. Carroll further shows that the extension of the life-cycle hypothesis to include a buffer stock motive generates a positive influence of expected income growth, regardless of possible aggregation effects, whereas the expected coefficient on real interest rates is close to zero.

Unfortunately, because of the relatively short sample period and the large number of explanatory variables, the degrees of freedom required for most stability tests are not available. However, to detect possible parameter shifts between the 1970s and the 1980s all equations were re-estimated including a dummy variable with the value of 1 for the period 1980-92 and otherwise 0. Given the focus of this paper, the dummy variable was first included as an intercept shift and then as a shift of the coefficient on house prices.

The results of estimating equation (ii) are presented in Table III.1, with the first column for each country showing the coefficients for a simple error-correction model

---

[40] A fixed a target for long-run real wealth would also produce positive coefficients for dlogp and ddlogp. On the other hand, positive coefficients for the inflation terms could be due to measurement errors, as household saving ratios as measured in the national accounts are overstated in periods of high inflation.

[41] A second reason for including Debt and dDebt is that without these variables the estimated coefficients on PH and dPH are likely to be biased upwards (in absolute terms) because the likely negative influence on saving of financial deregulation would be partly captured by the simultaneous rise in real house prices.

and the last column the final results after removing insignificant variables and testing for possible parameter changes. In most cases an intermediate version is also shown to provide some perspective to the final results. The last line in the table presents the steady-state saving ratios implied by each equation, which may also be used in evaluating the plausibility of the results.

For all countries the lagged saving ratio has a negative and highly significant coefficient, giving some support to the error-correction specification. Income growth is mostly found to have a positive coefficient, though for some countries the t-ratios are rather low. For the remaining variables, the results are rather mixed. Real interest rates have a positive influence on household saving in five countries, whereas in five cases the influence is negative. Higher inflation seems to stimulate household saving in four of the countries while only Norway shows evidence of a negative effect. The buffer stock hypothesis is supported in seven countries while for Italy very significant but negative coefficients were found.

The results for the debt/income ratio, equity prices and house prices were already discussed in the text, except for the instrumental variable used for Norway. When house prices were included together with equity prices (see the intermediate versions of Table III.1), the coefficients of house prices were positive while equity prices and changes in equity prices had a large and negative influence on household saving.[42] However, because the proportion of household wealth held in equities is very small (less than 5%) this negative influence seemed rather implausible. When an instrumental variable (using the lagged debt/income ratio, lagged real income changes and the lagged rate of unemployment as instruments) was applied, the expected negative sign was obtained, but equity prices continued to have a large and negative influence.

[42] As can be seen from Table III.2, equity prices and house prices are highly correlated in several countries, implying that their separate effects on household saving are difficult to estimate. For Japan, Italy and Finland, high positive or negative correlations are observed throughout the 1970-92 period, while for Belgium, Canada, France, the Netherlands, Sweden, the United Kingdom and the United States the high correlations are confined to the 1970s or the 1980s.

Table III.1

Estimated saving equations[1]

