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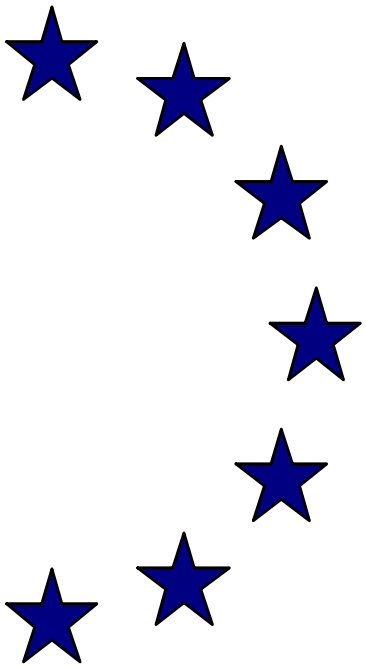

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Assessing the Factors of Resilience of Private Consumption in the Euro Area

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ASSESSING THE FACTORS OF RESILIENCE OF PRIVATE CONSUMPTION IN THE EURO AREA

Final report

The study "Assessing the factors of resilience of private consumption in the euro area (tender ECFIN/C/2004/02) was prepared by the National Institute of Economic and Social Research for the European Commission, Directorate-General for Economic and Financial Affairs.

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December 2005

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EXECUTIVE SUMMARY

Background and objectives

Understanding the behaviour of private consumption is crucial for the assessment of the economic situation in the short and the medium term. As the largest expenditure component of GDP, household spending plays a central role in the cyclical fluctuations of activity around its long-term growth path. According to consumption theory, households endeavour to smooth their spending over the life-cycle, a behaviour which should contribute to dampen the strength of cyclical downswings. However, recent developments in private consumption in the euro area have been disappointing. Since 2001, growth in private consumption has been persistently sluggish and has been much weaker than in some other EU countries or in the USA. Furthermore, after years of a declining trend, households have responded to deteriorating growth conditions with a rise in their saving rate in 2001-02. Since then their saving rate has remained broadly constant.

Against this background the objective of the present study is to analyse the sources of country differences in the resilience of private consumption. The study is based on the combination of a macroeconomic and microeconomic approach. First, an extensive econometric investigation of the macroeconomic determinants of private consumption is carried out for all euro-area Member States (excluding Luxembourg), some other EU countries (UK, Sweden and Denmark) and the USA (*"Part 1: Assessing the factors of resilience of private consumption in the euro area – A macroeconomic perspective"*). Both country-specific regressions and panel regression techniques are applied to macroeconomic data with a view to understand the short-term and long-term determinants of private consumption. Second, the macroeconomic analysis is completed by a microeconomic analysis based on household panel data (*"Part 2: Determinants of household saving in Germany, Spain and the United Kingdom – A microeconomic assessment*"). This part of the analysis, which is restricted to three countries (Germany, the UK and Spain), aims at taking advantage of microeconomic datasets to shed further light on the impact of income uncertainty, demographic changes and, indirectly, structural reforms on savings patterns.

Macroeconomic analysis

The macroeconomic section of the report undertakes extensive econometric investigation of the determinants of consumption in Europe and in the USA using macroeconomic quarterly data. We find that it is possible to explain consumption behaviour using traditional determinants (disposable income and net financial wealth) and that demographic developments and fiscal policy innovations contribute to the explanation. We also find a pervasive role for house price developments. These results help us to understand consumption developments in the last few years. We analyse the factors that have been behind weak consumption in the Euro Area, looking at forecast residuals and the decomposition of equations. We argue that changes in real personal disposable income have been the major factor behind weak growth in many countries, and that developments in financial and tangible (housing) wealth have also had some impact. There has also been residual weakness in consumption in Germany and Italy that may depend on recent changes in institutional environments such as social security and labour market reforms, although in Italy they are as

likely to be associated with weak supply side prospects. Consumption has also been weaker than we might anticipate on the basis of its determinants in Sweden, Finland, and Greece.

As a first step, we develop a common basic econometric framework for all countries where changes in aggregate consumption are based not only on real net financial wealth and real personal disposable income, but also reflect changes in real house prices and real interest rates (instrumented appropriately). A consumption function is estimated for each of the 15 countries considered. The estimated equations are specified as an error correction mechanism which captures both short-term and long-term relations between consumption and its determinants. We undertake panel data analysis in the same framework, and we report results. However, there is evidence from the panel estimation that the diversity of the European economies, especially in their dynamic responses, is significant. We would conclude from our panel work that assessing the factors causing slow consumption growth in Europe is better done using single equations with careful analysis of country-specific problems.

Recognising the diversity and complexity of aggregate consumption patterns across the wide range of countries in our sample, we further augment our econometric specification by explicitly modelling the effects of demographic changes and government spending. Importantly, the analysis of the forecast errors suggests that these two additional determinants improves our understanding of consumption behaviour in some countries, while consumer spending remains puzzling in others and this suggests scope for further work. This exercise is repeated in the panel analysis.

In both the single country studies and the panel estimation we also investigate the role of confidence, and find that it is seldom significant. However, where it is significant we find that it is Granger caused by wealth, but does not Granger cause wealth; consequently, it is redundant in evaluating both forecasts and equations of consumption. We also investigate the role of equity market volatility and of equilibrium unemployment as indicators of uncertainty, but we find no role for them except for the NAIRU in Spain and the US. In the latter two countries a rise in the NAIRU is associated with a rise in the savings ratio. We argue, however, that the significance of this term in the Spanish results is more than adequately picked up by the structural change dummies that have been included.

Basic model specifications involving only income and wealth effects suggest that consumption is largely driven by changes in income in Germany, Austria, Belgium, and Portugal, all of which had relatively unliberalised financial systems for much of the sample. In these countries the long-run real income effects of over 90% suggest a degree of liquidity constrained behaviour as consumers are not able to borrow to smooth their consumption over time. By contrast, the long-run income effect in the US, the UK and Sweden is below around 80%, as these countries have liberalised their financial markets in the late 1980s. They also have experienced major asset price fluctuations and/or banking crises, which may have prompted consumers to respond more actively to changes in asset values that are reflected in financial wealth holdings. The short run dynamics of income and financial wealth complement the long run elasticities – countries with strong dynamic income terms, such as Germany and Austria, tend to have weaker, if any, dynamic wealth terms. Not surprisingly, several Scandinavian countries along with the UK and the USA display the strongest dynamic wealth terms in the sample.

The inclusion of real interest rates and house prices tends to improve the general fit of the equations suggesting that these variables are important determinants of consumption patterns in Europe and the USA. The change in real house prices was found to be statistically significant in Germany, the UK, the USA, the Netherlands, Spain, Portugal, and Scandinavian

countries. With the notable exception of Germany, all the countries with significant house price effects have experienced housing market booms in recent years. In the context of limited financial liberalisation and significant evidence of liquidity constrained behaviour, German house prices have not followed the upward trajectory seen in many other countries and our findings suggest that lacklustre housing market developments may have contributed to weak consumption growth in Germany.

Changes in house prices did not have a statistically significant impact on aggregate consumption in France, Italy and Ireland – all countries where anecdotal evidence suggests a positive impact of rapidly rising house prices on consumption. The explanation of relative cycles in housing markets along with relatively recent strides in financial liberalisation may explain the statistical and economic insignificance of house prices on consumption in France and Italy. An additional possible explanation is that housing wealth effects are better captured by housing wealth data than by house price data. The case of Ireland may merit a somewhat different explanation: the rapid rise of nominal house prices may be more rooted in the impressive GDP and income growth over a sustained period of time. In this context, real house prices may be merely adjusting to the growing demand and prevailing income levels.

The inclusion of population composition into the model suggests that demographic changes may help explain changes in aggregate consumption patterns in Germany, France, Italy, Spain, Sweden and the USA. That we did not find demographic composition to be important in more countries in our sample may be due to relatively small aggregate changes in the overall population composition in many European countries over the entire sample. Where deep and liquid financial markets existed for much of the time covered by our sample, they helped to smooth consumption and thus render demographic factors less relevant as explicit determinants of changes in consumption. Where the impact of population composition is statistically significant, it tends to be of similar economic magnitude. In general, an increase in the share of younger age groups tends to lift consumption growth while an increase in the share of older age groups tends to reduce it. However, the share of the very young and the very old cohorts are both negatively correlated with consumption in Germany, again pointing to a limited scale of consumption smoothing in that country. Furthermore, the proportion of people over 65 in Germany has been rising somewhat faster in recent years as compared to the 1990s and this too may have weakened consumption growth in recent years although this effect seems so far to have remained small.

Overall, our findings indicate that fiscal developments have a limited impact on aggregate consumption. Changes in fiscal positions were found to be statistically significant in Spain, Sweden, Netherlands, Finland, Ireland and Italy and the results conformed to the accepted explanation of the Ricardian effects. Interestingly, significant level effects had a negative sign in the USA, confirming that US fiscal deficits have boosted consumption growth over the sample period. This may point to qualitatively different government spending in Europe as compared to the USA, but further analysis is needed to illuminate this point.

Microeconomic analysis

The microeconomic section of the report provides an analysis of savings behaviour based on household panel data in three countries (Germany, Spain and UK). Panel data were collected for the late 1990s and early 2000s (only 1998 and 2003 in the case of Germany). The microeconomic section draws on a graphical analysis of savings ratio by age and income cohorts as well as on estimated equations of savings behaviour. It aims at complementing the macroeconomic analysis which suggests that part of the recent weakness in private

consumption cannot be explained by traditional macroeconomic determinants in some Member States such as Germany.

First and perhaps most importantly the microeconomic data shed some light on what has been happening in Germany, when the aggregate savings ratio rose slightly between 1998 and 2003. Data by age and income cohort a-priori suggests that saving by households on middle and high incomes rose between these two years, with the effect being particularly marked among young households on high incomes. This is confirmed by econometric analysis which shows that the rise in the overall savings ratio between the two years may be mostly attributed to increased saving among households with high incomes. Such households can have a disproportionate influence on overall saving. In addition, the impression created from the fitted equations is that young people in Germany have a high savings ratio and this is probably what lies behind the overall savings ratio which can be described as high relative to other countries given that the pension scheme is not funded.

Another aspect of the rise in savings rates in Germany is that savings rates of employed households in their thirties have increased between 1998 and 2003. This is unlikely to be a consequence of life-cycle saving which tends to take place closer to retirement. However it may be precautionary saving associated with a fear of unemployment. It is not possible to assess whether that is in fact the case because we cannot observe fears from the available data. However further study would make it possible to assess unemployment risk as influenced by economic and demographic variables and to establish whether a latent variable describing this had any influence on saving behaviour.

An effect which emerges very clearly from the German data- which are of the highest quality of the three countries we studied both because the sample sizes are large and because the income questions are very methodical- is that an important influence on the pattern of aggregate saving by age is the composition of the population. Saving as a function of income may not change very much with age, but if people tend to move through income categories aggregate saving will be affected.

Less important, but interesting nevertheless is the fact that employed households save more than non-employed households even after adjusting for income. This may again indicate saving driven by fear of unemployment.

The pattern for Spain and the United Kingdom is less clear. In neither case can we match the movements in the micro-data to movements in the macro-economic aggregates. For both countries and particularly for Spain, savings patterns are much more volatile than they are for Germany. This results from much smaller samples and, in the case of Spain a survey which is much more focused on collecting consumption than income data. However the overall Spanish data give an impression of high saving by young households but declining with age, unlike Germany where it is increasing with age. Estimated regressions, particularly for low and middle income households, reinforce this impression and this may be a factor behind Spain’s high overall savings rate.

The United Kingdom offers a contrast to this continental picture of high saving by young people. The data indicate a savings rate which rises up to the age of thirty at least with further rises up to the age of fifty or later. The estimated regressions present this picture rather more strongly, with low saving by young people and even those on high incomes. Unless young people on high incomes expect further relative increases with the passage of time it is unlikely that the low savings rates can be attributed to life-cycle effects; they are more probably an indication of a credit culture which has depressed saving in the United Kingdom for a long

period.

We explored the effects of income uncertainty in all three countries using the measures which were available. We found a strong positive influence of income uncertainty on saving in the United Kingdom. In Germany we did not identify a significant effect. In Spain, where the only indicator of income uncertainty was constructed from the ratio of actual to normal income, the variable entered the equation with the wrong sign. It is impossible to say whether exploration of alternative measures of uncertainty would shed further light on this.

PART 1: ASSESSING THE FACTORS OF RESILIENCE OF PRIVATE CONSUMPTION IN THE EURO AREA – A MACROECONOMIC PERSPECTIVE[1]

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1 Introduction

The macroeconomic section of the project report provides a literature survey on aggregate consumption and saving, details the construction of a dataset, and provides an extended econometric assessment of determinants of aggregate consumption. We seek to cover all euro area countries (except Luxembourg), Sweden, Denmark, the UK and the US. Our principal analysis of consumption and saving at a macro level is based on recent developments in economics and econometrics and builds on work at the National Institute, as detailed in the references below. We undertake panel or single-country estimation for error correction models of aggregate consumption using quarterly data, with the objective of explaining recent behaviour rather than just attempting to test recent theories, although our results also throw light on their relevance. Static and dynamic residual analysis casts light on the recent cross-country patterns of consumption and causes of weak consumption in the Euro Area. We present decompositions of the factors affecting consumption derived from our preferred equations. These provide a good explanation of behaviour given all the factors that we study and hence can be used to explain weak consumption.

In the second section we report on average growth of consumption, personal disposable incomes and real financial wealth on average from 1990 to 2001 and then in each subsequent year. It is clear from this table that we have some developments to explain in Germany, and to a lesser extent in Italy, Finland, and Portugal, Otherwise, the three variables seem to tell a coherent story, with low income growth being accompanied by low consumption growth. Our empirical work suggests that we can explain much of the weakness in consumption in these countries, but not all of it, and that in Germany there are clearly developments that are difficult to capture in time series analyses. In general weak consumption is largely explained by weak growth in real personal disposable incomes, but other factors are contributing.

It is commonly assumed that aggregate consumption is largely a function of current real disposable incomes, and hence weak income growth explains sluggish consumption. Such an explanation is indeed consistent with the most basic textbook analysis of consumption based on Keynes' absolute income hypothesis and its popularization by Hicks and Hansen. However, recent consumption weakness in Europe may not be fully explained by weak income growth. Indeed, other factors appear to have been at work. However, these generally make a rather small contribution to our explanation with the exception of house price effects in a number of countries, and some of our variables, such as demographic indicators, evolve slowly over time and hence cannot be expected to make a contribution to explaining a sharp slowdown in consumption.

These additional effects and their link to income can be rationalised in the context of the life cycle hypothesis of consumption and saving. This framework forms the baseline for a great deal of empirically usable work on consumption, suggesting as it does that consumers accumulate assets during working life so as to live on the surplus during retirement (Ando and Modigliani 1963). Accordingly, planned consumption is a function of total wealth, based on human wealth and non-human wealth. This can be seen in the version of the Life-Cycle Hypothesis as derived in Deaton (1992). In this model, planned consumption (C_t^*) is a function of total wealth. Total wealth is the sum of human wealth (H_t) and non-human wealth (W_{t-1}).

Planned consumption can accordingly be expressed as a function of H_t and W_{t-1}

$$C_t^* = m(H_t + W_{t-1}) \qquad (1.1)$$

where *m* is the Marginal Propensity to Consume (MPC) out of total resources on average across the population. Meanwhile, unobservable human wealth can be proxied by some function *k* of current labour income (i.e. $H_t = kY_t$). The coefficient on human wealth (i.e. income) will be boosted when there are liquidity constraints on the availability of credit, since it implies that current consumption is closely tied to receipts of current income. Ultimately with liquidity constraints and no liquid wealth the equation would reduce to the naïve Keynesian equation with income only. More realistically, the ability to consume out of wealth, and in particular illiquid wealth, is enhanced when there are no liquidity constraints, and such wealth can be used to enhance consumption smoothing over time – either directly via decumulation or as security for borrowing. Hence we should expect that the dynamics of adjustment and the long run equilibrium in consumption equations will be influenced by the existence of liquidity constraints.

An indicator of the incidence of liquidity constraints can be constructed from the relative size of both the short and long run coefficients on income and those on financial and non-financial wealth terms in the consumption function. When there are no credit constraints, as in a liberalised financial system, the impact of current income in the short and long run should be lower, since consumers can borrow to cover shortfalls in income. Correspondingly, the short and long run impact of wealth will be greater, since it can be either directly decumulated or used as collateral for borrowing. On the other hand, we might expect to see a relatively larger role for recent changes in income in systems with more liquidity constrained consumers, whilst financial and especially non-financial wealth may have more influence when liquidity constraints are lower.

In assessing their current and future permanent income, consumers may take into account current fiscal policy (as they will anticipate repaying debt in future taxes in a Ricardian manner). Expected fiscal changes of governments (e.g. to pay for pension promises) will also be relevant, albeit harder to proxy. Uncertainty may be expected to reduce consumption for a given configuration of income and wealth, if the consumer accordingly requires a higher level of precautionary saving. Confidence indicators or share price volatility might show these effects. Demographic effects may also be important if the propensity to consume varies consistently in respect of age, as is implicit in the life cycle model. We explore these points in further detail below.

Recent studies by Institute staff, detailed in an annex, and our work in this paper use the ARDL (autoregressive distributed lag) approach to estimation, with an error correction specification, as indeed do recent studies in the US such as Davis and Palumbo (2001) and Lettau and Ludvigson (2004). We note that there is an alternative approach to the theory of consumption based on the Euler equation, which seeks to aggregate the optimal intertemporal consumption decision of a representative consumer characterised by rational expectations (Hall 1978). This suggests that consumption should be a random walk with a discount factor such as the real interest rate being the only relevant driving variable. The negative discount factor proxies the effect on consumption of intertemporal substitution ("the reward from saving").

While there is extensive empirical work with such equations in the US, it has become increasingly clear that consumption is in practice forecastable using additional lagged variables, notably income changes predicted from lagged information. Furthermore, the Euler approach in its pure sense leaves out long run information on the relationship between assets, income and consumption – and may suffer worse aggregation problems than "solved out" equations incorporating lags (Muellbauer and Lattimore 1995). The theory is also vitiated by

its assumption that all consumers are unconstrained in credit markets (Sarantis and Stewart 2003), and observed behaviour may be the result of some consumers optimising along an Euler relationship whilst others adjust consumption in relation to their current income. On the other hand, it is possible to nest an Euler specification within an ARDL model by including the current real interest rate, as do Barrell and Davis (2004a). The results show decisively that consumption is not appropriately modelled as a function of the interest rate alone, given the additional significance of differenced and levels terms in consumption itself, income and wealth.

The principal quarterly data needed for consumption estimation are aggregate consumption, real personal disposable income and net financial wealth (with real wealth derived using the consumers' expenditure deflator). These are drawn from standard sources and are as employed in the NiGEM model (Barrell et al 2003) and are discussed in the appendix. The data set is approximately complete, but some wealth data for Greece and Ireland have been constructed by NIESR as these series are not available from official sources after 1997. In addition some wealth data is constructed for the last year of our estimation period. Quarterly data on consumption and income for some countries has only been available since the 1990s, and although back series have now been constructed, it is clear that in, for instance, Belgium, Greece, Ireland and Denmark the data series do not have the same time series properties in the 1970s as in the 1990s.

In this study we find that it is possible to explain consumption with income and wealth effects, but we have to be careful with dynamics, add structural breaks, and utilise other variables where appropriate. Our preferred relationships include the growth of house prices in all countries except Austria, Italy, France, Belgium, Ireland Portugal and the Netherlands. Fiscal effects are present in Finland, the Netherlands, Sweden, Ireland, Italy, Greece and the US, mainly as dynamic effects, and population factors help explain consumption in the US, France, Sweden and the Netherlands. There are clear unexplained effects in Germany, Italy and Sweden in these equations.

2 Background data and previous studies

Before estimating equations it is worth asking what problems we think we might have to explain, and table 1 reports on average income, consumption and real financial wealth growth from 1990 to 2001, and compares this average to the developments in the three subsequent years. If consumption, income, and wealth are all growing at about the same rate there would be little to explain. If consumption is growing relatively more slowly in the recent past, given developments in income and wealth, then we might need to look for an explanation.

In France consumption growth has been more robust than we might have anticipated given data on income and wealth, whilst in Germany, apart from 2004, very weak income and wealth growth could explain weak consumption, but at first glance it does look as if it has been additionally weak. Italian consumption looks weak, but so does income growth, and there may be unexplained weakness. In Belgium consumption growth has been marginally weak, whilst both income and wealth (until 2004) were very weak. In Finland all three variables have been strong. Spanish, Greek and Irish consumption looks robust. Although Dutch consumption is weak, it also could be explained by income developments, as could Austrian weakness. Portuguese consumption looks as if it moves closely with income growth. From a simple analysis of the data we would expect to be looking for an explanation of weak consumption growth in Germany, much more than in other countries. There may also be a need to explain weak consumption growth in Italy, the Netherlands, Austria and perhaps Portugal.

Table 1: Growth in key variables
(Annual percentage change)

	BGC	BGRPDI	BGRNW	DKC	DKRPDI	DKRNW
Average 1990-2001	2.0	1.9	1.8	1.6	1.5	6.9
2002	0.3	0.9	-7.8	0.6	1.9	-8.9
2003	2.2	0.9	-6.1	0.9	1.1	3.3
2004	2.1	0.8	5.1	4.3	2.9	10.9

	FNC	FNRPDI	FNRNW	FRC	FRRPDI	FRRNW
Average 1990-2001	1.1	1.0	4.8	1.7	2.3	5.4
2002	1.6	3.0	3.5	2.3	3.2	0.0
2003	4.4	5.2	2.1	1.6	1.1	4.6
2004	2.8	5.2	16.7	2.3	1.7	5.8

	GEC	GERPDI	GERNW	GRC	GRRPDI	GRRNW
Average 1990-2001	3.6	3.5	5.0	2.3	1.5	9.7
2002	-0.5	0.0	6.6	3.3	2.0	-0.5
2003	0.1	0.6	-2.7	4.5	2.5	1.5
2004	0.2	0.7	10.6	4.4	6.6	0.9

	IRC	IRRPDI	IRRNW	ITC	ITRPDI	ITRNW
Average 1990-2001	5.0	5.2	6.8	1.7	0.3	4.3
2002	3.6	3.3	-25.9	0.4	0.6	-8.7
2003	3.4	0.3	-7.9	1.4	-0.1	3.8
2004	3.8	3.2	35.2	1.0	1.6	6.0

	NLC	NLRPDI	NLRNW	OEC	OERPDI	OERNW
Average 1990-2001	2.7	2.1	4.1	2.2	1.4	0.5
2002	0.9	1.6	-14.4	-0.1	0.1	0.7
2003	-0.7	-0.7	2.6	0.6	1.4	4.4
2004	0.0	-0.4	3.8	1.5	0.6	4.5

	PTC	PTRPDI	PTRNW	SDC	SDRPDI	SDRNW
Average 1990-2001	2.8	2.9	-2.9	1.3	2.4	2.5
2002	1.2	0.8	-1.5	1.4	2.2	-13.4
2003	-0.4	-0.1	-1.6	1.5	1.1	-3.3
2004	2.5	2.1	37.5	1.8	1.4	14.1

	SPC	SPRPDI	SPRNW	UKC	UKRPDI	UKRNW
Average 1990-2001	2.7	2.7	5.4	2.6	2.8	5.3
2002	2.9	3.6	-7.5	3.5	1.7	-13.8
2003	2.6	3.1	1.3	2.6	2.8	-7.2
2004	4.4	3.2	5.1	3.7	2.1	4.8

	USC	USRPDI	USRNW
Average 1990-2001	3.3	2.8	4.6
2002	2.7	3.4	-9.9
2003	2.9	2.6	0.5
2004	3.9	3.5	8.6

Key: C real consumption; RPDI real personal disposable income, RNW real personal net financial wealth.

The statistical properties of our consumption, income and wealth data are set out in Table 2 which indicates the data range and reports ADF tests on these data. In general the logs of the

data are not stationary, but once first differenced, they are, and hence the series are of order 1. It is therefore possible that for each country, consumption, income and wealth represent a cointegrating set.

Table 2: Full data period and ADF tests

	Data sample	LC	LRPDI	LRNW	DLC	DLRDPI	DLRNW
Belgium	70q2-03q4	-3.4	-2.2	-3.6	-5.7	-8.5	-7.1
Denmark	71q2-03q4	-2.1	-4.3	-2.0	-7.0	-7.1	-6.8
Finland	79q2-03q4	-1.6	-2.8	-1.3	-4.3	-5.5	-4.6
France	70q1-03q4	-2.6	-1.8	-2.9	-5.9	-11.2	-6.5
Germany	71q1-03q4	-1.4	-1.5	-3.9	-9.0	-8.5	-10.1
Greece	64q2-03q4	-3.2	-2.8	-2.1	-7.4	-4.1	-7.2
Ireland	77q2-03q3	-1.0	-1.1	-3.0	-2.5	-5.9	-5.5
Italy	72q1-03q4	-2.2	-1.4	-0.4	-4.9	-9.8	-7.8
Netherlands	70q2-03q4	-1.0	-3.13	-3.8	-6.6	-9.5	-8.5
Austria	70q2-04q1	-4.4	-2.8	-2.5	-11.2	-8.0	-5.8
Portugal	80q3-02q4	-2.0	-3.0	-2.1	-3.9	-4.6	-5.6
Sweden	61q2-03q4	-2.6	-2.0	-1.7	-5.4	-6.6	-7.1
Spain	70q2-03q4	-1.5	-1.5	-2.4	-4.0	-10.0	-5.2
US	61q2-04q2	-3.1	-3.6	-1.9	-6.5	-8.7	-8.4
UK	64q2-03q4	-1.5	-2.3	-2.1	-7.8	-9.0	-8.5

Key: LC is the log of real consumption; LRPDI the log of real personal disposable income, LRNW the log of real personal net financial wealth, a "D" prefix indicates the difference of the relevant variable. Critical value for a unit root at 95% level is -2.9

In order to evaluate the differential evolution of consumption in Europe we need access to wider ranges of data. These include estimates of real three month money market interest rates, consumer confidence indicators and fiscal balances. House price data is available from the BIS or ECB for all euro area countries, and it has been used in Barrell, Davis and Pomerantz (2004). Demographic data are drawn from the UN Demographic database (UN Population Division 2004). We use monthly share price data from Primark Datastream to derive the conditional volatility of equity prices. The indicators of the equilibrium level of unemployment that we use were provided by the Commission. The real interest rate, which is defined in a forward looking manner as the current short rate less annualised one-quarter ahead inflation, is a constructed variable that measures the true indicator with error and hence it is instrumented. Data for the tangible (mainly housing) wealth of households has been located for a subset of euro area countries, namely Germany, France, Italy, the Netherlands and Ireland, as well as for the UK and the US. As this data set is incomplete we discuss consumption with housing wealth effects in a separate section.

The macroeconomic effects of changes in employment legislation and pensions policies in the Euro Area were modelled via addition of dummy variables. These were based on a number of sources including the FRDB Social Reforms Database, which is compiled by Fondazione Rodolfo Debenedetti. The database includes details of the reforms in the following areas: pensions, employment protection and non-employment benefits. Data for all the Euro Area countries are included from 1987/1988 to 2001/2002. Since changes to social policies are ongoing in most countries, only years with structural reforms were used in the econometric estimation. In cases where several marginal reforms together added up to a substantial package of changes, this was included in estimation also. The information on when the reforms were announced was proxied by the starting quarter for the dummy variable in an attempt to model the effects of social reforms as accurately as possible in the context of a

macroeconomic model specification. (An Appendix contains a list of country specific reforms which were chosen for this exercise.)

In order to formally test the validity of the long run cointegrating relation between consumption, income and wealth, we run a series of regressions on the logs of these variables and conduct standard ADF tests on the residuals. Table 3 details the results for three regressions, where the first has unrestricted coefficients, the second imposes homogeneity across income and wealth effects, and the third repeats the first equation with the addition of a single step-dummy in the spirit of Perron (1989). Where it is possible, we have used the FRDB dataset to identify periods of reform measures to construct Perron-step variables.

Table 3: Long run cointegrating relations ADF tests

	BG	**DK**	**FN**	**FR**	**GE**	**GR**	**IR**	**IT**
Sample	74Q1-04Q4	74Q1-04Q4	79Q1-04Q4	74Q1-04Q4	74Q1-04Q4	74Q1-04Q4	77Q2-04Q4	74Q1-04Q4
E	-2.108	-2.405	-3.074	-2.291	-2.536	-4.398	-3.992	-3.433
E*	-2.109	-2.408	-3.016	-1.520	-2.254	-2.118	-4.062	-3.168
E**	-2.652	-4.106	-2.994	-2.702	-3.477	-5.485	-3.519	-3.926

	NL	**OE**	**PT**	**SD**	**SP**	**UK**	**US**
Sample	74Q1-04Q4	74Q1-04Q4	74Q1-04Q4	74Q1-04Q4	82Q1-04Q4	74Q1-04Q4	74Q1-04Q4
E	-2.103	-2.081	-2.636	-2.807	-4.588	-1.766	-2.798
E*	-2.496	-1.289	-2.126	-1.882	-4.122	-1.823	-1.805
E**	-4.151	-1.982	-4.373	-3.105	-4.893	-2.197	--

[a] Fourth order ADF test statistics reported

[b] Residuals E reported from the following cointegrating regressions where "delta" is a step dummy :

1. lnC = a + b*lnRPDI + c*lnRNW + E
2. lnC = a + b*lnRPDI + (1-b)* lnRNW + E*
3. lnC = a + b*lnRPDI + c*lnRNW + delta + E**

Dummys based on the FRDB dataset were included for Belgium, 1997 pensions reform; Finland, 1991 employment reform; France, 2000 employment reforms; Italy, 1995 pensions reforms; UK, 1996 non employment benefits reforms; and Spain, 1992 for unemployment benefit reforms and 1997 pensions reforms. Dummies were also included for the impacts of deregulation of the financial market in the UK, with 1989 chosen as the central year, for the post 1980 impacts of the Wassenauer agreements in the Netherlands (see Barrell and Genre (1999 for details), the deep structural reforms that began in the Swedish welfare state in 1992, and for the impacts on French consumption of ERM and Maastricht related policy changes in 1992. There is also clear evidence of structural break in the data during the re-unification of Germany, and this may reflect either a change in behaviour or the differences between West and unified Germany.

Overall, the test statistics do not reveal strong cointegrating relations. However, it is instructive to note that reform-based step equations (based on E**) find significant improvements in the test statistics when there is little difference between the first two equations (E and E*). This clearly holds for Denmark, Germany, Greece, the Netherlands, and Portugal, with positive, but slighter improvements for Belgium, France, Italy, and the UK. Indeed, the sample lengths employed are considerable and, as illustrated in the FRDB dataset, speckled with various reforms which can give rise to structural shifts. It is well known in the literature that such shifts can give rise to a unit root in a series when, in fact, it would otherwise be found to be stationary (see Perron (1989)). Therefore, without taking account of every potential break in the data, it would be difficult to conclude that these relations fail to

cointegrate. In addition, at this stage we have not included any of the other variables, such as house prices, that might determine consumption, and hence we cannot yet conclude that no cointegration is common. Another measure for assessing a cointegrating relation is advocated by Banerjee et al. (1993) which suggests that, in a full error correction model, finding an ECM term with a t-statistic greater than 3 (in absolute value) provides strong evidence of a cointegrating relation.

Issues raised by the consumption literature.
Following equation (1.1), if we assume that planned consumption does not always equal actual consumption and that human wealth can be proxied by some function *k* of current labour income (i.e. $H_t = kLY_t$) we can derive the following relationship for actual consumption (C_t)

$$C_t = aLY_t + bW_{t-1} + \varepsilon_t \qquad (2.1)$$

Our approach is consistent with that of Lettau and Ludwigson (2004), although we use a different definition of wealth and income, as there are no housing wealth data available for most countries in this study. Hence, we use a different definition of income, as the absence of housing wealth suggests we should use an income variable that includes income from housing. Lettau and Ludwigson (2004) argue that when wealth changes one must distinguish between the signal about longer run prospects one reads from the change and the noise related to temporary fluctuations in market values. We denote the structural component of wealth as W* and the transitory component as (W-W*). We would expect that the propensity to consume out of transitory wealth would be much lower than out of permanent wealth (i.e. $v_1 >> v_2$ below). A rise in equity or bond prices may reflect changes in long term interest rates or market perceptions of the future value of the equity stock that do not impact on the income flow from the asset, which we would denote r*W*. If wealth is held only for the income flow, then it would be wise to use the flow in our relationship, and not wealth. We may write this as

$$C_t^* = m\left(kLY_t + W_{t-1}\right) = m(kLY_t + k_1 r_t^* W_{t-1}^* + v_1 W_{t-1}^* + v_2 (W^*_{t-1} - W_{t-1})) \ . \qquad (2.2)$$

If $k=k_1$ then we should use total income instead of labour income in our regressions in order to avoid polluting (and perhaps exaggerating) our estimates of the effects of wealth. However, it is possible that wealth is held for precautionary reasons, as Carroll (2001) stresses, and not only for its income flow or its ability to shift consumption over time. Hence we should include both the income flow and the level of wealth, but also distinguish in our analysis between transitory and permanent changes in wealth. Hence we use the approximation

$$C_t = aRPDI_t + bRNW_{t-1} + \varepsilon_t \qquad (2.3)$$

Where RPDI is total real personal disposable income and RNW is real net financial wealth, excluding tangible assets. This equation is also appropriate in a forecasting context, as it saves splitting income into components.

However, this approximation of consumption behaviour has problems in describing consumption, income and wealth relationships, especially in growing economies. As suggested by Campbell and Deaton (1989), real income in levels is unlikely to be difference stationary. In particular, the first difference of the level of income does not display constant variance; earlier increases in the level of income, in any reasonable sample of data, are likely to be substantially less than increases later in the sample.

This non-constant variance would mean any long-run relationship for consumption would be potentially spurious, given that not all of our variables are difference stationary, and a short run error correction model (ECM) for consumption would have non-stationary dynamics. Campbell and Deaton (1989) argue that most logarithmic specifications fit the data much better than estimating the linear relationship, say, between the ratio of consumption to income and the ratio of wealth to income. It is clearly also much easier to analyse the dynamics of adjustment within a logarithmic model. Consequently we adopt a logarithmic approximation for equation (2.3) to ensure that income, in natural logs, is difference stationary and hence that our long-run relationship can be non-spurious. The logarithmic approximation is as follows

$$\ln C_t = c_0 + \alpha \ln RPDI_t + \beta \ln RNW_{t-1} + \xi_t \qquad (2.4)$$

In the presence of non-stationary data, we avoid using a static regression approach by utilising a dynamic error correction model, as advocated by Banerjee et al. (1993). Consequently, the estimated models feature a common error-correction formulation, with the long run, derived from (2.5), having terms in consumption, real personal disposable income and real net wealth, and short run dynamics and the real interest rate are added.

Our econometric approach hence involves the following consumption specification, with the observed real interest rate being instrumented as it is a proxy indicator for the underlying expected real interest rate:

$$\Delta \ln C_t = \alpha_0 + \alpha_1 * \ln C_{t-1} + \beta_1 * \ln RPDI_{t-1} + \beta_2 * \ln RNW_{t-1} + \gamma_i * \Delta \ln RNW_{t-j} + \gamma_i * \Delta \ln RPDI_{t-k} + \delta * RR_t + \delta_1 dRR_{t-1} \qquad (2.5)$$

In this context, the presence of variables other than the intercept and the real interest rate (RR_t) allows us to test for the validity of the Euler equation representation.

Housing wealth and consumption

Housing wealth can be allowed for in a consumption function in two different ways. We mainly follow the strand in the literature on consumption that uses changes in real house prices as an indicator of the potential impact of tangible wealth on consumption (see Ludwig and Sloek (2002)). Accordingly, we test for the difference of real house prices as a proxy for the dynamic impacts of tangible wealth, in addition to the log-difference of real net financial wealth. This permits a wide country coverage, since house prices are generally available. However, it is not feasible to include house prices in the long run solution, as they are not in the same dimension as housing wealth, because they are an index[2]. Hence it is not possible to calculate a marginal propensity to consume out of housing wealth, and the omission may bias results.

What one would ideally need is an estimate of the total stock of wealth in order that one can evaluate the relative impact of a one unit of currency change in net financial wealth as compared to a unit of non-financial wealth. These data are generally not available for euro area countries, and an appendix discusses results for countries where this data is available, and also looks at the existing literature, summarised by Catte et al (2004a). This study also investigates the role of housing equity withdrawal in consumption functions, and our comments on this are also discussed in the annex.

[2] Housing wealth is the house price multiplied by the housing stock, or $HW_t = PH_t * HS_t$. Without the housing stock it is impossible to scale the effects of house prices in the regression.

Demography

A corollary of the life cycle hypothesis is that a population which is unevenly distributed across age cohorts will have a separate demographic influence on aggregate saving behaviour. Omission of demographics (implicitly assuming a "representative-agent" approach is accurate) is likely to lead to errors in analysis and forecasting of consumption. Pioneering work in this area was by Fair and Dominguez (1991); Attfield and Cannon (2003) apply their work to the UK using a vector-error-correction approach. A further key background empirical paper is Masson et al (1995) who found the total dependency ratio to have a significant negative effect on private saving in a panel of both advanced and developing countries.

Following these studies, we test for demographic effects on consumption over and above the standard determinants, using the age cohorts 20-39, 40-64 and 65+ relative to the population. We note that most earlier work on demographics and consumption, as well as having fewer data points, also featured much more simple approaches to consumption estimation. It is important to investigate demographic effects in a fully specified model, as it may be possible that some of the impacts of demography on consumption are shared with wealth, which is accumulated in part to ensure the consumption smoothing that cohort evolution necessitates, only with the inclusion of both will we be able to evaluate correctly the separate effects.

A growing amount of empirical work suggests that personal saving is importantly influenced by pension arrangements and pension reform (World Bank (1994), Davis (1995)). In principle, funding of pensions could generate increased saving (Kohl and O'Brien (1998)). Illiquidity of pension assets may mean that other household wealth may not be reduced one-to-one when pension assets increase. Interaction between the need for retirement income and retirement behaviour may increase saving in a growing economy, as workers increase saving to provide for an earlier planned retirement. As unfunded social security is typically seen to reduce saving, because it implies an accumulation of implicit claims on future income, a switch toward funding of pensions should increase it (Feldstein 1995). There might be 'recognition effect' as people who witness the transition via pension reform from PAYG to funded systems realise the importance of saving for retirement. Tax incentives that raise the rate of return on saving via life insurance or pension funds may encourage higher aggregate saving. (McCarthy and Neuberger 2004).For recent empirical analyses of the positive effect on saving from funding of pensions, see Bosworth and Burtless (2004), while on the implicit wealth accumulation in pay-as-you-go systems reducing saving see Rossi and Visco (1995) and Feldstein (1995). However, these important issues are impossible to address in a macro-economic context except through the use of policy related dummy variables as in the discussion of the FRDB database.

Ricardian effects and consumption

Ricardian effects are tested by inclusion of appropriate variables reflecting government expenditures, deficits and/or debt ratios in the basic consumption specification. We note that in the empirical literature there have been a number of studies looking at fiscal effects on consumption, most of which have rejected Ricardian equivalence. For example Masson et al (1995) find a Ricardian offset from fiscal expansion raising household income of around 50% in 21 advanced countries, while Giavazzi et al (2000) reject Ricardian equivalence for a panel of 18 OECD countries. However, both OECD (2004) and Pomerantz and Weale (2005) find impacts of government surpluses on the savings rate using panel data analysis across a range of countries. Their results suggest that a one per cent of GDP increase in the government surplus would reduce private sector saving by around 2/3rds of that amount, leaving national saving increased. However, these studies use reduced form explanations and do not look directly at the determinants of consumption, and part of the result could come, for instance, through the impact of government borrowing on real interest rates.

As noted in Hemming et al (2002), there are a number of difficulties to be faced in estimating Ricardian equivalence in consumption, notably there is a need to include government spending which affects permanent income even in a Ricardian world, as otherwise there may be overestimation of other government variables. Also there is a signalling effect of debt financed tax cuts on future spending and taxation, which may vary between countries and over time. In this context it will be relevant to consider future impacts of fiscal policy in the context of the ageing of the population and the costs of pension systems, as illustrated in Dang et al (2001), Casey et al (2003) and Bogaert and Cotis (2001). Our own approach is simply to add the difference and lagged level of the fiscal position to the standard consumption function. The difference is instrumented given possible simultaneity with consumption. These coefficients give a preliminary indication of the degree of Ricardian behaviour in the European economies, and it is significant, albeit noticeably smaller than the reduced form estimates would suggest.

Consumer confidence, uncertainty and structural reforms

Both ongoing structural reforms and rising concerns related to the implications of aging could impact on consumption through their effects on the confidence consumers have in their income prospects. We attempt to incorporate the standard consumer confidence indicators in the consumption function, while noting that these may largely reflect short term issues such as the risk of unemployment. We also include indicators of the volatility of wealth, and of the equilibrium level of unemployment. We include these as they may both increase the need for precautionary saving. More volatile wealth may raise saving as may the risk of unemployment. An increase in equilibrium unemployment for given level of expected incomes will increase the expected volatility of incomes as the chances that individuals pass through spells of unemployment are increased.

The role of consumer confidence indicators is very similar to that of financial wealth, as this will reflect forward looking information contained in the equity markets. US evidence from Ludvigson (2004) shows that in that country, confidence does contain forward looking information but much of that information can be provided by other popular economic and financial indicators, and independent information provided is limited. There is thought to be a partial link to future income growth and non-stock-market wealth, although there remains a residual not accounted for by these variables. Although we can justify a separate role for confidence indicators, we would expect that we would find them significant but unimportant in a wider panel than the countries in Pain and Weale (2001).

As an alternative to direct confidence indicators, we use a conditional volatility indicator for the factors affecting consumer confidence, namely the conditional volatility of share prices derived from a GARCH model. Byrne and Davis (2004) undertook extensive research on the impact of such uncertainty indicators in respect of fixed investment, and found exchange rate volatility had a significant negative impact on investment. Rather less has been done on consumption, which is paradoxical given the focus of the "Consumption CAPM" asset pricing model on the links from equity markets to consumption. Nevertheless, we note that some relevant work using GARCH has been undertaken in Japan, where Oyama and Yoshida (1999) found an impact of uncertainty on consumption in Japan – but not in Germany or the US - including the error on a first order GARCH model in income in the aggregate consumption function. An alternative proxy suggested by Maravall and Planas (1999) is the standard error of a one period ahead forecast error from a univariate time series model for personal income. We can also compare the inclusion of confidence/uncertainty indicators to the work we have undertaken on the micro data sets that takes account of the uncertainty of expected income.

Annex: NIESR work on consumption

Barrell, Byrne and Dury (2003) found evidence of an effect of net financial wealth as well as income on consumption in the European economies, and tested in a panel context for differences between European countries. They found that it is possible to show that France, Germany, the Netherlands and Austria have similar consumption behaviour with significant financial wealth effects, but with some difference in the dynamics of adjustment. Byrne and Davis (2003) analysed the impact of disaggregated financial wealth on consumption for G-7 countries, and found that, contrary to earlier empirical work, illiquid financial wealth, (equities, bonds, life insurance and pension assets less mortgage debt) scaled by personal disposable income (PDI), tends to be a more significant long-run determinant of consumption than liquid financial wealth (deposits and money market instruments less other debt) across the G-7. They suggested that this pattern reflects a shift from liquidity constrained to life cycle behaviour following financial liberalisation, and also a more disaggregated pattern of wealth holding. Results were robust in SUR analysis, tested in a nested manner, using varying definitions of liquid assets and using non-property income instead of personal disposable income.

Barrell and Choy (2003) and Barrell and Davis (2004a) estimated consumption functions for the UK and the G-5 respectively, in the latter on a country-by-country and on a SUR panel basis (including pooled mean group estimation), which encapsulate roles for both financial and tangible wealth, where the latter is closely linked to the value of the stock of privately owned housing. Results suggest that housing-related tangible wealth plays a distinctive role in the determination of consumption in the short- and long-run. They also detected a marked negative effect of real interest rates.

An alternative to use of tangible wealth is non-financial asset prices. Analysts suggest that these have played a role in the evolution of consumption in many countries. Using GLS panel estimation for 19 countries, Barrell, Davis and Pomerantz (2004) found such a role for house prices in consumption, where the short run effect of a given rise in house prices on consumption far exceeded that of net financial wealth. Their estimates were used to analyse the effect of a banking or currency crisis on consumption, and the work showed that consumption plays an important role in the macroeconomic adjustment following a financial crisis. Furthermore, the effect of a crisis is aggravated by high leverage, notably as shown by the effect of a high debt-income ratio, despite the benefits of financial liberalisation in easing liquidity constraints. It is also greater in a small open economy than in the G-7. Meanwhile, falling house prices were shown to be part of the transmission process of financial instability, and high nominal interest rates are an indicator of sharp declines in consumption.

Barrell and Davis (2004b) sought to assess directly the impact of financial liberalisation on consumption. Their prior view is that the removal of liquidity constraints during liberalisation may reduce the response of consumption to short run changes in real personal disposable income, and may boost wealth effects correspondingly. They accordingly reported estimates of the significance of leveraged dummies for financial liberalisation within consumption functions featuring both tangible and financial wealth for the G-5 and two smaller OECD countries for which data are available, namely Canada and Sweden. The results are consistent with marked shifts in consumer behaviour over the five years following liberalisation, with a greater degree of consumption smoothing. They also find that wealth effects become more relevant and convergence to the desired consumption path is more rapid after liberalisation.

Al Eyd, Barrell and Holland (2005) investigate the role of wealth effects and find that financial market openness is clearly a factor behind the propagation of shocks in the world economy. They argue that it would be wrong to conclude that financial market openness has been a major factor behind coordinated movements in output. There is evidence that equity prices affect consumption in most economies, but the evidence to support a direct effect on investment is weak, at least outside the US and the UK. Work on the determinants of consumption suggests that the impact of changes in wealth on consumption in the Euro Area is, as least in the short term, small, although it builds up over time.

Al Eyd et al (2005) undertake two sets of experiments, and show that the pattern of fiscal multipliers is dominated by openness to trade, but that openness to foreign financial markets, as measured by Gross assets to GDP, reduces the scale of the multiplier, as do overall holdings of wealth. Some crowding out does come from domestic holdings of equities. They also undertake equity price shocks that are temporary, and in general when they shock Euro Area equity markets, the effects are small. It is clear that equity price shocks that originate in the US have significantly greater impacts than those that originate in Europe. Spillovers from global equity price shocks account for 80 to 90 per cent of the impacts of a global shock in the Euro Area, with most of the spillover coming from the US. This reflects the fact that the US response to a change in wealth is higher than in the Euro Area, in part because equity wealth to income is 2.5 times higher, and also because there are stronger impact effects of wealth. This in turn is driven by the significantly higher level of direct equity wealth ownership in the US, where over half of households own equities directly, whilst in Europe most equities in individual wealth are owned by institutions that offer life assurance and pensions.

3 Single Country Estimation

3.1. The workhorse model

The examination of the determinants of aggregate consumption begins with a detailed analysis of single country models of consumption based on our "workhorse" error-correction model (ECM) given by (3.1). By sequentially modifying the dynamic terms in (3.1), we are able to examine several alternative representations for each country. This systematic approach permits us to identify the contributions of specific variables and can also be seen as indirectly testing for the validity of the standard Euler equation representation.

$$\Delta \ln C_t = \alpha_0 + \alpha_1 * \ln C_{t-1} + \beta_1 * \ln RPDI_{t-1} + \beta_2 * \ln RNW_{t-1}$$
$$+ \gamma_i * \Delta \ln RNW_{t-j} + \gamma_i * \Delta \ln RPDI_{t-k} + \delta * RR_t + \delta_1 dRR_{t-1} + \delta_2 \Delta \ln RPH_t \qquad (3.1)$$

where *RPDI* is real personal disposable income, *RNW* is real financial wealth, *RR* is the level of the real interest rate, *RPH* is the real price of housing, and static homogeneity is imposed on the long run income and wealth terms. As discussed above, a log approximation is employed to ensure that the errors are stationary and that the estimation is efficient. In addition, the sample period is 1974-2004, which covers a long period of time but avoids the potentially differing behaviour in the pre Bretton Woods era.

Setting $\delta = \delta_1 = \delta_2 = 0$, we begin with a "basic" equation which only contains dynamic terms in income and wealth. This basic equation sets a common specification across countries where we endeavour to find significant roles for these dynamic terms. We then proceed by adding real interest rates in an effort to detect intertemporal substitution effects. Finally, we incorporate real house price effects to arrive at an equation which is in line with the recent literature discussed above. This new workhorse model serves to facilitate the examination of further dynamic terms of interest to this study.