Determinants	United States			Japan			Germany [3]			France	
	1.	2.	3.	1.	2.	3. [2]	1.	2.	3.	1.	2.
dlog Y_{-1}	0.18 (1.5)	0.27 (3.9)	0.36 (6.4)	0.23 (2.3)	0.05 (0.7)	-	0.19 (2.0)	0.19 (1.9)	0.29 (4.1)	0.40 (6.3)	0.43 (7.0)
S/Y_{-1}	-0.18 (1.4)	-0.76 (4.3)	-0.45 (6.9)	-0.06 (0.7)	-0.33 (5.1)	-0.37 (4.6)	-0.30 (1.1)	-0.065 (3.9)	-0.68 (6.1)	-0.05 (1.1)	-0.41 (5.5)
dp_{-1}		0.34 (3.8)	0.48 (4.4)		0.25 (4.6)	0.25 (6.5)		-	-		-
ddp		0.10 (2.4)	0.15 (3.4)		-	-		-	-		-
RI_{-1}		0.26 (2.8)	0.31 (3.7)		-	-		-0.31 (2.3)	-0.42 (4.2)		-0.24 (4.0)
dRI		-	-		-0.23 (4.7)	-0.24 (6.4)		-0.17 (2.2)	-0.14 (2.7)		-0.29 (4.7)
$Debt_{-1}$		-	-		-	-		-	-		-
dDebt		-0.24 (4.0)	-0.24 (2.8)		-0.02 (2.3)	-0.03 (2.7)		-0.32 (2.9)	-0.16 (2.5)		-0.14 (3.1)
PQ_{-1}		-	1.42 (2.8)		-	0.23 (1.3)		-1.10 (2.1)	-		-0.67 (1.9)
dPQ		-	-		0.031 (1.6)	0.36 (1.8)		-0.52 (1.1)	-		-0.53 (1.6)
PH_{-1}		-7.09 (2.5)	-2.93 (2.4)		-	-0.53 (1.5)		1.45 (0.7)	-		1.34 (1.2)
dPH		-	11.25 (2.5)		-			-	-1.68 (1.1)		-
U_{-1}		-	-		-			-	-		-
dU		-	-		-				0.61 (4.2)		0.32 (1.5)
C	0.63 (0.7)	9.32 (2.7)	-	-	4.41 (4.2)	5.42 (3.4)	3.38 (1.6)	9.65 (2.3)	9.72 (5.7)	-0.41 (0.5)	5.23 (3.0)
R^2	0.09	0.80	0.84	0.15	0.82	0.84	0.26	0.61	0.78	0.64	0.88
SE	0.99	0.46	0.41	1.09	0.52	0.48	0.83	0.60	0.45	0.71	0.36
DW	1.77	1.89	2.24	1.84	2.93	2.95	1.74	1.15	1.76	1.87	2.13
S/Y*	6.3	7.2	7.0	16.4	18.2	17.3	12.9	13.1	13.0	11.9	16.2
Average S/Y			7.0			17.7			12.8		16.4

[1] Estimated as: $d(S/Y) = a + b\ d\log Y_{-1} + c\ dp_{-1} + e\ ddp + f\ RI_{-1} + g\ dRI + h\ S/Y_{-1} + i\ Debt_{-1} + j\ dDebt + k\ PQ_{-1} + m\ dPQ + n\ PH_{-1} + r\ dPH + s\ U_{-1} + t\ dU$

with S = household saving at constant prices
Y = household disposable income at constant prices
dp = % change in consumer prices
RI = short-term interest rates less current rate of consumer price inflation
Debt = gross household debt as a percentage of disposable income
PQ = index of equity prices deflated by consumer prices
PH = index of house prices deflated by consumer prices
U = rate of unemployment, in percentages
C = intercept
S/Y* = long-term saving rate, derived using average values for dlog Y, dp, Debt, PQ and PH and setting ddp, dDebt, dPQ and dPH = 0 and dlog S = dlog Y
d = first difference operator
and subscripts = lags in years.

Table III.1 (cont.)

Determinants	Italy			United Kingdom			Canada		
	1.	2.	3.[4]	1.	2.	3.[5]	1.	2.	3.
dlog Y_{-1}	0.33 (2.9)	0.63 (4.6)	0.80 (5.5)	0.10 (0.8)	0.18 (1.5)	0.07 (0.7)	0.24 (2.3)	0.06 (1.5)	0.14 (2.3)
S/Y_{-1}	-0.06 (1.3)	-0.14 (2.1)	-0.11 (1.6)	-0.17 (1.0)	-0.99 (3.0)	-1.40 (4.0)	-0.04 (0.5)	-0.40 (9.1)	-0.52 (7.2)
dp-1		0.13 (1.5)	0.18 (2.4)		0.76 (3.3)	-		-	-
ddp		-	-		0.42 (2.6)	-		-	-
RI_{-1}		0.35 (2.7)	0.30 (2.7)		0.90 (3.4)	0.69 (3.0)		-	-
dRI		0.17 (2.7)	0.18 (2.9)		0.55 (3.1)	0.67 (4.7)		-	-
$Debt_{-1}$		-	-		-	-		-	-
dDebt		-	-		-0.38 (4.6)	-0.32 (3.8)		-0.39 (11.2)	-0.43 (10.6)
PQ_{-1}		0.66 (1.8)	0.75 (2.0)		-0.05 (0.1)	-		-3.95 (4.5)	-4.39 (4.5)
dPQ		-	-		0.07 (0.1)	-		-	-
PH_{-1}		5.04 (2.2)	2.80 (1.6)		-6.52 (2.4)	-6.90 (3.0)		1.48 (4.8)	1.17 (2.8)
dPH		4.50 (1.4)	-		-	-		-	
U_{-1}		-0.76 (3.6)	-0.83 (3.9)			0.24 (2.2)		-	0.26 (1.9)
dU		-1.13 (2.5)	-1.25 (2.9)			0.90 (3.0)		-	0.13 (1.0)
C	-0.23 (0.2)	-	1.54 (1.8)	1.44 (0.8)	8.57 (1.8)	12.38 (3.4)	-0.34 (0.3)	6.96 (5.9)	6.57 (5.0)
R^2	0.25	0.56	0.60	0.06	0.64	0.80	0.19	0.88	0.91
SE	1.06	0.80	0.76	1.31	0.82	0.60	1.26	0.49	0.45
DW	1.99	2.13	2.50	1.15	2.21	2.31	1.56	2.79	2.40
S/Y*	10.5	17.1	21.8	9.0	7.0	10.5	15.0	12.0	11.9
Average S/Y			21.5			9.6			10.6

[2] Dummy variable applied to PH_{-1}, with the following results (figures in brackets for 1980-92 show t-ratio for DUM PH_{-1}):

	1970-79	1980-92
Japan	-	-0.53 (1.5)
Belgium	10.62 (4.6)	12.65 (2.5)
Netherlands	-1.51 (1.6)	-0.47 (2.6)

[3] RI measured as long-term interest rate less current rate of inflation.

[4] C only applies to the period 1980-92.

[5] Nominal instead of real interest rate.

[6] Debt measured as bank credits to the private sector as a percentage of disposable income; for Australia, personal sector only, adjusted for break in series in 1989.

[7] PH measured by instrumental variable, using $Debt_{-1}$, RI_{-1} and Y_{-1} as instruments.

Table III.1 (cont.)

Determinants	Australia [6]		Belgium [6]			Denmark [6]		Finland		
	1.	2.	1.	2.	3. [2]	1.	2.	1.	2.	3.
dlog Y_{-1}	0.48 (7.7)	0.52 (10.1)	0.40 (4.4)	0.33 (3.8)	0.39 (5.0)	0.62 (5.5)	0.39 (6.9)	0.07 (0.5)	-	0.06 (0.6)
S/Y_{-1}	-0.09 (1.6)	-0.26 (3.6)	-0.25 (2.0)	-0.51 (3.4)	-0.47 (3.8)	-0.21 (2.1)	-0.84 (6.2)	-0.34 (1.9)	-0.72 (4.2)	-0.67 (3.2)
dp-1		-		-	-		-		-	-
ddp		-		-	-		-		-	-
RI_{-1}		-0.09 (2.4)		0.14 (1.7)	-0.32 (3.2)		-		0.08 (1.6)	-
dRI		-		-0.18 (1.7)	-0.30 (3.0)		0.16 (3.2)		-	-
$Debt_{-1}$		-		-	-		-0.16 (4.7)		-	-
dDebt		-0.21 (2.0)		-0.37 (3.7)	-0.32 (3.8)		-0.15 (4.2)		-0.37 (4.1)	-0.26 (2.8)
PQ_{-1}		-		-	-		4.00 (4.0)		-	-
dPQ		-		0.79 (1.4)	0.85 (1.7)		2.85 (4.5)		-	-
PH_{-1}		1.30 (1.6)		8.18 (3.3)	10.62 (4.6)		-2.49 (0.7)		-2.85 (2.3)	-2.09 (1.5)
dPH		-		14.17 (2.2)	14.78 (2.7)		-11.60 (4.2)		-2.01 (0.9)	-3.86 (1.6)
U_{-1}		-		-	-		0.40 (3.5)			-
dU		0.24 (1.8)		-	-		-			-
C	-0.58 (0.9)	-	2.72 (1.3)	1.18 (0.5)	-1.72 (0.8)	1.24 (1.1)	16.80 (4.5)	1.18 (1.3)	6.90 (3.2)	5.61 (2.1)
R^2	0.75	0.86	0.55	0.76	0.83	0.62	0.95	0.11	0.74	0.70
SE	0.70	0.51	1.20	0.88	0.74	2.18	0.78	1.66	0.91	0.98
DW	1.96	2.20	2.05	2.03	2.12	1.14	2.08	1.62	2.41	2.04
S/Y*	10.8	10.8	15.3	16.0	15.8	11.2	10.0	4.0	5.0	4.4
Average S/Y		9.3			15.3		9.6			3.6

Table III.1 (cont.)