Initial Basic Equations

We begin by looking at the "basic" equation results in Table 4 where it can be seen that the specification given by (2.5) was found to be estimable for all countries, except Spain where the significance level of the ECM indicates a failure to cointegrate. The ECM values (or speed of adjustment) vary substantially from a very slow speed of adjustment found in Sweden, 0.025 (per cent per quarter), to a relatively rapid adjustment of 0.29, found in Germany. Significance levels for the ECM terms in Denmark, Sweden and Belgium are low and suggest that, as with Spain, the equations may be mis-specified. We would expect the speed of adjustment to increase in both size and significance with the addition of relevant relations in the cointegrating vector. In general, the ECM terms across our sample of countries suggest a moderate convergence to the long run equilibrium where, for the remaining countries, the speed of adjustment is below 0.1, with the additional exceptions of Finland, Portugal and the Netherlands, all yielding just over 0.1.

Examining the long run elasticities, we can see long run real income effects of over 90% in Germany, Belgium, Denmark, Portugal, and Austria which, with the exception of Denmark, all had relatively unliberalised financial systems for much of the sample (see Boone et al. (2001)). As a result, the corresponding long run wealth effects in these countries are below 0.1 (given that long run homogeneity is imposed). Elsewhere, the long run income effect is somewhat lower, at 0.8-0.9 in Greece, France, Finland, the Netherlands and Ireland, while it is below 0.8 in Sweden, Italy, the UK, and the US.[3] The latter result is not surprising since all of these countries have liberalised financial markets and have experienced major asset price booms and/or banking crises over the sample, which might induce consumers to respond more to asset values. Stronger long run wealth effects (and, hence, weaker long run income effects) suggest a positive degree of consumption smoothing, while stronger long run income effects suggest a degree of liquidity constrained behaviour. In Italy, however, there is a large long run wealth effect; although, this can be attributed to the large amount of government debt held by the personal sector.

We note that using similar panel and single equation estimation techniques, Al-Eyd and Barrell (2005) find evidence of liquidity constrained behaviour in France and Germany, while finding less of this behaviour in the UK. The authors suggested that liquidity constrained behaviour, whether driven by financial market developments and/or other structural factors may be more binding in the former set of countries. Indeed, taken in terms of the life cycle/permanent income approach to consumption, *a priori*, in a financially liberalised country one might expect to find small or insignificant elasticities on short term income in addition to significant elasticities on short run wealth, including the real price of housing (see below). Conversely, significant income elasticities accompanied by insignificant wealth elasticities suggests that consumption is being driven by current income rather than overall wealth. The data do not tell us if these findings are driven by choice or necessity; however, this type of *ad hoc* interpretation is "industry standard" insofar as exercises of this nature are

[3] Given the failure to find a cointegrating relation in Spain over this sample period, these Basic results are inconclusive.

concerned (see for example Al-Eyd and Barrell (2005), Blundell-Wignall et al (1995), Campbell and Mankiw (1991), and Barrell and Davis (2004b)).

The short run dynamics support our priors regarding liquidity constrained consumers. In particular, we find that countries with strong dynamic income terms tend to have weaker, if any, dynamic wealth terms. This is because the strong presence of the former indicates significant liquidity constrained behaviour and thus little or no ability for agents to finance current consumption out of wealth. This holds clearly for Germany, Greece, Austria, and Portugal which, as mentioned above, are countries that were slow to liberalise their financial markets. We also fail to find significant wealth terms for the Netherlands and Belgium, although the income effect is rather weak in these countries. Other countries with smaller or less significant dynamic income terms tend to have the strongest dynamic wealth terms of the sample. This includes countries such as Sweden, Denmark, the UK and the US, all of which are financially liberalised. Some exceptions, however, are France, Finland and Ireland where these countries have substantial dynamic effects from both income and wealth terms. This is likely to be a result of the sample period where a strengthening of financial market reforms in the latter part of the sample coupled with a strong early income effect have combined to yield this outcome. A shallow, but persistent short run income effect in the US and the UK (evidenced by current and first-lagged significance of RPDI) complements a solid wealth effect.

The overall results from these Basic equations find that the speeds of adjustment are moderate, and in some cases are of borderline significance. Moreover, the presence of strong wealth and income effects (or a mixture of the two) is consistent with particular structural factors, including the stage of financial sector development and indicators of liquidity constrained behaviour. These Basic equations are of interest to this study because they are the "normal" way of modelling consumption (e.g. Muellbauer and Lattimore (1995)) and their weaknesses suggest that we would find systematic forecast failure using them. As a result, additional variables may prove to be relevant indicators of consumption and should be explored for their significance and additional forecasting power.

Real Interest Rates

The results from the basic equations are in line with our priors in respect of the degree and nature of financial market reform and reflect the data sample over which they were estimated. In general, we find that strong and significant terms in differences and levels of income and wealth lend support to an empirical representation for consumption that is more complex than suggested by the standard Euler equation approach. With the aim of finding intertemporal substitution effects, we now introduce the real interest rate into the analysis (where these series are derived from an instrumental variables procedure using lagged values of nominal interest rates and inflation).

Looking at Table 5, there is a significant (and negatively signed) lagged level term for the real interest rate in Italy, with borderline significance in the US, Germany, Ireland, Belgium, Sweden and the Netherlands. In addition, all of these countries except Germany have significant (or borderline significant) current difference terms for the real interest rate. The remaining countries – Austria, Belgium, Denmark, Finland, Greece, Portugal, Spain and the UK – fail to find significant, or correctly signed, real interest rate effects at either the level or current difference terms. As with the basic equation analysis, all else equal, one might expect to find significant real interest rate effects in countries with more developed financial markets and fewer liquidity constrained agents where the availability of loans makes current income less of a constraint on consumption. The results in Table 5, however, do not align as clearly with our priors as in the basic equations.

A notable feature of this set of estimations is that, in many countries, the ECM term gains both in size and in terms of significance with the addition of the real interest rate. This lends some empirical support to an intertemporal substitution effect and is in line with theoretical approach of the Euler equation approach. However, it is clear from the significance of other variables that the macro data do not lend much support to the presumption that consumers are forward looking with constant risk aversion, employ time wise separable utility functions that are essentially quadratic (so that we can use certainty equivalence), and who maximise over a long time horizon.

Real House Prices

Anecdotal evidence suggests that high and rapidly rising house prices help to support consumption growth. Most countries in the sample have experienced significant housing market booms over the past decade. Where a house price boom has ended, as in the Netherlands, consumption growth became sluggish or even negative (Debelle 2004). As shown in Table 6, with the inclusion of house prices into the basic model, the size and significance of the speed of adjustment coefficient is an improvement over the two previous models for France, Italy, the UK, the US, Spain, Germany, Portugal and Denmark. And, in all countries, except Belgium, the t-statistic of this ECM term has increased to 2.0 or above.

The magnitude of the effect of real house prices on changes in consumption over the entire sample period is most pronounced in Portugal, closely followed by those in Finland, Germany and the US and the UK. Perhaps, this is somewhat surprising, given the relatively depressed level of house price stability in Germany over the past decade. German house prices have not followed the upward trajectory seen in many European countries and in North America and have actually declined slightly since the late 1990s. Given the econometric results presented here, this might suggest that house prices have been a negative driver of German consumption growth over the past decade.

Significant house price effects are also found in Denmark, Sweden and Spain. Interestingly, the Spanish equation shows a marked improvement over the previous model estimates with the ECM term nearly doubling in size and becoming statistically significant. This suggests that the long run relations are now cointegrating and this is supported by significant long run income and wealth effects which are more in line with the other countries.

Despite the fact that Ireland has experienced a long period of rapidly rising nominal house prices there is no significant evidence of its contribution to consumption growth. Indeed, the rise in Ireland's house prices may be rooted in the impressive GDP and income growth that it has experienced over a sustained period of time, rather than in a housing boom that gives rise to strong wealth effects in consumption. Taken in this context, house prices may not be viewed as rising too rapidly, but merely adjusting to the growing demand and prevailing income levels and so may not stand out as a significant driver of aggregate consumption in Ireland.

Country Comparisons

The econometric results in Table 6 support the notion that consumption behaviour tends to be most similar in the UK and the US. Examining the long run elasticities, income and financial wealth effects in the UK and the US are similar to each other in magnitude, while the short-run dynamic adjustment in (lagged) income and financial wealth terms are nearly identical. Although the short-run income effect is somewhat larger in the UK as compared to that in the US, the dynamic adjustment process in both countries is rather similar. At the same time, interest rates seem to have a bigger impact on consumption in the US, as compared to the UK.

Including house prices reverses the sign on the interest rate coefficient in the UK, while it remains negative in the US; however, this term still remains insignificant in both country models.

Perhaps not surprisingly, Germany and Austria also exhibit a level of similarity in patterns of consumption behaviour. The long run income and wealth elasticities are similar in the Basic estimates and they grow closer with the addition of real interest rates and house prices. The dynamic adjustment process is also similar in both countries. Although the size of the income effect is larger in Germany as compared to Austria, net financial wealth does not play a role in the way either country's private consumption adjusts. Again, this remains the case with the addition of real interest rates and house prices.

Observations on Single Equation Estimates

Our analysis so far has revealed several important points about the determinants of aggregate consumption. In general, the speed of adjustment terms in the model specification tend to improve in both size and statistical significance with the addition of real interest rates and real house prices. The general fit and diagnostics of the equations also show some improvement with the addition of these two extra variables. If forecasts were to be constructed and evaluated using only the basic equation, then they would be missing information available in relationships that involve real interest rates and house prices. These observations lend some empirical support to the rejection of the standard Euler equation representation, at least over this sample period. The empirical findings presented here are in line with anecdotal evidence, prior estimates and other studies relating to the degree of financial market liberalisation, and liquidity constrained behaviour.

In our full model, real interest rates are significant in levels only in Italy, and perhaps also in the Netherlands, Ireland and the US. House price effects are more pervasive and they are insignificant only in Belgium, Ireland, Austria, France and Italy. In short, our analysis suggests that real interest rates and especially house prices appear to contribute toward a fuller understanding of the determinants of aggregate consumption patterns in the US and in some countries in Europe beyond that which can be explained through changes in income and financial wealth alone. Clearly, specification problems remain as serial correlation tests often fail, and we turn to these issues next.

Table 4: Single Equation Consumption Estimates Using Non-linear Least Squares (Basic equations)*

	OE	GR	FR	IT	UK	US	SP
Sample	74Q1-04Q4	74Q1-04Q4	74Q1-04Q4	74Q1-04Q4	74Q1-04Q4	74Q1-04Q4	82Q1-04Q4
Constant	-0.008	-0.005	-0.013	-0.036	-0.028	-0.012	-0.016
	(1.23)	(1.65)	(2.4)	(4.2)	(4.79)	(2.00)	(3.13)
ECM	-0.075	-0.038	-0.073	-0.068	-0.047	-0.061	-0.024
	(2.53)	(3.41)	(3.98)	(6.0)	(2.08)	(3.02)	(0.91)
ln RPDI(-1)	0.984	0.889	0.885	0.781	0.641	0.780	0.347
	(27.12)	(30.14)	(26.9)	(32.7)	(3.93)	(16.65)	(0.50)
ln RNW(-1)	0.016	0.101	0.115	0.219	0.359	0.220	0.653
D ln RPDI	0.272	0.481	0.418	0.148	0.223	0.149	
	(5.23)	(7.80)	(3.78)	(2.3)	(5.77)	(3.28)	
D ln RPDI(-1)					0.220	0.141	
					(5.66)	(3.19)	
D ln RNW					0.022	0.024	
					(2.61)	(2.03)	
D ln RNW(-1)			0.029				
			(2.4)				
Intercept dummy			92Q1	80Q1	89Q1		86Q1 92Q1
Single-point dummies	93Q1 77Q4 78Q1 84Q4	96Q1 99Q1 99Q3 00Q1	74Q4 80Q1 80Q2 96Q1	78Q2 78Q3 80Q1 84Q1 92Q3 92Q4 93Q1 93Q2 97Q2	78Q4 79Q2 79Q3 80Q2 80Q4 84Q3 97Q3	74Q1 74Q4 78Q2 80Q2 81Q4	96Q3 97Q3
R^2 adjusted	0.52	0.53	0.34	0.49	0.70	0.51	0.41
SE	0.012	0.0072	0.0056	0.0048	0.0059	0.0045	0.0055
LM(4)	14.87	25.75	10.2	12.7	2.28	11.51	3.75

Key: C stands for real consumption; RPDI for real personal disposable income, RNW for real personal net financial wealth, ECM for the error correction terms. A "D" prefix indicates the difference of the relevant variable.

Table 4 (cont.): **Single Equation Estimates using Nonlinear Least Squares** (Basic Equations)*

	GE	SD	NL	BG	PT	FN	DK	IR
Sample	74Q1-04Q4	74Q1-04Q4	74Q1-04Q4	74Q1-04Q4	80Q4-04Q4	79Q4-04Q4	74Q1-04Q4	77Q2-04Q4
Constant	-0.056	-0.006	-0.027	-0.01	-0.047	-0.007	0.3E-3	-0.018
	(4.0)	(2.1)	(3.0)	(1.5)	(4.5)	(2.1)	(0.1)	(3.3)
ECM	-0.293	-0.025	-0.121	-0.041	-0.105	-0.102	-0.039	-0.097
	(4.6)	(2.0)	(4.1)	(2.0)	(3.0)	(2.5)	(2.0)	(3.7)
ln RPDI(-1)	0.94	0.787	0.885	0.925	0.966	0.822	0.91	0.888
	(64.9)	(8.7)	(26.5)	(17.6)	(24.03)	(16.6)	(13.1)	(27.52)
ln RNW(-1)	0.06	0.213	0.115	0.075	0.034	0.178	0.08	0.112
D ln RPDI	0.774		0.118	0.161	0.252	0.497		0.278
	(13.8)		(2.4)	(2.2)	(4.4)	(5.9)		(4.8)
D ln RPDI(-1)						-0.306		
						(3.7)		
D ln RNW		0.027				0.027		0.0396
		(5.9)				(2.4)		(2.5)
D ln RNW(-1)							0.044	0.027
							(5.2)	(2.7)
D ln C(-1)		0.418				0.308		
		(5.9)				(3.6)		
Intercept Dummy	90Q1	92Q3	80Q1		86Q1			
Single point Dummy		75Q1; 77Q1; 82Q1; 93Q1; 97Q3; 99Q4;	74Q1;	75Q4; 92Q3; 80Q1;		82Q4; 83Q4; 92Q1; 02Q1; Time;	74Q2; 78Q4; 79Q1; 79Q3 86Q1; 93Q1; 94Q1;	82Q1; 99Q2; 99Q3;
R^2 adjusted	0.62	0.53	0.22	0.28	0.27	0.65	0.43	0.57
SE	0.006	0.004	0.008	0.005	0.008	0.006	0.01	0.007
LM(4)	6.1	14.3	5.6	7.6	4.8	13.1	2.0	5.1

Key: C stands for real consumption; RPDI for real personal disposable income, RNW for real personal net financial wealth, ECM for the error correction terms. A "D" prefix indicates the difference of the relevant variable.

Table 5: Single Equation Consumption Estimates Using Non-linear Least Squares (including real interest rates)*

	OE	GR	FR	IT	UK	US	SP
Sample	74Q1-04Q4	74Q1-04Q4	74Q1-04Q4	74Q1-04Q4	74Q1-04Q4	74Q1-04Q4	82Q1-04Q4
Constant	-0.010 (1.26)	-0.005 (1.51)	-0.016 (2.6)	-0.055 (5.7)	-0.029 (4.40)	-0.016 (2.54)	-0.018 (3.32)
ECM	-0.083 (2.72)	-0.039 (2.98)	-0.091 (3.5)	-0.094 (7.3)	-0.048 (2.07)	-0.076 (3.42)	-0.029 (1.06)
ln RPDI(-1)	0.981 (30.18)	0.894 (24.30)	0.896 (31.8)	0.785 (47.5)	0.638 (3.86)	0.779 (21.22)	0.459 (0.93)
ln RNW(-1)	0.019	0.106	0.104	0.215	0.362	0.221	0.541
D ln RPDI	0.192 (1.71)	0.472 (7.07)	0.411 (3.7)	0.209 (3.3)	0.223 (5.75)	0.174 (3.91)	
D ln RPDI(-1)					0.222 (5.50)	0.129 (3.01)	
D ln RNW				0.025 (2.1)	0.022 (2.59)	0.029 (2.53)	
D ln RNW(-1)			0.026 (2.15)				
RR (-1)	0. 4E-4 (0.04)	0.5E-5 (0.24)	0.4E-3 (1.0)	-0.7E-31 (3.9)	-0.2E-2 (0.11)	-0.3E-3 (1.63)	0.5E-3 (1.22)
D RR	-0.5E-3 (0.59)	0.8E-4 (0.39)		-0.4E-3 (1.8)		-0.7E-3 (2.14)	0.3E-3 (1.02)
R^2 adjusted	0.52	0.52	0.34	0.55	0.70	0.55	0.41
SE	0.012	0.0073	0.0056	0.0045	0.0060	0.0044	0.0055
LM(4)	12.61	27.91	9.8	7.8	2.28	14.09	3.13

* Dummy variables same as those in Basic equations (Table 3.1) unless reported differently here.

Key: C stands for real consumption; RPDI for real personal disposable income, RNW for real personal net financial wealth, ECM for the error correction terms, RR for the real interest rate. A "D" prefix indicates the difference of the relevant variable.

Table 5 (cont.): Single Equation Estimates using Nonlinear Least Squares
(Including Real Interest Rates)*

	GE	SD	NL	BG	PT	FN	DK	IR
Sample	74Q1-04Q4	74Q1-04Q4	74Q1-04Q4	74Q1-04Q4	80Q4-04Q4	79Q4-04Q4	77Q2-04Q4	77Q2-04Q4
Constant	-0.055	-0.011	-0.022	-0.004	-0.047	-0.007	0.001	-0.008
	(4.0)	(2.8)	(2.4)	(0.5)	(4.5)	(1.7)	(0.3)	(1.2)
ECM	-0.301	-0.039	-0.151	-0.035	-0.106	-0.01	-0.034	-0.057
	(4.8)	(2.7)	(4.6)	(1.7)	(3.0)	(2.5)	(1.7)	(1.9)
ln RPDI(-1)	0.942	0.817	0.923	0.962	0.967	0.823	0.918	0.886
	(67.1)	(15.6)	(33.1)	(16.2)	(24.2)	(16.2)	(10.6)	(16.4)
ln RNW(-1)	0.058	0.183	0.077	0.038	0.033	0.177	0.082	0.114
D ln RPDI	0.764		0.147	0.231	0.277	0.495		0.401
	(13.7)		(2.9)	(2.7)	(2.8)	(5.6)		(5.6)
D ln RPDI(-1)						-0.304		
						(3.4)		
D ln RNW		0.028				0.027		0.021
		(4.4)				(2.4)		(1.9)
D ln RNW(-1)							0.043	
							(4.5)	
D ln C(-1)		0.418				0.308		
		(5.9)				(3.6)		
RR(-1)	-0.6E-3	0.4E-3	-0.9E-3	-0.3E-3	-0.5E-4	-0.2E-4	-0.2E-3	-0.5E-3
	(1.7)	(1.6)	(1.9)	(1.6)	(0.1)	(0.1)	(0.2)	(1.6)
D RR		0.4E-3	-0.001	-0.4E-3	-0.9E-4			-0.001
		(2.0)	(2.1)	(1.5)	(0.3)			(2.8)
R^2 adjusted	0.63	0.54	0.25	0.29	0.26	0.65	0.42	0.59
SE	0.007	0.004	0.008	0.005	0.008	0.006	0.01	0.007
LM(4)	6.4	17.9	6.9	6.7	4.8	13.0	3.7	5.6

* Dummy variables same as those in Basic equations (Table 3.1) unless reported differently here.

Key: C stands for real consumption; RPDI for real personal disposable income, RNW for real personal net financial wealth, ECM for the error correction terms, RR for the real interest rate. A "D" prefix indicates the difference of the relevant variable.

Table 6: Single Equation Consumption Estimates Using Non-linear Least Squares (including real interest rates and house prices data)*

	OE	GR[a]	FR	IT	UK	US	SP
Sample	74Q1-04Q4	74Q1-04Q4	74Q1-04Q4	74Q1-04Q4	74Q1-04Q4	75Q3-04Q4	82Q1-04Q4
Constant	-0.011 (1.58)	-0.004 (0.97)	-0.015 (2.15)	-0.055 (5.8)	-0.015 (2.10)	-0.019 (2.95)	-0.016 (3.36)
ECM	-0.075 (2.45)	-0.033 (2.51)	-0.089 (3.4)	-0.095 (7.3)	-0.071 (3.14)	-0.097 (3.92)	-0.054 (1.99)
ln RPDI(-1)	0.966 (26.46)	0.877 (17.00)	0.905 (25.2)	0.784 (47.9)	0.873 (13.72)	0.812 (28.33)	0.769 (6.23)
ln RNW(-1)	0.034	0.123	0.095	0.216	0.127	0.188	0.231
D ln RPDI	0.314 (4.53)	0.495 (8.18)	0.412 (3.7)	0.214 (3.4)	0.197 (5.28)	0.160 (3.29)	
D ln RPDI(-1)					0.187 (4.79)	0.117 (2.57)	
D ln RNW				0.024 (2.0)	0.021 (2.61)	0.031 (2.64)	
D ln RNW(-1)			0.027 (2.18)				
RR (-1)	0.6E-3 (1.49)	0.1E-3 (0.65)	0.4E-3 (1.0)	-0.8E-3 (4.0)	0.1E-3 (0.34)	-0.4E-3 (1.70)	
D RR				-0.4E-3 (2.0)		-0.8E-3 (2.79)	
D ln RPH	-0.064 (1.04)	-0.102 (1.63)		-0.01 (1.0)	0.107 (3.78)	0.112 (2.56)	0.088 (2.95)
D ln RPH(-1)			0.021 (0.43)				
R^2 adjusted	0.55	0.55	0.34	0.55	0.73	0.51	0.46
SE	0.012	0.0069	0.0057	0.0045	0.0056	0.0042	0.0053
LM(4)	18.42	21.13	9.7	9.2	4.02	12.95	3.42

[a] Greek house price data are not available prior to 1990Q1.

* Dummy variables same as those in Basic equations (Table 3.1) unless reported differently here.

Key: C stands for real consumption; RPDI for real personal disposable income, RNW for real personal net financial wealth, ECM for the error correction terms, RR for the real interest rate, RPH for real house prices. A "D" prefix indicates the difference of the relevant variable.

Table 6 (cont.): Single Equation Estimates using Nonlinear Least Squares
(Including Real Interest Rates and Real House Prices)*

	GE	SD	NL	BG	PT	FN	DK	IR
Sample	74Q1-04Q4	74Q1-04Q4	74Q1-04Q4	74Q1-04Q4	80Q4-04Q4	79Q4-04Q4	77Q2-04Q4	77Q2-04Q4
Constant	-0.059 (4.3)	-0.002 (0.7)	-0.013 (1.4)	-0.002 (0.3)	-0.056 (5.4)	-0.004 (1.0)	0.005 (1.0)	-0.008 (1.2)
ECM	-0.337 (5.3)	-0.027 (2.1)	-0.143 (4.3)	-0.033 (1.6)	-0.114 (3.4)	-0.075 (2.2)	-0.041 (2.0)	-0.058 (1.9)
ln RPDI(-1)	0.948 (75.1)	0.908 (12.8)	0.947 (32.2)	0.981 (14.7)	0.909 (17.3)	0.906 (33.6)	0.989 (14.9)	0.884 (16.2)
ln RNW(-1)	0.052	0.092	0.053	0.019	0.091	0.094	0.011	0.116
D ln RPDI	0.735 (13.1)		0.095 (1.7)	0.199 (2.2)	-0.014 (-0.1)	0.454 (5.8)		0.408 (5.4)
D ln RPDI(-1)						-0.207 (2.8)		
D ln RNW		0.024 (3.8)				0.017 (1.7)		
D ln RNW(-1)							0.04 (4.2)	0.021 (1.98)
D ln C(-1)		0.359 (5.1)						
RR(-1)	-0.5E-3 (1.3)	0.3E-4 (0.2)	-0.8E-3 (1.8)	-0.3E-3 (1.4)	-0.2E-3 (0.75)	0.1E-3 (0.6)	-0.5E-3 (0.7)	-0.5E-3 (1.6)
D RR			-0.001 (1.8)	-0.4E-3 (1.5)	-0.2E-3 (0.8)			-0.001 (2.8)
D ln RPH	0.145 (2.3)	0.072 (3.1)	0.067 (2.0)	0.035 (1.1)	0.348 (3.2)			-0.008 (0.3)
D ln RPH(-1)						0.146 (7.3)	0.098 (2.0)	
Single point Dummy						Time;**		
R^2 adjusted	0.64	0.56	0.27	0.29	0.33	0.71	0.44	0.59
SE	0.007	0.004	0.008	0.005	0.008	0.005	0.01	0.007
LM(4)	6.7	12.5	9.5	6.1	1.1	7.3	4.9	5.9

* Dummy variables same as those in Basic equations (Table 3.1) unless reported differently here.
** Single point dummy variable dropped from those reported in Basic equations (Table 3.1)
Key: C stands for real consumption; RPDI for real personal disposable income, RNW for real personal net financial wealth, ECM for the error correction terms, RR for the real interest rate, RPH for real house prices. A "D" prefix indicates the difference of the relevant variable.

3.2. Expanding the determinants of consumption

The single equation analysis above suggests that basic models of consumption, based on income and wealth alone, may not be adequate predictors of the patterns in aggregate consumption experienced in the countries across our sample. In particular, we found that strong wealth effects in some countries warrant the inclusion of real house prices and real interest rates in the model specification; while in other countries strong indications of liquidity constrained behaviour discouraged the inclusion of these variables. In general, however, we find that many of the cointegrating relations improve in both size and significance with the workhorse model suggesting that this specification should form the basis of further analysis.

Building on this "workhorse" specification, we seek to improve the fit of this model by examining the significance of several alternative factors in the determination of aggregate consumption. These factors include demographic changes, fiscal effects, consumer confidence, equity market volatility, and a Commission Services estimate of equilibrium unemployment (the NAIRU). The factors are added to our workhorse model one at a time in an attempt to isolate their respective contributions and in order to preserve the limited degrees of freedom in the time domain. (All data sources are detailed in the Appendix.)

To model the impact of demographic changes on aggregate patterns of consumption, population estimates obtained from the United Nations are divided into age cohorts for each country – representing ages 20-39, 40-64, and 65 and over. The proportion of the total population (logged) in each age bracket provides the variable used in estimation. NIESR estimates of the government balance (at both the lagged level and current difference) are used to proxy for the fiscal effects on consumption where strong Ricardian behaviour is evidenced by an improvement (deterioration) in the fiscal position and concurrently stronger (weaker) consumption. Measures of consumer confidence are also incorporated at the lagged level and first difference where, *ceteris paribus*, we might expect to find a positive correlation between these measures and consumption. Equity price volatility is proxied with the lagged conditional variance from a GARCH (1,1) estimation using the logged difference of monthly share prices. Finally, the estimate of the NAIRU has been provided by the European Commission and enters the model at the lagged level, where we would expect to find a negative relation with consumption since, *ceteris paribus*, a rise in this term increases the individuals perception of risk and so should reduce consumption.

Demographic effects

Table 7 details the impact of adding demographic variables to the workhorse model. The analysis finds that population composition by age group has a statistically significant impact on aggregate consumption in France, the US, Spain, Germany and Sweden; although only France and Sweden show significant effects across all age cohorts. With the notable exception of Germany, younger age groups tend to contribute positively to consumption growth while older age groups tend to contribute negatively to consumption growth. The German results suggest that both the very young and the very old are negative contributors to consumption (the middle cohort is not significant); however, this result must be measured against the large dynamic income effect in Germany that suggests a significant degree of liquidity constrained behaviour. The young have smaller incomes and may be unable to borrow to smooth their consumption over time as compared to their counterparts in other countries with a greater degree of financial market development. Although there is no dynamic income effect in Spain, we find a similarly negative contribution from the younger age cohort, albeit at a borderline level of significance. These results are consistent with the findings of our micro analysis for these two countries. The micro analysis does not suggest a similar pattern for the

UK. We would suggest that Germany and Spain both have liquidity constraints, particularly in the young adult age bracket.

The largest demographic effect is found in Sweden where the young and middle aged cohorts boost consumption growth by 0.5 and 0.3 per cent (per quarter), respectively, while those in the 65 plus age cohort also boost consumption but only by about 0.05 per cent. The strong contribution from the youngest cohort reflects strong population growth in this age bracket over our sample as well as a robust dynamic wealth effect that is complemented by a high degree of financial sector development. In France, the young and middle aged cohorts share the same positive (significant) sign as those in Sweden, but the magnitude of their impact is about ½ the size of those in Sweden; while the 65 plus age cohort has a coefficient of just over 0.05 of one per cent, but is a negative contributor to consumption. Unlike in Sweden, France does have a strong dynamic income term, but it has only a moderate and borderline significant dynamic wealth effect.

The older population cohort was found to have a negative impact on consumption in seven countries in our sample, but only in Germany is this impact statistically significant. The negative contribution to consumption of the 65 plus age group is not strictly in line with the life cycle hypothesis which suggests that consumption, as a proportion of income, increases later in life as savings decrease. This counter theoretical effect in Germany may help explain some of the weakness in the pattern of consumption in this country, especially given the estimated magnitude of the effect in our equation. Since the late 1990s, the proportion of people over 65 in Germany has been rising somewhat faster as compared to the preceding decade, while the cohort of 20-39 year olds has been declining over the same time period.

Ricardian effects

Table 8 details the role of each country's respective fiscal position on consumption. In line with theoretical explanations of the impact of government spending on private consumption, we find some significant Ricardian effects at both the lagged level and first difference of this variable; although, the effects are most pronounced when fiscal effects are specified in first differences. In particular, we find statistically significant fiscal effects in Greece, Italy, Spain, Sweden, the Netherlands, Finland and Ireland; and borderline significant effects in Belgium. Interestingly, in the US, there is a negative and significantly signed effect, suggesting that US fiscal deficits exhibit a Keynesian multiplier effect and have boosted consumption growth over the sample period. This latter finding is also evident in France, albeit at borderline significance. In terms of economic importance, our results indicate that a significant improvement (deterioration) in the fiscal position is necessary in order to have a discernable impact on private consumption.

Confidence effects

Table 9 details the role of confidence indicators on consumption, where the sample period has been shortened and begins in 1985Q1, unless otherwise noted in the table. Confidence indicators in levels were found to be statistically significant in Austria, the US, and Spain with borderline significance in the UK, France and Portugal. In line with our priors, these contributions are positively correlated with consumption; however, the magnitude of these effects is rather small with the largest level effect in Austria having a coefficient of 0.7E-3. Confidence indicators where also found to be significant in first differences in the US and Sweden; although the Swedish sample is considerably shorter than the other countries leading us to question the validity of this result. The impact of the difference term in the US is approximately half the size of that found in levels for Sweden.

The results presented here are in line with our findings for the panel estimation (presented below) and build upon results presented elsewhere, as discussed in the literature review above. The addition of consumer confidence indicators, however, impacts differently on the estimated equations across countries. For example, in Austria and Spain it decreases the speed of adjustment and reduces the effects from house prices, as compared against the workhorse model estimates. In the US, there too is a considerable deterioration in the house price effect, although it is instructive to note that data for this country is based on a different source as compared to that for the Euro Area countries.

In general the confidence indicators appear to impact on the change in real financial wealth, and make it less significant. This suggest we check whether confidence Granger causes wealth or wealth Granger causes confidence. We undertake this analysis below, and we find that confidence only Granger causes wealth in countries where is not significant, and where it is significant it is Granger caused by wealth. Hence we would conclude that we have no significant role for confidence in estimating equations, but that it may be useful in a forecasting context to help us set residual judgements when wealth data is not available.

Equity price volatility

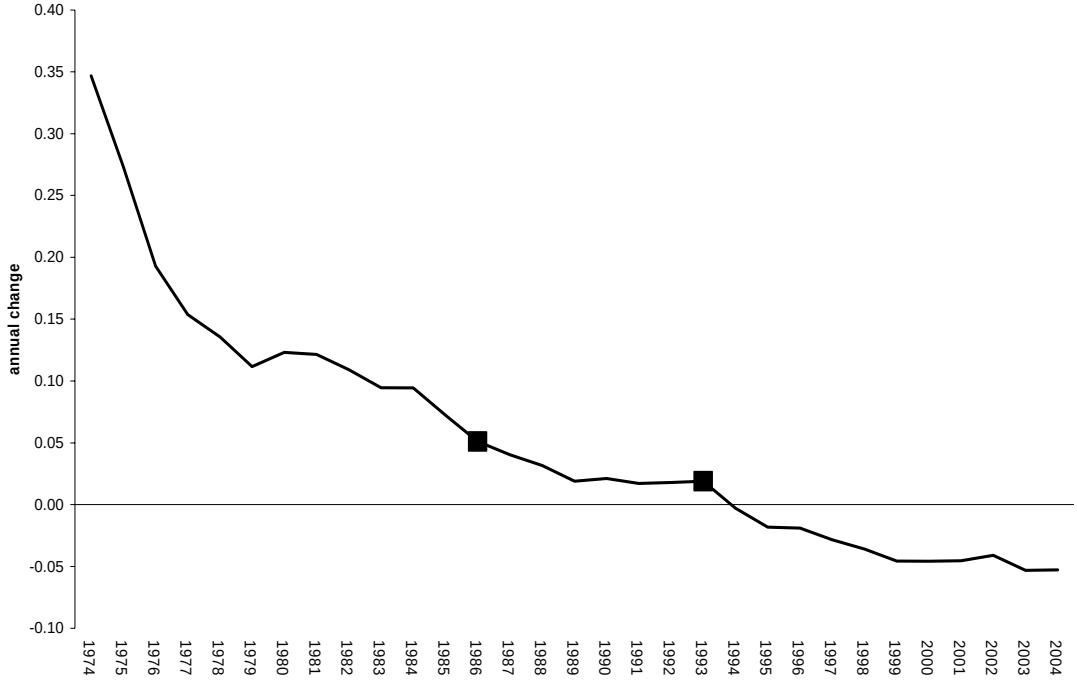
Table 10 details the impact of equity market conditional volatility (or uncertainty) on consumption. As indicated by the weak results in the panel estimation below, it is difficult to find a statistically significant link between equity volatility and consumption. Indeed, France is the only country where we find significant results and interestingly where the finding is a *positive* contribution. Taken in conjunction with a failure to find decisive contributions in any of the other countries, the results here suggest a very weak "traditional" wealth effect – i.e. a wealth effect associated only with equity prices. This is not that surprising given the strong income effects detailed in the above tables and once the degree and depth of financial market liberalisation in Europe is considered. We note that volatility has been high in Germany, but we can find no role for it in our equations.

Estimates of NAIRU

Table 11 details the impacts arising from the addition of estimates of equilibrium unemployment, or the NAIRU. Significant NAIRU effects are only found in Spain and with borderline significance in the UK and the US. We have not used this variable further in the case of the US and the UK as both have relatively stable unemployment, and changes in this slowly trending variable are unlikely to help us explain recent developments, and it is not clear that it is needed in either equation. We might anticipate that uncertainty arising from structural changes in the economy may also be reflected in the impact of the NAIRU, and it may also genuinely reflect increased uncertainty about income prospects, as we argue above. The strong significance of the Spanish result, especially as compared against the robust insignificance of the NAIRU in other European countries, prompts us to examine this finding closer.

Figure 1 plots the annual change of the Spanish NAIRU along with the two intercept dummy variables used in our equations, as indicated by the boxes along this series. It appears that the breaks in the NAIRU are matched almost identically with the intercept dummy variables, which may be giving rise to the robust significance of this term in the Spanish equation. The occurrence of the shift dummy variables and the breaks in the NAIRU are, of course, naturally linked through the structural changes in the Spanish economy during those periods. These include the joining of the European Union in 1986 and the ERM crisis in 1992-93, during which a number of reform measures were introduced in Spain.

Figure 1: Spanish NAIRU (annual change) and intercept dummy variables



Annual estimation of selected countries

The quarterly nature of the data used in this study implies the possible existence of residual seasonality effects, which could potentially give rise to biased parameter estimates. Therefore, it is instructive to test for the possibility of these effects by estimating some of our basic models in terms of annual data to see if we arrive at similarly oriented results, as compared against our quarterly estimates. We do this for a select set of countries where, for example, certain coefficient estimates might seem to be counter to our priors regarding their magnitude and significance. In particular, we consider countries which have large dynamic income terms and, hence, the implication of a significant degree of liquidity constrained behaviour. These are Germany, Austria, Italy, France and Ireland.

Table 12 details the annual findings for each country under two model variants, the basic equation (with dynamic income and wealth terms, where significant), and the basic equation with the addition of real house prices. Dynamic income terms are significant in all countries and across all variants. Moreover, these terms are of a comparable magnitude to those reported in (Table 4). Cumulative income effects are clearly illustrated with the German basic equation that delivers a much stronger income effect than in the quarterly results above. The same is seen in the Irish basic equation where both the income and wealth effects are nearly double in magnitude in this annual regression as compared to the quarterly estimates. The French equation shows an almost identical dynamic income effect to its quarterly counterpart, while the Italian equation has more than triple the effect. None of these results change significantly when the real price of housing is added. As such, it is clear from these annual results that there are no idiosyncratic seasonal effects in our quarterly analysis. We can therefore remain confident of the presence of liquidity constrained behaviour in these economies during the sample period covered in this study.

Table 7: Addition of Demographic Data to Single Equation Consumption Estimates Using Non-linear Least Squares
(Including real interest rates and house prices data)*

	OE	GR	FR	IT	UK	US	SP
Sample	74Q1-04Q4	74Q1-04Q4	74Q1-04Q4	74Q1-04Q4	74Q1-04Q4	75Q3-04Q4	82Q1-04Q4
Constant	-0.269 (1.48)	0.47 (1.62)	-1.22 (3.8)	0.351 (1.1)	-0.168 (0.66)	-0.719 (3.11)	0.204 (0.69)
ECM	-0.137 (2.61)	-0.036 (1.03)	-0.289 (5.2)	-0.099 (7.2)	-0.091 (3.52)	-0.248 (4.63)	-0.110 (3.15)
LRPDI(-1)	0.998 (34.90)	0.858 (5.40)	0.965 (56.5)	0.623 (7.0)	0.895 (15.63)	0.896 (37.26)	0.831 (15.79)
LRNW(-1)	0.002	0.142	0.035	0.377	0.105	0.104	0.169
D ln RPDI	0.338 (4.70)	0.465 (7.22)	0.487 (4.5)	0.207 (3.3)	0.216 (5.61)	0.197 (3.90)	
D ln RPDI(-1)					0.186 (4.74)	0.063 (1.38)	
D ln RNW				0.032 (2.5)	0.023 (2.84)	0.035 (3.10)	
D ln RNW(-1)			0.016 (1.36)				
RR (-1)	0.0006 (1.59)	0.0005 (2.09)	-0.0002 (0.67)	-0.0007 (3.0)		-0.001 (3.24)	
D RR				-0.0005 (1.95)	0.0003 (1.20)	-0.001 (3.23)	
D ln RPH	-0.066 (1.04)	-0.111 (1.74)		-0.0017 (1.59)	0.098 (2.89)	0.095 (1.99)	0.086 (2.84)
D ln RPH(-1)			0.08 (1.57)				
Log (20-40/pop)	-0.003 (0.14)	-0.107 (1.46)	0.223 (3.98)	-0.029 (0.97)	-0.001 (0.02)	0.106 (2.23)	-0.219 (1.88)
Log (40-64/pop)	0.035 (0.92)	-0.073 (0.78)	0.170 (3.28)	-0.092 (1.32)	0.057 (1.16)	0.138 (2.95)	0.109 (2.08)
Log (65+/pop)	0.053 (1.30)	0.050 (1.53)	-0.051 (2.02)	-0.011 (1.24)	-0.014 (0.31)	-0.055 (1.32)	0.056 (0.94)
R^2 adjusted	0.55	0.57	0.42	0.56	0.73	0.55	0.47
SE	0.012	0.0068	0.0053	0.0045	0.0056	0.0040	0.0053
LM(4)	17.87	22.72	8.9	6.9	4.04	10.33	3.88

* Dummy variables same as those in Basic equations (Table 3.1) unless reported differently here.

Key: C stands for real consumption; RPDI for real personal disposable income, RNW for real personal net financial wealth, ECM for the error correction terms, RR for the real interest rate, RPH for real house prices. A "D" prefix indicates the difference of the relevant variable.

Table 7 (cont.): Addition of Demographic Data to Single Equation Consumption Estimates Using Non-linear Least Squares
(Including real interest rates and house prices data)*

	GE	SD	NL	BG	PT	FN	DK	IR
Sample	74Q1-04Q4	74Q1-04Q4	74Q1-04Q4	74Q1-04Q4	80Q4-04Q4	79Q2-04Q4	77Q2-04Q4	77Q2-04Q4
Constant	0.623 (2.5)	-2.9 (3.1)	0.105 (0.3)	0.248 (1.5)	1.90 (0.6)	0.517 (1.6)	0.493 (1.6)	-0.196 (0.9)
ECM	-0.414 (5.8)	-0.0883 (3.6)	-0.163 (3.6)	-0.009 (0.4)	-0.119 (3.4)	-0.093 (2.38)	-0.036 (1.6)	-0.076 (2.02)
ln RPDI(-1)	0.926 (36.6)	0.903 (33.9)	0.97 (25.9)	0.182 (0.08)	0.949 (15.5)	0.833 (18.0)	0.861 (6.3)	0.934 (13.2)
ln RNW(-1)	0.074	0.097	0.03	0.818	0.051	0.167	0.139	0.066
D ln RPDI	0.701 (12.2)		0.098 (1.7)	0.098 (0.9)	0.024 (0.2)	0.492 (5.7)		0.428 (5.4)
D ln RPDI(-1)						-0.279 (3.3)		
D ln RNW		0.023 (3.8)				0.021 (2.1)		
D ln RNW(-1)							0.0391 (3.9)	0.022 (2.0)
D ln C(-1)		0.295 (4.1)						
RR(-1)	-0.5E-3 (1.2)	-0.1E-3 (0.7)	-0.001 (1.9)	0.2E-3 (0.6)	-0.4E-3 (1.1)	0.5E-3 (1.6)	-0.9E-3 (1.0)	-0. 9E-3 (1. 9)
D RR			-0.001 (1.8)	-0.2E-4 (0.1)	-0.4E-3 (1.1)			-0.001 (2.9)
D ln RPH	0.246 (3.3)	0.082 (3.7)	0.069 (1.95)	0.036 (1.1)	0.368 (3.2)			0.001 (0.3)
D ln RPH(-1)						0.132 (6.0)	0.111 (2.2)	
Log (20-40/pop)	-0.114 (2.6)	0.498 (3.1)	-0.037 (0.4)	-0.037 (1.5)	-0.273 (0.6)	-0.075 (1.5)	-0.167 (1.8)	0.039 (0. 9)
Log (40-64/pop)	-0.1E-3 (0.0)	0.322 (2.9)	-0.104 (0.6)	-0.03 (0.6)	-0.469 (0.7)	0.001 (0.02)	-0.098 (1.9)	-0.036 (1.0)
Log (65+/pop)	-0.121 (2.6)	0.049 (2.8)	0.146 (0.8)	-0.014 (0.8)	0.210 (0.6)	-0.108 (1.3)	0.152 (1.6)	0.071 (0.9)
Single point Dummy						Time;**		
R^2 adjusted	0.66	0.60	0.26	0.31	0.31	0.71	0.44	0.58
SE	0.006	0.004	0.008	0.005	0.008	0.005	0.01	0.007
LM(4)	6.6	14.2	11.1	4.8	1.3	5.8	6.8	8.6

* Dummy variables same as those in Basic equations (Table 3.1) unless reported differently here.
** Single point dummy variable dropped from those reported in Basic equations (Table 3.1).
Key: C stands for real consumption; RPDI for real personal disposable income, RNW for real personal net financial wealth, ECM for the error correction terms, RR for the real interest rate, RPH for real house prices. A "D" prefix indicates the difference of the relevant variable.

Table 8: Addition of Fiscal Policies to Single Equation Consumption Estimates Using Non-linear Least Squares
(Including real interest rates and house prices data)*

	OE	GR	FR	IT	UK	US	SP
Sample	74Q1-04Q4	74Q1-04Q4	74Q1-04Q4	74Q1-04Q4	74Q1-04Q4	75Q3-04Q4	82Q1-04Q4
Constant	-0.011 (1.43)	0.002 (0.47)	-0.022 (2.7)	-0.048 (4.8)	-0.013 (1.57)	-0.04 (5.05)	-0.012 (2.58)
ECM	-0.081 (2.51)	-0.028 (2.20)	-0.106 (3.8)	-0.096 (6.0)	-0.083 (2.71)	-0.131 (5.26)	-0.075 (2.35)
LRPDI(-1)	0.971 (28.44)	0.915 (19.12)	0.897 (29.2)	0.816 (24.36)	0.908 (13.60)	0.742 (28.01)	90.836 (11.28)
LRNW(-1)	0.029	0.085	0.103	0.184	0.012	0.258	0.164
D ln RPDI	0.335 (4.42)	0.511 (8.65)	0.454 (3.9)	0.235 (3.7)	0.204 (5.08)	0.158 (3.64)	
D ln RPDI(-1)					0.184 (4.60)	0.0798 (1.87)	
D ln RNW				0.21 (1.8)	0.020 (2.52)	0.029 (2.70)	
D ln RNW(-1)			0.023 (1.8)				
RR (-1)	0.5E-3 (1.40)	0.3E-3 (1.69)	0. 1E-3 (0.37)	-0.6E-3 (2.9)	0.7E-4 (0.42)	-0.5E-3 (2.40)	
D RR				-0.3E-3 (1.2)		-0.001 (2.76)	
D ln RPH	-0.08 (1.21)	-0.146 (2.38)	0.031 (0.63)	-0.005 (0.51)	0.110 (3.79)	0.140 (3.53)	0.027 (0.83)
GBR(-1)	0.5E-3 (0.68)	0.5E-3 (2.80)	-0.001 (1.76)	0.3E-3 (1.3)	0.2E-3 (0.62)	-0.0011 (4.40)	0.001 (2.69)
DGBR	0.002 (0.55)	0.002 (2.65)	-0.7E-5 (0.003)	0.002 (2.1)	0.3E-3 (0.51)	0.5E-4 (0.07)	0.004 (3.07)
R^2 adjusted	0.55	0.59	0.35	0.57	0.73	0.61	0.53
SE	0.012	0.0066	0.0056	0.0044	0.0057	0.0038	0.0049
LM(4)	19.94	11.52	10.4	9.3	3.27	5.92	5.07

* Dummy variables same as those in Basic equations (Table 3.1) unless reported differently here.
Key: C stands for real consumption; RPDI for real personal disposable income, RNW for real personal net financial wealth, ECM for the error correction terms, RR for the real interest rate, RPH for real house prices, GBR for the government budget ratio (as a share of GDP). A "D" prefix indicates the difference of the relevant variable.