Determinants	Ireland [6]						Netherlands [6]						Norway [3, 6]						Sweden					
	1.		2.		3.[4]		1.		2.		3.[2]		1.		2.		3. [7]		1.		2.		3.	
dlog Y_{-1}	0.38	(3.7)	0.42	(6.0)	0.32	(3.5)	0.23	(2.6)	0.32	(3.7)	0.48	(6.0)	0.51	(2.0)	0.37	(1.6)	0.23	(1.2)	0.41	(1.8)	0.36	(2.8)	0.28	(2.7)
S/Y_{-1}	-0.17	(1.6)	-0.45	(5.3)	-0.55	(5.3)	-0.45	(2.7)	-0.50	(2.8)	-0.33	(2.3)	-0.34	(2.3)	-1.45	(4.8)	-1.05	(5.2)	-0.14	(1.0)	-1.02	(5.6)	-1.00	(5.7)
dp-1			0.20	(4.2)	0.20	(4.3)			-		-				-1.31	(4.1)	-0.76	(3.7)			0.18	(1.1)	-	
ddp			-		-				-		-				-		-				-		-	
RI_{-1}			-		-				-		-				-1.41	(4.0)	-				-		-	
dRI			-		-				-		-				-		-				0.16	(2.0)	0.21	(3.3)
$Debt_{-1}$			-		-				-		-				-0.14	(2.6)	-				-0.19	(4.1)	-0.17	(4.7)
dDebt			-0.14	(1.6)	-0.14	(1.7)			-		-				-		-				-0.12	(2.4)	-0.17	(4.5)
PQ_{-1}			-		-				-		-				-3.83	(3.6)	-5.63	(4.8)			0.43	(0.9)	-	
dPQ			-		-				-		-				-1.39	(2.0)	-1.35	(2.0)			-		-	
PH_{-1}			3.06	(2.8)	5.84	(2.8)			-2.71	(2.5)	-1.51	(1.6)			9.36	(1.4)	-3.50	(4.0)			5.04	(2.6)	4.70	(2.6)
dPH			-		-				-6.04	(2.8)	-5.00	(2.9)			14.27	(1.8)	-4.20	(4.8)			-9.83	(2.9)	-8.47	(2.7)
U_{-1}			-		-				-		-				5.35	(4.3)	-				-		-	
dU			-		-				-		-				4.33	(4.9)	2.63	(4.5)			-		-	
C	0.95	(0.6)	-		-1.33	(1.6)	5.63	(2.5)	8.30	(2.7)	4.25	(1.6)	-0.44	(0.5)	12.00	(1.8)	4.98	(4.4)	-0.25	(0.4)	14.12	(2.9)	14.76	(3.2)
R^2	0.41		0.73		0.75		0.37		0.62		0.77		0.20		0.79		0.81		0.14		0.86		0.87	
SE	1.61		1.08		1.04		0.99		0.77		0.60		2.47		1.26		1.23		1.91		0.76		0.74	
DW	1.65		1.87		1.61		1.17		1.47		2.09		1.49		2.38		2.75		1.27		2.53		2.76	
S/Y*	13.9		12.2		12.6		13.6		13.9		13.6		2.2		2.9		2.7		2.7		1.9		1.6	
Average S/Y					13.8						13.5						2.4						2.0	

Table III.2

The correlation between real equity prices and real house prices

Country	1970-92	1970-80	1981-92
Australia	0.10	-0.10	0.30
Belgium	-0.45	-0.80	-0.22
Canada	-0.10	-0.74	0.44
Denmark	-0.33	0.20	-0.03
Finland	**0.77**	**0.83**	**0.70**
France	**0.52**	**0.88**	0.48
Germany	-0.31	-0.45	-0.46
Ireland	0.04	0.11	-0.06
Italy	-0.67	-0.70	-0.66
Japan	**0.82**	**0.62**	**0.74**
Netherlands	-0.42	-0.71	0.24
Norway	-0.17	-0.42	-0.45
Sweden	-0.36	-0.80	0.39
United Kingdom	**0.58**	-0.10	**0.83**
United States	0.36	-0.58	**0.88**

Note: Positive correlations in excess of 0.5 in bold.

Bibliography

Alworth, Julian S. and Borio, C.E.V. (1992): "The linkages between taxation, private saving decisions and financial intermediation: some international comparisons", in Fair and Boissieu (eds.) *Fiscal policy, taxation and the financial system in an increasingly integrated Europe* pp 69-104, Kluwer Academic Publishers.

Bank of England Quarterly Bulletin (1992): "Note on negative equity in the housing market", Vol. 32, Number 3, pp 266-268.

Bank of Japan (1990): "The recent rise in Japan's land prices: its background and implications", Special Paper, No. 193, December 1990.

Bayoumi, T. (1992): "Financial deregulation and household saving", Bank of England *Working Paper*, No. 5.

Blundell-Wignall, A. and Bullock, M. (1993): "Changes in the characteristics of the Australian business cycle: some lessons for monetary policy from the 1980s and early 1990s" in *Changes in the Business Cycle and the Implications for Monetary Policy*, Bank for International Settlements, April.

Börsch-Supan, A. and Stahl, K. ((1991): "Do savings programs dedicated to home ownership increase personal savings?", *Journal of Public Economics,* pp. 265-97.

Bosworth, B., Burtles, G. and Sabelhaus, J. (1991): "The decline in saving: some microeconomic evidence", *Brookings Papers on Economic Activity*, pp. 183-256.

Breedon, F.J. and Joyce, M.A.S. (1992): "House prices, arrears and possessions: a three equation model for the UK", *Bank of England Working Paper,* No. 14.

Brodin, P.A. and Nymoen, R. (1991): "Wealth effects and exogeneity: the Norwegian consumption function, 1966-89", *Arbeids Notat*, No. 1, Norges Bank.

Brunila, A. and Takala, K. (1993): "Private indebtedness and the banking crisis in Finland", *Working Paper*, No. 9/93, Bank of Finland.

Callen, T. (1991): "Estimates of private sector wealth", *Research Discussion Paper*, No. 9109, Reserve Bank of Australia.

Carroll, C.D. (1992): "The buffer-stock theory of saving: some macroeconomic evidence", *Brookings Papers on Economic Activity*, pp. 61-156.

Carroll, C.D. and Weil, D. N. (1993): "Saving and growth: a reinterpretation", *NBER Working Paper*, No. 4470.

Case, K.E. (1986): "The market for single family homes in the Boston area", *New England Economic Review*, pp 38-48, May/June.

Case, K.E. and Shiller, R. (1988): "The behaviour of home buyers in boom and post-boom markets", Federal Reserve Bank of Boston, *New England Economic Review*, November/December, pp. 29-46.

Case, K.E. and Shiller, R. (1989): "The efficiency of the market for single family homes", *American Economic Review*, Vol. 79, pp. 125-137.

Cutler, D.M., Poterba, J.M. and Summers, L.H. (1990): "Speculative dynamics and the role of feedback traders", *AEA Papers and Proceedings*, May, pp. 63-68.

Davis, E.P. (1977): "Debt, financial fragility and systemic risk", *Clarenden Press*, Oxford.

Deaton, A. (1977): "Involuntary saving through unanticipated inflation", *American Economic Review*, pp. 899-910.

Dicks, M.J. (1990): "A simple model of the housing market", *Bank of England Discussion Paper,* No. 49.

Deutsche Bundesbank (1993): "Zur Vermögenssituation der privaten Haushalte in Deutschland", *Monatsbericht*, Oktober, pp. 19-32.

Economic Planning Advisory Council (1989): "Trends in household debt and assets", *Council Paper*, No. 40, Canberra.

European Community Mortgage Federation (1989): "The valuation of property in the EC countries: a comparitive legal study", Grenz-Echo Verlag, Belgium.

———— " ———— (1993): "The special characteristics of mortgage credit in the EC", Mimeo.

Evans, G.W. (1989): "Pitfalls in testing for explosive bubbles in asset prices", *American Economic Review*, Vol. 81, pp. 922-930.