Table 8 (cont.): Addition of Fiscal Policies to Single Equation Consumption Estimates Using Non-linear Least Squares
(Including real interest rates and house prices data)*

	GE	SD	NL	BG	PT	FN	DK	IR
Sample	74Q1-04Q4	74Q1-04Q4	74Q1-04Q4	74Q1-04Q4	80Q4-04Q4	79Q2-04Q4	77Q2-04Q4	77Q2-04Q4
Constant	-0.056	0.9E-3	0.006	0.001	-0.055	-0.003	0.003	-0.002
	(3.9)	(0.2)	(0.5)	(0.1)	(5.0)	(0.8)	(0.4)	(0.2)
ECM	-0.34	-0.022	-0.199	-0.032	-0.105	-0.080	-0.029	-0.090
	(5.3)	(1.7)	(5.5)	(1.5)	(2.9)	(2.2)	(1.0)	(2.88)
ln RPDI(-1)	0.954	0.976	0.995	1.02	0.904	0.928	0.914	0.986
	(67.9)	(6.0)	(40.1)	(12.8)	(15.3)	(40.1)	(5.2)	(18.2)
ln RNW(-1)	0.046	0.024	0.005	-0.02	0.096	0.072	0.086	0.014
D ln RPDI	0.738		0.186	0.215	-0.004	0.518		0.428
	(12.7)		(3.3)	(2.4)	(0.03)	(6.3)		(5.7)
D ln RPDI(-1)						-0.184		
						(2.5)		
D ln RNW		0.017				0.009		
		(2.7)				(0.9)		
D ln RNW(-1)							0.038	0.019
							(3.9)	(1.8)
D ln C(-1)		0.286						
		(3.9)						
RR(-1)	-0.5E-3	0.2E-4	-0.6E-3	-0.3E-3	-0.4E-3	0.2E-3	-0.5E-3	-0.5E-3
	(1.4)	(0.1)	(1.4)	(1.7)	(1.1)	(0.9)	(0.6)	(1.8)
D RR			-0.001	-0.4E-3	-0.1E-3			-0.001
			(2.3)	(1.7)	(1.1)			(2.62)
D ln RPH	0.123	0.0459	0.041	0.031	0.359			-0.018
	(1.9)	(1.9)	(1.2)	(0.9)	(3.2)			(0.6)
D ln RPH(-1)						0.103	0.054	
						(4.5)	(0.9)	
GBR(-1)	0.4E-3	0.2E-3	0.003	0.001	-0. 5E-3	0.1E-3	-0.4E-3	0.5E-3
	(0.8)	(1.0)	(3.0)	(1.8)	(0.9)	(0.9)	(0.8)	(1.6)
DGBR	0.001	0.002	0.005	0.04	-0.7E-3	0.003	0.002	0.004
	(0.9)	(3.1)	(2.3)	(0.2)	(0.5)	(3.1)	(0.7)	(2.5)
Single point Dummy						Time**		
R^2 adjusted	0.64	0.59	0.40	0.30	0.32	0.71	0.44	0.61
SE	0.007	0.004	0.008	0.005	0.008	0.005	0.01	0.007
LM(4)	6.5	10.6	8.8	5.4	1.1	11.3	8.1	6.7

* Dummy variables same as those in Basic equations (Table 3.1) unless reported differently here.
** Single point dummy variable dropped from those reported in Basic equations (Table 3.1).
Key: C stands for real consumption; RPDI for real personal disposable income, RNW for real personal net financial wealth, ECM for the error correction terms, RR for the real interest rate, RPH for real house prices, GBR for the government budget ratio (as a share of GDP). A "D" prefix indicates the difference of the relevant variable.

Table 9: Addition of Confidence Indicators to Single Equation Consumption Estimates Using Non-linear Least Squares
(Including real interest rates and house prices data)*****

	OE	GR	FR	IT	UK	US	SP
Sample	96Q1-04Q4	85Q2-04Q4	85Q2-04Q4	85Q2-04Q4	85Q2-04Q4	75Q3-04Q4	86Q2-04Q4
Constant	-0.276 (3.35)	0.0005 (0.04)	0.0001 (0.02)	0.040 (1.11)	-0.003 (0.28)	-0.023 (3.42)	0.013 (0.95)
ECM	-0.601 (4.80)	-0.019 (0.44)	-0.118 (2.6)	0.007 (0.21)	-0.0655 (2.52)	-0.095 (3.94)	-0.033 (1.05)
LRPDI(-1)	0.775 (13.31)	0.774 (2.18)	0.995 (19.7)	-0.84 (0.11)	0.886 (9.27)	0.87 (22.63)	0.953 (3.56)
LRNW(-1)	0.225	0.226	0.005	1.84	0.114	0.13	0.047
D ln RPDI	0.482 (2.87)	0.424 (4.15)	0.350 (1.74)	0.176 (1.7)	0.145 (2.54)	0.11 (2.22)	
D ln RPDI(-1)					0.151 (2.56)	0.077 (1.62)	
D ln RNW				0.003 (0.17)	0.028 (2.90)	0.019 (1.57)	
D ln RNW(-1)			0.036 (2.7)				
RR (-1)	-0.002 (1.49)	-0.2E-3 (0.49)	0.1E-3 (0.24)	-0.3E-3 (0.62)	-0.6E-3 (1.61)	-0.5E-3 (2.13)	
D RR				-0.1E-3 (0.30)		-0.9E-3 (2.93)	
D ln RPH	0.034 (0.36)	-0.116 (1.63)		-0.008 (0.31)	0.051 (1.36)	0.081 (1.82)	0.061 (1.50)
D ln RPH(-1)			0.042 (0.81)	-0.3E-4 (0.24)			
CONF(-1)	0.7E-3 (2.29)	-0.2E-4 (0.08)	0.2E-3 (1.53)	-0.3E-4 (0.35)	0.2E-3 (1.58)	0.1E-3 (2.21)	0.4E-3 (2.61)
DCONF	0.5E-3 (1.15)	-0.2E-3 (0.79)	0.1E-3 (1.61)	-0.4E-4 (0.24)	0.4E-4 (0.21)	0.3E-3 (3.07)	0.5-3 (1.84)
R^2 adjusted	0.45	0.51	0.36	0.55	0.50	0.55	0.46
SE	0.007	0.0075	0.0047	0.0041	0.0051	0.0041	0.0053
LM(4)	5.41	6.71	12.9	3.0	3.23	11.73	6.24

* Dummy variables same as those in Basic equations (Table 3.1) unless reported differently here.
Key: C stands for real consumption; RPDI for real personal disposable income, RNW for real personal net financial wealth, ECM for the error correction terms, RR for the real interest rate, RPH for real house prices, CONF for consumer confidence. A "D" prefix indicates the difference of the relevant variable.

Table 9 (cont.): Addition of Confidence Indicators to Single Equation Consumption Estimates Using Non-linear Least Squares
(including real interest rates and house prices data)*

	GE	SD	NL	BG	PT	FN	DK	IR
Sample	85Q1-04Q4	95Q1-04Q4	85Q1-04Q4	85Q1-04Q4	85Q4-04Q4	95Q4-04Q4	85Q1-04Q4	85Q1-04Q4
Constant	-0.064 (3.0)	0.026 (1.4)	-0.02 (1.2)	-0.007 (0.3)	-0.039 (2.6)	0.009 (1.0)	0.006 (1.0)	-0.008 (0.7)
ECM	-0.314 (3.7)	**0.082 (1.8)**	-0.199 (4.3)	**0.007 (0.2)**	-0.108 (2.7)	-0.121 (1. 6)	-0.039 (1.9)	-0.114 (2.6)
ln RPDI(-1)	0.936 (42.2)	0.896 (9.4)	0.995 (29.5)	1.65 (0.6)	0.941 (17.2)	0.997 (40.1)	1.001 (13.4)	0.958 (18.2)
ln RNW(-1)	0.064	0.104	0.005	-0.65	0.059	0.003	-0.001	0.042
D ln RPDI	0.753 (11.1)		0.103 (1.2)	0.229 (1.3)	-0.047 (0.3)	0.345 (2.3)		0.444 (3.9)
D ln RPDI(-1)						-0.227 (1.4)		
D ln RNW		0.006 (0.4)				-0.3E-3 (0.03)		
D ln RNW(-1)							0.041 (4.2)	0.029 (2.5)
D ln C(-1)		-0.151 (0.9)						
RR(-1)	0.30E-3 (0.5)	-0.009 (0.1)	-0.002 (2.6)	-0.5E-4 (0.1)	-0.2E-3 (0.5)	0.8E-4 (0.1)	-0.4E-3 (0. 6)	-0.001 (2.7)
D RR			0.4E-3 (0.4)	-0.5E-4 (0.1)	-0.9E-4 (0.5)			-0.001 (2.1)
D ln RPH	-0.076 (0.55)	0.0039 (0.06)	0.097 (1.7)	-0.012 (0.2)	0.311 (2.6)			-0.036 (0.9)
D ln RPH(-1)						0.029 (0.6)	0.091 (1.7)	
CONF(-1)	0.1E-3 (1.1)	0.1E-3 (0.7)	0.1E-3 (1.5)	-0.5E-4 (0.5)	0.2E-3 (1.6)	0.9E-4 (0.4)	0.7E-4 (0. 4)	-0.2E-3 (1.1)
DCONF	0.1E-3 (0.6)	0.8E-3 (3.0)	-0.2E-3 (1.3)	0.2E-3 (1.4)	0.4E-3 (1.5)	-0.1E-4 (0.04)	-0.7E-4 (0.2)	0.6E-4 (0.4)
Single point Dummy						Time;**		
R^2 adjusted	0.66	0.45	0.32	0.08	0.27	0.31	0.43	0.56
SE	0.006	0.004	0.007	0.005	0.008	0.004	0.01	0.006
LM(4)	10.0	13.2	16.3	1.8	3.9	3.5	5.1	1.4

* Dummy variables same as those in Basic equations (Table 3.1) unless reported differently here.
** Single point dummy variable dropped from those reported in Basic equations (Table 3.1).
Key: C stands for real consumption; RPDI for real personal disposable income, RNW for real personal net financial wealth, ECM for the error correction terms, RR for the real interest rate, RPH for real house prices, CONF for consumer confidence. A "D" prefix indicates the difference of the relevant variable.

Table 10: Addition of Equity Price Volatility to Single Equation Consumption Estimates Using Non-linear Least Squares
(Including real interest rates and house prices data)*

	OE	GR	FR	IT	UK	US	SP
Sample	74Q1-04Q4	86Q1-04Q1	74Q1-04Q4	74Q1-04Q4	74Q1-04Q4	74Q1-04Q4	82Q1-04Q4
Constant	-0.340	0.0019	-0.018	-0.057	-0.015	-0.02	-0.016
	(1.78)	(0.15)	(2.5)	(5.7)	(2.08)	(3.2)	(3.37)
ECM	-0.136	-0.014	-0.085	-0.096	-0.070	-0.10	-0.055
	(2.29)	(-0.29)	(3.25)	(7.3)	(2.95)	(4.17)	(2.01)
LRPDI(-1)	1.068	0.752	0.905	0.781	0.873	0.813	0.765
	(23.67)	(1.30)	(24.5)	(46.8)	(12.98)	(30.52)	(6.15)
LRNW(-1)		0.248	0.095	0.219	0.127	0.187	0.235
D ln RPDI	0.331	0.440	0.390	0.218	0.197	0.159	
	(5.05)	(4.52)	(3.54)	(3.4)	(5.25)	(3.35)	
D ln RPDI(-1)					0.187	0.108	
					(4.71)	(2.41)	
D ln RNW				0.024	0.021	0.034	
				(2.0)	(2.57)	(2.99)	
D ln RNW(-1)			0.032				
			(2.6)				
RR (-1)		-0.1E-3	0.3E-3	-0.8E-3	0.1E-3	-0.4E-3	
		(0.28)	(0.97)	(4.1)	(0.28)	(1.89)	
D RR				-0.001		-0.001	
				(2.0)		(2.97)	
D ln RPH		-0.114	0.015	-0.009	0.11	0.11	0.089
		(1.61)	(0.31)	(0.78)	(3.65)	(2.62)	(2.99)
GVAR	0.4E-4	-0.017	0.901	0.114	-0.006	0.306	-0.122
	(0.14)	(0.11)	(2.1)	(0.61)	(0.04)	(1.01)	(0.65)
R^2 adjusted	0.73	0.50	0.36	0.55	0.73	0.53	0.46
SE	0.0057	0.0076	0.0056	0.0045	0.0057	0.0041	0.0053
LM(4)	5.26	6.62	11.3	8.1	4.25	10.52	3.79

* Dummy variables same as those in Basic equations (Table 3.1) unless reported differently here.
Key: C stands for real consumption; RPDI for real personal disposable income, RNW for real personal net financial wealth, ECM for the error correction terms, RR for the real interest rate, RPH for real house prices, GVAR for a measure of equity price volatility. A "D" prefix indicates the difference of the relevant variable.

Table 10 (cont.): Addition of Equity Price Volatility to Single Equation Consumption Estimates Using Non-linear Least Squares
(Including real interest rates and house prices data)*

	GE	SD	NL	BG	PT	FN	DK	IR
Sample	74Q1-04Q4	74Q1-04Q4	74Q1-04Q4	74Q1-04Q4	88Q2-04Q4	82Q2-04Q4	77Q2-04Q4	88Q3-04Q4
Constant	-0.063 (4.6)	-0.002 (0.5)	-0.014 (1.4)	-0.002 (0.3)	-0.037 (3.4)	-0.008 (1.5)	0.001 (0.2)	0.2E-3 (0.02)
ECM	-0.347 (5.5)	-0.025 (1.9)	-0.143 (4.3)	-0.034 (1.6)	-0.120 (2.0)	-0.093 (2. 5)	-0.045 (2.1)	-0.109 (2.1)
ln RPDI(-1)	0.941 (68.1)	0.897 (11.2)	0.947 (32.1)	0.984 (14.8)	0.884 (12.5)	0.878 (24.3)	0.977 (15.6)	0.993 (18.4)
ln RNW(-1)	0.059	0.103	0.053	0.016	0.116	0.122	0.0175	0.007
D ln RPDI	0.739 (13.2)		0.097 (1.7)	0.197 (2.2)	0.048 (0.3)	0.509 (5.5)		0.425 (3.8)
D ln RPDI(-1)						-0.276 (3.2)		
D ln RNW		0.023 (3.7)				0.019 (1.8)		
D ln RNW(-1)							0.039 (4.1)	0.031 (2.0)
D ln C(-1)		0.357 (5.0)						
RR(-1)	-0.5E-3 (1.5)	0.3E-4 (0.2)	-0.8E-3 (1.7)	-0.3E-3 (1.4)	-0.2E-3 (0.3)	0.3E-3 (0.9)	-0.4E-3 (0.5)	-0.001 (2.3)
D RR			-0.001 (1.8)	-0.4E-3 (1.5)	0.57E-3 (1.1)			-0.7E-3 (1.1)
D ln RPH	0.142 (2.3)	0.071 (3.1)	0.066 (2.0)	0.035 (1.1)	0.337 (2.8)			-0.066 (1.6)
D ln RPH(-1)						0.141 (6.0)	0.091 (1.8)	
GVAR	-0.175 (0.9)	-0.081 (0.1)	0.089 (0.3)	0.066 (0.3)	0.521 (1.4)	-0.132 (1.0)	1.071 (1.0)	-0.177 (0.5)
Single point Dummy					86Q1** *	Time**		
R^2 adjusted	0.64	0.56	0.26	0.28	0.34	0.72	0.44	0.58
SE	0.006	0.004	0.008	0.005	0.008	0.005	0.01	0.007
LM(4)	6.7	12.4	9.2	5.8	6.0	9.5	4.5	1.4

* Dummy variables same as those in Basic equations (Table 3.1) unless reported differently here.
** Single point dummy variable dropped from those reported in Basic equations (Table 3.1)
Key: C stands for real consumption; RPDI for real personal disposable income, RNW for real personal net financial wealth, ECM for the error correction terms, RR for the real interest rate, RPH for real house prices, GVAR for a measure of equity price volatility. A "D" prefix indicates the difference of the relevant variable.

Table 11: Addition of NAIRU estimates to Single Equation Consumption Estimates Using Non-linear Least Squares
(Including real interest rates and house prices data)*

	OE	GR	FR	IT	UK	US	SP
Sample	74Q1-04Q4	74Q1-04Q3	74Q1-04Q4	74Q1-04Q4	74Q1-04Q4	74Q1-04Q4	82Q1-04Q4
Constant	-0.14	0.5E-3	-0.019	-0.036	-0.011	0.008	-0.001
	(1.5)	(0.03)	(1.9)	(3.6)	(1.4)	(0.5)	(0.2)
ECM	-0.088	-0.026	-0.097	-0.077	-0.078	-0.170	-0.095
	(2.2)	(0.9)	(2.6)	(4.4)	(3.4)	(3.8)	(3.2)
LRPDI(-1)	0.986	0.816	0.971	0.853	0.881	0.917	0.826
	(21.2)	(3.6)	(18.8)	(20.9)	(15.7)	(24.8)	(15.2)
LRNW(-1)	0.014	0.184	0.029	0.147	0.119	0.083	0.174
D ln RPDI	0.321	0.488			0.208	0.191	
	(4.5)	(7.6)			(5.5)	(3.8)	
D ln RPDI(-1)			0.429		0.186	0.088	
			(3.4)		(4.8)	(1.9)	
D ln RNW					0.023	0.029	
					(2.9)	(2.5)	
D ln RNW(-1)			0.023				
			(1.9)				
RR (-1)	0.6E-3	-0.4E-4		-0.6E-38	0.3E-3	-0.5E-3	
	(1.6)	(0.2)		(3.3)	(1.4)	(2.4)	
D RR			-0.7E-3			-0.9E-3	
			(1.6)			(3.2)	
D ln RPH	-0.006	-0.053	0.046	-0.01	0.104	0.131	0.039
	(1.1)	(0.9)	(0.9)	(0.9)	(3.7)	(3.0)	(1.2)
NAIRU(-1)	0.9E-3	-0.4E-3	0.002	0.6E-3	-0.8E-3	-0.005	-0.002
	(0.5)	(0.3)	(1.3)	(0.8)	(1.6)	(1.9)	(3.0)
R^2 adjusted	0.55	0.52	0.33	0.37	0.74	0.54	0.51
SE	0.011	0.007	0.006	0.005	0.006	0.004	0.005
LM(4)	18.3	24.4	9.2	11.1	3.6	8.7	6.6

* Dummy variables same as those in Basic equations (Table 3.1) unless reported differently here.
Key: C stands for real consumption; RPDI for real personal disposable income, RNW for real personal net financial wealth, ECM for the error correction terms, RR for the real interest rate, RPH for real house prices. A "D" prefix indicates the difference of the relevant variable.

Table 11 (cont.): Addition of NAIRU estimates to Single Equation Consumption Estimates Using Non-linear Least Squares
(Including real interest rates and house prices data)*

	GE	SD	NL	BG	PT	FN	DK	IR
Sample	74Q1-04Q4	74Q1-04Q4	74Q1-04Q4	74Q1-04Q4	80Q3-04Q4	79Q2-04Q4	77Q2-04Q4	77Q2-04Q4
Constant	-0.066	-0.005	-0.012	-0.008	-0.034	-0.001	0.008	-0.014
	(4.1)	(1.4)	(0.8)	(0.9)	(1.9)	(0.3)	(0.7)	(1.7)
ECM	-0.344	-0.008	-0.145	-0.042	-0.12	-0.069	-0.038	-0.066
	(5.4)	(0.5)	(4.0)	(1.7)	(3.6)	(1.9)	(1.7)	(2.2)
ln RPDI(-1)	0.927	0.365	0.951	0.916	0.907	0.918	0.998	0.884
	(36.2)	(0.34)	(25.0)	(10.5)	(21.1)	(30.2)	(12.7)	(18.5)
ln RNW(-1)	0.073	0.635	0.049	0.084	0.093	0.082	0.002	0.116
D ln RPDI	0.729		0.096	0.197	0.045	0.437		0.428
	(12.9)		(1.7)	(2.2)	(0.3)	(5.2)		(5.6)
D ln RPDI(-1)				0.177		-0.179		
				(2.1)		(2.3)		
D ln RNW		0.023				0.021		
		(3.9)				(1.9)		
D ln RNW(-1)							0.041	0.019
							(4.0)	(1.8)
D ln C(-1)		0.259		0.191				
		(3.6)		(2.1)				
RR(-1)	-0.3E-3	0.4E-3	-0.8E-3	0.5E-4	-0.4E-3	0.4E-4	-0.5E-3	-0.001
	(0.8)	(0.2)	(1.5)	(0.2)	(1.2)	(0.2)	(0.7)	(2.3)
D RR		0.3E-3	-0.001		-0.4E-3			-0.001
		(1.6)	(1.7)		(1.1)			(3.2)
D ln RPH	0.156	0.059	0.067	0.038	0.31			0.002
	(2.4)	(2.7)	(2.0)	(1.1)	(2.8)			(0.05)
D ln RPH(-1)						0.139	0.103	
						(6.5)	(2.1)	
NAIRU(-1)	-0.9E-3	0.9E-3	-0.2E-3	-0.8E-3	-0.006	-0.1E-3	-0.6E-3	0.5E-3
	(0.9)	(1.5)	(0.2)	(0.9)	(1.4)	(0.6)	(0.3)	(1.7)
Single point Dummy						Time**		
R^2 adjusted	0.64	0.63	0.26	0.19	0.33	0.67	0.42	0.60
SE	0.007	0.004	0.009	0.005	0.008	0.006	0.01	0.007
LM(4)	6.4	13.0	9.7	0.9	1.1	5.7	6.4	6.4

* Dummy variables same as those in Basic equations (Table 3.1) unless reported differently here

** Single point dummy variable dropped from those reported in Basic equations (Table 3.1)

Key: C stands for real consumption; RPDI for real personal disposable income, RNW for real personal net financial wealth, ECM for the error correction terms, RR for the real interest rate, RPH for real house prices. A "D" prefix indicates the difference of the relevant variable.

Table 12: Annual estimates of selected countries Using Non-linear Least Squares

	GE Basic	GE Basic + RPH	IR Basic	IR Basic + RPH	FR Basic	FR Basic + RPH	OE Basic	OE Basic + RPH
Sample	1974-2004	1974-2004	1978-2004	1978-2004	1975-2004	1975-2004	1975-2004	1975-2004
Constant	-0.055 (2.2)	-0.058 (2.3)	-0.086 (3.3)	-0.087 (2.5)	-0.037 (2.3)	-0.016 (0.7)	-0.014 (0.9)	-0.012 (0.7)
ECM	-0.372 (2.7)	-0.401 (2.8)	-0.391 (3.4)	-0.392 (2.9)	-0.216 (4.0)	-0.166 (2.4)	-0.129 (1.8)	-0.124 (1.7)
ln RPDI(-1)	0.974 (58.7)	0.976 (61.9)	0.882 (22.0)	0.881 (20.4)	0.881 (26.9)	0.926 (13..5)	0.964 (20.7)	0.967 (19.6)
ln RNW(-1)	0.026	0.024	0.118	0.019	0.119	0.074	0.036	0.033
D ln RPDI	0.902 (23.7)	0.898 (23.2)	0.445 (3.4)	0.445 (3.2)	0.429 (3.9)	0.429 (3.4)	0.508 (4.7)	0.506 (4.6)
D ln RNW			0.067 (2.7)	0.067 (2.3)	0.044 (2.3)	0.038 (1.9)		
D ln RPH		0.036 (0.8)		-0.001 (0.02)		0.058 (1.17)		-0.017 (0.4)
Intercept Dummy					1992	1992		
R^2 adjusted	0.95	0.56	0.76	0.75	0.59	0.60	0.49	0.547
SE	0.007	0.004	0.015	0.016	0.008	0.008	0.012	0.013
LM(4)	0.9	12.4	0.02	0.03	1.6	2.0	3.9	4.8

Key: C stands for real consumption; RPDI for real personal disposable income, RNW for real personal net financial wealth, ECM for the error correction terms, RPH for real house prices. A "D" prefix indicates the difference of the relevant variable.

3.3. Preferred equations

In this study, we have endeavoured to provide a systematic examination of the main factors of aggregate consumption which is not only grounded in basic economic theory, but which also offers scope for modern interpretation on these seminal themes. The analysis presented above indicates that the patterns of aggregate consumption across Europe, the Euro Area and the US are not easily identified through a common model specification. Indeed, varying structural and institutional factors across these countries imply that saving and spending decisions are diverse and should be expected to respond differently to alternative economic indicators. Consequently, we have found that certain drivers of consumption are significant in some countries while they are insignificant in others.

The systematic nature of this study, therefore, runs the risk of obscuring the key determinants of aggregate consumption since the inclusion of irrelevant variables will not only distort the residuals, but will also restrict the forecasting performance of any model specification. To address these concerns, we build upon the above analysis to arrive at a set of *preferred equations* which include only the relevant variables from across all of the single country specifications above. Of course, the grouping of all relevant variables in the same specification may indeed render some previously significant variables obsolete, so the final specifications presented below contain only those which are relevant in this inclusive specification.

Table 13 lists the preferred equations. In all but a few cases, the ECM term is large in magnitude and highly significant, with a t-statistic greater than 3.0 (absolute) implying the presence of a strong cointegrating relation. However, in the remaining cases, the significance of the ECM term remains comfortably above 2.0. The long run income effect is stronger in those countries which, as discussed above, might be associated with less liberalised financial systems (such as Germany and Austria); while the (implied) long run wealth effect is strongest in countries with a greater degree of financial sector development (such as the UK and the US). The dynamic terms, however, vary substantially across countries and yield interesting results. For example, German consumption is best explained by income and the real price of housing, while French consumption is best explained by income and demographic factors. These findings have significant macroeconomic implications for policies aimed at both financial markets and government finances in these countries. Although, in some countries, such as Austria and Belgium, a very simple model determined by income alone is sufficient to determine aggregate consumption.

The findings presented here reflect a marked improvement over the model variants reported in the tables above. Not only do these results provide for a richer set of dynamic drivers of consumption they also help to highlight the implications for changes in macroeconomic policies. Finally, the insignificance of the real interest, and indeed the inclusion of these many other determining factors, supports the view of a more complex model of consumption than offered by the traditional Euler equation approach.

Table 13: Preferred equations*

	OE	GR	FR	IT	UK	US	SP
Sample	74Q1-04Q4	74Q1-04Q4	74Q1-04Q4	74Q1-04Q4	74Q1-04Q4	75Q3-04Q4	82Q1-04Q4
Constant	-0.008 (1.2)	-0.005 (1.6)	-1.076 (3.9)	-0.045 (4.6)	-0.016 (2.5)	-0.190 (4.4)	-0.017 (3.8)
ECM	-0.075 (2.5)	-0.038 (3.5)	-0.286 (5.6)	-0.081 (6.0)	-0.071 (3.2)	-0.222 (6.8)	-0.093 (3.2)
LRPDI(-1)	0.984 (27.12)	0.899 (32.7)	0.951 (52.3)	0.789 (40.7)	0.866 (14.2)	0.865 (30.7)	0.874 (18.2)
LRNW(-1)	0.016	0.101	0.049	0.211	0.134	0.135	0.126
D ln RPDI	0.272 (5.23)	0.504 (8.2)	0.449 (4.3)	0.208 (3.4)	0.198 (5.3)	0.167 (3.9)	
D ln RPDI(-1)					0.190 (5.1)		
D ln RNW				0.26 (2.3)	0.021 (2.7)	0.029 (2.8)	
RR (-1)				-0.5E-3 (3.3)		-0.4E-3 (2.4)	
D ln RPH					0.106 (3.8)		0.071 (2.4)
D ln RPH(-1)						0.089 (2.1)	
Log (20-40/pop)			0.192 (4.2)				
Log (40-64/pop)			0.160 (3.3)			0.043 (3.4)	
Log (65+/pop)			-0.054 (2.2)				
CONF(-1)						0.8E-4 (1.8)	
GBR(-1)						-0.001 (4.9)	
DGBR		0.002 (2.0)		0.002 (2.5)			
R^2 adjusted	0.52	0.54	0.41	0.56	0.73	0.62	0.52
SE	0.012	0.007	0.005	0.004	0.005	0.004	0.005
LM(4)	14.87	23.7	9.7	8.6	4.2	5.3	3.8

* Dummy variables same as those in Basic equations (Table 3.1) unless reported differently here.

Key: C stands for real consumption; RPDI for real personal disposable income, RNW for real personal net financial wealth, ECM for the error correction terms, RR for the real interest rate, RPH for real house prices, CONF for consumer confidence, GBR for the government budget ratio (as a share of GDP). A "D" prefix indicates the difference of the relevant variable.

Table 13 (cont.): Preferred equations*

	GE	SD	NL	BG	PT	FN	DK	IR
Sample	74Q1-04Q4	74Q1-04Q4	74Q1-04Q4	74Q1-04Q4	80Q3-04Q4	79Q2-04Q4	74Q1-04Q4	77Q2-04Q4
Constant	-0.059 (4.4)	-2.533 (2.8)	-0.5E-3 (0.4)	-0.01 (1.5)	-0.046 (4.4)	-0.5E-3 (0.2)	0.002 (0.7)	-0.017 (2.9)
ECM	-0.334 (5.2)	-0.077 (3.3)	-0.188 (5.3)	-0.041 (2.0)	-0.106 (3.0)	-0.067 (2.1)	-0.044 (2.3)	-0.096 (3.5)
ln RPDI(-1)	0.947 (74.1)	0.897 (30.6)	0.977 (36.2)	0.925 (17.7)	0.967 (24.6)	0.931 (38.5)	0.957 (18.9)	0.902 (29.9)
ln RNW(-1)	0.053	0.103	0.023	0.075	0.033	0.069	0.043	0.098
D ln RPDI	0.742 (13.2)		0.199 (4.2)	0.161 (2.2)	0.254 (4.4)	0.493 (6.6)		0.399 (6.1)
D ln RPDI(-1)						-0.147 (2.2)		
D ln RNW		0.018 (2.9)						
D ln RNW(-1)							0.042 (5.0)	
D ln C(-1)		0.253 (3.6)						
D RR								-0.6E-3 (2.7)
D ln RPH	0.157 (2.5)	0.062 (2.7)						-0.018 (0.6)
D ln RPH(-1)						0.104 (4.6)	0.091 (2.2)	
Log (20-40/pop)		0.428 (2.7)	0.003 (3.2)					
Log (40-64/pop)		0.291 (2.6)	0.007 (3.2)					
Log (65+/pop)		0.038 (2.4)						
DGBR		0.001 (2.4)				0.003 (3.4)		0.004 (2.5)
R^2 adjusted	0.64	0.62	0.38	0.28	0.26	0.72	0.45	0.60
SE	0.006	0.004	0.008	0.005	0.008	0.005	0.01	0.007
LM(4)	6.8	13.6	5.0	7.6	4.5	9.8	2.0	5.3

* Dummy variables same as those in Basic equations (Table 3.1) unless reported differently here

Key: C stands for real consumption; RPDI for real personal disposable income, RNW for real personal net financial wealth, ECM for the error correction terms, RR for the real interest rate, RPH for real house prices, CONF for consumer confidence, GBR for the government budget ratio (as a share of GDP). A "D" prefix indicates the difference of the relevant variable.

3.4. Consumer Confidence and Consumption

Recently there has been a growing interest in examining the link between confidence indicators and real economic activity (see Ludvigson (2004), for example). Confidence indicators are based on surveys conducted across both businesses and households and are designed to gather information on expectations of current and future economic conditions. In the context of the present report, we should ask if household confidence measures hold meaningful economic information on consumer expenditure beyond that contained in other observable economic and financial indicators, such as real net wealth and real house prices. If they do, then we should be able to improve our consumption model with the addition of consumer confidence measures.

In order to help us establish the desirability of using a measure of consumer confidence, we need to determine the causal relationship between this and the other variables of interest, namely real net wealth and real house prices. If we find that confidence Granger causes either real net wealth or real house prices, then it would be considered to have meaningful implications for real economic activity. However, if the reverse holds – i.e. that real net wealth Granger causes confidence and that real house prices Granger cause confidence – then any useful information we might obtain from the confidence measure is already contained in these observable variables. In this case, we would not expect to find confidence as a significant driver of aggregate consumption.

Here we conduct standard statistical tests to determine the Granger causality between real net wealth and confidence as well as between real house prices and confidence. We begin by specifying equations of the form

$$\Delta \ln RNW_t = \alpha_0 + \beta_i \sum_{i=1}^{4} \Delta \ln RNW_{t-i} + \gamma_j \sum_{j=1}^{4} conf_{t-j} + \varepsilon_t \,, \tag{3.2}$$

$$conf_t = \alpha_1 + \phi_i \sum_{i=1}^{4} \Delta \ln RNW_{t-i} + \theta_j \sum_{j=1}^{4} conf_{t-j} + \nu_t \,, \tag{3.3}$$

where real net wealth (*RNW*) is specified in first differences to ensure stationarity and the measure of consumer confidence (*conf*) is stationary in levels.[4] We then proceed by running each regression and testing the joint significance of the exogenous variables by conducting a variable deletion test. In the case of equation (3.2), we test the joint significance of the γ_j, whereas in equation (3.3) we test the joint significance of the ϕ_i. Determining the Granger causality between real house prices and confidence involves a similar set of equations as (3.2) and (3.3), except that real house prices (*RPH*) are substituted in place of real net wealth. The resultant F-tests on the unrestricted and restricted regressions are reported for each country in Tables 14-17 below.

The results presented in Tables 14 and 15 suggest that real financial wealth may Granger cause consumer confidence in Germany, Sweden and Finland, and possibly also in Greece and Spain. However, consumer confidence does not appear to Granger cause real net financial wealth in any of the above mentioned countries. Instead, consumer confidence may Granger cause real net financial wealth in the Netherlands, Belgium and Portugal. Given that our single country equations do not find a statistically significant role of consumer confidence in

[4] We substitute the first difference of real house prices (*RPH*) for *RNW* to examine the Granger causality between *RPH* and *conf*.

either the Netherlands, Belgium or Portugal, we conclude that it does not help to explain changes in consumption growth vis-à-vis its impact on real net financial wealth in any of the Euro Area countries.

As suggested in the above discussion, consumer confidence may also impact consumption through real house prices. Therefore, we examine Granger causality between confidence indicators and real house prices in our sample. The results of our analysis are summarised in Tables 16 and 17. These suggest that real house prices Granger cause consumer confidence in Ireland and Portugal, whilst confidence Granger causes real house prices in Austria, Germany, Spain and Ireland. These findings suggest that consumer confidence may help explain changes in consumption which are not captured by the evolution of real house prices. Since we find confidence indicators to be statistically significant determinants of changes in consumption in Austria and Spain, there appears to be a role for modelling confidence as a separate determinant of consumption in these countries.

Table 14: Granger Causality Tests in Single Equation Estimation: does confidence Granger cause real net financial wealth?

	OE	**GR**	***FR***	**IT**	**UK**	**US**	**SP**	
Sample	96Q1-04Q4	85Q2-04Q4	85Q2-04Q4	85Q2-04Q4	85Q2-04Q4	75Q3-04Q4	86Q2-04Q4	
F-Statistic	0.65	1.01	0.98	0.71	0.04	1.03	0.42	
	GE	**SD**	**NL**	**BG**	**PT**	**FN**	**DK**	**IR**
Sample	85Q1-04Q4	95Q4-04Q4	85Q1-04Q4	85Q1-04Q4	86Q2-04Q4	95Q4-04Q4	85Q1-04Q4	85Q1-04Q4
F-Statistic	1.36	1.09	2.06	2.96	2.24	0.62	1.63	1.18

Note: Red indicates countries where lagged confidence term was found to be a statistically significant determinant of consumption at the 95% level and italicized black were significant at the 90% level

Table 15: Granger Causality Tests in Single Equation Estimation: does real net wealth Granger cause confidence?

	OE	**GR**	***FR***	**IT**	**UK**	**US**	**SP**	
Sample	96Q1-04Q4	85Q2-04Q4	85Q2-04Q4	85Q2-04Q4	85Q2-04Q4	75Q3-04Q4	86Q2-04Q4	
F-Statistic	0.22	1.88	0.73	0.44	0.56	*3.87*	*1.76*	
	GE	**SD**	**NL**	**BG**	**PT**	**FN**	**DK**	**IR**
Sample	85Q1-04Q4	95Q4-04Q4	85Q1-04Q4	85Q1-04Q4	86Q2-04Q4	95Q4-04Q4	85Q1-04Q4	85Q1-04Q4
F-Statistic	2.76	4.47	0.6	0.69	1.13	4.86	1.86	1.52

Note: Red indicates countries where lagged confidence term was found to be a statistically significant determinant of consumption at the 95% level and italicized black were significant at the 90% level

Table 16: Granger Causality Tests in Single Equation Estimation: does confidence Granger cause real house prices?

	OE	**GR**	**FR**	**IT**	**UK**	**US**	**SP**	
Sample	96Q1-04Q4	85Q2-04Q4	85Q2-04Q4	85Q2-04Q4	85Q2-04Q4	75Q3-04Q4	86Q2-04Q4	
F-Statistic	2.39	0.36	0.26	0.53	1.81	1.35	2.31	
	GE	**SD**	**NL**	**BG**	**PT**	**FN**	**DK**	**IR**
Sample	85Q1-04Q4	95Q4-04Q4	85Q1-04Q4	85Q1-04Q4	86Q2-04Q4	95Q4-04Q4	85Q1-04Q4	85Q1-04Q4
F-Statistic	3.4	2.62	1.11	0.88	0.30	0.64	1.22	2.61

Note: Red indicates countries where lagged confidence term was found to be a statistically significant determinant of consumption at the 95% level and italicized black were significant at the 90% level

Table 17: Granger Causality Tests in Single Equation Estimation: do real house prices Granger cause confidence?

	OE	GR	FR	IT	UK	US	SP	
Sample	96Q1-04Q4	85Q2-04Q4	85Q2-04Q4	85Q2-04Q4	85Q2-04Q4	75Q3-04Q4	86Q2-04Q4	
F-Statistic	1.43	0.81	1.23	0.04	0.80	0.44	0.76	
	GE	**SD**	**NL**	**BG**	**PT**	**FN**	**DK**	**IR**
Sample	85Q1-04Q4	95Q4-04Q4	85Q1-04Q4	85Q1-04Q4	86Q2-04Q4	95Q4-04Q4	85Q1-04Q4	85Q1-04Q4
F-Statistic	1.13	2.49	0.92	0.56	4.55	1.61	1.56	4.22

Note: Red indicates countries where lagged confidence term was found to be a statistically significant determinant of consumption at the 95% level and italicized black were significant at the 90% level

3.5. Forecast Errors

Short term forecasts and decomposition of determinants of consumption

Given our new set of preferred equations, it is instructive to assess their forecasting performance and to decompose the contributions of each component to consumption in this final specification of some of the major economies. Here, we provide forecasts over recent history of the preferred equations and the initial basic equations (containing income and wealth dynamics). Both models are estimated up to 1999Q4 and then used to forecast the remainder of the sample to 2004Q4. In addition, the preferred equations are forecast over a shorter horizon covering the period 2001Q1 to 2004Q4 to highlight the period when most countries in our sample began to experience a marked deterioration in consumption. This is followed by the decomposition of consumption for the selected preferred equations. The Annex to this section contains the forecast errors relating to the workhorse model (interest rates plus house prices) and additions to this model, including demographics, fiscal effects, and confidence indicators.

Forecast errors

Tables 18 and 19 below detail the forecast errors for the basic and preferred equations, respectively, as measured against the actual data; and Table 20 details the shortened forecast horizon for the preferred equations.

Table 18: Single Equation Forecast Errors – Basic Equations
(Annual average)

	OE	GR	FR	IT	UK	US	SP
2000	0.0043	-0.0022	0.0008	0.0025	-0.0076	-0.0035	-0.0029
2001	0.0005	-0.0016	0.0008	-0.0042	-0.0006	0.0015	-0.0043
2002	0.0004	-0.0015	-0.0001	0.0008	0.0035	0.0047	-0.0033
2003	0.0014	0.0036	0.0000	-0.0006	0.0027	0.0096	-0.0038
2004	0.0025	-0.0055	0.0010	-0.0007	0.0067	0.0082	0.0006
Average 2000-04	**0.0018**	**-0.0004**	**0.0003**	**-0.0004**	**0.0009**	**0.0041**	**-0.0027**
Average 2002-04	**0.0014**	**-0.0011**	**0.0003**	**-0.0002**	**0.0043**	**0.0075**	**-0.0022**

	GE	SD	NL	BG	PT	FN	DK	IR
2000	0.0026	-0.0046	0.0114	0.0028	-0.0008	-0.0101	-0.0115	0.0031
2001	0.0024	-0.0077	0.0044	-0.0080	-0.0048	-0.0038	-0.0030	-0.0002
2002	-0.0019	-0.0003	0.0058	-0.0011	-0.0044	-0.0051	-0.0005	-0.0015
2003	-0.0013	-0.0048	-0.0004	-0.0002	-0.0028	-0.0007	-0.0012	0.0016
2004	-0.0053	-0.0037	0.0027	0.0011	-0.0007	-0.0092	0.0079	0.0004
Average 2000-04	**0.0005**	**-0.0043**	**0.0053**	**-0.0016**	**-0.0027**	**-0.0058**	**-0.0040**	**0.0007**
Average 2002-04	**-0.0028**	**-0.0029**	**0.0027**	**-0.0001**	**-0.0026**	**-0.0050**	**0.0021**	**0.0002**

The results for the basic equations tend to show systematic errors where long runs of positive and negative residuals imply that the equations either under or over predict consumption. Amongst the Euro Area countries, eight display negative residuals in the last two years, suggesting some weakness of consumption. They are particularly large in Germany, Finland and Greece. Systematic prediction failure is common among all countries except for Germany, Italy, the UK and Ireland where there appears to be a marked break in the behaviour of the residual suggesting a change in at least one of the key drivers of consumption. In general, however, the residuals from the basic equations imply that important determinants of private consumption growth are still missing in some of the country models. Thus, while not necessarily yielding significant contributions on their own, the alternative drivers of consumption reflected in the preferred equations could help to refine our understanding of private consumption and improve the forecast performance of the model.

Table 19: Preferred Equation Forecast Errors (2000-2004)
(Annual average)

	OE	GR	FR	IT	UK	US	SP
2000	0.0042	0.0002	0.0109	-0.0010	0.0026	0.0061	0.0014
2001	0.0068	-0.0004	0.0061	0.0015	-0.0057	-0.0023	-0.0008
2002	0.0035	-0.0012	0.0071	-0.0032	0.0018	0.0047	-0.0003
2003	0.0033	-0.0002	0.0072	0.0000	0.0003	0.0046	0.0002
2004	0.0042	0.0050	0.0110	-0.0010	0.0020	0.0094	-0.0004
Average 2000-04	**0.0050**	**-0.0044**	**0.0144**	**-0.0020**	**0.0055**	**0.0043**	**0.0045**
Average 2002-04	**0.0045**	**0.0008**	**0.0079**	**-0.0006**	**-0.0004**	**0.0041**	**-0.0003**

	GE	SD	NL	BG	PT	FN	DK	IR
2000	-0.0020	-0.0082	0.0054	-0.0001	-0.0039	0.0002	0.0019	-0.0001
2001	0.0031	-0.0043	0.0073	0.0028	-0.0012	-0.0008	-0.0110	0.0024
2002	0.0030	-0.0124	0.0048	-0.0080	-0.0066	0.0049	-0.0030	0.0025
2003	-0.0013	-0.0072	0.0071	-0.0011	-0.0057	0.0001	-0.0003	-0.0037
2004	-0.0003	-0.0101	0.0035	-0.0002	-0.0048	0.0030	-0.0011	0.0017
Average 2000-04	**-0.0046**	**-0.0072**	**0.0057**	**0.0011**	**-0.0014**	**-0.0024**	**0.0069**	**0.0018**
Average 2002-04	**0.0011**	**-0.0085**	**0.0057**	**-0.0016**	**-0.0046**	**0.0018**	**-0.0038**	**0.0007**

The preferred equations in Table 19 show some improvement in the forecast performance for most countries and there are fewer negative errors in the last two years of the sample. Amongst the Euro Area countries, however, Belgium Portugal and Germany do show negative errors in both of these years, but the forecast performance is clearly better in

Germany; although we appear to have a stronger explanation of the behaviour of consumption in most countries with these preferred equations. Hence, it is useful to turn to these determinants of aggregate consumption in order to gain an understanding of recent weaknesses in consumption growth

It is, of course, difficult to forecast so far out of sample, even though the equations were selected over the entire data period and particularly given that the driving variables are not forecast. Table 20 is even slightly better since this covers the shortened period and thus excludes any noise from the longer forecast horizon. However, there appears to be continued problems of over prediction with these shorter forecasts for Germany and Italy, while France shows continuous under prediction. In addition, Finland, Greece and Sweden appear to have weak consumption during this period. Given these persistent effects, we now examine consumption and its determinants in these six countries in more detail along with the UK as a comparator.

Table 20: Preferred Equation Forecast Errors (2001-2004)
(Annual average)

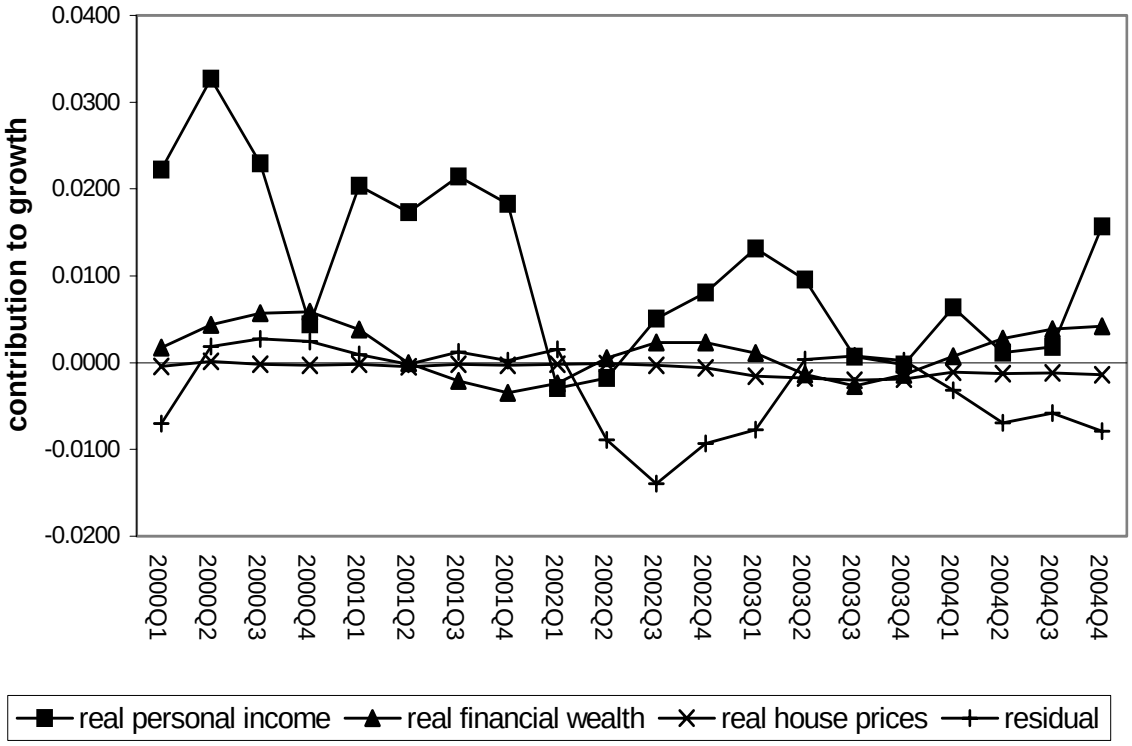
	OE	**GR**	**FR**	**IT**	**UK**	**US**	**SP**	
2002	0.0015	-0.0010	0.0018	0.0003	0.0011	-0.0003	0.0006	
2003	0.0026	0.0042	0.0041	-0.0007	0.0025	0.0024	0.0000	
2004	0.0031	-0.0050	0.0066	-0.0018	0.0061	-0.0022	0.0049	
Average	**0.0018**	**-0.0004**	**0.0031**	**-0.0006**	**0.0024**	**0.0000**	**0.0014**	
	GE	**SD**	**NL**	**BG**	**PT**	**FN**	**DK**	**IR**
2002	-0.0022	-0.0003	0.0051	-0.0005	-0.0046	-0.0012	0.0002	-0.0038
2003	-0.0011	-0.0061	0.0020	0.0003	-0.0036	0.0017	-0.0005	0.0017
2004	-0.0055	-0.0038	0.0041	0.0018	-0.0005	-0.0036	0.0076	0.0018
Average	**-0.0022**	**-0.0025**	**0.0028**	**0.0004**	**-0.0022**	**-0.0008**	**0.0018**	**-0.0001**

Decomposing Changes in Consumption

We utilise the dynamic structure of our equations in order to find the cumulated effects of the driving variables on consumption. The contributions depend not only on current events, but also on the impact of previous events on current consumption mediated through the lagged dependent variables. Hence, the residuals in our charts are 'dynamic' as they cumulate the effects of past omitted variables and other factors on the growth of current consumption. They are not, therefore, directly comparable to the 'static' residuals that we present in the tables above. We choose to present evaluations for the three largest Euro Area countries, the UK and Sweden, and two countries that have negative residuals in the tables in this section.

Figure 2

Decomposing the determinants of consumption in Germany



The German equation moves from a position of substantial under prediction to an almost equal and opposite over prediction in 2002 where it continues to grow (negatively) over the rest of the sample. This behaviour is also reflected in both of the preferred equation residual tables and suggests that at least one key driver of consumption has eroded during this period. As we can see from the decomposition chart, the dynamic residual is negative in 2002 and again, albeit it to a lesser extent, in 2004. This indicates that there have been factors reducing consumption in addition to those that we have been investigating. These may reflect the impact of worries about structural reforms to the labour market and social security, both of which may lead individuals to (correctly) perceive that they need to raise their level of savings. Weak housing markets in Germany have been marginally reducing consumption in that country, but this has been partly offset by the impact of stronger growth in real wealth. However, it is clear from the chart that the major factor holding back consumption growth in Germany has been the weak growth of real personal disposable income since the beginning of 2002.

The decomposition for the UK shows that the contribution of income growth slowed in 2002, but only marginally. Although strong growth in real house prices has added significantly to the strength of consumption boosting it by more than 1 per cent in 2003 and 2004. Weak financial asset prices and growing debts have meant that real financial wealth has held back consumption marginally in the UK. The dynamic residual is generally small, but appears positive in 2004. However, data revisions after our data set was cast have removed this under prediction and this is discussed in the National Institute Review for October 2005.

The decomposition for France shows that the contribution of real disposable income to the growth of consumption also slowed in 2002, albeit by a small amount. The French preferred

equation contains demographic factors and these build slowly over time and hence they add little to our understanding of recent patterns in French consumption. Growth in real financial wealth has added to consumption growth in 2004, but only marginally and overall it is clear that consumption was under predicted in 2004 evidenced by a positive contribution from the dynamic residual. This is consistent with the results in our forecast error tables.

There are large unexplained factors in the determination of Italian consumption, and this is reflected by the need for a number of one-off dummies in our regression equation. The decomposition for Italy shows that the cumulate effects of the equation residual have been regularly negative in the last 5 years. The Italian equation has a significant role for the real interest rate and as this has been low in recent years it has been supporting consumption, as has the direct effect of continual attempts to tighten fiscal policy. Real financial wealth effects have been strong, in part because the Italian wealth stock is biased toward bonds and their prices have been rising in a period of falling long term rates.

The Italian decomposition is repeated in the subsequent chart without the residual for clarity of exposition. It is clear from this chart that weak real personal income growth held back consumption from 2001 to the beginning of 2004, but since then it has been boosting consumption growth modestly. There has, however, been unexplained weakness in consumption growth in Italy in 2004 and 2005, possibly reflecting worries about future income prospects following-on from a very weak supply side performance over the last few years

Figure 3

Decomposing the determinants of consumption in the UK

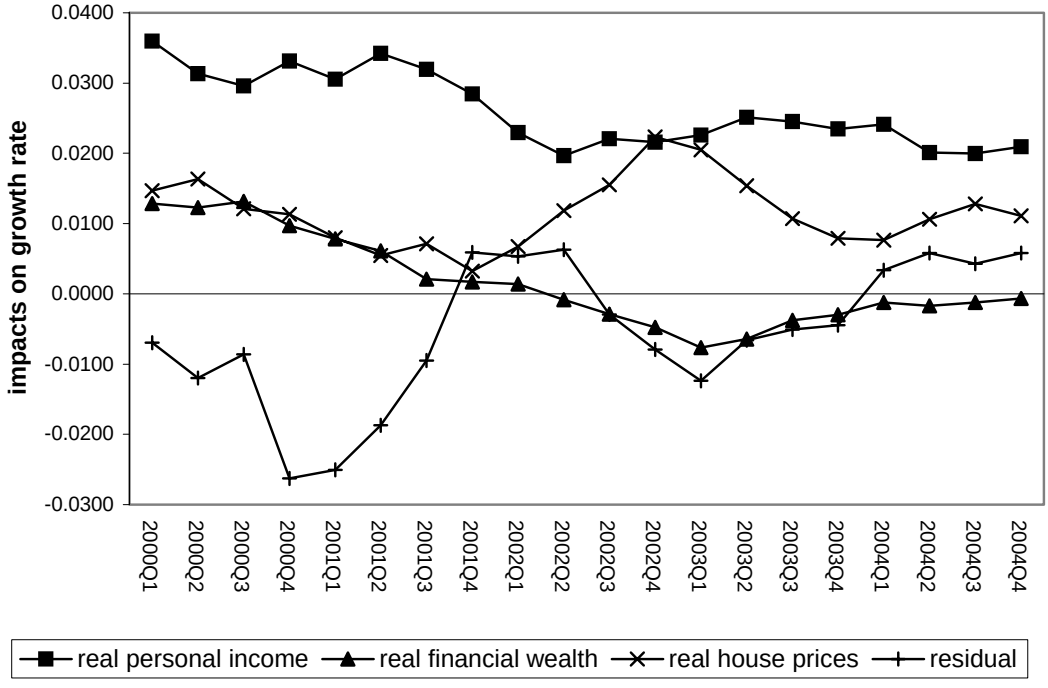


Figure 4

Decomposing the determinants of consumption in France

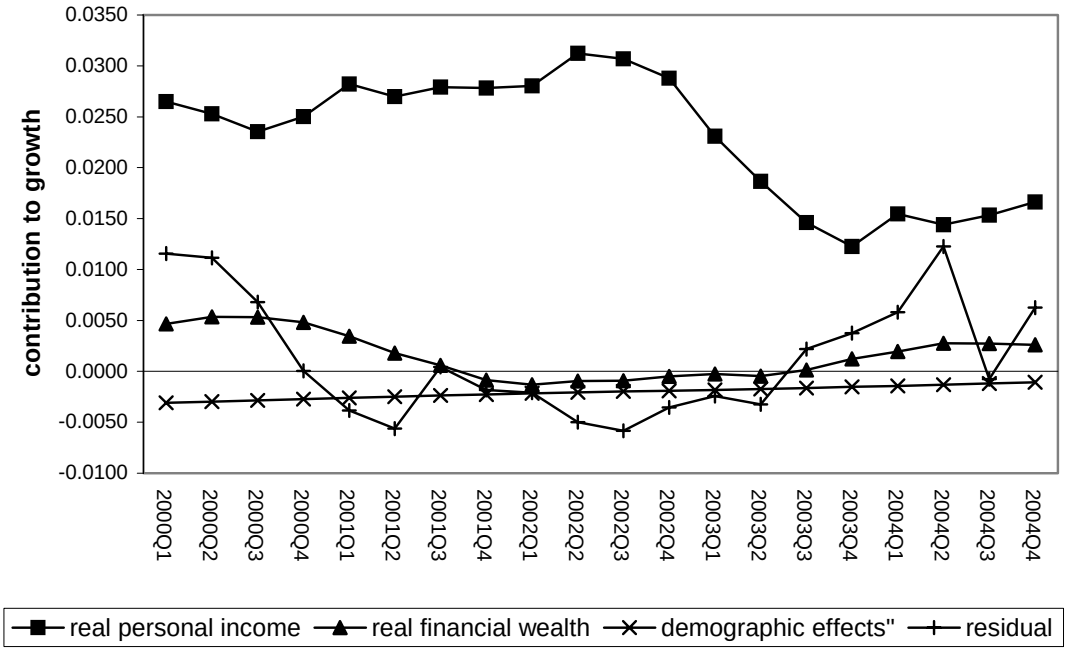


Figure 5

Decomposing the determinants of consumption in Italy

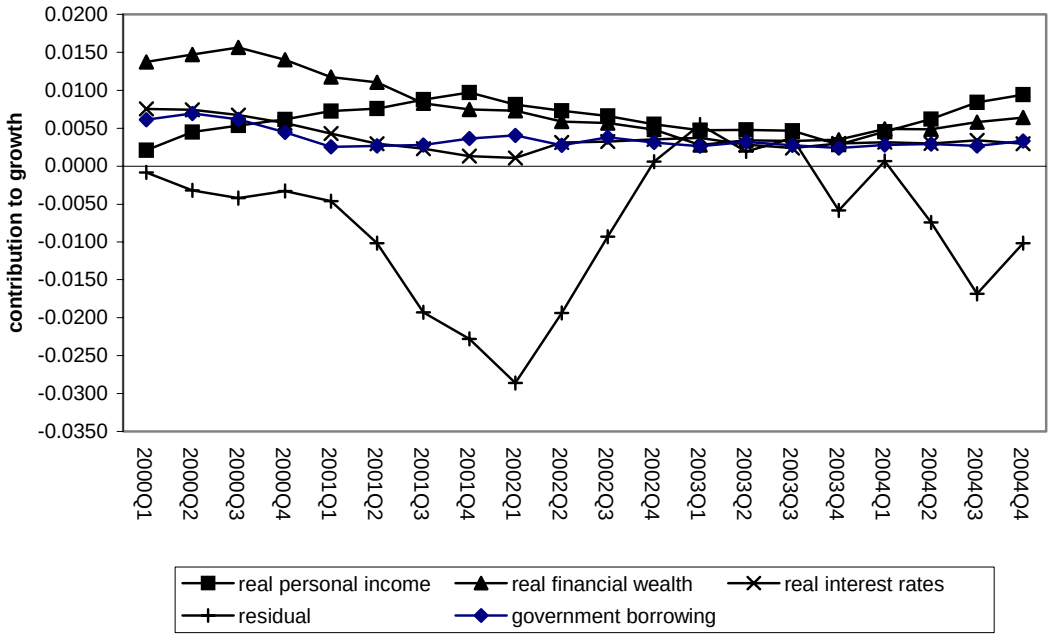


Figure 6

Decomposing the determinants of consumption in Italy without residuals

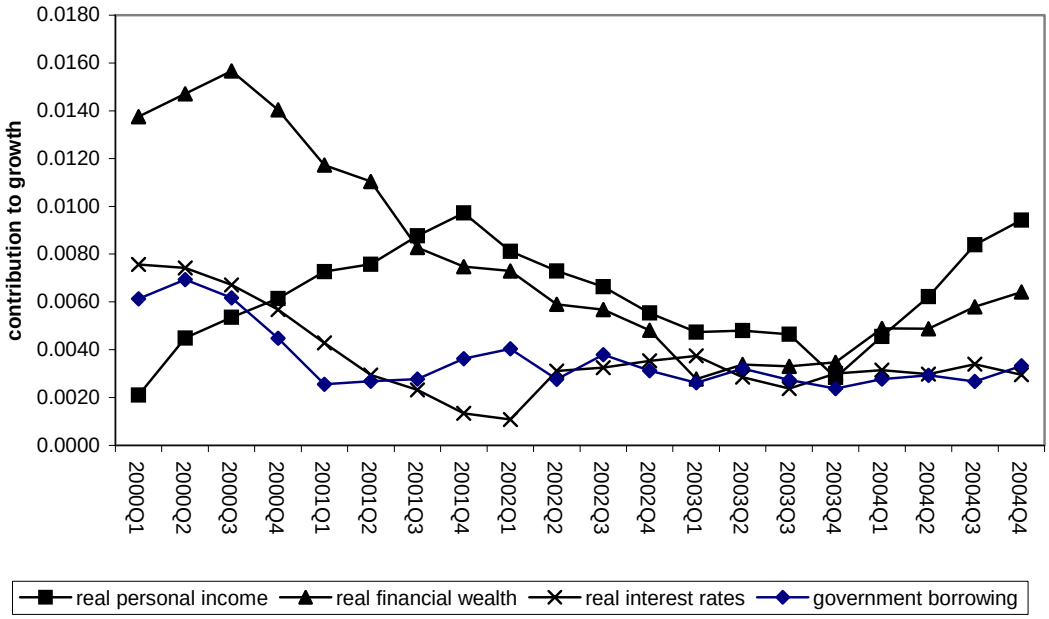


Figure 7

Decomposing the determinants of consumption in Greece

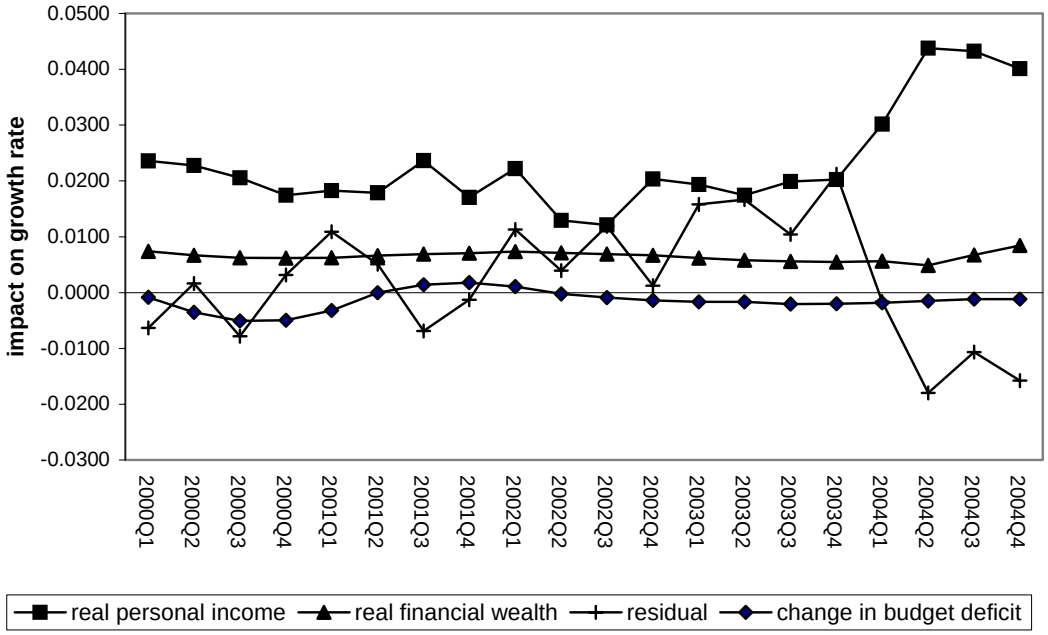


Figure 8

Decomposing the determinants of consumption in Sweden

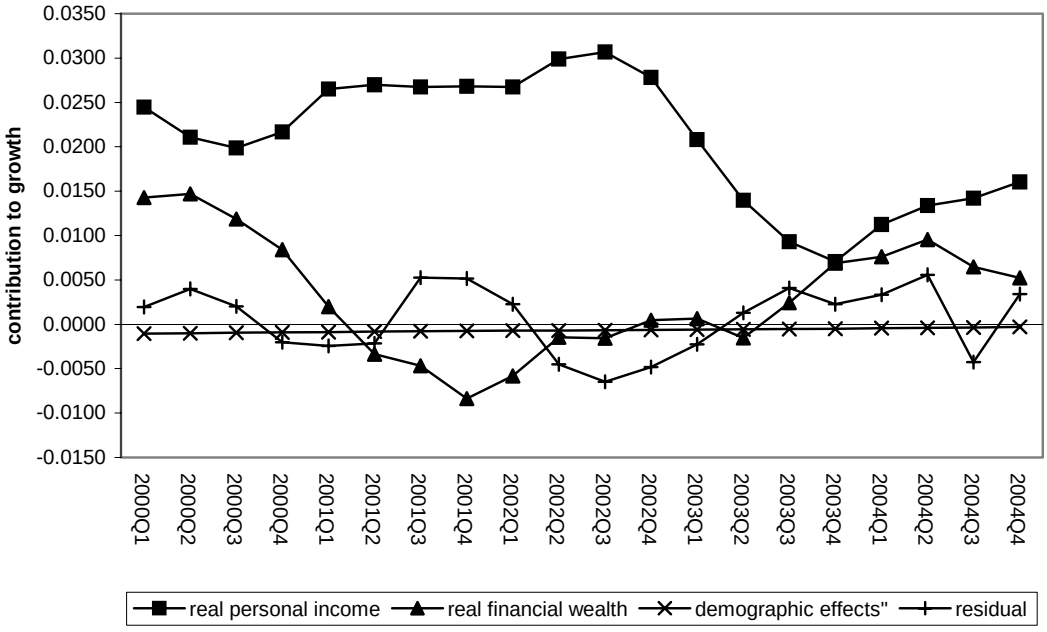
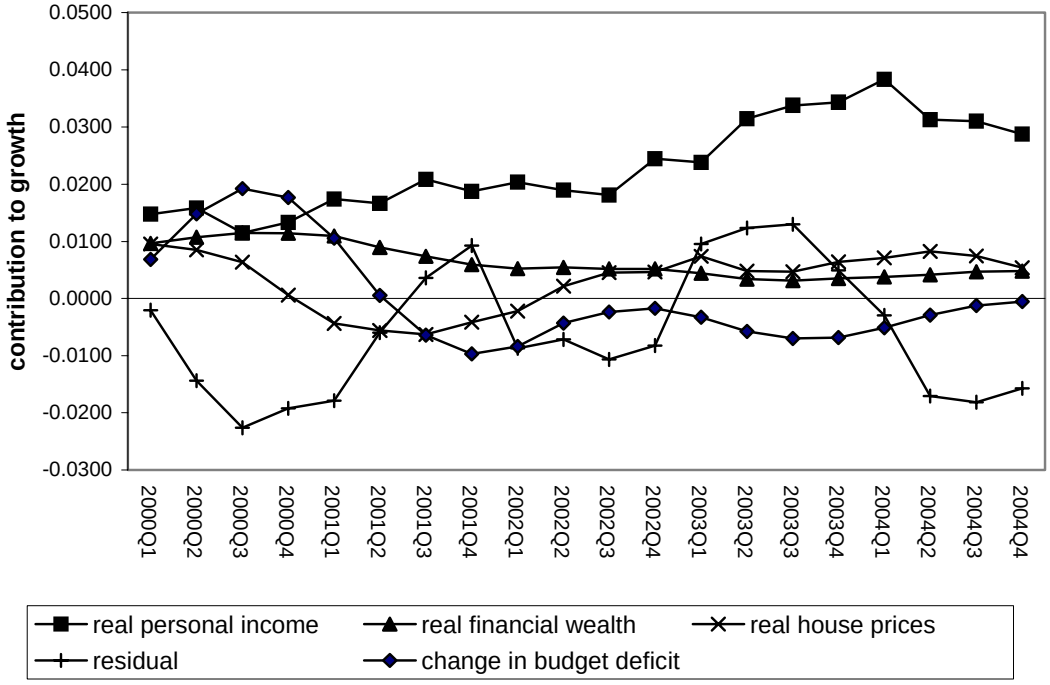


Figure 9

Decomposing the determinants of consumption in Finland



The decomposition for Sweden displays a similar pattern to that of Germany with a sharp slowdown in the impact of real personal income growth in 2002, which leads to a slowdown

in consumption growth. However, from the end of 2003, a strengthening of the impact of income growth, along with a positive impact of increases in real financial wealth, have helped to support consumption. The residual weakness we observe in static residuals above is washed-out in the dynamic residuals suggesting that consumption growth is explainable. Once again, demographic factors have no great impact on short term developments, as we would expect.

Our decomposition of growth for Finland shows that the residual weakness of consumption we have seen has come about despite a strengthening in the impact of personal income growth and positive contributions from house price growth and real financial wealth. Only fiscal policy has had a direct negative impact on consumption and in 2004 the impact of personal income growth declined slightly. Developments in 2005 will have to be captured by dummies to cover the impact of the strike in the paper and pulp industries.

The decomposition for Greece shows that consumption growth has been strong and has been supported by contributions from real personal income and from real financial wealth. In 2004, the impacts of personal income growth increased markedly as a result on the Olympics, but consumption growth did not respond, as we can see from the dynamic residual. This probably reflects a rational response to transitory developments.

Annex: residuals

Table 21: Single Equation Forecast Errors – New Basic Equations (With real interest rates and house prices) (Annual average)

	OE	**GR**	**FR**	**IT**	**UK**	**US**	**SP**	
2000	0.0044	-0.0007	0.0019	0.0003	-0.0054	-0.0039	-0.0026	
2001	0.0023	0.0012	0.0011	-0.0050	0.0020	0.0013	-0.0041	
2002	0.0030	0.0018	-0.0003	-0.0011	0.0003	0.0039	-0.0035	
2003	0.0015	0.0066	0.0001	-0.0021	0.0020	0.0088	-0.0046	
2004	0.0022	--	0.0018	-0.0035	0.0054	0.0060	0.0003	
Average 2000-04	**0.0027**	**0.0023**	**0.0007**	**-0.0020**	**0.0009**	**0.0032**	**-0.0029**	
Average 2002-04	**0.0022**	**0.0042**	**0.0006**	**-0.0022**	**0.0026**	**0.0062**	**-0.0026**	
	GE	**SD**	**NL**	**BG**	**PT**	**FN**	**DK**	**IR**
2000	0.0021	-0.0028	0.0100	0.0025	-0.0020	0.0007	-0.0112	0.0022
2001	0.0026	-0.0065	0.0044	-0.0084	-0.0060	0.0023	-0.0031	0.0002
2002	-0.0021	0.0000	0.0035	-0.0018	-0.0055	-0.0010	-0.0005	-0.0044
2003	-0.0018	-0.0052	-0.0017	-0.0016	-0.0051	0.0000	-0.0014	-0.0009
2004	-0.0065	-0.0042	0.0025	-0.0003	-0.0019	-0.0049	0.0063	-0.0021
Average 2000-04	**0.0002**	**-0.0036**	**0.0041**	**-0.0023**	**-0.0041**	**-0.0006**	**-0.0041**	**-0.0010**
Average 2002-04	**-0.0035**	**-0.0031**	**0.0015**	**-0.0012**	**-0.0042**	**-0.0020**	**0.0015**	**-0.0025**

* Due to a missing data point, GR is estimated only up to 2004Q3 permitting annual averages only up to 2003.

Table 22: Single equation forecast errors – New Basic Equations plus Demographic Data (Annual Average)

	OE	GR	FR	IT	UK	US	SP	
2000	-0.0091	-0.0001	0.0062	-0.0067	-0.0060	-0.0035	-0.0037	
2001	-0.0159	0.0033	0.0073	-0.0142	0.0032	0.0028	-0.0074	
2002	-0.0226	0.0043	0.0065	-0.0132	-0.0006	0.0044	-0.0104	
2003	-0.0336	0.0089	0.0099	-0.0177	0.0040	0.0096	-0.0153	
2004	-0.0395	0.0006	0.0129	-0.0239	0.0072	0.0057	-0.0132	
Average 2000-04	**-0.0241**	**0.0034**	**0.0075**	**-0.0129**	**0.0015**	**0.0038**	**-0.0100**	
Average 2002-04	**-0.0319**	**0.0046**	**0.0098**	**-0.0183**	**0.0035**	**0.0066**	**-0.0130**	
	GE	**SD**	**NL**	**BG**	**PT**	**FN**	**DK**	**IR**
2000	-0.0048	-0.0045	0.0093	0.0000	-0.0096	-0.0032	-0.0049	-0.0113
2001	-0.0025	-0.0143	0.0025	-0.0118	-0.0132	0.0011	-0.0130	-0.0030
2002	-0.0093	-0.0086	-0.0007	-0.0053	0.0000	-0.0016	-0.0162	-0.0005
2003	-0.0083	-0.0102	-0.0063	-0.0049	0.0000	0.0007	-0.0203	-0.0014
2004	-0.0158	-0.0070	-0.0014	-0.0041	0.0000	-0.0047	-0.0234	0.0064
Average 2000-04	**-0.0062**	**-0.0094**	**0.0012**	**-0.0055**	**0.0000**	**-0.0008**	**-0.0136**	**-0.0041**
Average 2002-04	**-0.0111**	**-0.0086**	**-0.0028**	**-0.0048**	**0.0000**	**-0.0018**	**-0.0200**	**0.0015**

Table 23: Single equation forecast errors – New Basic Equations plus Confidence Indicators (Annual Average)

	OE*	GR	FR	IT	UK	US	SP	
2000	--	-0.0027	0.0003	0.0021	-0.0059	-0.0034	-0.0014	
2001	--	0.0010	0.0020	-0.0053	0.0008	0.0042	0.0006	
2002	--	0.0021	-0.0010	-0.0002	0.0013	0.0052	0.0034	
2003	--	0.0088	0.0008	-0.0047	0.0011	0.0111	0.0031	
2004	--	-0.0035	0.0001	-0.0035	0.0047	0.0072	0.0071	
Average 2000-04	**--**	**0.0011**	**0.0005**	**-0.0020**	**0.0004**	**0.0049**	**0.0026**	
Average 2002-04	**--**	**0.0025**	**-0.0001**	**-0.0028**	**0.0024**	**0.0078**	**0.0045**	
	GE	**SD**	**NL**	**BG**	**PT**	**FN**	**DK**	**IR**
2000	0.0010	-0.0111	0.0080	0.0003	-0.0019	0.0000	-0.0116	0.0022
2001	0.0022	-0.0346	0.0025	-0.0089	-0.0058	0.0076	-0.0036	-0.0009
2002	-0.0037	-0.0258	0.0022	-0.0021	-0.0048	0.0051	-0.0007	-0.0144
2003	-0.0032	-0.0211	-0.0021	-0.0015	-0.0047	0.0101	-0.0006	-0.0094
2004	-0.0087	-0.0228	0.0033	-0.0014	-0.0015	-0.0018	0.0070	-0.0069
Average	**-0.0009**	**-0.0232**	**0.0027**	**-0.0030**	**-0.0043**	**0.0057**	**-0.0041**	**-0.0056**
Average 2002-04	**-0.0052**	**-0.0232**	**0.0012**	**-0.0016**	**-0.0037**	**0.0045**	**0.0019**	**-0.0102**

* Due to data limitations, Austria cannot be forecast over a suitable period.

Table 24: Single equation forecast errors – New Basic Equations plus Fiscal Balance (Annual Average)

	OE	GR	FR	IT	UK	US	SP	
2000	0.0019	-0.0005	0.0035	-0.0002	-0.0071	-0.0024	-0.0004	
2001	-0.0013	0.0013	0.0032	-0.0046	-0.0002	0.0035	-0.0016	
2002	0.0026	0.0028	-0.0009	-0.0012	-0.0003	0.0031	-0.0006	
2003	0.0005	0.0072	-0.0025	-0.0020	0.0020	0.0074	-0.0010	
2004	0.0013	-0.0030	-0.0014	-0.0031	0.0059	0.0037	0.0041	
Average 2000-04	**0.0010**	**0.0016**	**0.0008**	**-0.0020**	**0.0001**	**0.0030**	**0.0001**	
Average 2002-04	**0.0015**	**0.0024**	**-0.0016**	**-0.0021**	**0.0026**	**0.0047**	**0.0008**	
	GE	**SD**	**NL**	**BG**	**PT**	**FN**	**DK**	**IR**
2000	0.0028	-0.0034	0.0070	0.0023	-0.0016	0.0007	-0.0093	-0.0006
2001	0.0053	-0.0060	0.0048	-0.0082	-0.0059	0.0023	-0.0023	0.0025
2002	-0.0013	0.0012	0.0058	-0.0010	-0.0045	-0.0010	0.0013	-0.0078
2003	-0.0012	-0.0056	0.0025	-0.0012	-0.0047	0.0000	-0.0005	-0.0075
2004	-0.0057	-0.0044	0.0045	-0.0002	-0.0015	-0.0049	0.0079	-0.0079
Average 2000-04	**0.0014**	**-0.0035**	**0.0050**	**-0.0020**	**-0.0041**	**0.0005**	**-0.0027**	**-0.0034**
Average 2002-04	**-0.0027**	**-0.0029**	**0.0043**	**-0.0008**	**-0.0035**	**-0.0019**	**0.0029**	**-0.0077**

4 Panel estimation

It is possible to investigate consumption behaviour in the Euro Area, the EU and the US using panel data analysis. This involves imposing restrictions on parameters across countries that may not be strictly valid, and we test for this in various ways. We first estimate a basic model of all countries and for the EMU members, we then add progressively the real interest rate and the change in real house prices. This gives us a basis from which we can evaluate the roles of consumer confidence, government deficits, demography, equity price volatility and equilibrium unemployment indicators to see if these in turn have had an impact on consumption. We report the residuals on the three basic equations and those where the additional variables are significant in order to aid the evaluation of the reasons for weak consumption in Europe. In an annex we also use the panel analysis to test for various specification changes, such as the inclusion of gross wealth and gross liabilities and changing the time domain.

4.1 Basic Results for a fixed effects panel

We chose for the base case the sample period 1974-2004, which covers a long period of time but avoids the potentially differing behaviour in the pre Bretton Woods period. As in the single equation evaluation, we start with a basic model including levels and dynamics in real personal disposable income (RPDI) and real financial wealth (RNW), and we then add the lagged level of real interest rates (RR) as well as the current change, as well as the rate of

change in the real house (RPH) to this model. We use the same log approximation to ensure that errors are stationary and estimation is efficient. Our workhorse model discussed above is

$$\Delta \ln C_t = \alpha_0 + \alpha_1 * \ln C_{t-1} + \beta_1 * \ln RPDI_{t-1} + \beta_2 * \ln RNW_{t-1}$$
$$+ \gamma_i * \Delta \ln RNW_{t-j} + \gamma_i * \Delta \ln RPDI_{t-k} + \delta * RR_t + \delta_1 dRR_{t-1} + \delta_2 \Delta \ln RPH_t \quad (4.1)$$

The results of GLS fixed effects unbalanced panel estimation using the simplest possible specification are shown in Table 25, column 1 and all the variables are significant at 95%. The short run effect of a 1% increase in income is a rise in consumption of 0.14%, while the effect of a 1% rise in real net financial wealth effect in the short run is smaller at 0.01%. In the long run the income effect is 0.67% (the ratio of the income term to the error correction coefficient) while the corresponding wealth effect is 0.15%. Given our time domain contains almost 120 elements, even with an error correction coefficient of 0.02 (0.1 approximately if it were annual data) we do not expect the time series bias on the lagged dependent variable (see Nickel (1981) and Judson and Owen (1999)) to be significant.

The parameter results are in line with existing estimates (such as those of Barrell and Davis (2004a)). According to the F tests, the equality of slope coefficients as well as the fixed effects are accepted relative to Leamer's (1978) diffuse prior. This is an F test with critical values which become larger as the number of observations grows, an alternative to the conventional testing procedure, which is certain to reject all point null hypotheses when sample sizes become large. The diagnostics imply no heteroskedasticity or autocorrelation. The second column shows the corresponding result for the Euro Area. The results are very similar, although we note that the short run wealth effect smaller. Also, the coefficient on the change in net financial wealth is not significant for the EMU countries as a whole. Diagnostics are again satisfactory.

There are additional questions we can address. The third and fourth columns show extended equations to allow for an effect of real interest rates. This is a generated regressor, and hence it is measured with error, and it is therefore instrumented by past interest inflation and rates. It is clear that in both the full sample and the euro area, real interest rates had a significant long run effect on consumption on average, but the short run effect of a change in real interest rates is insignificant and possibly of the wrong sign. Other variables remain significant, and dynamic terms in real income and to a lesser extent real wealth are larger in size than in the equations without real rates, suggesting that some specification error has been removed. Note that this result does imply that an Euler approach would not be appropriate, given the significance of the short and long run income and wealth variables, as well as lagged consumption. The Euler approach would imply that significance should only attach to the coefficients on interest rates. There is no autocorrelation or heteroskedasticity, and pooling is also accepted.

Table 25: Panel consumption functions for 1974-2003

	Basic		+Real interest rate		+House prices	
	All	**EMU**	**All**	**EMU**	**Full sample**	**EMU**
LC(-1)	-0.020	-0.020	-0.021	-0.020	-0.046	-0.048
	(4.2)	(3.7)	(4.3)	(3.8)	(7.9)	(7.5)
LRPDI(-1)	0.014	0.012	0.013	0.012	0.035	0.036
	(2.54)	(2.0)	(2.5)	(2.0	(5.9)	(5.5)
LRNW(-1)	0.0039	0.0037	0.0041	0.0040	0.0050	0.0058
	(6.0)	(5.3)	(5.9)	(5.3)	(6.4)	(6.7)
DLRPDI	0.14	0.14	0.23	0.27	0.198	0.27
	(10.1)	(9.3)	(12.5)	(12.9)	(9.9)	(11.3)
DLRNW	0.009	0.0046	0.0089	0.0054	0.0083	0.0063
	(2.8)	(1.2)	(2.8)	(1.4)	(2.6)	(1.7)
DRR			0.000097	0.000093	0.00019	0.00019
			(1.5)	(1.5)	(3.2)	(3.0)
RR(-1)			-0.00034	-0.00045	-0.00033	-0.00049
			(4.4)	(5.5)	(4.3)	(5.8)
DLRPH					0.084	0.052
					(7.9)	(4.4)
F (pooling)	4.8 (8.3)	6.4 (7.8)	3.5 (8.6)	4.2 (8.1)	3.1(8.8)	3.3 (8.3)
F (fixed effects)	5.0 (7.6)	4.9 (7.3)	4.7 (7.6)	4.9 (7.2)	6.5 (7.6)	8.0 (7.2)
R-bar sq	0.10	0.11	0.13	0.17	0.19	0.22
LM het	.09 (0.77)	1.26 (0.26)	0.20 (0.66)	3.97 (0.05)	0.35(0.55)	0.63 (0.43)
DW	2.0	2.0	2.0	2.0	2.2 (1.00,1.00)	2.2 (0.99,1.00)
	(0.59,0.68)	(0.52,0.63)	(0.92,0.96)	(0.84,0.92)		
Implicit long run:-						
income effect	0.67	0.60	0.63	0.58	0.77	0.75
wealth effect	0.15	0.19	0.20	0.203	0.11	0.12

Key: C stands for real consumption; RPDI for real personal disposable income, RNW for real personal net financial wealth, ECM for the error correction terms, RR for the real interest rate, RPH for real house prices. A "D" prefix indicates the difference of the relevant variable.

Finally in Table 25 we show the impact of adding real house prices as well as real interest rates to the basic equation to address the potential impact of tangible wealth on consumption. This is restricted to the short run and does not allow for accumulation as well as price increases, given lack of tangible wealth data for the full set of countries. It can be seen that the difference in the log of house prices is highly significant both for the total dataset and for the euro area countries, albeit much smaller when the UK, US, Denmark and Sweden are excluded – countries which are financially liberalised and where house prices have been buoyant in recent years. The effect is also considerably larger than that of the change in real financial wealth, which nevertheless remains significant. The rest of the parameters are significant, with the exception of the change term in real financial wealth in EMU. The error correction term doubles in size as compared to the previous specification, and becomes more significant, suggesting we have a much better specified model. The long run impact of income rises markedly in this relationship, suggesting that the simpler relationships without house prices suffered from omitted variable biases.

4.2 Robustness checks on data period and gross wealth

Robustness checks on the estimates in Table 25 were conducted, and are reported in Annex Tables 37, 38 and 39. We first split the net financial wealth term into assets and liabilities and tested to see whether these two variables had differential impacts, and we concluded that they did not. We then successively lengthened and then reduced the data period. Using the long run effects of income and wealth as a diagnostic, it can be seen that there are few dramatic changes to the estimates. Including the period before 1974 reduces the income effect for all countries in the basic and real interest rates equations but the results with real house prices

included are virtually identical. The more recent estimates beginning in 1980 generally show higher long run income effects – implausibly so for the simpler equations for the EMU countries, while the long run wealth effect is comparable.

4.3 Expanding the determinants of consumption

Table 26 shows three variants on the basic equation that we found were potentially significant, whilst table 27 includes two that did not add to our explanation. All of these experiments are intended to capture some of the potential factors underlying weak consumption in Europe. These are, first, low consumer confidence, second poor fiscal performance, third, demographic ageing, fourth, the changing pattern of equilibrium unemployment and fifth, equity market volatility. In estimating equations allowing for consumer confidence, we incorporated the first difference and the lagged level of the confidence indicator derived by the Eurostat for each country. We similarly in assessing fiscal effects on consumption include the difference and level of the fiscal deficit. We instrumented the current difference given possible simultaneity with the difference of consumption. Third, we added demographic data in terms of the lagged log of the share in total population of the three age groups 20-39, 40-64 and 65+. We then added a Commission Services estimate of equilibrium unemployment (the NAIRU) for each country. Finally, we included the lagged conditional variance derived from country-by-country GARCH (1,1) estimation of equity prices, based on a monthly series in the log-difference of share prices[5].

Confidence effects

The first two columns of Table 26 show that the level of confidence is highly significant, whilst difference effects only matter if we include the non-EMU countries. Note that the estimates using confidence indicators only utilise them from 1985, and in some countries in 1995, due to short period over which confidence series are available, and hence cannot be directly compared with other results. Confidence is more significant in the all countries regression than in the EMU regression, suggesting it may be more significant in the US and the UK than in the Euro Area. It is notable that inclusion of confidence leads to insignificance of a number of variables, including short run wealth effects in both regressions as well as changes in interest rates in our basic regression for All countries and house prices in the EMU regression. We do find a significant role for the lagged level of confidence in both the whole sample and in the EMU regression, but current dated effects may be absent in the Euro Area. Our results are consistent with the work of Pain and Weale (2001) as well as with the more negative results we find in our single equation study. Ludvigson (2004) which shows that confidence does contain forward looking information but much of that information can be provided by other popular economic and financial indicators, and independent information provided is limited.

[5] Details of the volatility regression estimates is available on request.

Table 26: Additions to basic equations for 1974-2004

	Confidence (1985 on)		Govt deficit		Demographics	
	All	**EMU**	**All**	**EMU**	**All**	**EMU**
LC(-1)	-0.043	-0.063	-0.048	-0.052	-0.045	-0.048
	(6.0)	(6.9)	(8.0)	(7.7)	(7.5)	(7.1)
LRPDI(-1)	0.030	0.042	0.038	0.039	0.034	0.032
	(4.2)	(5.0)	(6.2)	(5.8)	(5.5)	(4.4)
LRNW(-1)	-0.0039	0.0062	0.0047	0.0055	0.0048	0.0056
	(3.3)	(4.4)	(6.0)	(6.3)	(5.8)	(6.0)
DLRPDI	0.166	0.28	0.20	0.28	0.20	0.274
	(6.3)	(8.7)	(9.9)	(11.2)	(9.9)	(11.3)
DLRNW	-0.0030	-0.0054	0.0082	0.0062	0.0078	0.0057
	(0.75)	(1.2)	(2.6)	(1.7)	(2.5)	(1.5)
DRR	-0.0000021	-0.000098	0.00021	0.00022	0.00017	-0.00016
	(0.02)	(0.9)	(3.4)	(3.3)	(2.7)	(2.5)
RR(-1)	-0.00033	-0.00078	-0.00029	-0.00043	-0.00039	-0.00056
	(2.7)	(5.2)	(3.6)	(4.7)	(4.7)	(6.3)
DLRPH	0.065	0.033	0.078	0.043	0.085	0.052
	(4.3)	(1.87)	(7.2)	(3.5)	(8.0)	(4.3)
DCONF	0.00021	0.00076				
	(3.3)	(1.0)				
CONF(-1)	0.00016	0.000091				
	(5.4)	(2.7)				
DGBR			0.0016	0.0027		
			(2.2)	(3.1)		
GBR(-1)			0.00013	0.00019		
			(1.5)	(1.9)		
Log (20-40/pop)					0.013	0.018
					(2.2)	(2.5)
Log (40-64/pop)					0.004	0.012
					(0.4)	(1.0)
Log (65+/pop)					-0.004	-0.0028
					(0.6)	(0.6)
F (pooling)	2.8 (9.6)	2.6 (8.9)	2.7 (9.3)	2.8 (8.7)	3.2 (9.5)	3.2 (8.9)
F (fixed effects)	*7.3 (7.1)*	*8.1 (6.7)*	6.2 (7.5)	*7.3 (7.2)*	5.8 (7.5)	*7.8 (7.2)*
R-bar sq	0.22	0.24	0.20	0.19	0.19	0.22
LM het	0.59 (0.44)	4.4 (0.035)	.30 (.59)	1.0 (0.3)	0.69 (0.41)	1.3 (0.25)
DW	2.2	2.2	2.2	2.2	2.2	2.2
	(0.999,1.0)	(0.995,1.0)	(1.0,1.0)	(0.99,0.99)	(1.0,1.0)	(0.99,1.0)
Long run income	0.70	0.8	0.79	0.81	0.76	0.67
Long run wealth	0.091	0.02	0.10	0.08	0.11	0.12

Key: C stands for real consumption; RPDI for real personal disposable income, RNW for real personal net financial wealth, ECM for the error correction terms, RR for the real interest rate, RPH for real house prices, CONF for consumer confidence, GBR for the government budget ratio (as a share of GDP). A "D" prefix indicates the difference of the relevant variable.

Note: Brackets after F tests show critical value for Leamer diffuse priors, brackets after LM heteroskedasticity test and DW show P-values.

As the introduction of confidence measures removes the change in real financial wealth from the equations we investigated the relationship between wealth and confidence by checking whether confidence Granger causes net financial wealth. We started by running a regression of the change in the log of wealth on the two lags of itself and two lags in the change in confidence, and then repeated the exercise with confidence as the dependent variable. We found no significant role for confidence in the wealth regression, but we did find a significant role for wealth in the confidence regression. Hence changes in wealth Granger cause changes in confidence, and not the other way around. This suggests it would not be appropriate to

include confidence in an econometric equation, but it could be helpful in forecasting, as full sets of data on wealth are only available with a lag. The evolution of confidence could be used to help make judgements about the setting of future residuals in forecasts for consumption using equations that did not include confidence factors. In addition, we can forecast wealth using equity prices and other easily available indicators such as personal sector liabilities and holdings of monetary assets. We should note that in both experiments the confidence regression fails the fixed effects test.

Ricardian effects

The second set of results shows that the fiscal positions (columns 3 and 4) also have an impact on consumption. They are consistent with a Ricardian explanation whereby an improvement (deterioration) of the fiscal position leads to stronger (weaker) consumption. The change in the fiscal position is instrumented by lags of itself to allow for the possible simultaneity with changes in consumption, and it is significant in both regressions. The change in deficits is significant in both regressions, but the level of the deficit is not significant in the regression for all countries, and is only marginally significant in the EMU regression. We calculate that in the long run a one per cent increase in the government surplus in the Euro Area might increase consumption by 0.1 per cent. However, the EMU regression fails the fixed effects test.

Demographic indicators

The demographic results differ a little between the full sample and the EMU countries, with more significant results for the latter. The only age related variable which is significant is the proportion in the 20-39 age groups, the size of which boosts consumption, ceteris paribus. This is plausible as this is the age group that has to spend a large proportion of its income on accumulating consumer goods, not least owing to mortgage borrowing which counts as negative saving. The middle group have a positive but insignificant effect on consumption. The 65+ age group meanwhile reduces consumption, but the effect is not significant. Note that this is not strictly in line with the life cycle hypothesis since it would imply high saving by 40-64s and negative saving by the elderly as they decumulate assets. As was the case for fiscal effects, the standard variables tend to be significant in this case, although the long run income effect is low in the Euro Area. We should note that the demographic effects cause the EMU regression to fail the fixed effects test.

Estimates of the NAIRU

We added a series representing equilibrium unemployment to the regression on the assumption that increases in the NAIRU increase individuals specific perceptions of risk, and hence should reduce consumption. In particular a higher NAIRU with a given level of income should raise the risk of spells of unemployment. This should raise the need for precautionary saving, and hence reduce consumption for each level of income. In both the full sample in the EMU countries we found no significant role for the NAIRU, although its effect was of the correct sign. We should note that the NAIRU variable cause the EMU regression to fail the fixed effects test,

Equity price volatility

The fourth set of results is for conditional volatility of equity prices. An increase in the volatility of wealth would perhaps raise the need for precautionary saving, as assets would be harder to collateralise in such an environment. We find in each case that equity price volatility is not significant. Asset price volatility may be to a large extent unobserved as market based assets are often held by life assurance companies and pensions funds, and consumers may

have little understanding of the impact of equity price volatility on their wealth[6]. Changes in financial wealth may therefore contain few signals for consumers, and we would expect that changes in real net financial wealth would not be significant. The short run impacts of financial wealth that we observe are small but they are marginally increased by the inclusion of equity market volatility, and they become significant in our Euro Area regressions. It is possible that equity market volatility helps us understand consumption behaviour, but the evidence in support of this proposition is not strong.

Table 27: Additions to basic equations for 1974-2004

	Equilibrium Unemployment		**Equity market volatility**	
	All	**EMU**	**All**	**EMU**
LC(-1)	-0.045	-0.048	-0.045	-0.053
	(7.9)	(7.4)	(7.2)	(7.2)
LRPDI(-1)	0.034	0.035	0.034	0.039
	(5.8)	(5.3)	(5.4)	(5.3)
LRNW(-1)	-0.0054	0.0062	0.0047	0.0062
	(6.5)	(6.5)	(5.0)	(5.4)
DLRPDI	0.19	0.27	0.175	0.25
	(9.7)	(11.0)	(8.3)	(9.6)
DLRNW	0.0089	0.0068	0.010	0.0089
	(2.8)	(1.8)	(2.9)	(2.0)
DRR	-0.00021	-0.0002	0.00014	-0.00011
	(3.4)	(3.1)	(2.3)	(1.7)
RR(-1)	-0.0003	-0.00046	-0.00036	-0.00058
	(3.6)	(5.2)	(4.1)	(5.9)
DLRPH	0.082	0.051	0.089	0.054
	(7.7)	(4.2)	(8.0)	(4.3)
Nairu	-0.000199	-0.00015		
	(1.5)	(1.0)		
GVAR			-0.099	-0.12
			(1.36)	(1.43)
F (pooling)	2.9 (9.1)	3.0 (8.5)	3.0 (8.9)	4.3 (8.3)
F (fixed effects)	6.2 (7.5)	*7.3 (7.2)*	6.0 (7.4)	*7.2 (7.0)*
R-bar sq	0.19	0.22	0.16	0.20
LM het	.42 (0.52)	062 (0.43)	0.4(0.51)	2.1 (0.15)
DW	2.2 (1.0,1.0)	2.2 (0.99,1.0)	2.2 (1.0,1.0)	2.3 (1.0,1.0)
Long run: income effect	0.76	0.73	0.76	0.72
Wealth effect	0.12	0.13	0.14	0.12

Key: C stands for real consumption; RPDI for real personal disposable income, RNW for real personal net financial wealth, ECM for the error correction terms, RR for the real interest rate, RPH for real house prices, GVAR for a measure of equity price volatility. A "D" prefix indicates the difference of the relevant variable.
Note: Brackets after F tests show critical value for Leamer diffuse priors, brackets after LM heteroskedasticity test and DW show P-values.

4.4 Pooled mean group estimation

As we know from the individual country studies above there are good reasons to presume that we should not assume common dynamics across our group of countries, and it is also not clear that this group of countries share a common long run. Although the regressions reported above include test for general poolability which are weakly passed, there are a number of more specific hypotheses we can test. We can undertake a series of regressions where we relax in turn the restrictions on the dynamics around the error correction term, the speed of error correction and ultimately the long run structure of common coefficients. This sequence

[6] Note that we also tested for a separate effect of the log pension assets/GDP ratio and its first difference. These are derived from annual data from the OECD and national sources. In fact, there is no significant effect either at the short or the long run. Hence results are not reported here.

of test has been advocated by Pesaran and Smith (1995), and they not only help us avoid biases in the parameters of the panel, but also allow us to investigate interesting differences between countries.

Table 28 shows the basic Pesaran style pooled mean group (PMG) estimates where we allow for a common long run and a common error correction by idiosyncratic dynamic terms. The coefficients on the long run are not markedly changed compared to the GLS panel shown in Table 25. Long run income effects take up more than 90 per cent of the explanation of the long run, and static homogeneity essentially holds in the data, and is not imposed. Nevertheless, the dynamic terms do suggest significant differences in the dynamics of consumption across countries. Net wealth differences are significant only in Finland, Ireland, Sweden and the UK, countries that have experienced asset price booms and/or banking crises over the estimation period. As regards the income growth term, it is not significant in Sweden and Spain and is only significant at 90% in Belgium, France and the Netherlands. Similar patterns are reproduced for the euro area. The size of the dynamic income term in particular varies markedly, much in line with the results in Barrell and Davis (2004a), from 0.1 in the Netherlands to 0.76 in Germany in both estimates, suggesting pooling is not fully appropriate for the difference terms.