Fisher, P.G. (1993): "Housing and consumption in the United Kingdom" in *Changes in the Business Cycle and the Implications for Monetary Policy*, Bank for International Settlements, April.

Fleming, M.C. and Nellis, J.G. (1984): "Housing prices in the United Kingdom: the problems of measurement", *National Westminster Bank Quarterly Review*, November, pp. 43-52.

Fleming, M.C. and Nellis, J.G. (1990): "The rise and fall of house prices: causes, consequences and prospects", *National Westminster Bank Quarterly Review*, November, pp. 35-51.

Fuhrer, J.C. (1992): "Do consumers behave as the life-cycle/permanent-income theory of consumption predicts?", *New England Economic Review*, September/October, pp. 3-14.

Garber, P.M. (1990): "Famous first bubbles", *Journal of Economic Perspectives*, Vol. 4, No. 2, pp 35-54.

Goodman, J. and Ittner, J. (1993): "The accuracy of homeowners' estimates of house value", *Working Paper*, No. 131, Economic Activity Section, Federal Reserve System, Washington.

Green, R.K. and Hendershott, P.H. (1993): "Demographic factors and real house prices", *NBER Working Paper,* No. 4332.

Hayashi, F. (1989): "Is Japan's saving rate high?", *Quarterly Review*, Federal Reserve Bank of Minneapolis, Spring, pp. 3-9.

Hayashi, F., Ito, T. and Slemrod, J. (1988): "Housing finance imperfections, taxation and private saving: a comparative simulation analysis of the United States and Japan", *Journal of the Japanese and International Economies*, pp. 215-38.

Hendry, D.F. and von Ungern-Sternberg, T. (1981): "Liquidity and inflation effects on consumers' expenditure" in A. Deaton (ed.) *Essays in the Theory and Measurement of Consumers' Behaviour*, Cambridge University Press, Cambridge.

Hicks, J.R. (1939): "Value and Capital: an inquiry into some fundamental principles of economic theory", *Oxford Clarendon Press*, esp. ch. XIV on income.

Holmans, A.E. (1990): "House prices: changes through time at national and sub-national level", *Government Economic Service Working Paper,* No. 110.

Holmes, M.J. (1993): "Housing equity withdrawal and the average propensity to consume", *Applied Economics*, pp 1315-22.

Horioka, C. (1988): "Saving for housing purchase in Japan" in *Global Role of the Japanese Economy with affluent Savings and accumulated Wealth*, EPA, Tokyo, pp. 213-53.

International Union of Housing Finance Institutions (1992): "International Housing Finance Sourcebook 1992".

Ito, T. and Hirono, K.N. (1993): "Efficiency of the Tokyo housing market", *Bank of Japan Monetary and Economic Studies*, Vol. 2, No. 1, July 1993, pp 1-32.

Ito, T. (1993): "The land/housing problem in Japan: a macroeconomic approach", *Journal of the Japanese and International Economies*, 7, pp. 1-31.

Jappelli, T. and Pagano, M. (1989): "Consumption and capital market imperfections: an international comparison", *American Economic Review*, pp. 1088-1105.

Kaku, K. and Fukuda, K. (1993): "The recent cyclical developments and implications for monetary policy in Japan" in *Changes in the Business Cycle and the Implications for Monetary Policy*, Bank for International Settlements, April.

Kearl, J.R. (1978): "Inflation and relative prices distortions: the case of housing", *Review of Economics and Statistics*, Vol. LX, No. 4, November, pp. 609-14.

Kindleberger, C.P. (1992): "Bubbles" in Newman P., Milgate M. and Eatwell J. (ed): *The new Palgrave dictionary of money and finance*, Vol. 1, Macmillan Press.

King, M. (1990): "Discussion", *Economic Policy*, pp. 383-87.

Koskela, E. and Viren, M. (1991): "Household saving, interest rates, inflation and taxation: some cross-country evidence", *Discussion Papers*, No. 10/91, Bank of Finland.

Koskela, E. and Viren, M. (1992): "Inflation, capital markets and household saving in the Nordic countries", *Scandinavian Journal of Economics*, pp. 215-27.