Table 28: Pooled mean group estimates (basic equation) for 1974-2003

	ALL			EMU	
LC1	**-0.03064**	**-5.4**	LC1	**-0.02767**	**-4.3**
LRPDI1	**0.026584**	**4.3**	LRPDI1	**0.024016**	**3.3**
LRNW1	**3.82E-03**	**6.0**	LRNW1	**3.36E-03**	**4.8**
BGDLRNW	2.69E-04	0.0	BGDLRNW	-3.40E-04	0.0
DKDLRNW	0.012231	1.5	FNDLRNW	**0.050326**	**3.1**
FNDLRNW	**0.050339**	**3.0**	FRDLRNW	0.014812	0.8
FRDLRNW	0.015093	0.8	GEDLRNW	-2.19E-03	-0.1
GEDLRNW	-1.69E-03	-0.1	GRDLRNW	-7.79E-04	-0.1
GRDLRNW	-4.19E-04	-0.1	IRDLRNW	**0.035781**	**2.7**
IRDLRNW	**0.035405**	**2.6**	ITDLRNW	0.023492	1.1
ITDLRNW	0.0235	1.0	NLDLRNW	9.61E-03	1.0
NLDLRNW	9.57E-03	1.0	OEDLRNW	-6.39E-03	-0.6
OEDLRNW	-6.00E-03	-0.5	PTDLRNW	3.64E-03	0.2
PTDLRNW	3.84E-03	0.2	SPDLRNW	6.24E-03	0.8
SDDLRNW	**0.035186**	**2.9**	BGDLRPDI	**0.216662**	**1.8**
SPDLRNW	7.06E-03	0.9	FNDLRPDI	**0.397863**	**4.4**
UKDLRNW	**0.089261**	**3.4**	FRDLRPDI	0.275503	1.7
USDLRNW	0.015343	0.6	GEDLRPDI	**0.755716**	**9.8**
BGDLRPDI	**0.215564**	**1.7**	GRDLRPDI	**0.380354**	**5.0**
DKDLRPDI	**0.129441**	**1.9**	IRDLRPDI	**0.456334**	**5.8**
FNDLRPDI	**0.398454**	**4.3**	ITDLRPDI	**0.257751**	**2.2**
FRDLRPDI	**0.270938**	**1.6**	NLDLRPDI	0.081707	1.6
GEDLRPDI	**0.756563**	**9.6**	OEDLRPDI	**0.720613**	**5.9**
GRDLRPDI	**0.38094**	**4.9**	PTDLRPDI	**0.352983**	**4.2**
IRDLRPDI	**0.454713**	**5.7**	SPDLRPDI	0.043396	0.7
ITDLRPDI	**0.256864**	**2.1**			
NLDLRPDI	**0.084206**	**1.6**			
OEDLRPDI	**0.714433**	**5.7**			
PTDLRPDI	**0.355909**	**4.1**			
SDDLRPDI	0.068673	0.9			
SPDLRPDI	0.03955	0.6			
UKDLRPDI	**0.170627**	**3.1**			
USDLRPDI	**0.246701**	**2.8**			

* Figures in bold are significant at 10% or more

Table 29 Pooled mean group estimates (extended equation – levels terms) 1974-2003

	ALL			EMU	
LC1	-0.04078	-5.9	**LC1**	-0.03533	-4.4
LRPDI1	0.03537	5.0	**LRPDI1**	0.028745	3.3
LRNW1	3.47E-03	3.2	**LRNW1**	4.09E-03	3.0
RR(-1)	-1.44E-04	-1.5	**RR(-1)**	-2.84E-04	-2.3

We also ran a PMG equation including real interest rates and real house prices.. Interest rate effects are more significant in the Euro Area than in the whole sample, once we allow for heterogeneity in the dynamics. Concerning difference terms (Table 30), only Ireland, Sweden and the UK feature significant financial wealth terms; for RPDI there are significant differences in Finland, Germany, Ireland, Italy, Austria, the UK and the US. Germany and Austria (OE) display the largest short term income effects (over 0.7) in the sample, whilst for most countries it lies around 0.3. When we consider short term effects for real rates it is Germany, Austria and the US that are sensitive, although in the former case this may reflect the change in the level of real interest rates around 1990 that was associated with the structural changes that came with unification. For house prices, the estimate of the impact of changes on consumption highlights Denmark, Finland, Ireland, the Netherlands, Sweden, Spain, the UK and the US. Similar results obtain for the EMU sample. Note that it is implies that for some countries, only the long run and error correction terms determine consumption growth. This result may reflect the rather restricted dynamic specification in the panel, as our single country studies about suggest that for some countries, such as France, a lag in the change in RPDI is need in the equation. Of course the validity of the dynamics that come from the PMG depend in turn on the validity of the PMG assumptions that the error correction and the long run coefficients are equal.

Table 30: Pooled mean group estimates (extended equation – difference terms)

	ALL			EMU	
BGDLRNW	3.90E-03	0.2	BGDLRNW	5.07E-03	0.3
DKDLRNW	-3.35E-03	-0.4			
FNDLRNW	0.019162	1.0	FNDLRNW	0.019727	1.1
FRDLRNW	0.019443	1.1	FRDLRNW	0.020093	1.1
GEDLRNW	-7.87E-03	-0.3	GEDLRNW	-7.63E-03	-0.3
IRDLRNW	**0.028776**	**2.0**	IRDLRNW	**0.032747**	**2.3**
ITDLRNW	0.029772	1.2	ITDLRNW	0.033121	1.4
NLDLRNW	8.43E-03	0.9	NLDLRNW	9.83E-03	1.0
OEDLRNW	-7.83E-03	-0.7	OEDLRNW	-7.29E-03	-0.7
SDDLRNW	**0.027993**	**2.3**			
SPDLRNW	-3.78E-03	-0.4	SPDLRNW	-2.92E-03	-0.3
UKDLRNW	**0.046722**	**1.7**			
USDLRNW	8.26E-03	0.3			
BGDLRPDI	0.193545	1.4	BGDLRPDI	0.19195	1.4
DKDLRPDI	0.0481	0.6			
FNDLRPDI	**0.290118**	**2.9**	FNDLRPDI	**0.277976**	**2.8**
FRDLRPDI	0.206316	1.2	FRDLRPDI	0.198797	1.2
GEDLRPDI	**0.712478**	**8.7**	GEDLRPDI	**0.711517**	**8.6**
IRDLRPDI	**0.259067**	**2.6**	IRDLRPDI	**0.254722**	**2.6**
ITDLRPDI	**0.222674**	**1.9**	ITDLRPDI	**0.229721**	**1.9**

NLDLRPDI	0.054176	0.8	NLDLRPDI	0.049181	0.8
OEDLRPDI	**0.749811**	**5.9**	OEDLRPDI	**0.739645**	**5.8**
SDDLRPDI	-0.04236	-0.5			
SPDLRPDI	-0.09449	-1.2	SPDLRPDI	-0.09687	-1.3
UKDLRPDI	**0.135004**	**2.5**			
USDLRPDI	**0.170173**	**1.9**			
BGDRR	4.45E-04	0.6	BGDRR	3.88E-04	0.5
DKDRR	7.99E-06	0.0			
FNDRR	-5.63E-04	-0.8	FNDRR	-6.2E-04	-0.8
FRDRR	1.29E-03	1.4	FRDRR	1.24E-03	1.3
GEDRR	**-1.29E-03**	**-1.7**	GEDRR	-1.36E-03	-1.8
IRDRR	-3.47E-05	-0.1	IRDRR	-9.05E-05	-0.2
ITDRR	-7.66E-04	-0.9	ITDRR	-8.10E-04	-1.0
NLDRR	2.05E-04	0.8	NLDRR	1.12E-04	0.4
OEDRR	**-2.88E-03**	**-3.2**	OEDRR	**-2.95E-03**	**-3.3**
SDDRR	2.66E-04	0.8			
SPDRR	-1.66E-04	-0.8	SPDRR	-2.38E-04	-1.1
UKDRR	4.20E-04	0.8	BGDLRPH	0.011935	0.2
USDRR	**-2.09E-03**	**-1.8**	FNDLRPH	**0.160752**	**4.5**
BGDLRPH	0.020851	0.4	FRDLRPH	0.028491	0.5
DKDLRPH	**0.174038**	**4.5**	GEDLRPH	0.069286	0.9
FNDLRPH	**0.16899**	**4.7**	IRDLRPH	**0.197463**	**3.2**
FRDLRPH	0.03972	0.6	ITDLRPH	-0.01238	-0.7
GEDLRPH	0.075721	1.0	NLDLRPH	**0.11106**	**3.4**
IRDLRPH	**0.216592**	**3.5**	IRDLRPH	**0.197463**	**3.2**
ITDLRPH	-9.93E-03	-0.5	ITDLRPH	-0.01238	-0.7
NLDLRPH	**0.120747**	**3.7**	NLDLRPH	**0.11106**	**3.4**
OEDLRPH	0.042288	0.8	OEDLRPH	0.041902	0.8
SDDLRPH	**0.159987**	**3.5**			
SPDLRPH	**0.118563**	**3.0**	SPDLRPH	**0.110955**	**2.8**
UKDLRPH	**0.150336**	**4.3**			
USDLRPH	**0.143285**	**1.6**			

Table 31 assesses whether it would be justified pool these models. There are number of test available for poolability, with the most restrictive being the classical F test and the least being Leamer's dispersed prior. The first set of results test for the equality of long run coefficients given that dynamics differ whilst the second block of results test for the equality of the dynamic coefficients given the equality of the long run coefficients. Although our preferred general models for all countries and for EMU countries with house prices and interest rates have an F test of only 2 or 2.2 respectively on the equality of the long run coefficients across equations, this is above the Classical statistical test for parameters with T*N degrees of freedom and 56 restrictions. Only the test for a common error correction term amongst EMU countries, but no common long run coefficients, is passed at the classical level of significance. However, the classical test is probably too restrictive, as the relevant number of degrees of freedom for this test could be as low as T which equals 120, which is the size of the time domain, and it is unlikely to be as high as T*N, where N is the number of cross section elements. The observed F is well below the level of the widely used Leamer's dispersed prior, and this suggests that we could perhaps accept that poolability in these cases.

Given the acceptance of pooled long runs, we can test to see if we can pool the dynamic terms in the equations. The relevant F statistics range from 3.7 to 9.1, all of them well above the Classical level, and most below the Leamer dispersed prior. Indeed the only one that falls outside the dispersed prior is the basic EMU model, whilst the extended EMU model with house prices and interest rates falls well inside. There is a case to be made on Classical

grounds for there being no poolability, whilst we could also argue that all coefficients in the extended model are poolable if we are more flexible. The error correction terms are potentially poolable in the all country case, and probably so in the Euro Area, However, in this case both dynamics and long run effects would still differ between countries. The PMG results above reflect the noticeable diversity amongst the dynamics of adjustment terms, and pooling these terms would lead to poor forecasting equations for each of the Euro Area countries. Hence we would argue that the panel results and their residuals should be seen as indicative, and that the evaluation of the weakness of consumption in the Euro Area is best undertaken with our individual equations in the previous section. However, maintaining poolablity of the long run structure whilst allowing differences in the dynamics may also be of interest, and it is perhaps defendable

Table 31: F tests on equality of coefficients in PMG for 1974-2003

	Equality of long run coefficients(1)				Equality of dynamic coefficients(2)			
ALL	**F-test**	**Restrictions**	**Leamer**	**Classical**	**F-test**	**Restrictions**	**Leamer**	**Classical**
Basic PMG (Table 28)	**3.1**	**42**	**7.6**	**1.4**	**6.7**	**28**	**7.7**	**1.5**
PMG with house prices and real rates (Table 30)	**2.0**	**56**	**7.7**	**1.4**	**3.7**	**56**	**8.0**	**1.4**
Memo: PMG with interest rates	**2.8**	**56**	**7.8**	**1.4**	**3.7**	**42**	**7.8**	**1.4**
ECM pooling in PMG-house prices-real rates (3)					**1.6**	**14**	**7.2**	**1.6**
EMU								
Basic PMG (Table 28)	**4.0**	**30**	**7.4**	**1.5**	**9.1**	**20**	**7.4**	**1.4**
PMG with house prices and real rates (Table 30)	**2.2**	**40**	**7.4**	**1.4**	**3.9**	**40**	**7.6**	**1.4**
Memo: PMG with interest rates	**3.4**	**40**	**7.5**	**1.4**	**4.4**	**30**	**7.5**	**1.5**
ECM pooling in PMG-house prices-real rates (3)					**1.5**	**10**	**6.9**	**1.7**

Notes: (1) PMG is compared with a totally unrestricted equation, (2) PMG is compared with totally restricted equations (3) Test for equality of ECMs in PMG equation.

4.5 Looking at the pattern of residuals

Following these sets of results, we may undertake a measurement of residuals country by country in order to find whether consumption has been weak in recent years relative to cross-country average determinants. In addition we should look for residuals that have been becoming increasingly negative, as these will have been contributing to slow growth in domestic demand. We look at static and dynamic residuals, at averages across years for all countries, utilising only those equations where additional significant variable were added. Hence no results are reported for equity price volatility or for NAIRU effects.

We first look at the pattern of residuals on equations that include income and wealth, as these are the industry standard. If these do not suggest that there is an unexplained weakness in consumption then we can conclude that weak growth in consumption, if it has been observed,

is due to weak income or wealth growth. In our panel estimates we have two contenders for the basic model, one with common parameters and the PMG model where dynamics are allowed to differ across countries. If either of these is not predicting well we can look for alternative explanations that might be provided by house prices, demography, or fiscal policy effects.

Static residuals

A notable feature shown in Table 32 is sizeable negative residuals for Germany, and to a lesser extent in France, in 2002-4, which is the period of principal interest. This implies over prediction by the equations (weak consumption). In Germany the residual is larger than in France, though both are larger in 2003 than 2004. Virtually all other countries, including Italy and the UK, have some alternation in residuals, the exceptions on the negative side being the Netherlands for most specifications, and on positive side the US. These results would suggest that there are missing explanatory factors in our specification. There are similar results for the equations for the EMU countries alone (Table 33).

Dynamic residuals

Tables 34 and 35 show the corresponding dynamic residuals, cumulating errors through the lagged dependent variable for the 12 quarters up to the current observation. The cumulative negative error is again sizeable for Germany and to a lesser extent France, as well as Denmark, Austria and (in 2003-4) the Netherlands. The US and Ireland have sizeable, albeit declining, positive dynamic residuals. The German dynamic residuals are far higher in the simple fixed effects panel than in the PMG results, and as we add real interest rates and house prices the dynamic residual in Germany falls to just over 2 per cent in 2004, compared with 5 per cent in the basic panel. However, this remains one of the largest discrepancies on the table, and it increases more than any other residual.

Looking at these residuals in terms of a progression through the models helps us to draw some conclusions on the main areas where consumption is unexplainably weak. Focusing on Table 34, in the basic fixed effects panel, the EMU countries where there us a large dynamic residual in 2004 is France, Germany, Italy, the Netherlands and Austria. In our preferred PMG specification, with real interest rates and house prices, we get a consistent result only for France, Germany and the Netherlands. Looking then at the variants, we see that in all cases the large dynamic residual recurs for France and Germany. However, in the Netherlands the demographics reduce the residual considerably. In the EMU regression residuals in Table 35 the results are broadly consistent but dynamic residuals are rather lower for France in the basic case and here Germany is most prominent.

Annual average residuals

Looking at the data year by year in Table 36 there tend on average to be negative residuals for most of the specifications in 2002-3 but positive in 2004, suggesting that the specifications do not capture all aspects of the recession. We take an unweighted average for these results, and hence Denmark and Ireland, for instance, where behaviour appears not to be captured by our model as well as in other countries, carry the same weight as France and Germany, which represent more than half of the Euro Area sample in value terms. Given this constraint, we can compare the average dynamic residual on our fixed effects EMU panel with the same for the PMG model. The average residual falls from -0.87 to -0.27, suggesting that allowing for some heterogeneity allows us to explain more of the behaviour of consumption. This conclusion also leads us to look at individual country regressions.

Conclusions and Further Work

In general we can claim that adding real interest rate effects and including a role for house prices improves our ability to understand consumption behaviour, and to explain weak consumption in the Euro Area in the last few years. It is clearly wrong to use a common equation with common dynamics for all these countries, and the PMG is our preferred explanation of developments. This allows short run dynamics to vary but has a common long run explanation. There is some evidence that the direct inclusion of government borrowing and indicators of the age structure help us explain consumption behaviour, but they add little that is substantive in terms of the recent residuals. Confidence measures help us forecast consumption, but as they are caused by wealth, they are not directly useful. However, even after the inclusion of all relevant factors, we may conclude that consumption has displayed unexplained weakness in a number of European countries, especially in Germany.

Table 32: Static residuals (percent, quarterly averages) – all countries

		BG	DK	FN	FR	GE	GR	IR	IT	NL	OE	PT	SD	SP	UK	US
Basic	2002	0.01	0.06	-0.07	-0.12	-0.48	-0.10	-0.31	0.02	-0.08	-0.31	-0.08	0.18	0.16	0.21	0.02
fixed effects	2003	0.05	0.10	0.28	-0.23	-0.55	0.36	-0.03	-0.21	-0.67	-0.13	0.05	-0.14	0.02	0.01	0.28
panel	2004	0.15	0.88	-0.19	-0.05	-0.32	-0.29	0.03	-0.18	-0.28	-0.19	0.29	0.04	0.52	0.41	0.26
Real rates	2002	0.00	-0.01	-0.20	-0.16	-0.48	-0.17	-0.31	0.03	-0.09	-0.29	-0.05	0.11	0.06	0.23	-0.03
fixed effects	2003	0.04	-0.03	0.11	-0.25	-0.52	0.26	-0.14	-0.23	-0.63	-0.15	0.01	-0.18	-0.15	0.00	0.20
panel	2004	0.12	0.73	-0.28	-0.13	-0.39	-0.50	0.29	-0.28	-0.29	-0.21	0.23	-0.07	0.36	0.41	0.14
Real house prices	2002	-0.03	-0.04	-0.22	-0.31	-0.45	-0.09	-0.34	0.19	-0.01	-0.33	-0.23	-0.08	-0.05	-0.05	0.05
fixed effects	2003	0.06	-0.10	0.12	-0.45	-0.46	0.52	-0.14	-0.06	-0.52	0.01	-0.21	-0.34	-0.29	0.03	0.30
panel	2004	0.26	0.61	-0.28	-0.35	-0.36	-0.22	0.49	-0.10	-0.21	0.00	0.03	-0.29	0.26	0.39	0.22
PMG	2002	-0.03	0.07	0.00	-0.14	-0.35	-0.20	-0.27	0.05	-0.12	-0.23	-0.08	0.37	0.17	0.23	0.02
basic	2003	0.05	0.08	0.00	-0.20	-0.20	0.32	0.03	-0.19	-0.74	-0.10	0.05	-0.20	0.04	0.00	0.23
	2004	0.17	0.84	-0.36	-0.05	-0.32	-0.48	0.11	-0.22	-0.32	-0.13	0.36	0.03	0.52	0.42	0.20
PMG	2002	-0.02	-0.02	-0.11	-0.12	-0.37	-0.24	-0.20	0.00	-0.14	-0.19	-0.10	0.31	0.04	0.20	-0.04
Real rates	2003	0.03	0.01	-0.07	-0.22	-0.24	0.24	-0.09	-0.28	-0.76	-0.10	-0.01	-0.26	-0.11	-0.02	0.12
	2004	0.10	0.83	-0.40	-0.12	-0.35	-0.56	0.31	-0.30	-0.36	-0.11	0.33	-0.06	0.37	0.36	0.13
PMG	2002	0.02	-0.01	-0.27	-0.13	-0.32	0.00	-0.26	0.23	-0.04	-0.08	-0.09	0.06	-0.09	-0.44	-0.04
Real house prices	2003	0.10	-0.05	-0.01	-0.25	-0.16	0.46	-0.05	-0.01	-0.63	0.05	-0.15	-0.43	-0.23	-0.07	0.15
	2004	0.24	0.69	-0.30	-0.13	-0.28	-0.17	0.57	0.00	-0.28	0.06	0.14	-0.33	0.28	0.18	0.11
Demographics	2002	0.05	-0.02	-0.09	-0.22	-0.38	-0.12	-0.48	0.22	0.07	-0.33	-0.24	-0.04	-0.11	-0.02	0.15
	2003	0.15	-0.07	0.28	-0.35	-0.36	0.49	-0.32	-0.01	-0.42	0.03	-0.22	-0.30	-0.36	0.07	0.40
	2004	0.37	0.67	-0.10	-0.25	-0.23	-0.25	0.31	-0.03	-0.09	0.04	0.04	-0.25	0.19	0.43	0.32
Uncertainty	2002	-0.01	-0.03	-0.06	-0.28	-0.41	na	-0.47	0.18	0.03	-0.34	-0.25	-0.02	-0.02	-0.05	0.09
	2003	0.10	-0.09	0.21	-0.43	-0.36	na	-0.30	-0.07	-0.49	0.01	-0.22	-0.30	-0.25	0.05	0.33
	2004	0.25	0.62	-0.24	-0.35	-0.33	na	0.29	-0.12	-0.23	0.00	0.00	-0.31	0.27	0.38	0.23
Confidence	2002	-0.09	-0.16	-0.19	-0.20	-0.36	-0.05	-0.49	0.05	0.13	-0.42	-0.03	-0.07	0.06	-0.16	0.14
	2003	0.17	-0.06	0.27	-0.17	-0.26	0.77	-0.06	-0.10	-0.17	0.04	0.11	-0.15	-0.07	-0.02	0.48
	2004	0.24	0.60	-0.15	-0.23	-0.15	-0.06	0.38	-0.03	0.12	-0.01	0.35	-0.09	0.41	0.30	0.29
Fiscal effects	2002	-0.07	-0.03	-0.23	-0.25	-0.44	-0.05	-0.36	0.16	0.00	-0.29	-0.31	-0.04	-0.05	0.01	0.12
	2003	-0.01	-0.11	0.19	-0.40	-0.43	0.56	-0.17	-0.05	-0.50	0.03	-0.21	-0.38	-0.30	0.07	0.36
	2004	0.22	0.56	-0.26	-0.32	-0.33	-0.19	0.43	-0.08	-0.23	0.00	0.00	-0.33	0.29	0.40	0.25

Table 33: Static residuals (percent, quarterly averages) – EMU

		BG	FN	FR	GE	GR	IR	IT	NL	OE	PT	SP
Basic	2002	0.03	-0.05	-0.08	-0.45	-0.08	-0.28	0.04	-0.06	-0.28	-0.07	0.20
	2003	0.08	0.32	-0.18	-0.50	0.40	0.03	-0.20	-0.64	-0.09	0.07	0.08
	2004	0.19	-0.14	-0.01	-0.28	-0.19	0.13	-0.16	-0.21	-0.16	0.34	0.58
RR	2002	-0.01	-0.24	-0.14	-0.46	-0.17	-0.29	0.03	-0.08	-0.26	-0.03	0.04
	2003	0.05	0.08	-0.21	-0.48	0.26	-0.12	-0.23	-0.59	-0.13	-0.01	-0.16
	2004	0.13	-0.28	-0.12	-0.38	-0.50	0.34	-0.30	-0.24	-0.19	0.24	0.35
RHP	2002	-0.01	-0.28	-0.31	-0.44	-0.09	-0.25	0.25	0.01	-0.22	-0.19	-0.05
	2003	0.10	0.05	-0.39	-0.44	0.47	-0.05	0.01	-0.47	0.02	-0.21	-0.28
	2004	0.27	-0.32	-0.32	-0.40	-0.34	0.54	-0.08	-0.17	0.00	0.02	0.26
PMG	2002	0.00	0.03	-0.10	-0.31	-0.16	-0.20	0.07	-0.08	-0.21	-0.06	0.22
basic	2003	0.08	0.03	-0.15	-0.16	0.36	0.10	-0.18	-0.71	-0.07	0.06	0.09
	2004	0.20	-0.31	0.00	-0.28	-0.43	0.18	-0.20	-0.28	-0.10	0.38	0.58
PMG	2002	0.00	-0.11	-0.08	-0.35	-0.21	-0.16	-0.01	-0.13	-0.17	-0.11	0.06
RR	2003	0.04	-0.05	-0.19	-0.22	0.25	-0.07	-0.31	-0.74	-0.09	-0.03	-0.10
	2004	0.10	-0.37	-0.09	-0.33	-0.54	0.35	-0.31	-0.34	-0.11	0.33	0.39
PMG	2002	0.03	-0.31	-0.14	-0.32	-0.02	-0.21	0.22	-0.01	-0.08	-0.08	-0.10
RHP	2003	0.11	-0.03	-0.27	-0.16	0.45	-0.01	-0.02	-0.60	0.06	-0.15	-0.24
	2004	0.25	-0.33	-0.14	-0.29	-0.20	0.62	0.00	-0.27	0.07	0.13	0.27
Demographics	2002	0.11	-0.10	-0.16	-0.32	-0.09	-0.39	0.28	0.11	-0.23	-0.19	-0.11
	2003	0.24	0.26	-0.24	-0.28	0.47	-0.25	0.06	-0.34	0.02	-0.21	-0.36
	2004	0.42	-0.07	-0.16	-0.21	-0.33	0.33	0.00	-0.02	0.02	0.04	0.19
Uncertainty	2002	0.02	-0.10	-0.27	-0.37	na	-0.34	0.28	0.09	-0.18	-0.19	-0.01
	2003	0.18	0.15	-0.37	-0.29	na	-0.16	0.05	-0.39	0.04	-0.20	-0.24
	2004	0.29	-0.28	-0.31	-0.36	na	0.39	-0.06	-0.16	0.03	0.00	0.28
Confidence	2002	-0.02	-0.24	-0.24	-0.34	-0.12	-0.31	0.13	0.17	-0.23	-0.04	0.08
	2003	0.21	0.20	-0.21	-0.26	0.57	0.09	-0.02	-0.17	0.00	0.00	-0.07
	2004	0.33	-0.14	-0.23	-0.26	-0.29	0.66	-0.07	0.17	-0.03	0.27	0.45
Fiscal	2002	-0.06	-0.29	-0.20	-0.43	-0.03	-0.27	0.19	0.03	-0.16	-0.31	-0.05
	2003	0.00	0.15	-0.31	-0.39	0.53	-0.08	0.02	-0.42	0.05	-0.19	-0.30
	2004	0.22	-0.30	-0.27	-0.35	-0.30	0.46	-0.07	-0.19	0.00	-0.01	0.31

Table 34: Dynamic residuals (percent, quarterly averages) – all countries

		BG	DK	FN	FR	GE	GR	IR	IT	NL	OE	PT	SD	SP	UK	US
Basic	2002	-0.89	-4.26	-0.34	-0.06	-2.39	-1.80	6.90	0.17	2.94	-0.93	5.12	1.04	3.21	2.77	3.14
fixed effects	2003	-0.68	-4.68	0.49	-1.15	-3.25	-0.32	5.30	-0.71	-0.14	-1.89	2.25	0.36	2.24	2.39	3.09
Panel	2004	-0.02	-1.90	-0.18	-1.40	-4.85	-0.98	3.76	-1.86	-2.28	-1.51	0.95	-0.36	2.92	2.91	2.96
Real rates	2002	-1.41	-5.81	-1.81	-0.88	-2.37	-1.27	5.14	0.29	2.36	-1.09	4.61	-0.70	1.28	2.86	3.16
fixed effects	2003	-1.11	-6.13	-1.25	-1.80	-3.19	-0.34	3.83	-0.91	-0.39	-2.02	1.85	-1.29	0.18	2.42	3.02
Panel	2004	-0.45	-3.74	-1.94	-2.07	-4.88	-1.84	3.29	-2.42	-2.43	-1.65	0.42	-2.04	0.71	2.80	2.47
Real house prices	2002	-0.97	-5.68	-1.22	-2.19	-1.91	-0.75	3.88	3.02	1.25	-0.39	0.85	-2.71	-0.15	1.29	3.69
fixed effects	2003	-0.63	-5.84	-0.37	-3.56	-2.63	0.89	3.13	1.83	-0.63	-0.91	-1.69	-3.24	-1.52	0.93	3.82
Panel	2004	0.27	-3.79	-1.15	-4.21	-4.18	0.47	3.34	0.43	-1.87	-0.20	-2.60	-4.17	-1.01	1.60	3.38
PMG	2002	-1.01	-4.30	-0.51	-0.54	-1.30	-2.53	5.13	0.23	3.07	-0.57	4.85	2.12	3.69	2.76	2.94
Basic	2003	-0.94	-4.80	-0.07	-1.41	-1.85	-1.29	4.48	-0.62	-0.34	-1.68	2.06	1.58	2.70	2.38	3.07
	2004	-0.25	-2.09	-1.21	-1.52	-2.83	-2.56	3.74	-1.94	-2.73	-1.08	1.01	0.63	3.31	2.87	2.81
PMG	2002	-1.50	-4.67	-1.65	-0.65	-1.32	-1.34	3.07	-0.66	1.79	-0.55	3.30	0.81	1.34	2.35	2.18
Real rates	2003	-1.10	-4.98	-1.07	-1.47	-1.91	-0.51	2.60	-1.34	-1.26	-1.53	0.75	0.34	0.28	1.82	1.92
	2004	-0.47	-1.88	-2.07	-1.64	-2.81	-1.95	2.49	-2.54	-3.10	-0.87	0.35	-0.52	0.92	2.23	1.64
PMG	2002	-0.49	-5.42	-0.91	-0.79	-0.76	1.37	3.22	2.83	1.22	1.26	-0.45	-1.39	0.55	-0.62	2.44
Real house prices	2003	-0.17	-5.54	-0.25	-1.72	-1.21	2.40	3.13	2.23	-1.12	0.36	-2.58	-1.84	-1.02	-1.29	2.30
	2004	0.61	-2.99	-1.24	-1.94	-2.13	1.35	3.79	1.17	-2.59	1.14	-2.35	-3.10	-0.57	-0.74	1.76
Demographics	2002	-0.29	-5.77	0.44	-1.24	-1.61	-0.96	2.51	2.96	1.84	-0.97	0.64	-2.41	-0.90	1.60	4.83
	2003	0.26	-5.77	1.45	-2.44	-2.00	0.63	1.41	1.96	0.21	-1.24	-1.87	-2.86	-2.35	1.31	5.05
	2004	1.35	-3.54	0.87	-2.96	-3.20	0.18	1.33	0.79	-0.76	-0.28	-2.70	-3.73	-1.91	2.07	4.67
Uncertainty	2002	-0.72	-5.37	-0.05	-1.75	-1.38	na	2.01	2.92	1.58	-0.18	0.85	-2.12	0.34	1.53	4.05
	2003	-0.23	-5.50	1.13	-3.11	-1.80	na	1.27	1.76	-0.23	-0.69	-1.71	-2.45	-1.00	1.22	4.19
	2004	0.55	-3.42	0.27	-3.84	-3.36	na	1.20	0.27	-1.61	-0.14	-2.70	-3.52	-0.64	1.83	3.69
Confidence	2002	-2.29	-6.77	-1.37	-2.00	-2.06	-0.54	0.19	0.48	0.78	-1.51	0.99	-1.63	-0.43	-0.15	2.95
	2003	-1.41	-6.56	0.01	-2.58	-2.28	1.54	0.43	-0.19	0.45	-1.92	-0.12	-1.89	-0.88	-0.24	3.95
	2004	-0.25	-4.15	-0.32	-2.69	-2.96	1.46	1.25	-0.81	0.39	-0.96	0.15	-2.33	0.31	0.48	3.99
Fiscal effects	2002	-1.80	-5.35	-1.29	-1.88	-1.72	-0.68	3.01	2.14	0.96	-0.42	0.27	-2.86	-0.27	1.03	3.24
	2003	-1.36	-5.37	-0.18	-2.99	-2.38	1.09	2.25	1.34	-0.75	-0.83	-2.05	-3.27	-1.58	0.88	3.61
	2004	-0.43	-3.32	-0.89	-3.50	-3.70	0.80	2.37	0.20	-1.79	-0.16	-2.59	-4.09	-0.91	1.72	3.43

Table 35: Dynamic residuals (percent, quarterly averages) – EMU

		BG	FN	FR	GE	GR	IR	IT	NL	OE	PT	SP
Basic	2002	-0.44	0.08	0.49	-1.92	-1.43	7.92	0.50	3.51	-0.57	5.51	4.00
	2003	-0.28	0.87	-0.57	-2.78	0.11	6.31	-0.46	0.41	-1.52	2.63	3.06
	2004	0.38	0.27	-0.78	-4.37	-0.37	4.84	-1.63	-1.74	-1.10	1.34	3.77
RR	2002	-1.41	-2.01	-0.75	-2.02	-0.68	5.14	0.54	2.53	-0.91	4.46	1.22
	2003	-1.14	-1.60	-1.59	-2.82	0.07	3.95	-0.88	-0.10	-1.85	1.74	0.04
	2004	-0.46	-2.28	-1.82	-4.53	-1.60	3.59	-2.56	-2.12	-1.43	0.29	0.53
RHP	2002	-1.13	-1.93	-2.62	-1.76	0.15	3.41	3.70	1.58	0.28	0.95	-0.66
	2003	-0.67	-1.30	-3.66	-2.49	1.40	3.08	2.52	-0.13	-0.33	-1.50	-1.80
	2004	0.31	-2.08	-4.10	-4.10	0.46	3.63	1.01	-1.35	0.32	-2.55	-1.18
PMG	2002	-0.52	-0.10	0.04	-0.77	-2.10	6.18	0.51	3.81	-0.16	5.19	4.52
Basic	2003	-0.47	0.36	-0.77	-1.29	-0.81	5.66	-0.38	0.36	-1.28	2.40	3.57
	2004	0.22	-0.70	-0.83	-2.28	-2.04	4.97	-1.72	-2.14	-0.65	1.25	4.22
PMG	2002	-1.17	-1.76	-0.15	-0.99	-0.98	4.63	-0.29	3.12	-0.26	4.73	2.18
RR	2003	-1.03	-1.40	-1.04	-1.58	-0.25	4.24	-1.52	-0.28	-1.40	1.68	0.96
	2004	-0.49	-2.31	-1.30	-2.75	-1.86	4.23	-3.11	-2.87	-0.72	0.38	1.40
PMG	2002	-0.50	-1.47	-1.11	-0.74	1.31	3.38	3.09	1.37	1.37	-0.27	0.09
RHP	2003	-0.14	-0.83	-1.99	-1.19	2.32	3.53	2.38	-0.87	0.50	-2.50	-1.39
	2004	0.68	-1.76	-2.20	-2.21	1.24	4.42	1.24	-2.38	1.30	-2.41	-0.90
Demographics	2002	0.08	0.21	-1.19	-0.99	0.15	2.08	3.33	2.24	-0.42	0.73	-1.46
	2003	0.85	1.13	-1.93	-1.27	1.38	1.36	2.44	0.89	-0.78	-1.62	-2.64
	2004	2.07	0.69	-2.14	-2.40	0.47	1.53	1.27	0.02	0.12	-2.52	-2.06
Uncertainty	2002	-0.69	-0.78	-2.23	-0.88	na	1.43	4.08	2.15	0.98	1.08	-0.27
	2003	0.06	0.29	-3.17	-1.24	na	1.33	3.01	0.67	0.42	-1.32	-1.23
	2004	0.96	-0.54	-3.65	-2.85	na	1.72	1.46	-0.58	0.88	-2.41	-0.69
Confidence	2002	-1.67	-1.63	-2.57	-1.05	0.07	0.32	1.21	1.51	-0.72	0.99	-0.42
	2003	-0.62	-0.49	-2.85	-1.51	1.33	0.89	0.66	1.02	-1.11	-0.40	-0.70
	2004	0.66	-0.70	-2.77	-2.49	0.53	2.30	-0.16	1.02	-0.31	-0.22	0.60
Fiscal	2002	-2.25	-2.05	-2.11	-1.41	0.02	2.44	2.41	1.27	0.24	0.26	-0.73
	2003	-1.65	-0.98	-2.80	-2.06	1.53	2.16	1.73	-0.20	-0.24	-1.89	-1.83
	2004	-0.61	-1.62	-3.07	-3.39	0.81	2.57	0.57	-1.17	0.34	-2.52	-0.98

Table 36: Residuals by year

		Static all countries	Static EMU	Dynamic all countries	Dynamic EMU
Basic	2002	-0.06	-0.10	0.98	1.61
fixed effects	2003	-0.05	-0.06	0.22	0.71
Panel	2004	0.07	0.01	-0.12	0.06
Real rates	2002	-0.09	-0.15	0.29	0.56
fixed effects	2003	-0.11	-0.14	-0.48	-0.38
Panel	2004	0.01	-0.09	-0.92	-1.13
Real house prices	2002	-0.13	-0.14	-0.13	0.18
fixed effects	2003	-0.10	-0.11	-0.69	-0.44
Panel	2004	0.03	-0.05	-0.91	-0.87
PMG	2002	-0.03	-0.07	0.94	1.51
Basic	2003	-0.06	-0.05	0.22	0.67
	2004	0.05	-0.02	-0.12	0.03
Real house prices	2003	-0.09	-0.08	-0.42	-0.02
	2004	0.05	0.01	-0.52	-0.27
Demographics	2002	-0.10	-0.10	0.04	0.43
	2003	-0.07	-0.06	-0.42	-0.02
	2004	0.08	0.02	-0.52	-0.27
Confidence	2002	-0.12	-0.11	-0.89	-0.36
	2003	0.05	0.03	-0.78	-0.34
	2004	0.13	0.08	-0.43	-0.14
Fiscal effects	2002	-0.12	-0.14	-0.37	-0.17
	2003	-0.09	-0.09	-0.77	-0.57
	2004	0.03	-0.04	-0.86	-0.83

Annex: Additional specification tests

We report on three specification test which indicate that our choice of wealth variable and our choice of time domain are all acceptable.

Table 37: Variant for all based on splitting net wealth

	Basic	**+ Real interest rate**	**+ House prices**
LC(-1)	-0.035	-0.037	-0.052
	(6.2)	(6.1)	(7.7)
LRPDI(-1)	0.032	0.031	0.039
	(5.2)	(5.1)	(6.0)
LRGW(-1)	0.0029	0.0039	0.0069
	(3.0)	(3.2)	(4.8)
L(1-(RGL/RGW)) (-1)	0.0067	0.0068	0.0039
	(4.1)	(3.7)	(1.8)
DLRPDI	0.246	0.252	0.192
	(12.7)	(12.2)	(8.6)
DLRNW	0.01	0.01	0.0096
	(3.3)	(3.1)	(2.7)
DRR		0.00011	0.00018
		(0.9)	(1.5)
RR(-1)		-0.00022	-0.00011
		(2.6)	(1.2)
DLRPH			0.077
			(7.5)
F (pooling)	3.5 (8.5)	3.4 (8.8)	3.2 (9.1)
F (fixed effects)	5.1 (7.7)	4.7 (7.6)	5.7 (7.5)
F (LRNW Restriction)	2.0 (7.3)	1.9 (7.3)	4.2 (7.2)
R-bar sq	0.146	0.138	0.17
LM het	3.1 (0.08)	2.1 (0.15)	1.02 (0.31)
DW	2.1 (0.91, 0.95)	2.09 (0.96,0.98)	2.2 (1.0, 1.0)
Long run income effect	0.91	0.84	0.75
Long run Gross wealth effect	0.09	0.11	0.13

Note: Brackets after F tests show critical value for Leamer diffuse priors, brackets after LM heteroskedasticity test and DW show P-values.

We tested whether the restriction implicit in the net wealth term (i.e. that gross assets and gross liabilities have equal and opposite signs) is accepted. This is done by replacing the lagged log of real net wealth (RNW) with the lagged log of gross wealth (RGW) and the term log (real gross liabilities/real gross wealth) (RGL) and then testing the restriction that the coefficient on these two terms are equal. The test is reported only for the 'All' grouping but is repeated for each equation specification. We use the identity that real Net Financial Wealth (RNW) is equal to real Gross Financial Wealth (all financial assets, denoted RGW) less real Gross Financial Liabilities (RGL), and our test is based on the decomposition:

$$B_{1*}\log(RNW) =. \quad B_{1*}\log(RGW-RGL)$$
$$= \quad B_{1*}\log(RGW*(1-RGL/RGW))$$
$$= \quad B_{1*}\log(RGW)+ B_{1*}\log(1-RGL/RGW) \qquad \text{(A1)}$$

As shown in the rows at the bottom of table 37 (LRNW Restriction) on splitting net wealth, we found that for each of the specifications, this result was accepted by the Leamer (1978) diffuse prior F test. The coefficients on income and on gross wealth were similar to those reported in the rest of the table.

Tables 37 and 38 extend and contract the time domain in order to test for the stability of the parameters of the equations we are estimating. The panel estimates are 'unbalanced' in that when data are missing for countries or variables then that country no longer has weight in the estimation for that period. A number of countries have missing data before 1980, and more have missing data before 1974, although some, such as the US, have data for all the variables of interest back to 1961q1. In general the first data constraint is for house prices and the second is for wealth.

Table 38: Unbalanced panel consumption functions for full sample

	Basic		**Real interest rate**		**House price**	
	All	**EMU**	**All**	**EMU**	**Full sample**	**EMU**
LC(-1)	-0.036	-0.031	-0.036	-0.031	-0.046	-0.042
	(7.1)	(5.3)	(6.8)	(5.2)	(7.1)	(5.6)
LRPDI(-1)	0.029	0.024	0.029	0.023	0.036	0.031
	(5.5)	(3.7)	(5.2)	(3.4)	(5.4)	(3.9)
LRNW(-1)	0.0035	0.0031	0.0039	0.0036	0.0055	0.0061
	(7.2)	(5.5)	(6.6)	(5.3)	(6.4)	(5.9)
DLRPDI	0.24	0.28	0.25	0.28	0.18	0.22
	(13.1)	(11.9)	(12.3)	(11.7)	(7.9)	(7.4)
DLRNW	0.0089	0.006	0.009	0.0068	0.0091	0.0097
	(3.3)	(1.8)	(3.2)	(2.0)	(2.6)	(2.1)
DRR			0.00022	0.00021	0.00019	0.0001
			(2.0)	(1.6)	(1.5)	(0.6)
RR(-1)			-0.00017	-0.00023	-0.00014	-0.0003
			(2.2)	(2.5)	(1.5)	(2.6)
DLRPH					0.077	0.042
					(7.2)	(3.4)
F (pooling)	5.0 (8.3)	6.3 (7.9)	4.6 (8.7)	5.7 (8.2)	4.0 (8.6)	4.9 (8.0)
F (fixed effects)	7.4 (7.7)	6.3 (7.3)	6.4 (7.7)	5.6 (7.3)	7.0 (7.5)	7.0 (7.0)
R-bar sq	0.15	0.16	0.15	0.16	0.16	0.16
LM het	2.02	0.05	0.9	0.03	1.1	0.04
	(0.155)	(0.83)	(0.34)	(0.9)	(0.3)	(0.8)
DW	1.96 (0.164, 0.226)	1.93 (0.087, 0.138)	2.0 (0.3 0.42)	1.95 (0.1, 0.2)	2.2 (1.0 1.0)	2.2 (0.99, 0.998)
Implicit long run:-						
income effect	0.81	0.77	0.81	0.74	0.78	0.74
wealth effect	0.1	0.1	0.11	0.12	0.12	0.15

Note: Brackets after F tests show critical value for Leamer diffuse priors, brackets after LM heteroskedasticity test and DW show P-values. Dates for full sample are indicated in Table 25.

On either data period we would suggest that it is useful to include real interest rates and real house prices in any explanation of Euro Area consumption developments, although the greater prevalence of liquidity constraints before 1974 leads to a decline in the size of the coefficient on real interest rates in the longer regression, but it also falls in significance in the shorter sample, suggesting that other problems may also be present. As regards other variables, the interest rate change is often significant with the full unbalanced panel and less so in 1980-2003. The level of the real rate remains significant in the Euro Area, however. The difference of house price effect is larger in the 1980-2003 estimates, consistent with financial liberalisation. All the diagnostics

remain satisfactory except for the 1980-2003 estimates that feature heteroskedasticity. This would suggest that using a longer data period is important when arriving at an explanation of consumption in the Euro Area, and this should be taken into account when assessing the inclusion of confidence indicators below.

Table 39: Panel consumption functions for 1980-2003

	Basic		**Real interest rate**		**House price**	
	All	**EMU**	**All**	**EMU**	**Full sample**	**EMU**
LC(-1)	-0.028	-0.031	-0.029	-0.032	-0.041	-0.044
	(4.2)	(3.8)	(4.3)	(3.9)	(5.2)	(4.4)
LRPDI(-1)	0.026	0.031	0.026	0.031	0.036	0.038
	(3.5)	(3.4)	(3.5)	(3.4)	(4.3)	(3.4)
LRNW(-1)	0.0042	0.0037	0.0044	0.004	0.0044	0.005
	(5.8)	(4.8)	(5.9)	(5.1)	(3.9)	(3.6)
DLRPDI	0.21	0.27	0.22	0.28	0.14	0.21
	(9.6)	(10.4)	(9.8)	(10.4)	(5.7)	(6.5)
DLRNW	0.012	0.0079	0.012	0.009	0.009	0.01
	(3.5)	(2.1)	(3.7)	(2.3)	(2.5)	(2.1)
DRR			0.0001	0.0001	0.0001	0.00004
			(0.7)	(0.7)	(1.1)	(0.3)
RR(-1)			-0.00013	-0.0002	-0.0001	-0.00032
			(1.3)	(1.7)	(0.9)	(2.1)
DLRPH					0.111	0.072
					(8.5)	(4.5)
F (pooling)	5.1 (8.2)	5.8 (7.7)	4.2 (8.6)	4.8 (8.1)	4.2 (8.6)	5.0 (7.9)
F (fixed effects)	5.9 (7.4)	5.3 (7.1)	5.8 (7.4)	5.3 (7.1)	5.5 (7.2)	5.5 (6.8)
R-bar sq	0.13	0.15	0.13	0.15	0.19	0.18
LM het	0.79 (0.373)	18.5 (0.00)	1.0 (0.3)	19.7 (0.0)	5.7 (0.02)	15.5 (0.0)
DW	1.9 (0.026, 0.047)	1.93 (0.091, 0.153)	1.9 (0.02, 0.05)	1.9 (0.1, 0.17)	2.0 (0.55, 0.73)	2.0 (0.44, 0.66)
Implicit long run:-						
income effect	0.93	1.0	0.9	0.97	0.88	0.86
wealth effect	0.15	0.12	0.12	0.13	0.11	0.11

Note: Brackets after F tests show critical value for Leamer diffuse priors, brackets after LM heteroskedasticity test and DW show P-values.

5 Housing Wealth

It is widely suggested that trends in housing help to account for the pattern of relative resilience of consumption across countries in recent years. It is widely suggested that consumption in the UK, Spain and to some extent France has been supported by their housing market developments whilst Germany has been held back by developments in house prices. If there are no credit constraints, as in a liberalised financial system, there seems no reason for tangible assets (which are mainly housing) not to enter the consumption function in the same way as illiquid financial wealth. On the other hand, we note that there are arguments suggesting that housing wealth should have a lower weight in consumption than financial wealth, independently from its liquidity. Housing offers utility in itself and is a consumer durable as well as an asset. There will be a wealth effect of increased housing wealth, whether it arises from higher house prices or from accumulation of residential fixed investment for all consumers, which depends on the liquidity of housing. But it may be largely offset by an income and substitution effect for those who are not owner occupiers. Those wishing to buy houses will have to save more to do so, while those renting in a free market will anticipate higher future rents. Hence it is possible, under relatively strong assumptions, that there will be no impact of house prices on consumption. The assumptions would be the same as those for full Ricardian equivalence to hold for government debt, whereby public debt is not net wealth when there are no liquidity constrained consumers, equivalence of discount rate amongst consumers and the government and rational expectations.

There have been a variety of studies looking at the role of housing wealth in the economy, and they are surveyed by Barrell and Davis (2004a). Some work has also included an estimate of housing, or mortgage, equity withdrawal, as in Catte et al (2004a and 2004b), who found that there were significant effects of their estimate of mortgage equity withdrawal on consumption in the UK and the Netherlands, as well as Australia, Canada and the US. For Germany, France Italy and Spain they found the average level of equity withdrawal over 1990-2002 to be close to zero, and correspondingly found no impact on consumption. This was felt to be consistent with less developed mortgage markets in these countries, where renegotiation or second mortgages are uncommon.

Quite apart from the fact that existing work finds no effect in any of the major EMU countries, we do not consider further work on equity withdrawal wise except in cases where there are appropriate data, which is where housing wealth data exist. In other cases the approximation used (typically as in Catte et al 2004) which involves owner occupied housing investment less the change in the mortgage stock) is too crude to be able to produce usable results. The confusion between sources and uses of funds that this approach is based on also makes the results difficult to give economic meaning, and if good housing wealth data were available, we would advise that it be used.

1. Owner occupation and the ownership of homes in the household or personal sector are not the same thing. In Germany for instance owner occupation is under 50 per cent, but home ownership in the sector is over 60 per cent.

2. Homes owned in the sector are not necessarily representative of home overall and they may vary in the evolution of prices from the overall index used in many studies.

3. It is possible to borrow on the strength of home ownership in many ways other than on a mortgage, even in unliberalised markets, and housing wealth can be collateralised against a loan even when it is not directly used as collateral. Hence one should use a wider measure of borrowing in this approach.

4. The existence of housing wealth even in unliberalised financial markets should enable individuals to plan their consumption with different levels of financial wealth than they would otherwise hold, and an increase in housing wealth may boost consumption through a reduction in saving. This will not be caught by equity withdrawal, but it will be captured directly by housing wealth effects in consumption equations.

5. The housing investment flow data in the national accounts includes the transactions cost of purchasing housing, and even in the liberalised UK this is 0.6 per cent of GDP, and about 10 per cent of housing investment. It is also very variable and cyclical. Unless this is excluded results will be questionable.

We would conclude that constructing good data on housing equity withdrawal would require the same information set as producing and using a good estimate of housing wealth data. This would be a very expensive process well beyond the scope of this study.

The alternative to using either house prices or equity withdrawal is including both financial and non-financial wealth in the consumption function. This can be seen in the extended version of equation (2.1.) shown here. In this model, planned consumption (C_t^*) is a function of total wealth. Total wealth is the sum of human wealth (H_t), net financial wealth (FW_{t-1}) and tangible wealth (TW_{t-1}) which includes both housing assets and other durables. Planned consumption can accordingly be expressed as a function of H_t, FW_{t-1} and TW_{t-1}

$$C_t^* = m\left(H_t + FW_{t-1} + TW_{t-1}\right) \qquad (5.1)$$

The differences between the impact of housing and financial wealth can be tested in both the short and long run as is the case in Barrell and Davis (2004a). It is better to utilise data on the value of the asset stock rather than its price, in part because this allows us to test for a long run as well as an immediate impact. It also allows for an effect of accumulation and transfers of wealth that could be expected to impact on consumption, as well as capital-appreciation due to changes in asset prices – or from changes in consumer prices given we use real wealth measures. Nevertheless, although an approach using total and tangible wealth seems most desirable, data limitations mean it can only be checked in an experimental way for a subset of countries on a country by country and not a panel basis, and with the most recent data for checking residuals generally not available, in part because the data is annual, and published with a noticeable lag. Both problems can be partly overcome, as we discuss below.

Series for *housing wealth* are not available for all countries and this precludes any estimation in either a comparison of equations across all countries or in a full panel context. However, here we examine the role of tangible wealth in the single equation framework using a subset of countries for which we were able to obtain official series for housing wealth. This permits both long run and dynamic interpretations of these *tangible wealth* effects on consumption. We augment the standard specification to incorporate a role for real housing wealth in the long run cointegrating vector. This is done by constructing a series for *real total wealth* (*RTW*), which is the sum of real

net financial wealth (*W*) and housing wealth (*HW*) deflated by consumer prices. In the dynamic terms we disaggregate this relation to examine short run contributions from each real wealth term.

Our approach to the incorporation of housing wealth in consumption studies differs from that of Catte et al, as they use a two stage process to construct their error correction models, and they have a wider choice of variables in their long run. In relatively short data sets the two stage process can lead to parameter biases, as Banerjee et al (1993) discuss. Hence a single stage error correction procedure is to be preferred. In addition it is worth using economic theory as well as statistical procedures for setting up the long run. They include real interest rates and the unemployment rate in their long run relationship, which we consider unwise as both are potentially stationary series. They also include the inflation rate in their long run, and our objection to this is not that it is stationary over long periods, which it is. We consider it a problem that the resulting equation in not properly homogenous in the price level, and we would exclude inflation on grounds of economic suitability alone. We suspect that the significant inflation effects they find in Canada, France and Japan mask an omitted variable. The absence of systematic effects of changes in real housing wealth in their study may also be a consequence of including inflation in their long run, as it acts as a proxy for revaluations of wealth.

We choose to use a standard one stage error correction model involving income and wealth, with potential real interest rate effects as well as income dynamics and change terms in real wealth indicators. The specification we use is:

$$\Delta \ln C_t = \alpha_1 * \ln C_{t-1} + \beta_1 * \ln Y_{t-1} + \beta_2 * \ln RTW_{t-1} + \gamma_i * \Delta \ln W_{t-j} + \gamma_i \Delta \ln RHW_{t-m} + \gamma_i * \Delta \ln Y_{t-k} + \alpha_0 + \delta * RR_{t-1} \quad (5.2)$$

where *RHW* is real housing wealth and, again, long-run homogeneity is maintained by use of the following identity.

$$\alpha_1 * (\ln C_{t-1} - \beta_1 * \ln Y_{t-1} + (1 - \beta_1) * \ln RTW_{t-1}) = 1. \quad (5.3)$$

Recent work using this specification includes Barrell and Davis (2004a and 2004b), where significant effects from housing wealth are found in all G5 countries as well as in other economies in the European Union.

Usable data for real housing wealth are obtainable for Denmark, France, Germany, Ireland, the Netherlands, the UK and the US, although financial wealth data has to be estimated in Ireland after 1997 as it is not published. Data are also available for Italy and for Spain, but in neither country does the scale of housing wealth as a share of total wealth seem reasonable, and we have not utilised the series in our final results. Initial estimation confirmed out views.

The data start in 1980Q1 and for the UK and US we have a full sample running to 2004Q4. For the remaining countries the sample ends in 2001Q1, except Germany which runs to 2003Q4, and in addition we have had to splice data carefully in 1990q1, but we have to look for additional breaks at that point. For consistency, we construct the missing quarters of housing wealth data for each of these countries using a simple dynamic equation of the form

$$HW_t = (1-\delta_H)HW_{t-1} * \Delta \log PH_t + \phi_{PS} RIH_t, \qquad (5.4)$$

where PH is the price of housing (from above), *RIH* is real housing investment adjusted for property transactions costs, δ_H is the depreciation rate of housing, and ϕ_{PS} is the proportion of property owned by the personal sector.

We run standard ADF tests for the newly created variables, *RTW* and *RHW*. These are detailed in Table 40, where it is clear that both *RHW* and *RTW* are non-stationary in levels; however, in most countries the differences variables are stationary, implying variables are integrated of order 1. In some cases, such as France, the first difference of *RHW* appears non-stationary, but the first difference of the combined variable, *RTW*, is found to be stationary. One noticeable exception is Ireland, where the first difference of both *RHW* and *RTW* are non-stationary; although this result is on the borderline in the latter case and it most likely attributable to a structural shift in the housing wealth data beginning in the 1990s. Taken in conjunction with the results for *RPDI* in the introduction above, the findings here suggest that consumption, income and real total wealth should form a cointegrating relation. As in the analysis above, we examine the ECM terms in the full equations below for evidence of cointegration.

Table 40: Full data period ADF tests for RTW and RHW

	DK	FR	GE	IR	NL	UK	US
Sample	81Q2-04Q4	81Q2-04Q4	81Q2-04Q4	81Q2-04Q4	81Q2-04Q4	81Q2-04Q4	74Q3-04Q4
LRHW*	-0.670	1.944	-2.976	-0.224	-0.985	-1.195	0.131
DLRHW*	-4.356	-1.183	-4.414	-1.809	-2.943	-2.765	-3.140
LRTW*	-0.487	1.331	-2.164	0.682	0.026	-1.122	-0.129
DLRTW*	-4.071	-4.004	-5.947	-2.457	-3.339	-3.477	-5.060

* Fourth order ADF test reported (critical value at 95% is -2.89)

Key: LRHW stands for the log of real housing wealth and LRTW the log of real total wealth. A "D" prefix indicates the difference of the relevant variable.

In examining the role of housing wealth in determination of consumption, we have employed an equation specification that is comparable to the "new basic" equation detailed in Table 6; and here real interest rate effects and short term real net wealth effects complement the short run housing wealth and long run total net wealth additions. The results are provided in Table 41, where two significant developments merit discussion. First, there is clear evidence of housing wealth effects in all countries in the short run. Second, this finding is attended by a marked increase in the size of the ECM term (or speed of adjustment to the long run equilibrium) as compared to the basic case regressions reported in Table 6 in all but one case.

Table 41: Addition of Real Housing Wealth to Single Equation Consumption Estimates Using Non-linear Least Squares (including real financial wealth and real interest rates)

	DK	FR	GE	IR	NL	UK	US
Sample	80Q3-04Q4	80Q3-04Q4	80Q2-04Q4	80Q3-04Q4	80Q2-04Q4	80Q2-04Q4	74Q1-04Q4
Constant	-0.042	-0.046	-0.297	-0.016	-0.064	-0.113	-0.054
	(1.8)	(1.4)	(4.9)	(0.4)	(3.0)	(4.9)	(3.1)
ECM	-0.069	-0.049	-0.391	-0.091	-0.190	-0.193	-0.119
	(2.6)	(2.4)	(5.6)	(2.5)	(4.4)	(5.6)	(3.3)
ln RPDI(-1)	0.748	0.646	0.778	0.946	0.932	0.794	0.706
	(7.6)	(2.3)	(20.5)	(6.1)	(38.6)	(28.6)	(20.2)
ln RTW(-1)	0.252	0.354	0.222	0.054	0.068	0.206	0.294
D ln RPDI		0.5162	0.683	0.363	0.107	0.108	0.169
		(4.2)	(10.9)	(5.1)	(1.9)	(2.4)	(3..3)
D ln RNW						0.032	0.030
						(3.6)	(2.3)
D ln RNW(-1)	0.036	0.030		0.027			
	(3.1)	(2.7)		(2.5)			
D ln C(-1)							
RR(-1)					-0.75E-3	-0.14E-3	-0.29E-3
					(1.2)	(0.5)	(1.2)
D ln RHW	0.092	0.122	0.223		0.124	0.106	0.087
	(2.1)	(2.1)	(2.0)		(3.2)	(3.7)	(2.1)
D ln RHW(-1)				0.176 (2.5)			
D ln STP* RHW(-1)				-0.129 (1.07)			
Intercept Dummy	8802	9201;	9001	8102; 9903;		8901;	
Single point Dummy	8601; 9401;	8002; 8404; 8501; 9301; 9601; Time;		8201; 8202; 9902; 9903;	8202; 8401; 9102;	8002; 8004; 8403; 9703;	7802; 8002; 8104; 8503; 8701;
R^2 adjusted	0.32	0.420	0.69	0.613	0.334	0.633	0.408
SE	0.010	0.004	0.006	0.007	0.007	0.005	0.005
LM(4)	5.4	3.1	8.8	4.5	2.6	4.5	9.9

* A step dummy was used for D ln IRRHW for the period 1990Q1 to 1999Q1 illustrating a break in the data and the decline of real housing wealth effects over the 1990s. This is reflected by the negative sign, although note that the coefficient is not significant.

Key: C stands for real consumption; RPDI for real personal disposable income, RNW for real net financial wealth, RHW for real housing wealth, RTW for real total wealth, ECM for the error correction terms, RR for the real interest rate, RPH for real house prices. A "D" prefix indicates the difference of the relevant variable.

Strong and significant dynamic housing wealth terms are found in almost all countries where elasticities range from 0.09 in the US to 0.22 in Germany. The UK, France, and the Netherlands all have elasticities greater than 0.1, while Denmark lies below 0.1. There is also a significant role for changes in real net financial wealth in Denmark, France, Ireland, the UK and the US, but it is absent in Germany and the Netherlands. In cases where both series are found to be significant, it is instructive to note that these short run housing wealth elasticities are between 2½ to 4 times greater than the short run net financial wealth elasticities. This implies that short run

housing wealth effects are much greater contributors to the dynamics of aggregate consumption than comparable net financial wealth effects. Similar results were found in Barrell and Davis (2004a and 2004b) cited above. We would argue that these differences reflect the different degree of knowledge about asset price changes. House prices are immediately visible to those who own them, whilst the majority of financial assets that change in market value because of price changes (bonds, equities) are held indirectly by insurance and pension funds. In addition, as Lettau and Ludwigsen (2004) argue, there is a great deal of noise in financial wealth data, and consumers have to separate signal from noise when making their consumption decisions.

For Ireland Table 41 depicts two short run housing wealth variables with opposing signs. We employ a step dummy to shift the dynamic term for housing wealth in Ireland from 1990Q1 to 1999Q1 where there is a noticeable shift in the macroeconomic data. This is due mainly to the rapid economic growth seen in Ireland during this period where real incomes rose substantially and became the main drivers of consumption. As such, contributions from real housing wealth to consumption declined over this period and our specification here is meant to capture this shift while preserving prior contributions from housing wealth effects (although we note that the shift variable is not significant).

Turning now to the long run wealth effects, we see a decline in long run income effects in most countries as evidenced by smaller elasticities on RPDI with respect to those in Table 6, and, given the imposition of homogeneity, a consequent increase in long run total wealth effects. There is a marked decline in long run income elasticities in Denmark, France, Germany the UK and the US, but an increase in Ireland. One would expect to see higher long run total wealth effects in countries with a greater degree of financial liberalisation. As discussed above, the significance of the error correction coefficient can provide information on the detection of a cointegrating relation (e.g. Banerjee et al. (1993)). In comparison with Table 6, Table 41 shows improvement in both the relative size and statistical significance of the ECM terms for all countries except France, where both figures are stronger in Table 6, and the US, where the size of the parameter has improved, but not the statistical significance. Using the t-statistic as a rough indicator of cointegration, it is clear that Germany, Netherlands, the UK and the US all have identifiable cointegrating relations.

Overall, the above findings suggest that housing wealth is a significant contributor to aggregate consumption. On average across the sample we find that the short run housing wealth effect is nearly 3¼ times that of the net financial wealth effect. In the long run, we find an increased role for real total wealth. The net effect from the housing wealth additions is a more dynamic long run equation and hence stronger evidence of a cointegrating relation. However, lack of good quality data for most countries precludes us using this approach across the whole sample, and we utilise house price data. However, it is clear that they are a poor substitute for wealth data.

6 Conclusions

This report undertakes extensive econometric investigation of the determinants of consumption in Europe and in the US using macro data. We find that it is possible to explain consumption behaviour, and that demographic developments and fiscal policy innovations contribute to the explanation. We also find a pervasive role for house price developments. These results help us to understand consumption developments in the last few years. We analyse the factors that have been behind weak consumption in the Euro Area, looking at forecast residuals and the

decomposition of equations. We argue that changes in real personal disposable income have been the major factor behind weak growth in many countries, and that developments in financial and tangible (housing) wealth have had some impact. There has also been residual weakness in consumption in Germany and Italy that may depend on recent changes in institutional environments such as social security and labour market reforms, although in Italy they are as likely to be associated with weak supply side prospects. Consumption has also been weaker than we might anticipate in Sweden, Finland, and Greece.

Our work extends the analysis of the determinants of aggregate consumption beyond income and financial wealth and applies it to the countries of the European Union and the US. We develop a common econometric framework for all countries where changes in aggregate consumption are based not only on real net financial wealth and real personal disposable income, but also reflect changes in real house prices and real interest rates (instrumented appropriately). We undertake panel data analysis in the same framework, and we report results. However, there is evidence from the panel estimation that the diversity of the European economies, especially in their dynamic responses, is significant. We would conclude from our panel work that assessing the factors causing slow consumption growth in Europe is better done using single equations with careful analysis of country-specific problems.

Recognising the diversity and complexity of aggregate consumption patterns across the wide range of countries in our sample, we further augment our econometric specification by explicitly modelling the effects of demographic changes and government spending. Importantly, the analysis of the forecast errors suggests that the expanded model of consumption behaviour improves our understanding of the determinants of aggregate consumption in some countries, while consumer spending remains puzzling in others and this suggests scope for further work. This exercise is repeated in the panel analysis.

In both the single country studies and the panel estimation we also investigate the role of confidence, and find that it is seldom significant. However, where it is significant we find that it is Granger caused by wealth, but does not Granger cause wealth; consequently, it is redundant in evaluating both forecasts and equations of consumption. We also investigate the role of equity market volatility and of equilibrium unemployment as indicators of uncertainty, but we find no role for them except for the NAIRU in Spain and the US. We argue, however, that the significance of this term in the Spanish results are more than adequately picked up by the structural change dummies that have been included.

Basic model specifications involving only income and wealth effects suggest that consumption is largely driven by changes in income in Germany, Austria, Belgium, and Portugal, all of which had relatively unliberalised financial systems for much of the sample. In these countries the long run real income effects of over 90% suggest a degree of liquidity constrained behaviour as consumers are not able to borrow to smooth their consumption over time. However, the data cannot be used to indicate whether such reliance on current income for consumption is driven by choice or necessity. By contrast, the long run income effect in the US, UK and Sweden is below 80%, as these countries have liberalised their financial markets in the late 1980s. They also have experienced major asset price fluctuations and/or banking crises, which may have prompted consumers to respond more actively to changes in asset values that are reflected in financial wealth holdings. The short run dynamics of income and financial wealth complement the long run elasticities – countries with strong dynamic income terms, such as Germany and Austria, tend

to have weaker, if any, dynamic wealth terms. Not surprisingly, several Scandinavian countries along with UK and US display the strongest dynamic wealth terms in the sample.

The inclusion of real interest rates and house prices tend to improve the general fit of the equations suggesting that these variables are important determinants of consumption patterns in Europe and the US. The change in real house prices was found to be statistically significant in Germany, UK, US, the Netherlands, Spain, Portugal, and Scandinavian countries. With the notable exception of Germany, all the countries with significant house price effects have experienced housing market booms in recent years. In the context of limited financial liberalisation and significant evidence of liquidity constrained behaviour, German house prices have not followed the upward trajectory seen in many other countries and our findings suggest that lacklustre housing market developments may have contributed to weak consumption growth in Germany.

Changes in house prices did not have a statistically significant impact on aggregate consumption in France, Italy and Ireland – all countries where anecdotal evidence suggests a positive impact of rapidly rising house prices on consumption. The explanation of relative cycles in housing markets along with relatively recent strides in financial liberalisation may explain the statistical and economic insignificance of house prices on consumption in France and Italy. The case of Ireland may merit a somewhat different explanation: the rapid rise of nominal house prices may be more rooted in the impressive GDP and income growth over a sustained period of time. In this context, real house prices may be merely adjusting to the growing demand and prevailing income levels.

The inclusion of population composition into the model suggests that demographic changes may help explain changes in aggregate consumption patterns in Germany, France, Italy, Spain, Sweden and the US. That we did not find demographic composition to be important in more countries in our sample may be due to relatively small aggregate changes in the overall population composition in many European countries over the entire sample. Where deep and liquid financial markets existed for much of the time covered by our sample, they helped to smooth consumption and thus render demographic factors less relevant as explicit determinants of changes in consumption. Where the impacts are statistically significant, they tend to be of similar economic magnitude and positively correlated with consumption, as for example in France, Spain and US. By contrast, demographic changes in Germany have a negative impact on aggregate consumption, again pointing to a limited scale of consumption smoothing in that country. Furthermore, the proportion of people over 65 in Germany has been rising somewhat faster in recent years as compared to the 1990s and this too may have contributed directly to weak consumption growth since 2000.

Overall, our findings indicate that fiscal developments have a limited impact on aggregate consumption. Changes in fiscal positions were found to be statistically significant in Spain, Sweden, Netherlands, Finland, Ireland and Italy and the results conformed to the accepted explanation of the Ricardian effects. Interestingly, significant levels effects had a negative sign in the US, confirming that US fiscal deficits have boosted consumption growth over the sample period. This may point to qualitatively different government spending in Europe as compared to the US, but further analysis is needed to illuminate this point.

Appendix on FRDB Database

Details of the FRDB Pension and Employment Variables Selection
Reforms of Employment Protection Legislation in Europe from 1986 to 2002

Country	Year	Month	Description	Scope	Sign
FN	1991	1	Individual employer's contributions are made independent of the lay-off record of the firm concerned	structural	increasing
FR	2000	1,2	THE CONSTITUTIONAL COUNCIL approves the second 35-hour week law, except as regards the payment of overtime. The agreements already signed by the social parts will continue to apply. Entry into force of the second AUBRY law setting out the provisions for the reduction of the working week from 39 to 35 hours in all companies employing more than 20 people.	structural	decreasing
GE	1996		The employment threshold, at which EPLs apply is increased from 5 to 10 employees (on a full basis) per firm. A law comes into force liberalising employment conditions. Legal conditions covering dismissals are relaxed.	structural	increasing
NL	1995		THE GOVERNMENT DECIDES TO EASE DISMISSAL PROCEDURES. According to the new rules, an employer can dismiss his employee at the same time or even before asking permission from the director of the Public Employment Office.	structural	increasing
PT	1991		FIRING RESTRICTIONS EASED. Through a wider range of admissible lay-off.	structural	increasing
SP	1994	5	INDIVIDUAL DISMISSALS EASED: zero days of notice is required when length of service is below 15 days for blue collar workers or below 1 month for white collar workers. Thereafter (only for objective dismissal): one month when length of service is below one year, 2 months when length of service is between one and two years and 3 months for two or more years' service. COLLECTIVE REDUNDANCIES: the firms can initiate a collective dismissal if the dismissal affects to 10 or 30 percent of workers depending on the size of the firms. The legally acceptable causes for collective dismissals have been expanded to include production and organisational causes. Law 19/5/1994 nr.11.	structural	increasing
SD	1997		The length of notice periods is now determined on the basis of tenure rather than age.	marginal	increasing

			Enterprises' rehiring obligations vis-à-vis laid-off workers now expire after nine months instead of twelve. Twelve-months fixed term contracts are available with no restrictions: all enterprises are allowed to employ up to five persons on such contracts; these are allowed to be prolonged for up to 18 months. Introduction of a three-year limit after which temporary contracts have to be turned into permanent contracts. Unions at local level are allowed to deviate from some of the prescriptive rules laid down in law.		increasing increasing decreasing increasing

Appendix 1 (cont). Details of the FRDB Pension and Employment Variables Selection Reforms of Non-Employment Benefits in Europe from 1986 to 2002

Country	Year	Description	Scope	Sign
DK	1994	'A comprehensive Labour Market Reform is approved by the Parliament: The maximum duration of unemployment insurance benefits is limited to seven years. 'The Unemployment Benefits period is split in two (four plus three years) with full-time activation through job offers, training and education compulsory in the second period. Policy implementation is decentralised to regional labour market authorities.	structural	increasing
	1996	'Another Labour Market Reform is approved: Eligibility criteria for access to Unemployment Benefits are tightened (compulsory activation of 13 weeks of unemployment for youths below 25 years of age or 52 weeks for all above 25 years). 'The minimum age for access to Unemployment Benefits is raised from 17 to 19. 'The maximum duration of Unemployment Benefits is lowered to 5 years.	structural	increasing
NL	1987	The two key parts of the previous Unemployment Benefits scheme (WW, unemployment insurance and WWW, unemployment assistance) are combined and eligibility requirements are tightened. The maximum duration of benefits is more closely linked to the age and length of the contribution period. The Revision of the Social Security System Act is enacted to reduce the incentive to obtain a disability pension rather than an unemployment benefit.	structural	increasing

		Criteria governing access to disability pensions are tightened. Claimants who are less than 80% disabled will receive a pro-rated disability pension supplemented by an unemployment related component declining over time. The total benefit will decline over time as the unemployment-related portion of the benefit falls, with a maximum benefit period of five years. Eligibility requirements for unemployment benefits are tightened: the worker obliged to accept an appropriate job even outside his geographical region.		
SP	1992	A decree to redress fiscal slippage approved by the Government: the minimum contribution period for eligibility is raised from 6 to 12 months. Lump-sum Unemployment Insurance schemes offering lump-sum payments are phased out. The system of minimum unemployment assistance allowances is reformed: it now provides those who have worked for at least three months but are not eligible to unemployment insurance with 75 per cent of the minimum wage. The amount is reduced by over 10 per cent. The unemployed people are no longer allowed to take up the unemployment insurance payment in a single instalment in order to start a new business as a self-employed worker.	structural	increasing
SD	1997	The Employment Bill repealed before it entered into force and the revised proposal forwarded in March: The qualifying period is increased from 5 to 6 months (it had been proposed 9 months). The proposal for an upper limit of the duration is dropped. The underlying structure of the Unemployment Benefit is changed: the benefit now consists of an earning-related part and a flat rate component. The maximum Unemployment Insurance (earning-related component) benefit is raised. The possibility of requalifying for benefits through participation subsidised jobs no longer available.	structural	increasing decreasing increasing decreasing increasing
UK	1996	Unemployment Benefit is replaced by the Job-Seekers' Allowance. The duration of the Job Seekers Allowance is halved (from 12 to 6 months).	structural	increasing increasing

		The replacement rate of the Job Seeker Allowance is lowered.		increasing
		The Income Support scheme is replaced by the means-tested component of the JSA as a safety-net with a marginal withdrawal rate of 100 per cent.		increasing
		A new family credit, the Working Families' Tax Credit, guaranteeing all people in employment with dependent families (including lone parents) a minimum level of income (£200 a week) and giving them an allowance to cover the costs of child care; the hours a week which someone can work if their spouse is unemployed and in receipt of means-tested benefit have been increased from 18 to 24 hours.	marginal	increasing
		Introduction of a minimum income guaranteed for people with disabilities to move them into a paid job.		increasing

Appendix 1 (cont). Details of the FRDB Pension and Employment Variables Selection Reforms of Pension Systems in Europe from 1986 to 2002

Country	Year	Month	Description	Scope	Sign
BG	1997		Pensionable age for women will be gradually increased and aligned with those of men (65 years).	marginal	decreasing
			The minimum working period for early retirement, which now stands at 24 years, will be gradually increased to 35 by the year 2005.	marginal	decreasing
			The age limit for early retirement has been raised from 55 to 58 but early retirement before 60 is allowed only if it is explicitly stated in a collective agreement.	marginal	decreasing
FN	1997	1	An additional sickness insurance contribution of 3% of pension income will be collected from pension recipients.	structural	decreasing
			Pension reform (1996-1997): pensions are more closely linked to work history; the minimum national pension is restricted only to with employment-derived pensions below a certain limit.		
			The additional and basic national pensions are abolished.		
			Creation of a "buffer fund" for Unemployment Insurance scheme and Pension scheme to run deficits during downturns and surpluses during upturns.		
			The share of employees' social security contributions was raised as of 1 January 1999 with a corresponding reduction in the employers'		

			share. The minimum age of the unemployment pensions was further raised, to 60 years.		
GE	1992		A reform proposal put forward and agreed upon by the Government: The de facto net-wage adjustment principle for pensions is formally adopted (the average pension is indexed to the average net wage). The retirement age is gradually increased from 60/63 years for women and men respectively to a uniform retirement age of 65 years (starting in 2001 and completed in 2012 for women and 2006 for men). This implies the abolition of the present flexible retirement-age scheme; early retirement may still be obtained with a reduction in pension levels, while pension benefits for those working after the age of 65 are increased. For contributions between 1973 and 1992 multiples (used in computing the individual relative contribution position) below 75 percent are multiplied by 1.5 up to the maximum of 75 percent, effectively reducing the redistribution for workers with income position below 50 percent. Contributions to the pension system during periods where contributors are receiving income-support payments paid by the unemployment insurance fund is to be increased. Contribution-free years of higher education are reduced. Pensions for low-income earners to be upgraded. Age 65 set as the pivotal age for benefit computations: for each year of earlier retirement up to five years and under certain conditions, benefits will be reduced by 3.6 percentage points in addition to the effect of few service years. Rewards for later retirement were also introduced: the pension is increased by 6 percent for each year of retirement postponed. The possibility of partial retirement is introduced: all rules and regulations apply in proportion. In the new Länder old-age pensions are raised by 11.65 per cent and legislation on pensions extended to the new Länder.	structural	increasing decreasing decreasing decreasing decreasing increasing decreasing increasing increasing
IT	1995		New law on pension programmes: Retirement age: flexible from 57 to 65 for both men and women.		increasing

			New formula to calculate old age pension, "pro-rata" is introduced: those having at the time of reform less than 18 years of contribution, will enter contribution system; capitalisation of contributions based on nominal GDP growth; the coefficient converting cumulative contributions into annual pensions is based on residual life expectancy, plus adjustment to real GDP growth (1.5%). Eligibility to social pensions requires at least 5 years of contributions, subject to the condition that pension is at least 20% higher than old-age assistance; Indexation of pensions to price inflation. Contribution rate: 32% for employees; 20% for the self-employed. Seniority pensions: Eligibility is raised to 40 years of contributions, or 35 years of contributions plus an age of 57. Private pension funds: earnings-ceiling for participation in public system, to favour the creation of private funds; fiscal incentives for contributions paid.		decreasing decreasing decreasing decreasing decreasing
NL	1996		The Pension Fund for Civil Servants is privatised.	structural	decreasing
PT	1993		Reforms on pension formula: The basis to calculate old-age pension will be 15 (rather than 10) years, and the accrual rate will be reduced from 2.2 per cent to 2 per cent. A gradual rise in the retirement age for women from 62 in 1993 to 65 years by 1999. An increase in the contribution period required for full pension. A reduction in the contribution rate paid by employers of 0.75 percentage points, offset by a rise in VAT rates of 1 point, receipts of which are marked for social security.	structural	decreasing
SP	1997		In July the Parliament has approved legislation introducing several reform to pension system: Gradual extension of the basis to calculate pensions from the last 8 years of contributions to the last 15 years. Unification of the different contribution ceilings at the level of the highest one. Reduction of front-loaded accumulation of pension rights, which provides incentives to retire early by having an accumulation rate which diminishes in relation to the years of	structural	decreasing

			contributions.		
SD	1998	6	A new retirement pension system will be introduced gradually, starting in 1999; passage from a pay-as-you-go system to a prefunding system with two kind of pensions: income-related pension and prefunded pension. The retirement age will be flexible without upper age limit. The state guarantees a minimum pension to those who have earned insufficient pension right. Future pensions will be based on all income earned from the age of 16.	structural	decreasing decreasing increasing decreasing

Data description and sources

Prefix	**Country**	
OE	Austria	
BG	Belgium	
DK	Denmark	
FN	Finland	
FR	France	
GE	Germany	
GR	Greece	
IR	Ireland	
IT	Italy	
NL	Netherlands	
PT	Portugal	
SP	Spain	
SD	Sweden	
UK	United Kingdom	
US	United States	
Suffix	**Description**	**Source**
2039	per cent of population aged 20-39	UN World Population Prospects (2004 Revision)
4064	per cent of population aged 40-64	UN World Population Prospects (2004 Revision)
65 or 65p	per cent of population aged 65 and over	UN World Population Prospects (2004 Revision)
C	private consumption, constant currency	All national sources: Statistik Austria (OE); Banque Nationale de Belgique (BG); Danmarks Statistik (DK); Statistics Finland (FN); INSEE (FR); Statistisches Bendesamt (GE); National Statistics Service of Greece (GR); CSO Ireland (IR); Instituto Nazionale di Statistica (IT); Central Bureau voor de Statistiek (NL); National Statistics Office (PT); INE (SP); Statistics Sweden (SD); ONS (UK): BEA (US). Austrian data seasonally adjusted by NIESR. Irish data before 1999 is spliced using old 1995 fixed base series. Spanish data before 1995 is spliced using old 1995 fixed base series.
CED	private consumption deflator	All national sources, as for private consumption.
CONF	confidence indicator	Eurostat and University of Michigan Survey for the US
GBR	government budget ratio, as per cent of GDP	Budget deficit/surplus levels are collected from OECD except for ONS (UK) and BEA (US). These are divided by nominal GDP figures obtained from the institutions listed in the source for private consumption.
GVAR	measure of equity price volatility	NIESR estimation (GARCH (1,1)); monthly share prices (looged first difference)
HW	housing wealth	OECD Economic Outlook, table 58
NAIRU	non-accelerating inflation rate of unemployment	European Commission, smoothed by NIESR.

NW	net financial wealth, personal sector	Oesterreichische Nationalbank (OE); Banque Nationale de Belgique (BG); Danmarks Nationalbank (DK); Statistics Finland (FN); Banque de France (FR); Bundesbank (GE); Banca d'IItalia (IT); Eurostat (NL, PT); Banco de Espana (SP); Statistics Sweden (SD); ONS (UK); Federal Reserve (US). GR and IR are NIESR estimates.
PH	index of house prices	European Central Bank (OE, BG, DK, GR, IT,NL, PT, SP, SD); Statistics Finland (FN); INSEE (FR); Bulwein AG (GE); Department of Environment and Local Government (IR); Office of the Deputy Prime Minister (UK); Office of Federal Housing Enterprise Oversight (US). Irish series is average of new and second-hand homes (excluding apartments).
R3M	3-month interest rate	OECD Main Economic Indicators except Financial Times (UK) and Federal Reserve (US)
RNW	real net wealth, i.e. net wealth deflated by CED	NIESR calculations
RPDI	real personal disposable income	All personal disposable income figures in current prices are taken from OECD, except for UK (ONS), US, (BEA) and (Bundesbank) Germany. All series are deflated by NIESR using the consumer expenditure deflator.
RPH	index of real house prices, i.e. deflated by CED	NIESR calculations
RRF	instrumented interest rate	Constructed by NIESR using Instrumental Variables

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PART 2: DETERMINANTS OF HOUSEHOLD SAVING IN GERMANY, SPAIN AND THE UNITED KINGDOM – A MICROECONOMIC ASSESSMENT

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1 Introduction

This second part presents the findings of an analysis of household saving in Germany, Spain and the United Kingdom carried out using micro-economic data; the study is supported by and carried out on behalf of DG-ECFIN at the European Commission. These three countries represent a country with slow economic growth in the Euro Area and two countries with appreciably faster economic growth, one inside and the other outside the Euro Area. The purpose of this part of the study is to shed some light on the slow growth of consumption in Germany by investigating whether there are identifiable groups of households whose saving has increased in the last few years and also to discover whether there are any substantial difference between Germany and the other two countries which might account for more rapid demand growth in Spain and the United Kingdom. The micro-economic analysis complements the macro-economic analysis also carried out in the first part.

The study of consumption and saving behaviour using micro-economic data faces a number of problems. First of all, there are few countries which maintain panel studies of household income and expenditure over any substantial period. The data for Germany and the United Kingdom are provided by cross-section surveys. The Spanish survey is a rotating panel; data are collected once a quarter from each household, with the household remaining in the panel for eight quarters. This means that, even in Spain if the keys to the panel are used satisfactorily, it is difficult to apply to the individual responses the standard theoretical model based on intertemporal optimisation to the study of consumption expenditure. Secondly there are questions about coverage. In the United Kingdom where funded pensions form an important part of provision for retirement, both employers and employees contribute to pension schemes. Net household incomes are measured net of pension contributions which are an important part of household saving. But employee contributions are not well recorded and there is no data source which provides information on employer contributions. Thus it is impossible to study saving in micro-economic data using the same definitions as those adopted in macro-economic data. Here we have tried to define income and consumption and saving in the same way in Germany, the United Kingdom and Spain using the budget surveys in the three countries. The German *Einkommens- und Verbrauchsstichprobe*, EVS, is available in 1998 and 2003. The Spanish *Encuesta Continua de Presupuestos Familiares*, ECPF, has, as its name implies, run continuously since 1998 with the data available up to the first half of 2003; we have used the data since 1999. The United Kingdom *Family Expenditure Survey*[7], FES, is conducted annually; we have studied 1997, 1999, 2001 and 2003. The surveys are described in greater detail in the Appendix.

Although the Spanish survey provides, in principle, panel information on both consumption and saving we were unable to link[8] the individual observations in a manner which was satisfactory- i.e. with the ages of nearly all household heads stable across the panel and with reasonable correlations of household incomes in successive quarters. We were therefore unable to make full use of these data.

[7]This was combined with the *National Food Survey* to become the *Expenditure and Food Survey* in 2002

[8]There were a number of problems. The delivery of the data was a slow process- although they have subsequently become available over the internet. A separate request was needed to obtain the key to link successive quarters and this was initially refused by INE. When the data arrived we contacted the person listed as providing support but he was on holiday. By the time of his return we concluded that there was not sufficient time to absorb and use the panel aspect. A Spanish member of staff was employed throughout our discussions with INE.

The disadvantages in the use of micro-economic data are offset by other advantages. The most important of these is that it is possible to see how saving depends on household characteristics in addition to income. The most important characteristic which we expect to influence saving behaviour is age, but other factors such as education may also be important.

This report proceeds as follows. We being with an account of the movements in the consumption and saving shown in the macro-economic data comparing these with what is shown in the survey aggregates. We then survey the existing literature, discussing the life-cycle framework used as the basis for much modelling of saving behaviour and the modelling framework that other researchers have adopted to study the sort of micro-economic data to which we have access. This is followed by sections which describe our findings country by country. Conclusions draw out the similarities and differences between the countries.

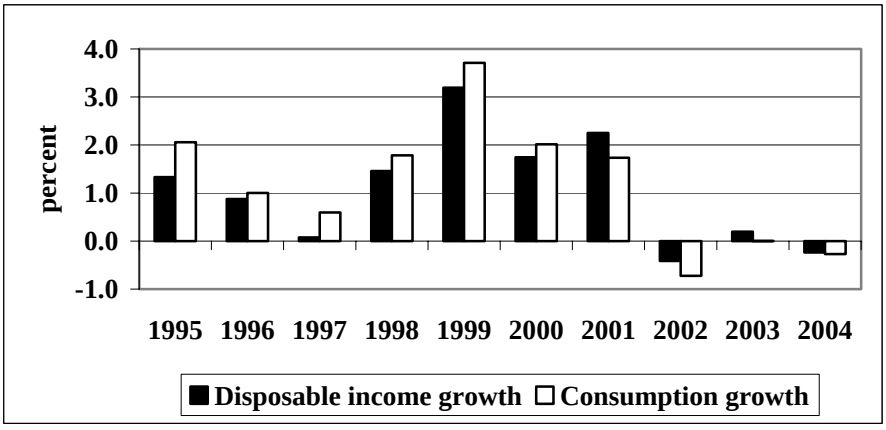
2 The Macro-Economic Context and the Micro-Economic Aggregates

In this section we present the macro-economic context of the data, looking at how aggregate household saving has changed over time. We then look at saving as measured in the micro-economic surveys, focusing on three income categories (< 60% median, 60-140% median and >140% median) and two employment categories (employed/not employed) drawing attention to the extent to which the pattern in the micro surveys matches what can be seen in the macro-economic aggregate.

2.1. Germany

Low private consumption growth in Germany is sometimes regarded as one of the reasons for low corporate investment and a low labour demand. Figure 10 shows that the growth rates of real consumption (consumption in prices of the year 1995) of private households (including NIPSH) indeed were low in most years of the period from 1995 to 2004. The lowest growth rates and even negative rates are present in the last years from 2002 to 2004. The average yearly growth rate of real consumption over the period from 1995 to 2004 was 1.18 % p.a.

Figure 10: Growth Rates of Consumption and Real Disposable Income, Germany



One reason for low consumption growth may be low income growth. Another reason may be a rise in the savings rate. Figure 10 shows that the growth rates of real disposable income (deflated

using the consumer price index) of private households (including NPISH) were also low in the period considered. While the growth rates of real consumption and real disposable income differ considerably in most years, the average yearly growth rates of real disposable income (1.04 % p.a.) and real consumption (1.18 % p.a.) differ only slightly. Thus, for the whole period, it can be concluded that low growth of income was more important for low consumption growth.

In principle, it is possible to infer the development of the savings rate from the development of disposable income and consumption because the savings rate may be defined as the ratio of disposable income minus consumption to disposable income. However, it is more convenient to look at the savings rate directly. Moreover, it is of interest to include the net increase in future pension rights from company pension plans in the definition of the savings rate. In this case, savings are defined as disposable income plus the net increase in future pension rights minus private consumption. The savings rate is the ratio of savings to disposable income plus the net increase in future pension rights. Figure 11 shows the development of the savings rate for both definitions. Note that the second definition is the one used by the German Federal Statistical Office.

Figure 11: Savings Rates of Private Households, Germany

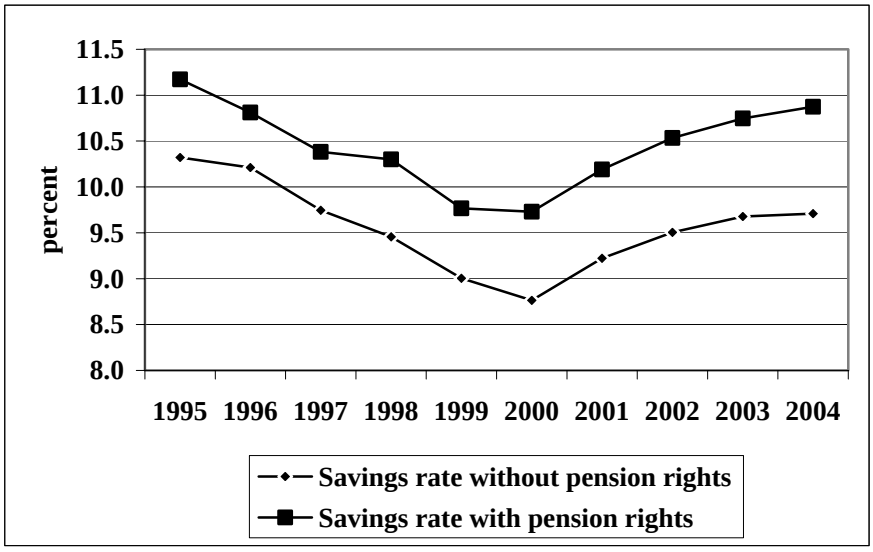


Figure 11 shows that that the savings rate fell during the late 1990s and increased again starting with the year 2001. The increase was especially high in the year 2001. In each year following the year 1995, the savings rate was lower than in the year 1995. The development of the savings rate has thus contributed to the somewhat higher average growth rate of real consumption compared to the growth rate of real disposable income mentioned above. Looking at the two years for which we have micro-economic data, 1998 and 2003, it can be seen that the saving rate is only slightly higher in the second year.

However, the increase of the savings rate in the last few years had a negative impact on real consumption. As can be seen from figure 11, the rise in the savings rate including net increases in future pension rights for company pensions from the year 2001 on was somewhat higher then the one excluding these rights. This is due to the fact that the net increase in future pension rights for company pensions grew over the period from the year 2000 to the year 2004.

These findings indicate that low growth of real disposable income of private households was more important for the observed low consumption growth than changes in the savings rate. It is of interest to know whether low income growth of private households was primarily due to low GDP growth or due to a shift of resources from private households to the other sectors (government, enterprises) in the German economy.

Figure 12: Growth Rates of Real GDP and Real Household Disposable Income, Germany

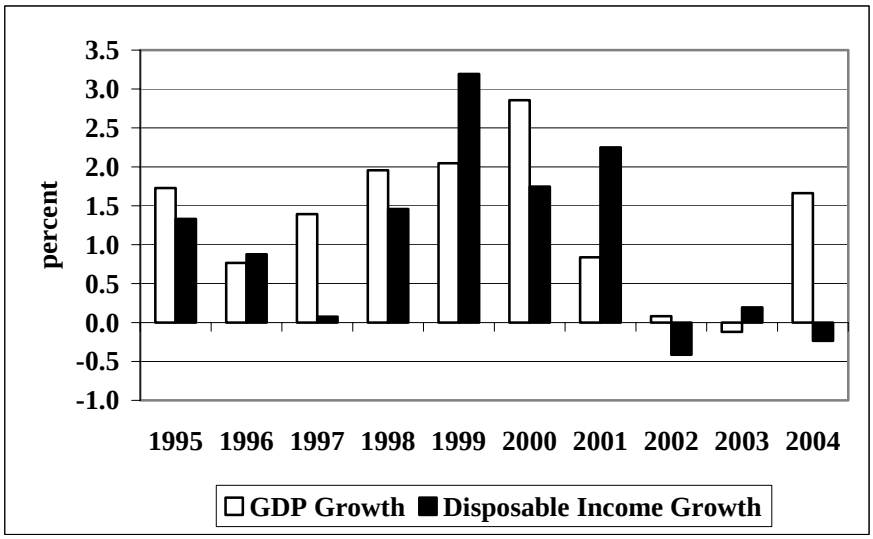
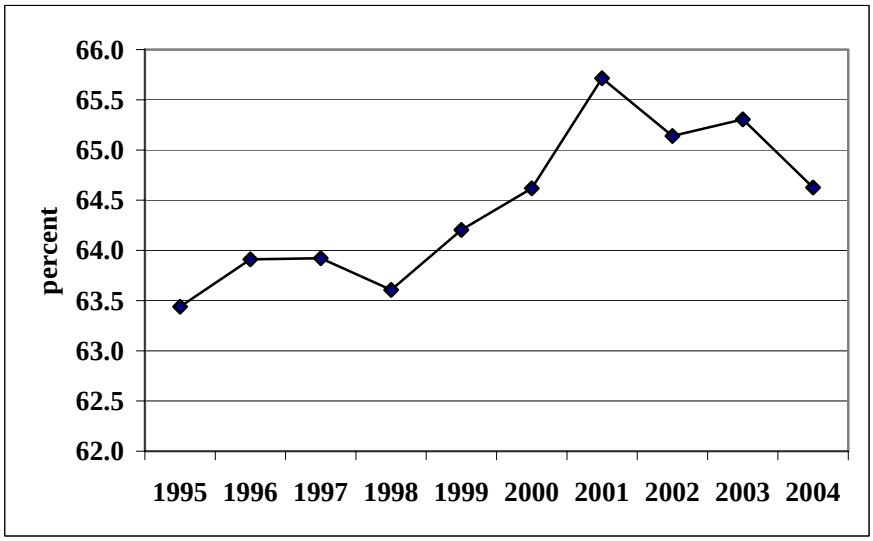


Figure 12 shows that the growth rate of real GDP was low as well in most years. In some years it exceeded the growth rate of real disposable income of private households, in some other years it was lower. The average growth rate of real GDP in the years 1995 to 2004 was 1.32 % p.a. and thus higher than the growth rate of real disposable income of private households (1.04 % p.a.).

Figure 13: Share of Household Disposable Income in GDP, Germany



However, the lower growth rate of real disposable income compared to the growth rate of real GDP does not imply that the share of disposable income of private households in GDP decreased. As figure 13 shows, it actually increased. The average increase of the general price level (GDP deflator) was 0.97% p.a. in the period 1995 to 2004 and thus considerably lower than the average increase of the consumption price level (1.38 % p.a.) which was used to deflate disposable income of private households. Thus households experienced prices of consumption goods rising faster than the price of overall output.

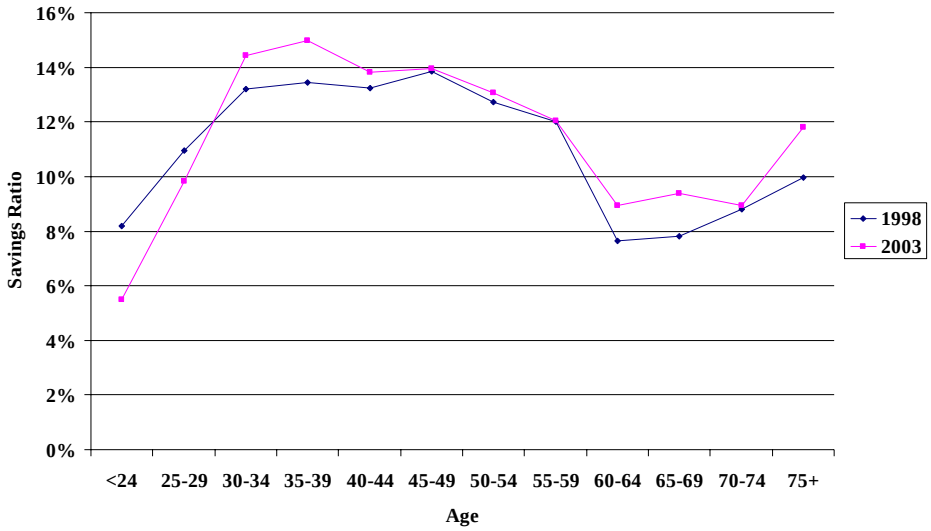
We now turn to the disaggregate data on consumption and saving in Germany, looking at the data from the EVS which we use subsequently in our regression analysis. We show averages only for those households whose savings ratios lay in the range – 0.5 to 0.5 so as to exclude results which were likely to be attributable to measurement errors[9] and apply similar trimming to our subsequent regression analysis. The data for saving in Germany classified by age group are reasonably stable; we show in figure 14 the savings ratio classified by age for 1998 and 2003. Figure 14 shows the means of the savings ratios of individual households classified by age group. This gives a lower figure than would aggregate saving divided by aggregate income in each age band because the savings ratios of high-income households tend to be greater than those of low income households. The pattern shown in the graph is largely in line with what one might expect from the life-cycle savings model, in that people save more while they are of working age than after their retirement. However, saving of young people is surprisingly high and it is also surprising that saving does not show a clear peak in the years when many people no longer have families to support and might be saving up for retirement.