Koskela, E., Loikkanen, H.A. and Viren,M. (1992): "House prices, household saving and financial market liberalisation in Finland", *European Economic Review*, pp. 549-58.

Lehmussaari, O-P. (1990): "Deregulation and consumption", *IMF Staff Papers*, pp. 71-93.

Lomax, J. (1991): "Housing finance - an international perspective", *Bank of England Quarterly Bulletin*, Vol. 31, No. 1, pp. 56-64.

Longworth, D.J. and Poloz, S.S. (1993): "The changing nature of economic cycles: implications for the conduct of monetary policy" in *Changes in the Business Cycle and the Implications for Monetary Policy*, Bank for International Settlements, April.

Manchester, J. and Poterba, J. (1989): "Second mortgages and household saving", *Regional Science and Urban Economics*, pp. 325-46.

Mankiw, N. and Weil, D. (1989): "The baby boom, the baby bust, and the housing market", *Regional Science and Urban Economics*, Vol. 18, No. 2, pp. 235-58.

Meen, G.P. (1990): "The measurement of mortgage market constraints and the implications for econometric modelling of UK house prices", *Oxford Bulletin of Economics and Statistics*, Vol. 52, No. 1, pp. 1-23.

Miles, D. (1992a): "Housing and the wider economy in the short and long run", *National Institute Economic Review*, pp. 64-78.

Miles, D. (1992b): "Housing markets, consumption and financial liberalisation in the major economies", *European Economic Review*, pp. 1093-1136.

Muellbauer, J. (1992): "Anglo-German differences in housing market dynamics", *European Economic Review*, pp. 539-548.

Muellbauer, J. and Murphy, A. (1990): "Is the UK balance of payments sustainable?", *Economic Policy*, pp. 347-82.

Muellbauer, J. and Murphy, A. (1992): "Booms and busts in the UK housing market", Mimeo.

———— " ———— (1993): "Income expectations, wealth and demography in the aggregate UK consumption function", *manuscript.*

OECD (1988): "Urban housing finance".

Poterba, J.M. (1984): "Tax subsidies to owner-occupied housing: an asset market approach", *Quarterly Journal of Economics*, pp. 729-752.

Poterba, J.M. (1991): "House price dynamics, the role of tax policy and demography", *Brookings Papers on Economic Activity 2*, pp. 143-183.

Sheiner, L. (1993): "Housing prices and the saving of renters", *Federal Reserve Board*, Note.

Sheiner, L. and Weil, D.N. (1992): "The housing wealth of the aged", *NBER Working Paper*, No. 4115.

Skinner, J. (1991): "Housing and saving in the United States", *NBER Working Paper*, No. 3874.

———— " ———— (1993): "Is housing wealth a side show?", *University of Virginia and NBER*, Note.

Smith, L.B., Rosen, K.T., and Fallis, G. (1988): "Recent developments in economic models of housing markets", *Journal of Economic Literature*, Vol. 26, March, pp 29-64.

Steindl, C. (1993): "Changes in the US cycle: shifts in capital spending and balance sheet changes" in *Changes in the Business Cycle and the Implications for Monetary Policy*, Bank for International Settlements, April.

Takayama, N. (1988): "Household asset holdings and the saving rate in Japan", in *The Global Role of the Japanese Economy with affluent Savings and accumulated Wealth*, EPA, Tokyo, pp. 87-197.

Takayame, N. and Kitamura, Y. (1993): "Household saving behaviour in Japan", *Discussion Paper Series A,* No. 280, Hitolsubaski University, Tokyo.

Vaidyanathan, G. (1993): "Consumption, liquidity constraints and economic development", *Journal of Macroeconomics*, pp. 591-610.

van Riet, A.G. (1993): "Monetary policy and the business cycle: the Dutch experience with adjustment under a fixed Guilder/Deutsche Mark exchange rate" in *Changes in the Business Cycle and the Implications for Monetary Policy*, Bank for International Settlements, April.

Wheeler, U. and Chowdhury, A.R. (1993): "The housing market, macroeconomic activity and financial innovation: an empirical analysis of US data", *Applied Economics*, pp. 135-92.

Yoshitomi, M. (1988): "Concluding remarks" in *Global Role of Japanese Economy with affluent Savings and accumulated Wealth,* EPA, Tokyo, pp. 271-84.