It is also surprising that old people continue to save, instead of running down their assets[10]. One reason for this may be that old people have difficulties keeping accurate records of their expenditure, and therefore tend to understate their spending. Comparing 1998 and 2003, we can see that saving was generally higher, although people in their twenties saved less. If an economic motive is to be given to the rising savings rate of people in their thirties, it is likely that it is precautionary in nature. Caroll and Samwick (1997) suggest that life-cycle saving does not become the dominant saving motive until people are around forty-five. To speculate further, then, it is more likely that fear of unemployment rather than retirement saving is the factor behind rising saving of people in their thirties. However, it is difficult to provide an economic motive for the rising saving of people in their sixties and seventies.

[9] The exclusion of "genuine" outliers can, however also improve the resulting estimates. There is a lengthy statistical literature on this question. See for example Staudte and Sheather (1990).

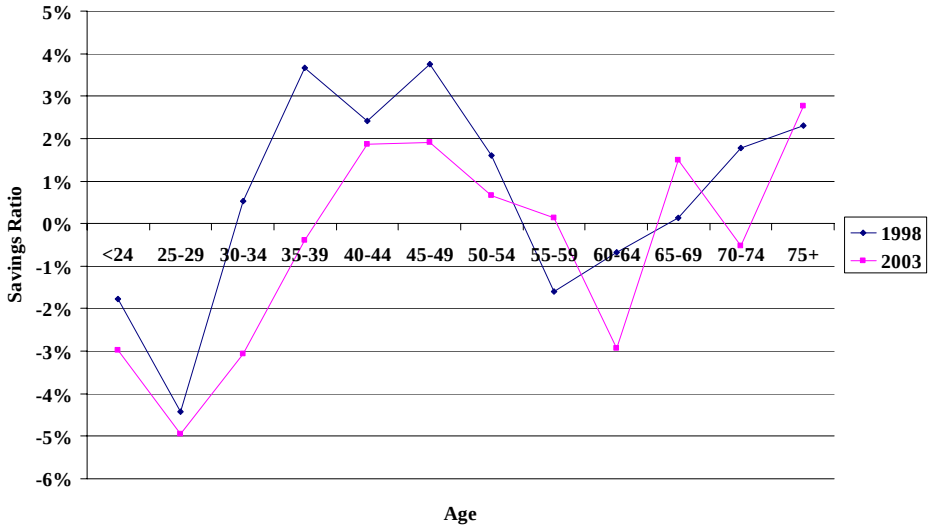
[10] Even though their income is provided by pensions and thus it can be argued that income is itself partly dissaving, the apparent recording of consumption below income is unexpected given the life-cycle framework.

Figure 14: Savings Ratio in Germany, All Households



We now turn to look at saving by income category. We explore three income classes, households whose income after adjusting for family size is less than 60% of the median, those whose income is between 60% and 140% of the median and those whose incomes lie above 140% of the median. In figure 15 we show the savings rates of the households with incomes less than 60% of the median. These households have low savings rates at all ages. As observed in the aggregate data, the peak savings rates come earlier than might have been expected, and at the same time we also see more saving than dissaving by old people. People in their twenties are net borrowers. In contrast to the average picture, these households tended to save more in 1998 than in 2003.

Figure 15: Household Savings Rates in Germany, Households with Income less than 60% of Median Income



In figure 16 we look at the saving behaviour of the group on middling incomes. The main features of the trends observed in the aggregate are present here, Saving is high among people in their thirties and falls off when people retire. Recorded saving then rises as people age in retirement. Saving by people in their twenties is surprisingly high. And the savings ratio in 2003 is higher than that for 1998 at most ages, consistent with the aggregate picture.

Figure 16: Household Savings Ratios: Germany, Households with Incomes between 60% and 140% of Median Income

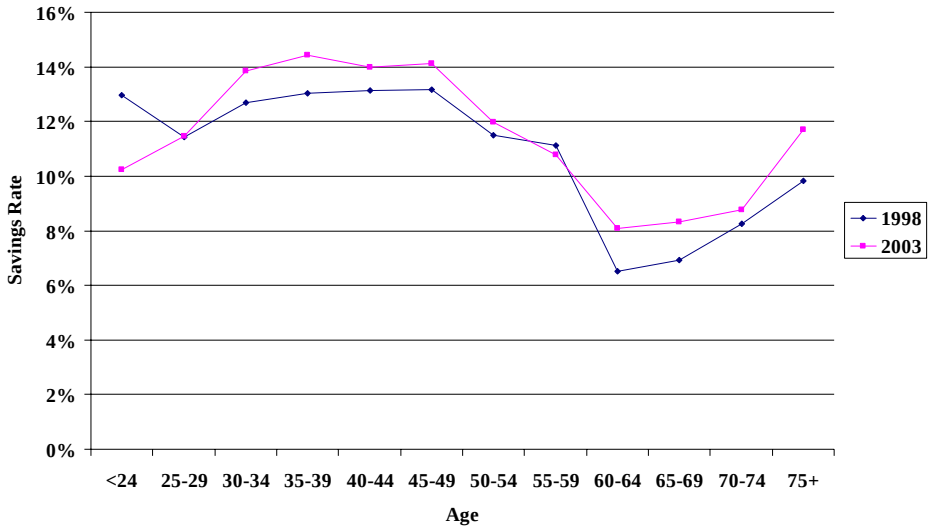


Figure 17: Household Savings Rates in Germany, Households with Income more than 140% of Median Income

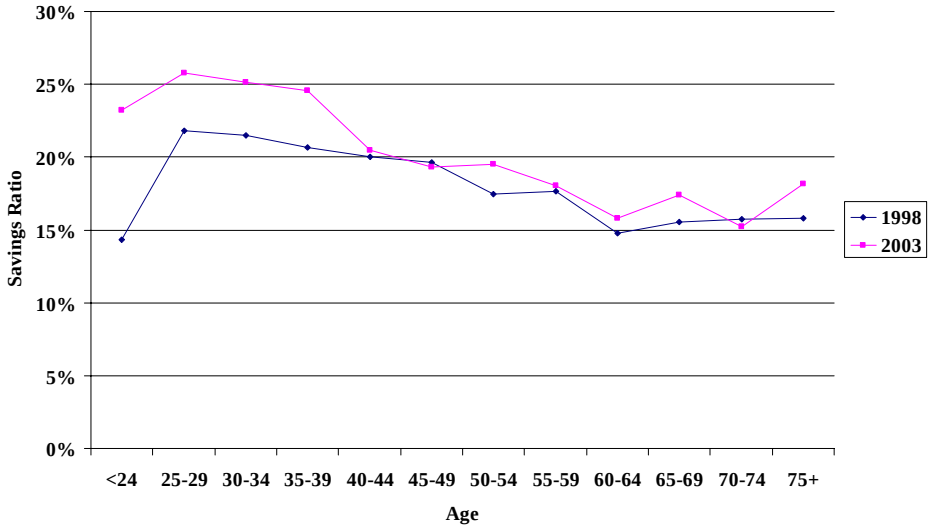
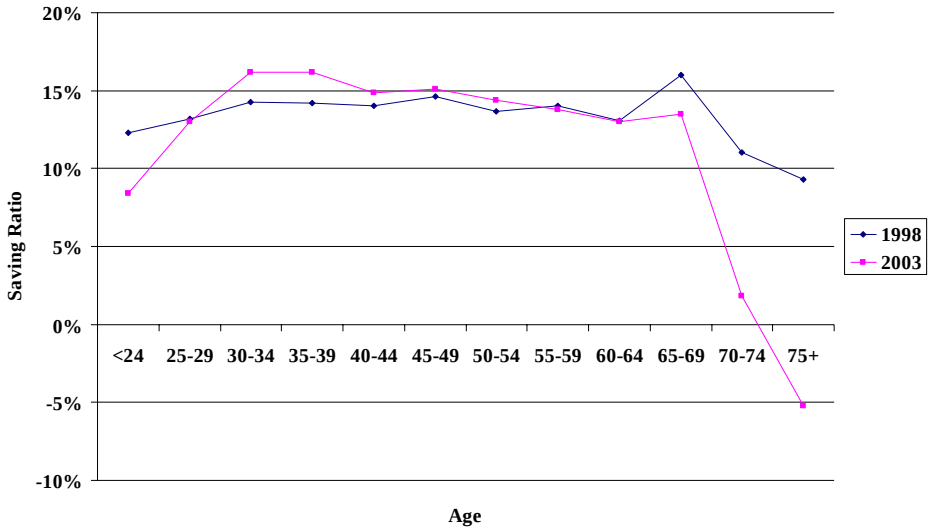


Figure 17 shows the savings ratio of households with high incomes. Here the pattern of high saving by young people is very pronounced, with the exception of the youngest group in 1998. Once again at most ages saving is higher in 2003 than in 1998 and the effect is pronounced among households headed by young people. The tendency for savings rates to rise in retirement is not marked in this income group.

We now look at saving by employment category. Obviously most household heads of working age are employed, although Germany has relatively high proportions of non-employment among young people and also among people aged 60-64. Beyond the age of 65 most household heads are not employed, and the data for households where the head is employed are based on small samples. In figure 18 we can see that saving by households headed by employed people in their

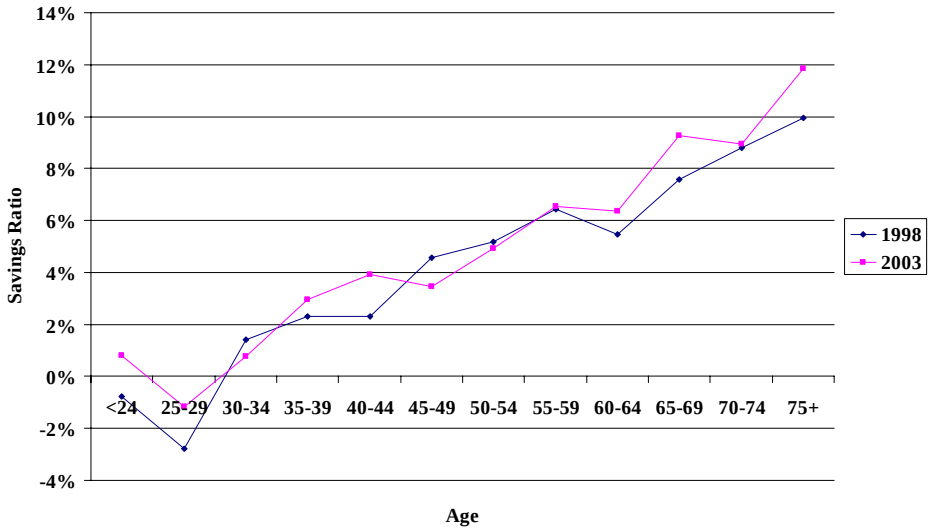
thirties rose markedly between 1998 and 2003, with smaller increases among households headed by employed people in their forties and early fifties; saving by households headed by employed people in their early twenties fell. No great importance should be attached to the data for people aged sixty-five and older.

Figure 18: Household Savings Rates in Germany, Households with Employed Heads



Finally in figure 19 we look at the savings behaviour of households headed by people who do not work for any reason. This shows a steady increase in saving with age with no important differences between 1998 and 2003. One explanation of the rise in the savings rate with age is that as people age their expectation of returning to work, and thus of receiving a higher income in the future than they do at present, declines. Investigation of this is, however, beyond the scope of this study.

Figure 19: Household Savings Rates: Germany, Households with Heads not Employed



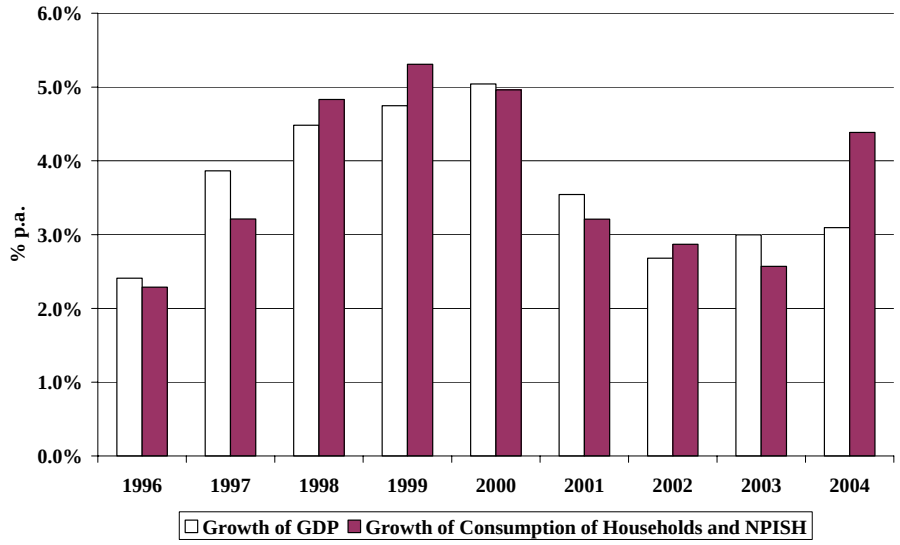
A general observation we can draw from these data is that the life-cycle profile is much more strongly visible in the saving pattern of all households than it is for most of the subgroups. While

this project has not studied income dynamics of individual households, the reason for this is that most households do not spend their whole life cycle in any one of the categories we have identified. In particular unemployment rates among young people are much higher than those of prime age workers. A comparison of figures 18 and 19 suggests that the pattern of figure 14 would be generated if the proportion of households not working is lower for people in their thirties than in their twenties. Similarly and for much the same reason young households are more likely to have low incomes than are middle-aged households. This on the one hand provides a reason for young people individually not wanting to save and on the other hand in aggregate explains why in the population as a whole one would see a saving rate higher for people in their thirties than in their twenties.

2.2. Spain

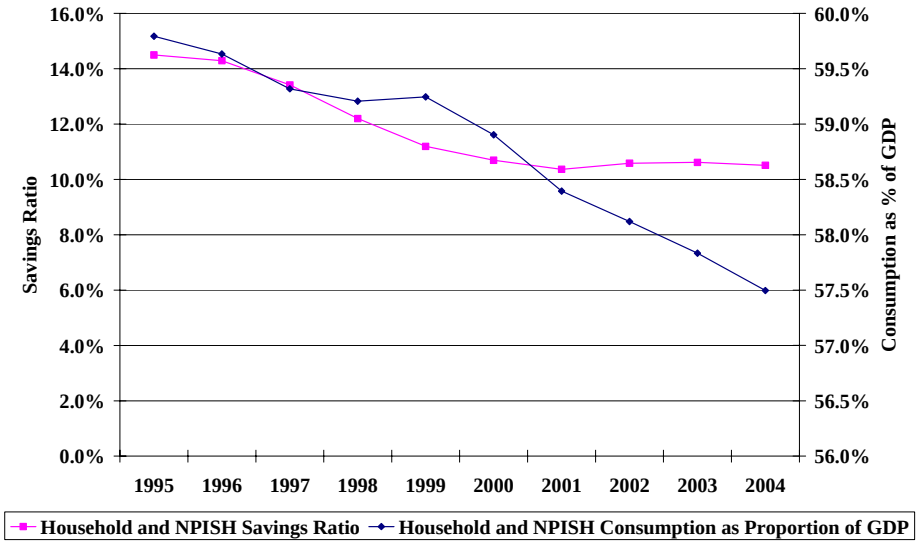
Spain is perhaps the most successful of the large economies in the Euro Area. In figure 20 we show the growth rates of output and consumption over the last nine years. The chart shows that consumption and GDP have grown very much in line, with the possible exception of 2004, where consumption has grown considerably faster. However the data for 2004 are described as provisional and it would therefore be wrong to assert that Spain had relied strongly on consumption-led growth in 2004.

Figure 20: Growth Rates of GDP and Private Consumption, Spain



Study of savings ratios suggests a picture which is, on first inspection, inconsistent with that shown by figure 20. The share of household consumption in GDP has declined steadily, while the household savings rate declined until 2001 since when it has stabilized as figure 21 shows. The decline in the share of consumption in GDP can be reconciled with volume growth rates which are much the same for both variables only as a result of the price of consumption goods growing less fast than that of GDP as a whole.

Figure 21: Saving and Consumption Ratios, Spain



The declining share of consumption in GDP has been associated with a declining share of household and NPISH disposable income in GDP as shown in figure 22. Thus, as the earlier figures imply, consumption growth has been maintained in Spain despite a falling share of household incomes in GDP. There have been two mechanisms for this. First, between 1996 and 2000 household savings ratios have fallen. Secondly, slow growth in consumption prices relative to the GDP deflator has meant that real incomes have been supported even though the share of income in GDP has fallen in contrast to the situation in Germany. This has undoubtedly been an important factor in sustaining the growth of consumption and therefore of GDP itself in Spain.

Figure 22: Household and NPISH Disposable Income as a Proportion of GDP, Spain

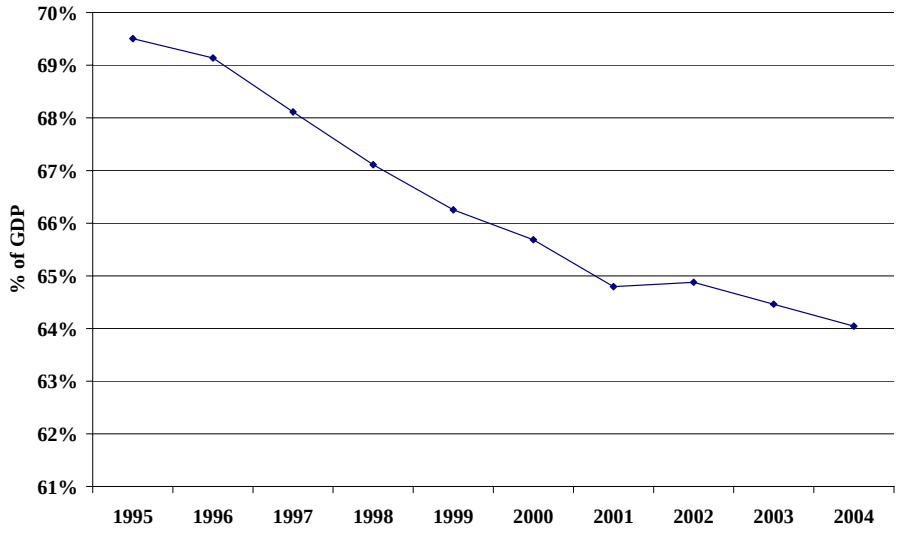


Figure 23 confirms this picture. In the period up to 2000 GDP growth outran real income growth and consumption was supported by a falling household savings rate. But from 2002 onwards real income has matched or outrun GDP growth despite the declining share of nominal income in nominal GDP.

Figure 23: Growth Rates of Real Household and NPISH Disposable Income and Real GDP, Spain

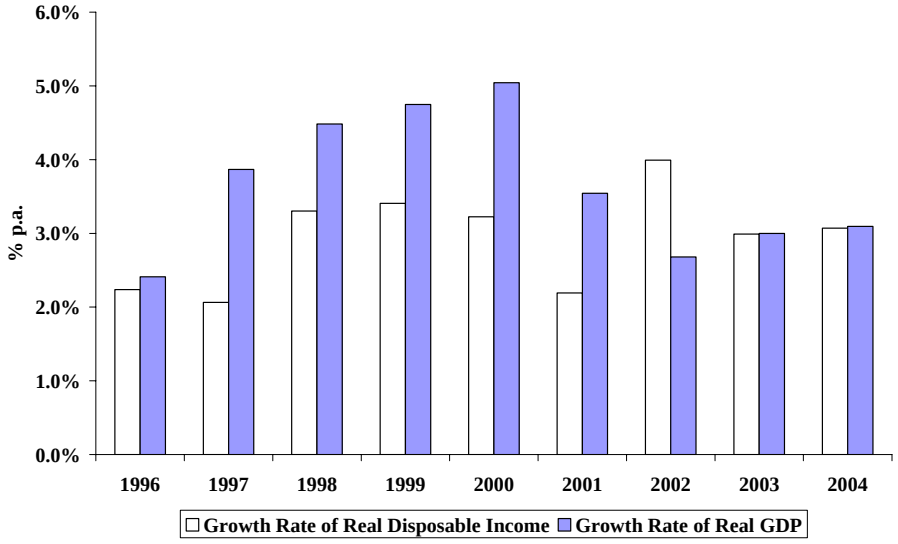
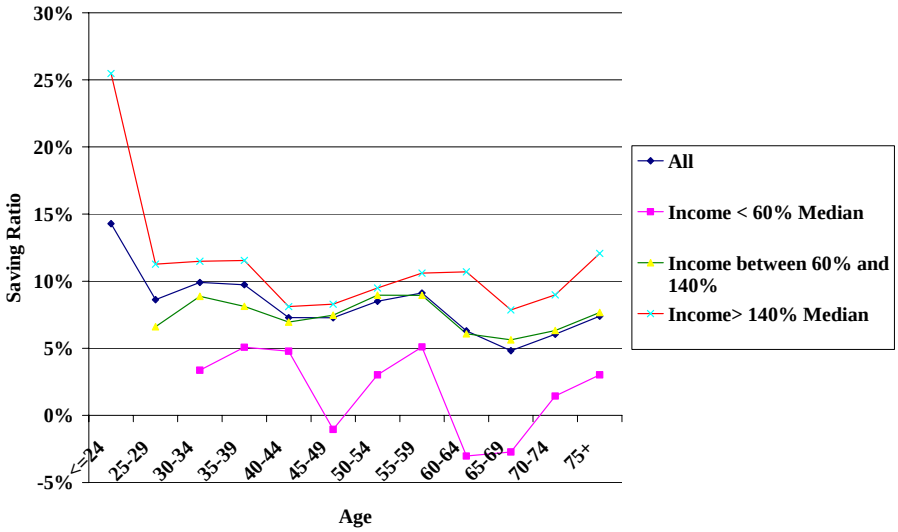


Figure 24 Household Saving, Spain – By Income Group, Average of All Years



We now turn to a summary of the individual data which we subsequently study econometrically, showing, in figure 24 the averages over the five years we study, 1999-2003[11] of the mean savings rates by individual households as a function of age and income category. This has the effect of smoothing fluctuations in data which we subsequently show to be much more volatile than those for Germany. The lowest category, income, after adjusting for household size using McClement's scale below 60% of median corresponds to a standard definition of poverty. We have selected as two other categories, an income between 60% and 140% of the median and an income above 140% of the median so as to give a reasonable and symmetric spread. As with Germany we trim the data showing means for those households with savings ratios in the range -0.5 to 0.5. The *Encuesta* has disproportionately more households headed by old people than by young people in

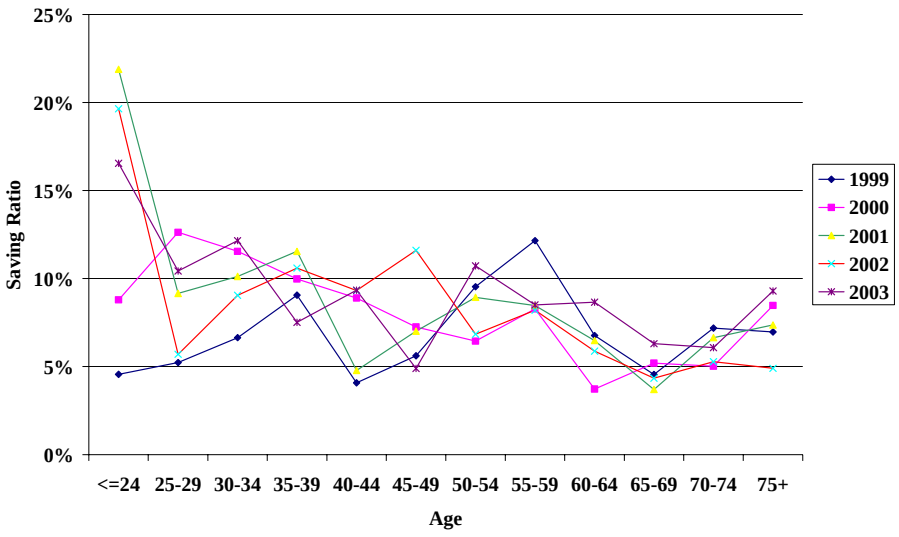
[11] Data are available only for the first two quarters of 2003

the sample (see Appendix) and we found that in some years there are no households in age 20-24 or age 25-29 categories in some of the income categories. For this reason the lines in figure 24 do not show entries for all age groups in all income categories.

The relative savings rates of the households in the different income bands show that people on high incomes save more than those on low incomes. Young people are relatively high savers contradicting what would be expected in a life-cycle framework in which incomes rise with experience (Mincer, 1974). Saving falls off modestly between the late fifties and the late sixties; this can be seen as evidence for life-cycle behaviour. The failure to observe dissaving among retired people is, however, a common property of such data and may be a consequence of the failure of old people to keep correct records of their expenditure when responding to budget surveys.

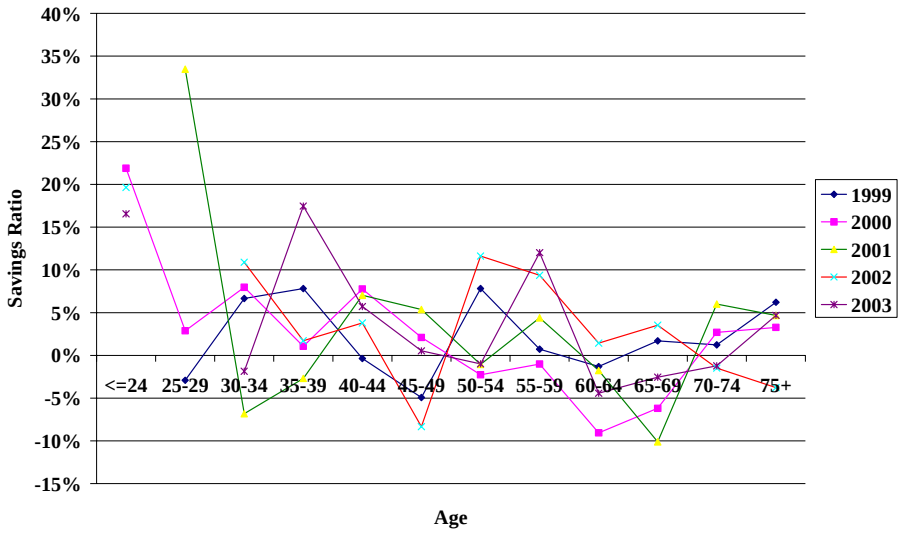
In figure 25 we explore saving rates in individual years. During the period the macro-economic savings ratio, shown in figure 21 declined gradually. The movement was, however, not very large. The data from the survey itself are rather erratic and there is no clear tendency either in terms of saving by young people relative to old people or in terms of movement of the saving curve over time. We attribute the erratic movements to the small sample size (see Appendix). The 1999 curve points to low saving by young people while later data point to higher saving; in particular the 2000 curve suggests that saving declines fairly steadily with age. The erratic nature of these data may be compounded because the survey is designed primarily as an expenditure survey. The information it provides on income is much less detailed than that provided in Germany or the United Kingdom. With less effort devoted to the collection of income data it is perfectly possible that they are less accurate.

Figure 25: Household Saving: Spain, All Households



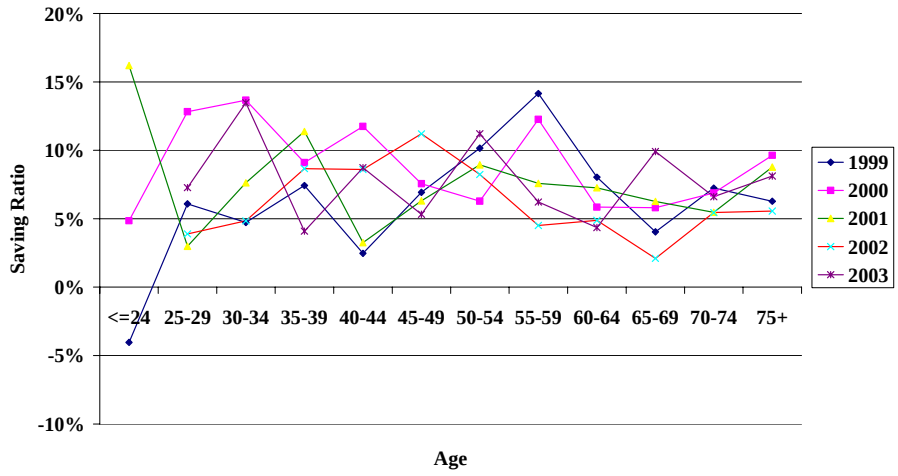
In figure 26 we look at the savings rates of households with incomes below sixty per cent of the median. The erratic nature of the data is more pronounced here, given the fact that the means are calculated from smaller numbers of observations than are used in figure 25. In particular the high savings rates observed for young people are estimated from very small samples. It is not possible to discern in these data clear factors driving the decline in the overall savings rate over time.

Figure 26: Spanish Saving Ratio – Income below 60% of Median



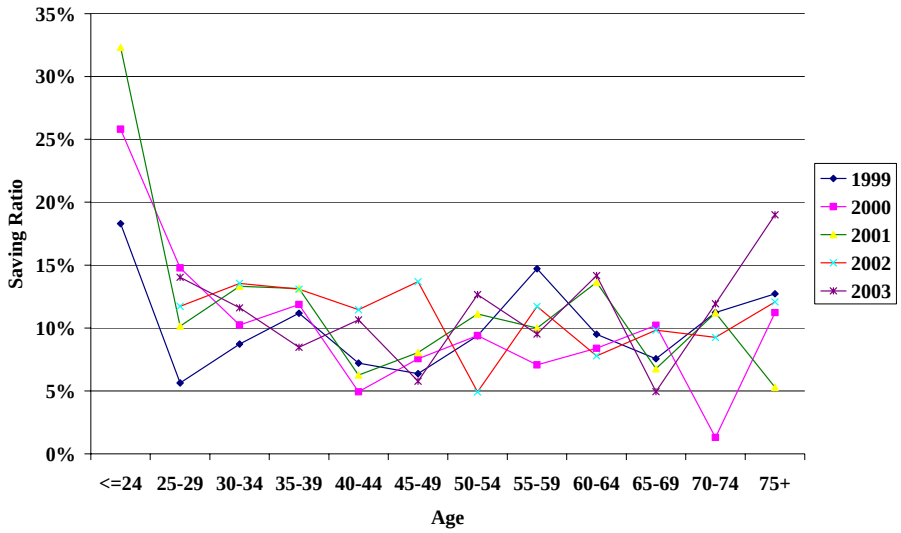
In figure 27 we show the saving behaviour of the households in the middle income band, with incomes of between 60% and 140% of the median annual income after adjusting for household size. Once again the data for young people are particularly affected by small sample sizes.

Figure 27: Spanish Savings Ratio – Income 60% to 140% of Median



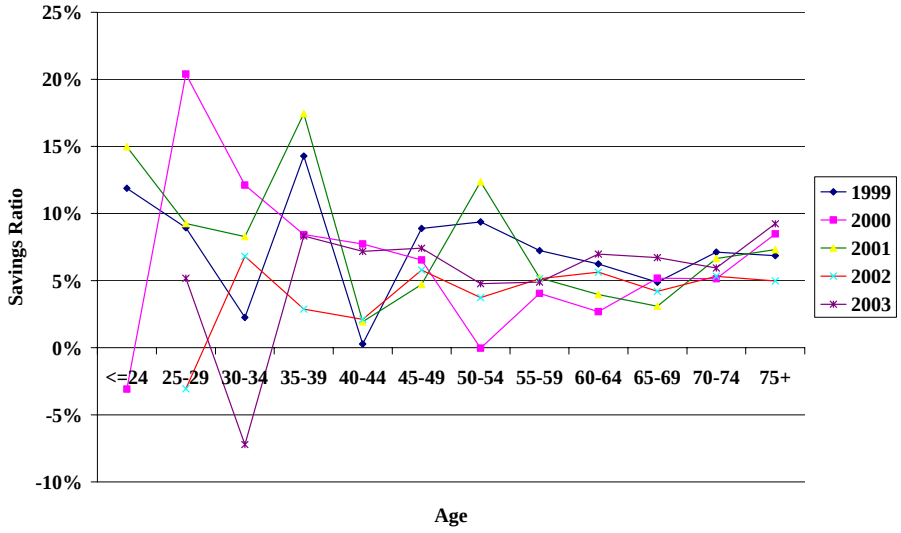
In figure 28 we look at the saving behaviour of households with incomes above 140% of the median after adjusting for household size. Again the high saving of young households is calculated from a very small number of observations. It is difficult to discern any life-cycle savings pattern in these data.

Figure 28: Spanish Savings Ratio – Income > 140% Median



We now turn to the question of savings by employment status. In figure 29 we show saving by people who are not employed. As with the other countries, this represents a minority of the population of people aged under sixty, but the vast majority of those aged sixty-five or more.

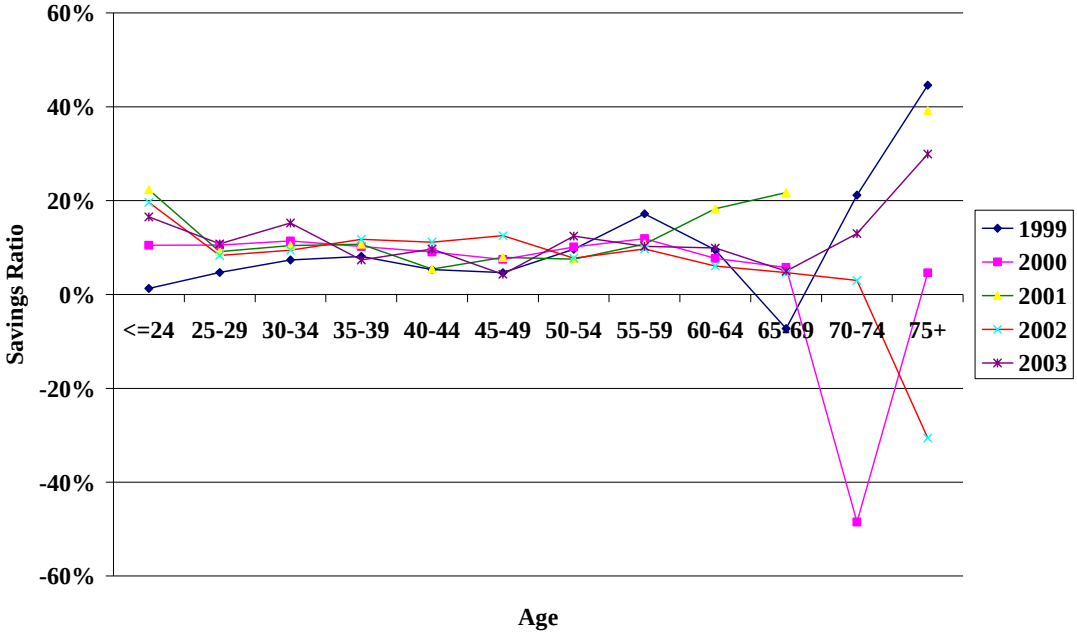
Figure 29: Spanish Savings Ratio – Households whose Heads are not in Employment



The volatile nature of these data for people of working age makes them difficulty to interpret. Not surprising, as the sample sizes increase for people aged sixty and above, the series become more stable.

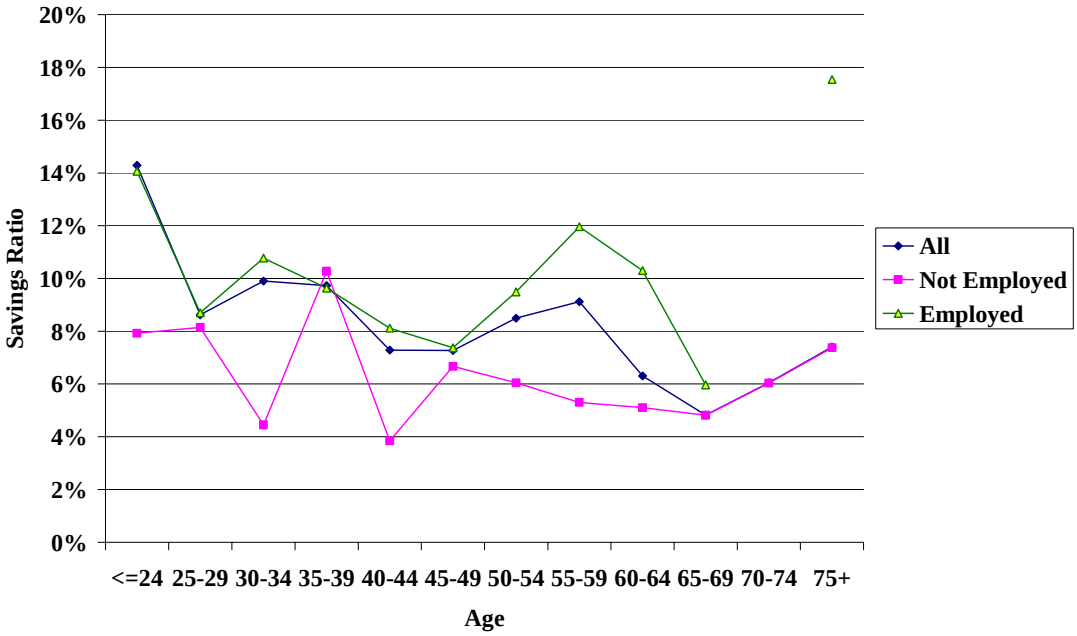
In figure 30 we show the savings behaviour of households whose heads are in employment. There is no obvious evidence of the downward drift in the savings ratio observed in the aggregate data between 1999 and 2003. The erratic pattern in the data for people aged sixty-five and over is a consequence of a very small sample.

Figure 30: Spanish Savings Ratio – Households whose Heads are not in Employment



Given the volatility of the data there is some point in looking at the averages of the savings rates across all years. This is shown in figure 31. The much lower volatility allows these data to be shown on a different scale and saving by employment households is seen to be higher than that by non-employed households- with the exception of households whose heads are aged 35-39, as would be expected. But, as we have observed earlier, the savings data for Spanish households are volatile even when aggregated across all years.

Figure 31: Spanish Savings Ratio – Saving by Employment Status, Average across all Years



2.3. The United Kingdom

The United Kingdom, in contrast to some of its neighbours, has experienced something of a consumer boom in the last ten years. As figure 32 shows, the household savings rate fell sharply in 1998 and has remained lower than the level of the mid-1990s since then. Nevertheless, the period since 1998 was marked by a low, rather than declining savings ratio and a general conclusion is therefore that, while low saving may have led to a high level of demand since 1998, there is little reason to think that, for the aggregate economy, a falling savings ratio was responsible for rising demand.

Figure 32: Household and NPISH Consumption and Saving, United Kingdom

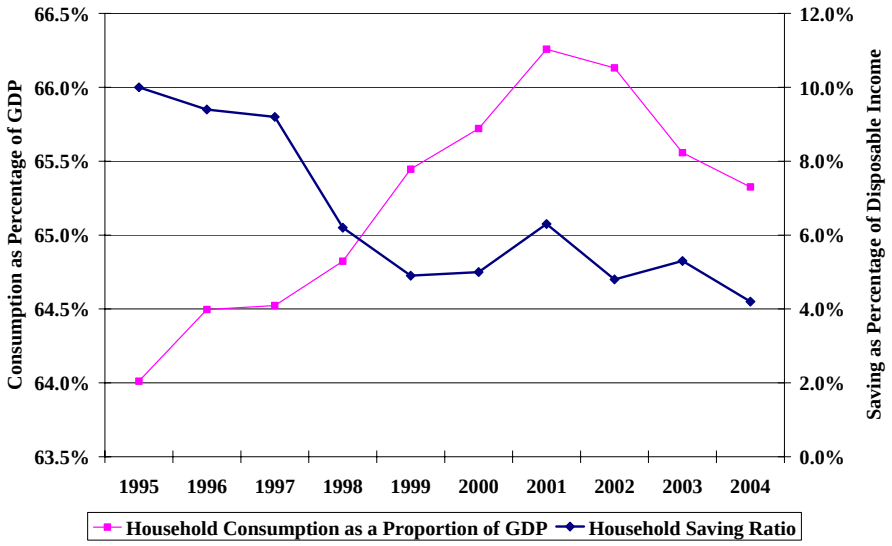
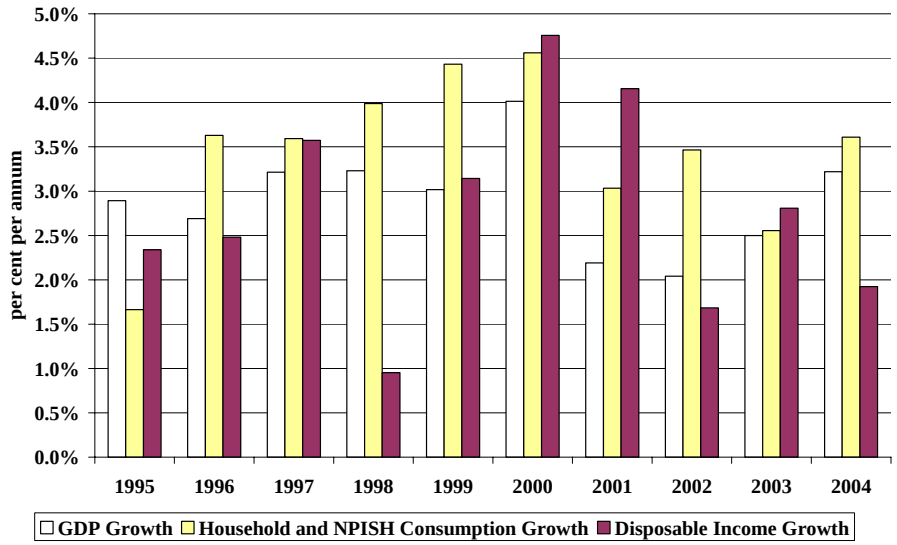


Figure 33: Growth Rates of GDP, Household Consumption and Household Real Disposable Income, United Kingdom

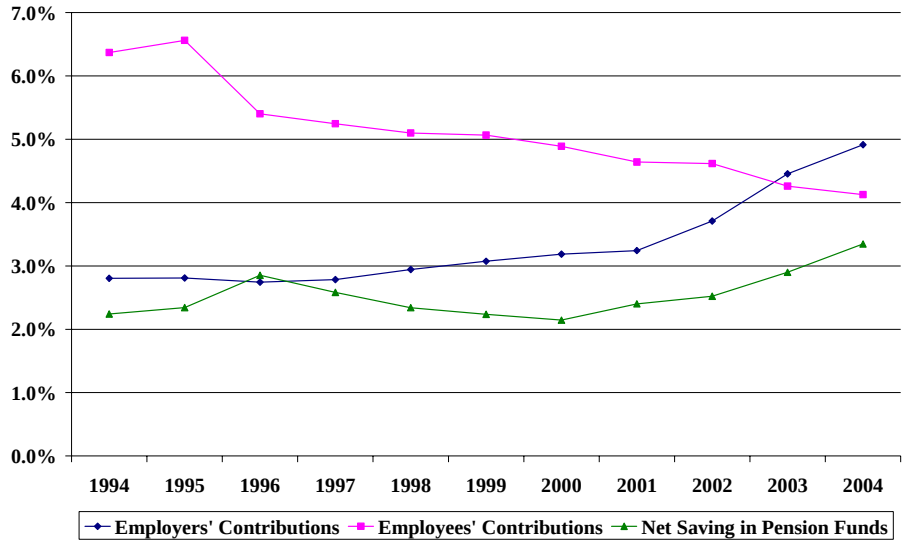


On the other hand, as figure 33 also shows, from 1998 to 2001 consumption as a share of GDP

(with both measured at current prices) rose even though the savings ratio was constant. This can be explained by household income taking a rising share of GDP.

Looking at the movements in volume terms, however, we can see that in each year from 1996 to 2004 household consumption has grown faster than GDP. To the two factors which might explain growth in current price consumption exceeding that of current price GDP (a falling household savings ratio and a rising share of household income in GDP) we can add a third factor, a favourable movement in the terms of trade for consumers, or equivalently, a situation where the consumption deflator has been rising less rapidly than the GDP deflator, so that independently of movements in income shares, household incomes have risen faster than GDP. This has, undoubtedly been an additional factor behind consumption buoyancy in the United Kingdom, as it has been in Spain.

Figure 34: Pension Contributions as a Proportion of Household Disposable Income, United Kingdom



Much saving in the United Kingdom is institutionalised, with provision for old age relying substantially on funded pensions rather than pay as you go arrangements. In figure 34 we show contributions paid by employers and employees into pension schemes. These constitute a large part of the saving by people of working age. However these funds are obviously paying out pensions as well as receiving pension contributions and the graph also shows the net inflow into pension funds (the change in the net equity of households in pension funds); this represents the net flow of institutional saving.

Over the last five years there have been a number of disappointments associated with private pension provision. In part this has happened simply because investors in pension schemes received smaller pensions than they had hoped for (and perhaps been led to expect). There were also a number of occasions where the opacity of the saving vehicles meant that investors did not realise the risks they were taking, and others where entitlements to defined benefit pensions were lost at least in part because companies became insolvent at a time when there were deficits in their pension funds. This situation, associated with a reluctance of individuals to invest at a time of stock market weakness, is often thought to explain the reduced employee investment in pension funds shown figure 34. Employee contributions may also have been deterred by the

extension of means testing of retirement benefits (the Minimum Income Guarantee which was replaced by the Pension Credit). This imposes high effective marginal tax rates at relatively low levels of income and is widely described as a reason for "not bothering to save" as too is more general uncertainty about the returns likely to result from pension saving. We also note that there have been substantial revisions to the data as a result of the discovery that earlier estimates of pension contributions involved double-counting[12]. However employer contributions have been rising because stock market weakness led to short-falls in defined benefit pension schemes and increases in contributions in 2002 and 2003 represent an attempt to reduce these deficits.

We now turn to the aggregated pattern of saving as identified from the Family Expenditure Survey data, looking at the average savings rate by household as a function of the age of the head of the household. We do this for all households, for households in three income categories, those with incomes below 60%of the median after adjusting for household size, those with incomes of 60%-140% of the median and those with incomes above 140% of the median; we also distinguish households with heads in employment from those whose heads are not in employment. As with Spain we look first at the average over all the years we study (1997, 1999, 2001 and 2003) because averaging over time smooths out the effects of data noise. We then look at the figures for the individual years. In interpreting these data it must be remembered that the saving behaviour of high income households has more influence on aggregate saving than does that of low income households. As with Germany and Spain, the graphs we present are constructed from data for households whose savings ratios lie in the range -0.5 to 0.5, so as to filter out extreme values which are likely to be due to recording errors most notably associated with very low reported incomes.

Figure 35: UK Saving by Income Group – Average of All Years

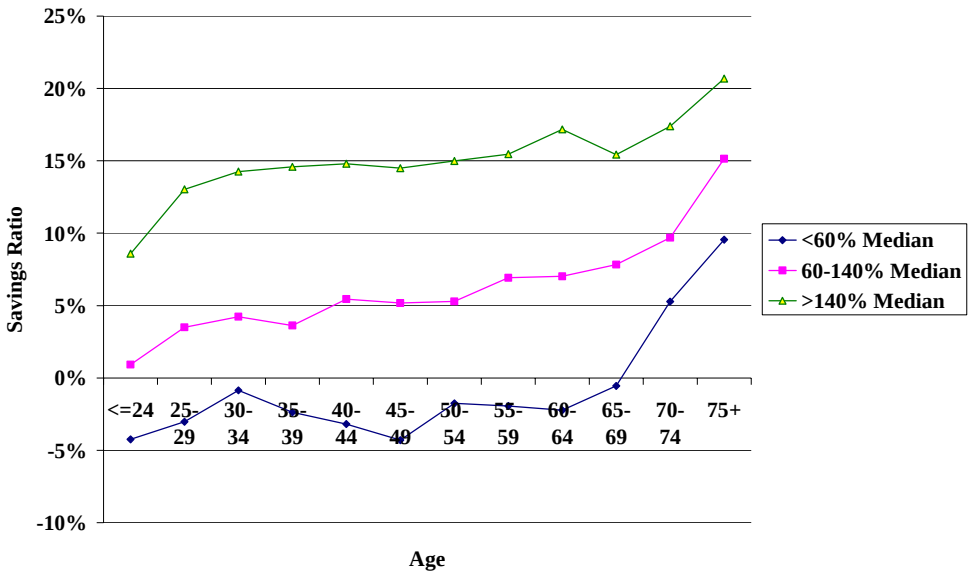
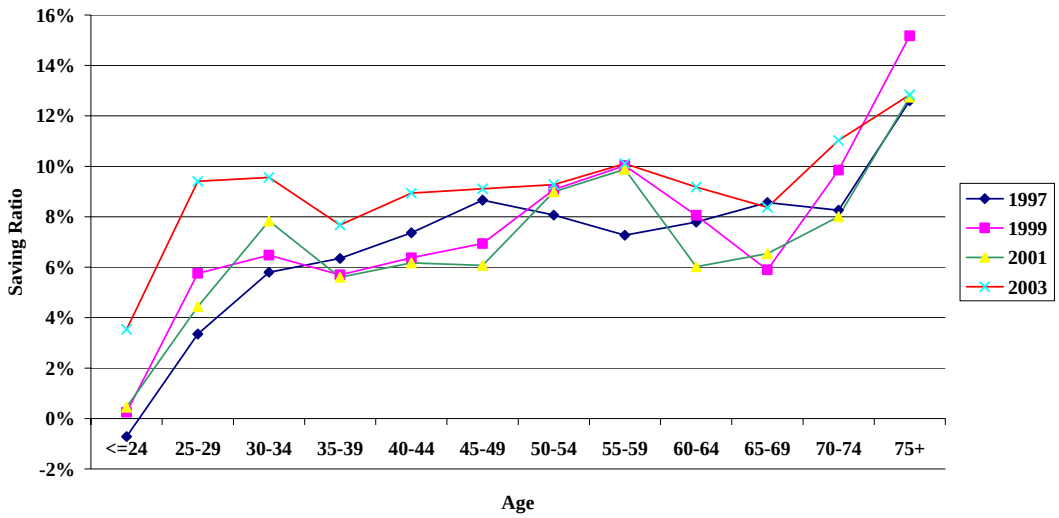


Figure 35 shows elements of the pattern one might expect. At all ages saving is an increasing function of income. For the two upper bands, and in particular for the middle income band it tends to rise with age during working life. All three income bands show high reported saving

[12]Transfers between pension funds were erroneously counted as new contributions in the Blue Books published up to 2004.

ratios for elderly people. It should be remembered that the incomes these people receive are pensions and, to the extent that they are funded pensions, the incomes are themselves paid largely by dissaving; thus on a national accounting definition the saving of these groups would almost certainly be negative. Nevertheless the tendency of old people to save out of their pensions is a puzzle here as already observed elsewhere.

Figure 36: UK Saving Ratio – All Households



In figure 36 we show the saving pattern by age averaged across all survey respondents. The general pattern observed in the average is also present in the individual years. Nevertheless, the striking feature of figure 36 is that the saving rate of households in 2003 was, at almost all ages, higher than that in the other years. This contrasts with the observation in figure 33 that the aggregated saving rate was appreciably higher in 1997 than in subsequent years. The divergence between the two has to be attributed to a combination of measurement error in both the macro and micro data, definitional differences and aggregation effects[13].

Figure 37 looks at the saving of those with incomes after adjusting for household size below sixty per cent of the median in the year in question. We have already seen in figure 35 that these households have low savings ratios and this is shown to be generally true in figure 37. However the savings ratios in 2003 are something of a puzzle. There is no obvious reason (such as a substantial change in availability of credit) which should have made it harder to borrow for people on low incomes in 2003 than it had been in earlier years. Because the households represented in this graph have very low incomes, movements in their saving are not likely to have much influence on the overall pattern of saving.

[13] Averaging savings ratios should not be expected to give the macro-economic savings ratio since households are given equal weight in the average instead of being weighted by their incomes.

Figure 37: UK Saving Ratio – Income below 60% of Median

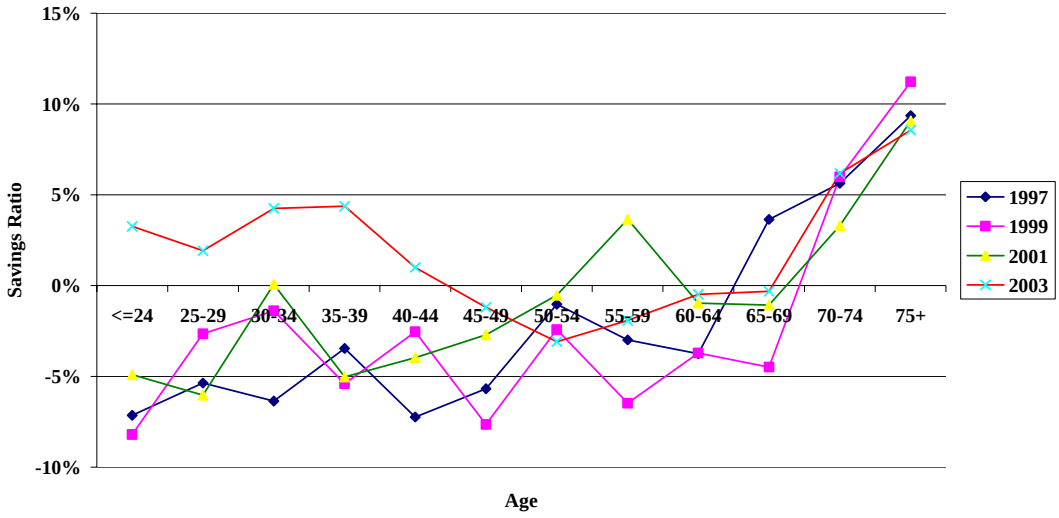
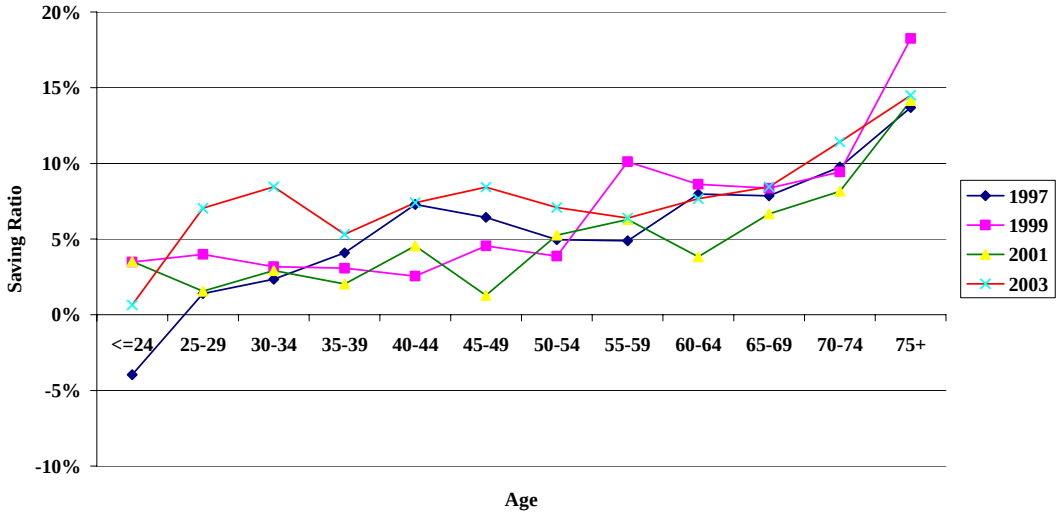


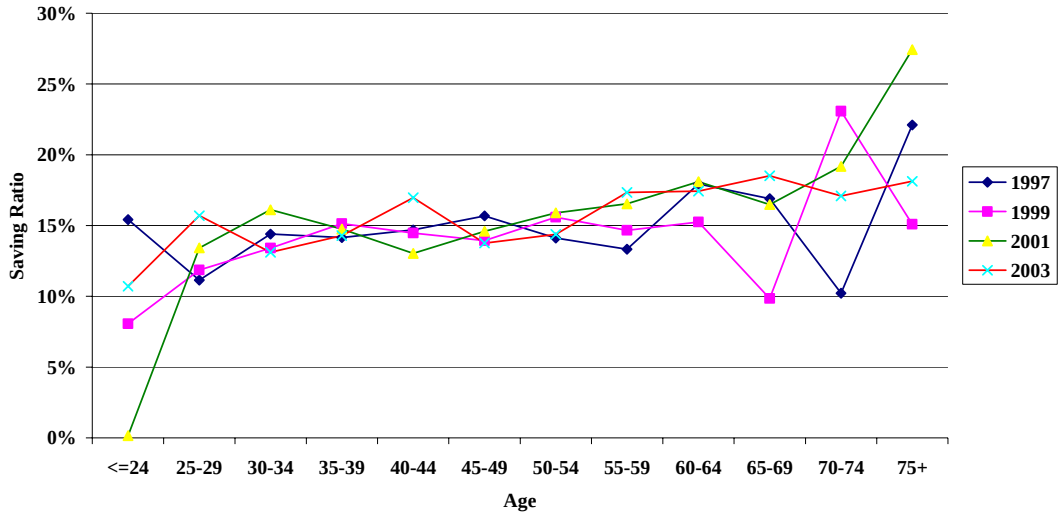
Figure 38 shows the savings ratio for the middling households with incomes between sixty and one hundred and forty per cent of the median after adjusting for household size. Again a high savings rate is shown in 2003 but one can also see that in 1997 saving was high among households with heads aged 35-49.

Figure 38: UK Savings Ratio – Income 60% to 140% of Median



In figure 39 we look at the savings behaviour of those households with incomes of more than 140% of the median after adjusting for household size. For households with heads aged twenty-five to sixty there is very little variation between the years. There may be some significance to the fact that the savings rate of young households has fallen since 1997, although the volatile nature of it in the subsequent years does raise doubts about the statistical importance of this. The figures become erratic among households with heads aged sixty-five and over. The sample sizes in these categories are small since relatively few households of this age have incomes substantially above the median for the whole population.

Figure 39: UK Savings Ratio – Income > 140% Median



In figure 40 we turn to the question of saving as a function of employment status. The chart shows the savings rates of households whose heads were not employed or self employed. For 2003 we can see the anomalous savings rate for households with heads aged forty-five and under; this was also visible in figure 37. Once again erratic movements reflect, at least to some extent the small sample size among the younger age groups. By contrast most household heads aged sixty-five and over are not employed and their households are therefore represented in this graph.

Figure 40: UK Savings Ratio – Households not in Employment

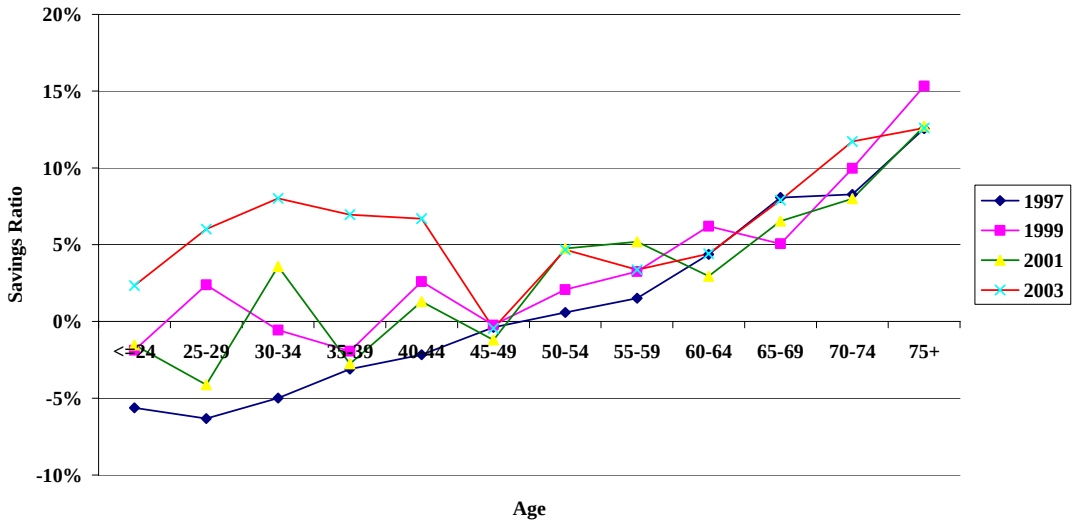
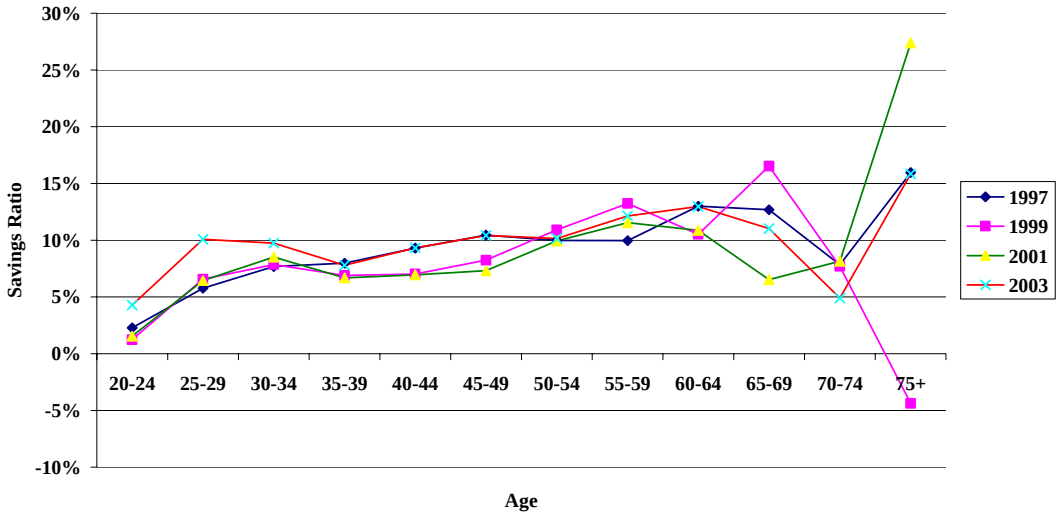


Figure 41 shows the savings rates of households whose heads are in employment. Here the data for households with heads aged sixty-five and over are volatile as a result of the small number of households with employed heads of this age. Among younger households the anomalies in the 2003 data are plainly present. Beyond that we can observe higher saving in 1997 than in 1999 and 2001 for households in the mid age range thirty-five to forty-nine.

Figure 41: UK Savings Ratio – Households in Employment



These data provide only a tenuous link with the striking observation of the macro-economic data in figure 33- i.e. that the savings rate was appreciably lower in 1999, 2001 and 2003 than it had been in 1997.

There is a question whether this is an artifact of the trimming process we have adopted- looking only at the savings of households with savings ratios between -0.5 and 0.5. We compared the full datasets for people with incomes between 60% and 140% of the median and for those with incomes above 140% of the median, looking at how the savings rate had changed if all households in these categories were considered instead of the trimmed sample. We found that the untrimmed mean had risen for both income bands. We did not explore households with incomes below 60%of the median since without any trimming, these include households with reported incomes very close to zero and not much meaning can be given to the untrimmed mean. Nevertheless, this exercise allowed us to conclude that the rise in the savings ratio shown in comparing the 2003 survey to the 1997 survey is not an artifact of the trimming process.

The main finding from this analysis is that saving by young people and particularly those in their early twenties is low while that of retired people is surprisingly high. As with Germany saving by people who are not employed tends to rise with age but, because the UK has lower unemployment than Germany this is not enough to create a clear life-cycle profile in the overall pattern of saving as a function of age (figure 35). There is evidence of higher saving in 2003 and particularly by those in the middle income band. But since this is not matched in the macro-economic data it is difficult to know how much weight to place on it.

3 Life-Cycle Analysis and Income Uncertainty

The life-cycle framework- that people plan their consumption over their life time, saving or borrowing so that fluctuations in income are smoothed out and in particular so that consumption can be sustained after retirement, has provided the basic theoretical framework for understanding consumption behaviour since the work of Modigliani (1954). However, early micro-economic studies (Blundell, 1988) showed that only a part of consumption variability explained by the life cycle theory. Moreover, there are phenomena such as excess smoothness of consumption with respect to unanticipated changes of income, excess sensitivity of consumption regarding anticipated changes in income and the underspending of elderly that cannot be accounted for by the simple life cycle theory (see Zeldes, 1989, Caballero, 1990 and Skinner, 1988). Subsequent research on the life-cycle model focused on the impact of income uncertainty on savings. These models used to look at precautionary saving relax the assumption of certainty equivalence so that savings behaviour depends not only on the level of expected income but also on its variance[14]. In such circumstances, theory predicts that increasing uncertainty about future income reduces current consumption and increases savings. However, a closed form solution for optimal consumption with random human capital does not exist except in rather restricted circumstances.

Intertemporal optimisation models of saving have placed considerable emphasis on the role of the precautionary motive for wealth accumulation. Nevertheless, the range of results from empirical papers is disturbingly large. Kennickel and Lussar (2004) distinguish three groups of empirical papers on precautionary saving. Theoretical intertemporal models such as those developed by Skinner (1988), Caballero(1991), Carrol and Samwick (1998), Gourinchas and Parker (2002) and Irvine and Wang (2001) all indicated that precautionary savings are a sizeable part, ranging from 20 to 60 percent, of all savings. However, empirical studies conducted for the US and Europe yield mixed results. Dardanoni (1991) using UK Family Expenditure Survey (FES) shows that 60 percent of saving is due to a precautionary motive. Dardonni (op.cit) employed a linear regression where consumption was a function of normal income and income uncertainty[15]. Under his framework the normal income was swept into the constant term and income uncertainty was estimated by its variance. Results from a cross section analysis showed that the constant was not statistically significant. This implies that findings on the importance of precautionary saving were overstated. Carrol and Samwick (1997) and Carrol and Samwick (1998) using data from Panel Study and Income dynamic (PSID) and two measures of income uncertainty show that between

[14]The precautionary saving model is based on the assumption that the next period utility function has convex marginal utility (see Leland, 1968, Dreze and Modigliani, 1972). This implies that the third derivative of utility function is positive. Under these circumstances certain equivalent does not hold and the expected marginal utility of consumption at next period is higher than the marginal utility of consumption. We can write this relation as follows:

$$E_t[u'(C_{t+1})] > u'(E_t[C_{t+1}]) \quad \text{(a)}$$

where C_{t+1} denotes the level of consumption at time $t+1$, $u'()$ denotes the marginal utility and E_t indicates expectation given the information set at time t. This implies that an Euler equation that connect consumption between two periods will hold with the following inequality:

$$u'(C_t) < E_t[u'(C_{t+1})] \quad \text{(b)}$$

(a) implies that uncertainty about future income reduce current consumption and increase savings.

[15]Dardanoni (1991) grouped households according to the occupation of the reference person. He measured income uncertainty as the variance of labour income of each individual group.

32 and 50 percent of wealth accumulation is due to extra uncertainty that households face compare to the lowest uncertainty group.[16] Empirical papers such as of Engen and Gruber (2001), Miles (1997) and Hubbard, Skinner and Zeldes (1995) also found results in favour of the important role of precautionary savings in wealth accumulation.

Alternatively, Dyan (1993) using Expenditure Survey data and a measure of risk based on the variance of consumption found that the equivalent precautionary premium (EPP) suggested by Kimball (1990) as a measure of income uncertainty was not statistically different from zero. This indicates that there was no evidence of precautionary savings affecting wealth accumulation. Skinner (1988) showed that households with riskier occupations do not save more than other groups with lower occupation risks. Skinner (1988) used the occupation of the reference person of household as a proxy for income uncertainty. This suffers from the drawback that it does not take account of the income variance associated with changes to family circumstances.

Empirical studies conducted by Guiso, Luigi and Terlizzesa (1992), Lusardi (1997), Lusardi (1998) and Lusardi (2000) utilised subjective probabilities of income risk to estimate the effects of precautionary savings. Evidence from an OLS regression shows a moderate but significant role of precautionary saving. Results from instrumental variable regression implemented by Lusardi (1997), Lusardi (1998) and Lusardi (2000) and Arrondel (2002) show that although the precautionary savings motive was found to be significant, it was more modest than the studies of the previous paragraph showed.

Leland (1968) defined precautionary saving as the difference between consumption when income is certain and when income is uncertain but has the same mean as the former. As is clear from the discussion above, the issue that obviously arises is what is the appropriate measure of uncertainty. In the literature on precautionary saving many proxies for uncertainty have been used. The majority of these studies have been criticised by Kennickel and Lussardi (2004) for ignoring the existence of information asymmetry between the econometrician and individual agents regarding the risk associated with future income. Although this criticism is correct it can be addressed fully only if data on the subjective perception of households regarding their income uncertainty is available. But using information from panel data about the income uncertainty of individual households means that the criticism can be met, at least if one makes the conventional assumption associated with rational expectations- that economic agents understand their environment.

The EVS and FES collect information on income and expenditure for a cross-section of households but they do not provide any panel data; as we noted the ECPF does collect panel information but we were unable to exploit it. Miles (1997) in a study related to our work uses a proxy of earning uncertainty based on the second moment of the residual of an income equation- an approach we can follow for all three countries. He estimates an income equation using cross sectional data from the FES. In his framework past macroeconomics shocks are ignored. So too is

[16]The first measure of income uncertainty based on a theoretical model developed by Kimball (1990) is the equivalent precautionary premium (EPP). The coefficient of EPP is given is given as follows:

$\rho = C_{ht}(U'''/U'')$ where C_{ht} is the level of consumption of i household, U''' and U'' are the third and second derivative of utility function. The second measure of income uncertainty is based on the variance of income distribution. Income uncertainty is computed across various groups of occupation, industry and education categories. Carrol and Samwick (op.cit) compute the variance of income distribution by taking the ratio of current income over the average income.

any distinction between individual-specific effects accounting for persistent differences in income between households and income uncertainty arising from short-term volatility. In order to provide a better measure of uncertainty we draw on information from income panel data where possible. Even then, because we cannot identify the income uncertainty specific to the households in the expenditure surveys, there might be risks that the full effect of uncertainty is missed and appropriate econometric methods are needed to deal with this.

For Germany and the United Kingdom, we measure income uncertainty as the variance of expected one period ahead income explained by current income and demographic characteristics. This involves a two step approach which we have addressed slightly differently in the two countries. We take the variance of the change in log household income adjusted for household size, using changes in individual household incomes shown in the Socio-Economic Panel (GSOEP) and British Household Panel Survey in Germany and the United Kingdom respectively. We then use the mean values of the household economic and demographic characteristics to explain the household-specific income variances. Estimated coefficients from the second regression are used to construct proxy variance estimates which can be applied to the cross-section income/expenditure data. In Spain, as noted, we could not identify the links between quarters and were unable to estimate income variance in this way.

The implications of our definition of uncertainty should be fully spelled out. A belief that public or private pensions apparently promised would be paid only at some known fraction of the rate promised (e.g. 80%) is not itself uncertainty but simply an expectation about the future level of income. Provided that households feel they have access to satisfactory savings media such a belief will, in the context of the life-cycle model, tend to raise savings rates as people try to maintain a smooth consumption profile in the face of reduced expectations of future income. But a belief that the amount paid out will be symmetrically distributed around 80% of the promised figure, but ranging between 60% and 100% will result in a further increase in saving as households try to insure themselves against the risk that incomes could turn out to be substantially lower than the central figure of 80% of what is promised. Obviously neither the expectation of the central figure nor the distribution around it can be observed in from the sort of data available to us.

A question was raised about the influence of the fear of unemployment. To the extent that unemployment affects households' incomes and that the pattern identified in the panel surveys correctly represents the way in which households see future income risks arising from the threat of unemployment, then our approach does take on board influences arising from the risk of unemployment. What it does not do is pick up variation in that risk over time or identify the impact of a fear about unemployment over and above the effect of unemployment on income. Given the relatively short periods of the income panels it is difficult to see that the effects of temporal heteroscedasticity on income risk could easily be identified.

4 The Modelling Framework

Because of the difficulties in deriving closed form solutions to the consumer's optimisation problem under uncertainty empirical studies of precautionary savings generally follow from models of the following type, with C_h representing consumption per effective household member:

$$ln(C_h) = f(\sigma^2, Y, Y_p, X) \tag{4.1}$$

σ^2 indicates the risk associated with income calculated as described above and Y is observed income; Y_p is described by the authors whose approach we follow as permanent income, although in our empirical work the variable used might more plausibly be called normal income; X is set of indicators such as education, age, marital status etc. that explain income behaviour. Given a logarithmic expression for consumption as the starting point, it is more appropriate to estimate an equation for the level of the savings ratio than its logarithm and we adopt the following structure:

$$(S/Y_p)_h = f(\sigma^2, Y, Y_p, X)_h \tag{4.2}$$

Lusardi (2000) and Kennickel and Lussardi (2004) argue that empirical results based on equation (4.2) suffer from potential bias. This is so because they use both a wrong functional form of $f()$ and wrong measurement of income risk. Lusardi (op. cit) and Kennickel and Lusardi (op. cit) mentioned a number of shortcomings for the studies that use the variance of non capital income as a measure of income uncertainty. First income is measured with errors. Therefore the estimated coefficients from (4.2) will be inconsistent. Secondly, the income equation will be subject to model uncertainty. Finally and most importantly, each household knows more about its income uncertainty than the econometrician. The last point, raised by Caballero (1991) and Browning and Lusardi (1996), creates the possibility that income uncertainty as estimated by the econometrician might be insured against; however the chance of this is probably not very great since, for reasons associated with both moral hazard and adverse selection, the market for insurance against income risk is very imperfect.

A different approach followed by Dyan (1993) would be to use the variance of consumption rather than the variance of income; this in fact fits more happily into the framework provided by optimising behaviour (Deaton, 1992). However without panel consumption data, it is harder to produce a satisfactory measure of the variance of consumption than it is to estimate the variance of income.

Another approach that gets around the two pitfalls mentioned above is based on a direct survey question. A pioneer study of this approach is that of Guiso, Luigi and Terlizzesa (1992) who used Bank of Italy Survey of Household Income and Wealth (SHIW) data. The novelty of this approach lies on the estimation of income uncertainty based on the subjective perception of households regarding the variability of earnings in the year following the interview. The advantage of this approach is that it deals with the problem of the information that is available to the household and not to the econometrician. Lusardi (2000) adopting the approach of Gusiso, Jappelli, and Terlizzesa (op.cit) constructed a measure of earnings uncertainty by using the

subjective probabilities of job loss available from the Health and Retirement Study (HRS) in the US. Kennickel and Lussardi (2004) measure precautionary savings relying on a direct question about precautionary wealth included in the Survey of Consumer Finances (SCF). The exact question was: " *About how much do you think you and your family need to have in savings for unanticipated emergencies and other unexpected things that may come up?"*[17] Eisenhauer and Ventura (2003) using a similar question available since 2003 in the Survey of Italian Household Income and Wealth (SHIW) estimate the effects of precautionary savings.[18]

4.1. Model Specification

We measure income uncertainty in Germany and the United Kingdom by the variance of the change in household income from one year to the next. Although the Spanish survey is a panel survey, we were unable to link the successive observations in a manner which was coherent, and we have not therefore been able to calculate this income uncertainty term for Spain.
If $Y_{h,t}$ denotes household income per effective household member, then

$$u_{h,t} = ln\, Y_{h,t} - ln\, Y_{h,t-1} \tag{4.3}$$

Our measure of income uncertainty is then given as

$$(\sigma^2_{u,h} = \frac{1}{T-1}\sum_{t=1}^{t=T}\left\{ \hat{u}_{h,t} - \frac{1}{T}\sum_{t=1}^{t=T}\hat{u}_{h,t} \right\}^2)$$

We then construct measures of income uncertainty by regressing $\sigma^2_{u,h}$ on log income and a vector of other observed variables using the average values over the period in which we compute the variances. We fit the following regression relationship:

$$\sigma^2_{u,h} = f(ln\, Y_h, \boldsymbol{Z}_h) + v_h \tag{4.4}$$

Given this we can impute income uncertainty using EVS/FES data based on the estimated coefficients $\hat{\theta}$ and $\hat{\boldsymbol{\varphi}}$ obtained from (4.4)[19].

$$\hat{\sigma}^2_{u,h} = \hat{\theta}_0 + \hat{\theta}_1 ln\, Y_h + \hat{\boldsymbol{\varphi}}\boldsymbol{Z}_h \tag{4.5}$$

Equations (4.1) and (4.2) point to the need for estimates of permanent income. The approach used in work of this type, and which we follow, is to estimate normal or fitted values of income from a regression equation which explains income in terms of demographic and other relevant characteristics. Indeed without panel consumption/income surveys there is little else that can be

[17]This question was pilot-tested in order to assess whether it was understood properly by the responders (for more details see Kennickell and Lussardi 2000).
[18]The exact wording of the question is as follows
"You *are offered the opportunity of acquiring a security permitting you, with the same probabilities, either to gain £ 10 million or to lose all the capital invested. What is the most that you are prepare to pay for this security*".
[19]Although we could not find a satisfactory equation for Germany with the income variable present.

done. Nevertheless, such measures, based on a comparison of actual to normal income cannot capture the effects of temporary macroeconomic shocks associated with the economic cycle (see Carrol, Dynan and Krane, 2003) and obviously describe a concept rather different from permanent or life-cycle income. However given such a measure of normal income, it is possible to take the view that the square of {actual income/normal income -1} is also an indicator of income uncertainty. The larger this variable is, the larger have been the income shocks to which the household has been subjected; if the income shocks are heteroscedastic, then it is an indicator of the variance of household-specific shocks. We use this as an indicator of uncertainty in addition to $\hat{\sigma}^2_{u,h}$. For Spain it is the only indicator we have available.

In line with much other work (e.g. Miles, 1997) we measure normal income as follows:

$$ln \hat{Y}_{p,h,t} = \boldsymbol{Z}_{h,t} \hat{\boldsymbol{b}} \tag{4.6}$$

where $\hat{\boldsymbol{b}}$ is a vector of coefficients calculated by estimating the regression equations

$$ln Y_{h,t} = \boldsymbol{Z}_{h,t}\boldsymbol{b} + e_{h,t} \tag{4.7}$$

The vector $\boldsymbol{Z}_{h,t}$ includes a variety of factors that might affect income. One is the age of the household head. Education is very likely to affect income and so may family circumstances such as marital status. Time dummies and interactive effects are also included. We then look at saving computed as the difference between actual income (i.e. $Y_{h,t}$) and total expenditure measured as a proportion of actual income.

To summarise our approach, we use equations (4.5) and (4.6) as inputs in equation (4.8) to measure the impact of income uncertainty on the savings ratio. Estimating equation (4.8) we also include demographic variables in the vector $\boldsymbol{Z}^*_{h,t}$; the parameter vector associated with this is denoted $\boldsymbol{\gamma}$ to distinguish it from the scalar parameters. We include the square of the exponent of the estimated value of $e_{h,t}$, less 1 $\hat{\varepsilon}^2_{t.h} = \left\{Exp(\hat{e}_{t.h}) - 1\right\}^2$ (which is equal to {actual income/normal income -1}^{2}) as an additional explanatory variable which can also play a role in representing uncertainty; in the case of Spain it is the only indicator of uncertainty which we have available.

$$(S/Y_{h,t}) = \alpha_0 + \alpha_1 ln(\hat{Y}_{p,h,t}) + \alpha_2 ln(Y_{h,t}/\hat{Y}_{p,h,t}) + \alpha_3 \hat{\varepsilon}^2_{h,t} + \alpha_4 \hat{\sigma}^2_h + \boldsymbol{Z}^*_{h,t}\boldsymbol{\gamma} + v_{h,t} \tag{4.8}$$

It should be noted that this follows the traditional specification with terms in log normal income and log of the ratio of actual to normal income. This has the implication that the full impact of normal income is shown by α_1- α_2 while the impact of actual income is shown by α_2.

In order to avoid problems of collinearity, the demographic variables used in the savings regression cannot be exactly the same as those in the final version of the permanent income regression. At least one variable in the permanent income regression has to be dropped. In some sense this creates a bias towards the explanation of differences in the savings ratio by differences in permanent income rather than directly in the omitted variable. Because in (4.8) permanent

income and both uncertainty terms uncertainty are generated regressors the problem of inconsistent standard errors as considered by Pagan (1984) arises. We address this problem using instrumental variable estimation or other appropriate techniques. We choose as instruments variables that have not been used in the final forms of (4.4) and (4.6).

5 Determinants of Savings Behaviour

Micro-economic data such as those we use here can be subject to large variations; it is not clear whether this is due to reporting errors or represents genuine variation. In either case there are, however, advantages in suppressing the influence of outliers. The most convenient way of doing this is by trimming the sample. In the work described here we have looked only at those households which report a savings ratio between -0.5 and 0.5 of net income; in other words they consume between 50% and 150% of their reported income. This raises the question whether such households are different in their behaviour from those households with more extreme savings behaviour. We address the problem of selectivity bias following Heckman (1976), estimating a probit equation to determine the probability that a particular household is in our trimmed sample. The addition of inverse Mills ratio derived from this probit equation in (4.8) corrects for the selectivity bias that otherwise might arise. A similar problem arises in the estimation of the parameters of equation (4.4) because not all households included in the surveys we use have adequate income records; we deal with this in the same way. We adjust standard errors for heteroscedasticity following Amemiya (1983).

There are important questions how we handle the effects of age in both the permanent income and the savings equations. Income equations frequently contain linear and quadratic terms in age, following Mincer (1974). We have followed this approach; we have, however, included separate linear and quadratic terms for people over 65, to allow for the fact that age is likely to influence retirement income in a manner different from the way in which it influences the income of households headed by people of working age.

By contrast it is much harder to identify a general pattern for the expected link between age and saving behaviour. We might expect savings rates to be at their highest in the years before retirement but have no obvious precedent for the shape of the profile. We handle this by introducing age dummy variables which indicate five-year bands for the age of the head of the household. The definitions of the other variables are straightforward and give rise to dummy variables. Different countries obviously have different education systems and the education dummies which we use reflect this.

The theoretical models which we have set out above do not provide a strong specification of the way in which the various demographic variables should enter the equation. We allow for the possibility that there may be interactive effects as well as additive effects by introducing the products of the variables as well as the variables themselves. This obviously means that that there is a large number of variables in the unrestricted equations.

We now present the results country by country.

5.1 Germany

In our analysis of Germany we first consider the determinants of income uncertainty, with the latter measured as the variance of the growth of household income after adjusting for the effects of changes to household size. We then consider the factors which influence the normal level of income. This allows us to estimate saving as a function of normal income and income uncertainty as well as of observed variables such as actual household income and demographic characteristics. We conclude with a representation of the simulated savings behaviour of households of different income levels.

5.1.1 Income uncertainty

Income volatility as a proxy for income uncertainty may be represented in several ways. We have chosen the variance of the growth of log income (variances of changes in log income). The consumer expenditure surveys (EVS) for Germany do not allow to assess individual income changes over time and thus, do not allow to assess income uncertainty. The appropriate data set for assessing income changes for Germany is the German Socio-Economic Panel (GSOEP). The regression for the variance of changes of log income is based on the waves 1996 to 2003 of the German Socio-Economic Panel. We included all households for which observations are available for all years.

In order to identify how income changes vary with socio-demographic characteristics, we include several characteristics from which we expect that they have an impact on income uncertainty:

We used the mean of log real income per household member over the period 1996 to 2003 to identify effects of income on income uncertainty. In order to reduce the impact of changes in the household composition over time, income was divided by the household size, where the household size was computed using McClements' scale.

The specification for income deserves a comment. A simple descriptive analysis of the data shows that the variance of the changes in log income per person is high at rather low levels of income, then decreases first rather sharply and then slowly to increase slightly again in the last two income deciles. In order to capture the high income volatility at low income levels, a dummy for low income (poverty) is considered. The dummy is equal to 1 if the mean of income per person in the household in the period 1996 to 2003 is lower than 60% of the median of the mean income per person for all households in the period 1996 to 2003. In order to consider the increase of income volatility at high income levels, the square of the mean of log income per person is included for those households who are not in poverty.

Table 42: Determinants of Income Uncertainty – Germany

	Unrestricted		Restricted	
	Coefficient	z	Coefficient	z
Log Y_m	-0.215	-4.670	-0.215	-4.670
$(Log\ Y_m)^2$	0.013	4.150	0.013	4.170
Poverty	0.588	4.270	0.590	4.290
Degree	0.002	0.280		
Age	0.001	0.860	0.001	0.890
Age^2	-1.500×10^{-5}	-1.700	-1.600×10^{-5}	-1.740
Married	-0.025	-5.360	-0.025	-5.350
Hown	-0.009	-2.100	-0.009	-2.090
Constant	1.002	5.560	1.000	5.560
R^2	0.028		0.027	
Standard Error	0.1235		0.1235	
Significance test of restrictions	F(1,3754)	0.08	P=77%	

Variable definitions: The dependent variable is σ^2*, the variance in the growth of real income per effective household member between 1996 and 2003. Log* Y_m*- mean of log income per person in the household over the period 1996 to 2003; (Log* Y_m*)* ^{2}*- mean of log income per person in the household squared if household not in "poverty" (see below); Poverty: a dummy for low income, which is equal to 1 if the mean of income per person in the household in the period 1996 to 2003 is lower than 60% of the median of the mean income per person for all households in the period 1996 to 2003;Degree: educational status =1 if graduate (college); Age: age of household head.* Age^2*: age of household head squared. Married: marital status of household head (1 if married); Hown: homeownership (1 if homeowner). Except for income, the values for the explanatory variables relate to the year 1997.*

According to the regression results shown in table 42, income volatility decreases with income and increases with the square of income. Due to the increase in the square of income, the variance slightly increases again at very high income levels. The positive coefficient for the poverty dummy shows that income volatility is higher at very low levels of income compared to higher income levels.

The fact that the household head holds a college degree has no significant effect on income volatility. We excluded the dummy for degree in a restricted model (see table 42). Income volatility first increases with age but decreases in higher ages. The decrease starts at about age 50. This seems entirely plausible because a considerable part of the income of pensioners is provided by the public pension scheme and there were only small changes in public pensions in the period under consideration. Income volatility is somewhat lower if the household is married and the household owns a home.

The low value for the coefficient of determination indicates that the estimation based on the variables included is able to explain only a rather small part of the observed variation of income in the survey period. Thus the results should be interpreted carefully.

5.1.2 Normal Income

The estimation of normal income is based on the two waves of the EVS 1998 and 2003. The dependent variable of the model for normal income is the log of disposable income (in Euro per month) as defined above, adjusted for household size. The estimated equation is shown in table 43.

Table 43: Determinants of Normal Income: Germany

Dependent Variable Log Real Household Disposable Income per person	Coefficient	Z
Married	0.341	22.19
Hown	0.003	0.17
Morg	0.212	11.56
Size	-0.713	-40.42
Age×Married	-0.006	-18.52
Age	0.032	20.77
Age^2	-3×10^{-4}	-17.05
Age65p	-0.015	-14.98
$Age65p^2$	2×10^{-4}	14.5
Age×Degree	0.001	5.44
Age×Size	0.009	19.25
Age×Hown	0.002	7.19
Age×Morg	0.001	1.69
Degree	0.220	17.7
Time98	-0.018	-4.66
Constant	7.603	227.22
R^2	0.226	
Standard Error	0.43	

Variable definitions: Married: marital status of household head (1 if married), Hown: homeownership (1 if homeowner), Morg: mortgage payment (1 if homeowner is paying mortgage), Size:log household size (measured using McClements scale). Age: age of household head, Age^2: age of household head squared, Age65p: age of household head, zero if age of household head is less than 65, $Age65p^2$: age of household head squared, zero if age of household head is less than 65, Degree: dummy variable, 1 if graduate, zero otherwise, Time 98: dummy for year 1998. Seasonal dummies were also included.

Seasonal effects may be present because for every observation the data were collected for a quarter of a year only and about one quarter of the total survey population was interviewed in each quarter of the year. To account for these effects seasonal dummies were used. A dummy for the year 1998 (Time98) is included to capture differences in the general economic situation in the years 1998 and 2003. The model is estimated by OLS.

The regression for normal income is based on the pooled data of the Consumer Expenditure Survey for the years 1998 and 2003. The results are shown in table 43. The reference household is headed by a person who is not married, not a homeowner, does not hold a degree and was observed in the second quarter of the survey years. According to the results, the (log of) disposable income per person in the household is higher if the household head is married. But, as

the coefficient for the interaction between marital status and age indicates, the impact of being married is negative in old age.

The coefficient for homeownership is slightly negative. However, it has to be remembered that the coefficients for mortgage payments and for the interaction term between age and homeownership are positive. As most young homeowners pay mortgages, the positive coefficient for mortgage payments indicates that the income of young homeowners is higher than the income of young tenants. For older homeowners, the interaction term is of high importance. The positive interaction term between age and homeownership indicates that the income of older homeowners is higher than the income of older tenants.

Income per person is lower in larger households. The positive coefficient for the interaction term between age and size shows that the negative impact of household size on income per member decreases with age. For households below age 65, the results show an increase of income per person with age and a decrease in the square of age. The maximum is at about age 45. The coefficients for households with a household head at age 65 or older show that the decrease in income after the maximum continues in older ages, but at a slower rate. A college degree increases income per person considerably. The impact is higher for households with an older household head. The time dummy for the year 1998 indicates that there may have been a slight increase in income per person between the years 1998 and 2003.

Homeownership, mortgage payments and age are highly correlated. The results for the unrestricted case show an insignificant coefficient for homeownership. However, as homeownership is a precondition for mortgage payments, we decided to exclude mortgage payments in the restricted model (see table 43).

5.1.3 Determinants of Savings

The dependent variable of the main model is the savings ratio. The savings ratio is defined as the relation of savings and actual income. For several reasons, the savings ratio may show high positive or negative values. The most important reason is that the survey period lasts only three months and durables purchased in the survey period are fully treated as consumption. In order to limit the impact of these facts, it is necessary to restrict the observations included in the estimation. We restrict the households in the estimation to those with a savings ratio between – 0.5 and + 0.5. To take account of the possible selection bias, we estimate the savings ratio following the Heckman approach.

The results for the probit equation are shown in table 44.

Table 44: Sample selection (probit) to explain whether households have savings rates within the ratio [-0.5,0.5] – Germany

Dependent Variable is 1 if Household Savings Ratio lies in interval [-0.5, 0.5], 0 otherwise	Coefficient	Z
Log Y	0.072	2.740
Log Y × Time98	0.002	0.810
Age 25-29	-0.175	-3.110
Age 30-34	-0.158	-2.740
Age 35-39	-0.091	-1.470
Age 40-44	-0.037	-0.540
Age 45-49	-0.043	-0.580
Age 50-54	-0.071	-0.880
Age 55-59	-0.209	-2.410
Age 60-64	-0.278	-3.010
Age 65-69	-0.297	-3.050
Age 70-74	-0.303	-2.980
Age >=75	-0.313	-3.010
Married	-0.203	-3.540
Married × Time98	-0.004	-0.140
Divorce	0.093	3.020
Age × Married	0.004	4.270
Age × Income	-1.000×10^{-6}	-19.090
Degree	0.069	5.040
σ^2	-0.005	-5.510
Age $\times \sigma^2$	3.800×10^{-5}	1.930
Constant	1.289	5.390
Number of observations	75429	

Variable definitions: Log Y: the log of actual disposable income, Log Y x Time98: log of income times year 1998, Age 25-29 to Age>=75: dummy variables for age groups 25-29, 30-34, …, 70-74, 75 and older, Married: marital status of household head (1 if married), Married ×Time98: married times year 1998, Divorce: marital status of household head (1 if divorced), Age × Married: interaction between age and marital status, Age x Y: interaction between age and disposable income, Degree: educational status =1 if household head holds a college degree, σ^2*: variance of the change in log income (imputed measure for income uncertainty), Age×*σ^2*: interaction between age and the variance of the change in log income, Time 98: dummy for 1998. Quarterly dummies were also included.*

The dependent variable of the savings regression is the ratio of savings to actual disposable income. The regression is based on the pooled data of the German Expenditure Surveys of 1998 and 2003. The estimates of standard error take account of the fact that two of the variables (σ^2 and Y_P are estimated). We estimate the savings equation on the quarterly data including orthogonalized dummies so that results can easily be reported as yearly averages. We explore the question of stability over time by including a time dummy for 1998 and also including this multiplied by key economic and demographic variables. An F-test then allows us to establish whether any model parameters including those linked to the time dummy or its product with other variables can be set to zero within the bounds of conventional significance testing.

The impact of income uncertainty on the savings rate is negative and insignificant. We restrict this, its interaction with age and the term in the square of the ratio of actual to normal income to zero. We find some but not all of the time terms can be restricted to zero. However the change in the savings pattern between 1998 and 2003 is not straightforward. There is a substantial negative

dummy for 1998 although other terms are also present which may offset this. This means that it is hard to generalize and the best way of observing how things have changed between 1998 and 2003 is to look at the simulated saving behaviour of sample households. We do this for households in three income categories.

A similar point arises about an analysis of the effects of age on saving behaviour; age effects arise both though the dummy terms and as multiplicative terms interacting with various other variables. Age also affects the level of normal income; this has a small influence identified as the difference of the coefficients on *log* Y_P and *log* (Y/Y_P) and the overall picture is best distilled by looking at fitted values for representative households of different ages.

Table 45: Determinants of the Savings Ratio: Germany

Dependent Variable is	Unrestricted		Restricted	
Household Saving Ratio	Coefficient	z	Coefficient	z
σ^2	-0.210	-1.41		
Log Y_P	0.104	9.1	0.108	10.67
Log Y/Y_P	0.148	30.37	0.149	35.92
$(Y/Y_P-1)^2$	-0.001	-1.35		
Age 25-29	-0.007	-0.97	-0.003	-0.51
Age 30-34	-0.010	-1.35	-0.006	-0.91
Age 35-39	-0.022	-2.77	-0.018	-2.89
Age 40-44	-0.035	-3.98	-0.032	-5.02
Age 45-49	-0.036	-3.62	-0.033	-5.08
Age 50-54	-0.044	-3.99	-0.040	-6.15
Age 55-59	-0.033	-2.67	-0.027	-4.06
Age 60-64	-0.047	-3.58	-0.038	-5.49
Age 65-69	-0.032	-2.29	-0.019	-2.66
Age 70-74	-0.022	-1.47	-0.007	-0.97
Age >=75	0.003	0.19	0.019	2.52
Degree	-3.96×10^{-4}	-0.04		
Degree ×98	-0.034	-2.56	-0.036	-4.86
Married	0.020	1.61	0.021	3.13
Married×98	-0.015	-1.31	-0.001	-4.43
Age × Married	-0.001	-2.53		
Age × Married ×98	3.93×10^{-4}	1.82		
Age × Degree	-3.32×10^{-4}	-1.6	-3.69×10^{-4}	-4.53
Age × Degree × Time98	4.40×10^{-4}	1.74	0.001	3.09
Size	-0.058	-3.9	-0.068	-11
Age × Size	-2.02×10^{-4}	-0.69		
Age × Size ×98	0.001	3.65	0.001	4.9
Time98	-0.268	-3.3	-0.255	-3.37
Age $\times \sigma^2$	0.004	1.33		
Hown	0.039	14.51	0.039	15.11
Poverty	-0.024	-5.36	-0.024	-7.9
Empl	0.022	1.68	0.011	2.85
Emp×98	0.025	1.93	0.007	1.74
Empl×Age	-2.63×10^{-4}	-1.02		
Empl×Age×98	-2.89×10^{-4}	-1.13		
Log Y_P *×98*	0.032	2.96	0.031	3.11
Log Y/Y_P *×98*	-0.029	-6.82	-0.028	-6.81
λ	-0.732	-7.82	-0.841	-12.57

Constant	-0.424	-5.16	-0.435	-5.72
R^2	0.110		0.110	
Standard Error	0.201		0.201	
F-test on restrictions	F(9,66660)	1.32	P=21.8%	
Number of observations	66701		66701	

Variable definitions: σ^2; variance of the change in log income (imputed measure for income uncertainty), Y, Real income per person Y_p normal income per person (imputed). Age 25-29 to Age>=75: dummy variables for age groups 25-29, 30-34, …, 70-74, 75 and older, Degree: educational status =1 if household head holds a college degree, Time98,dummy variable for observations in 1998. Size: log household size (measured using the McClements scale).Hown: home ownership (1 if home owner), Poverty: a dummy for low income, which is equal to 1 if the mean of income per person in the household in the period 1996 to 2003 is lower than 60% of the median of the mean income per person for all households in the period 1996 to 2003; λ: Mills Ratio constructed from the Probit equation for the exclusion of households with a savings outside the interval [-0.5,0.5]. The equations included household size, dummies for degrees and marital status, with the product of these and the dummy for 1998 in addition. Quarterly dummies were also included. Interactive terms given by the product of age with size and age with marital status, both multiplied by the dummy for 1998 in the unrestricted equation

Normal income as well as the ratio of actual income to normal income has a positive impact on the savings rate. The coefficients are of similar size suggesting that it is actual income rather than permanent income which is responsible for the dominant income effect. The effect of permanent income is lower in 1998 than in 2003 and the effect of the ratio of actual to permanent income is stronger. The implication of the dummies is that in 1998 nominal income plays no role, and in fact has a small negative coefficient. Households with married heads saved more in 1998, but the effect was attenuated in 2003. In 1998 graduates under the age of 55 had a lower saving ratio than in 2003 at any given level of normal income but beyond this age it increased slightly. At any given level of income and normal income size depresses saving slightly, perhaps reflecting the fact that households with children expect those children eventually to leave home or bring in an income, implying in either case that income per effective household member is likely to be higher in the future than it is at present.

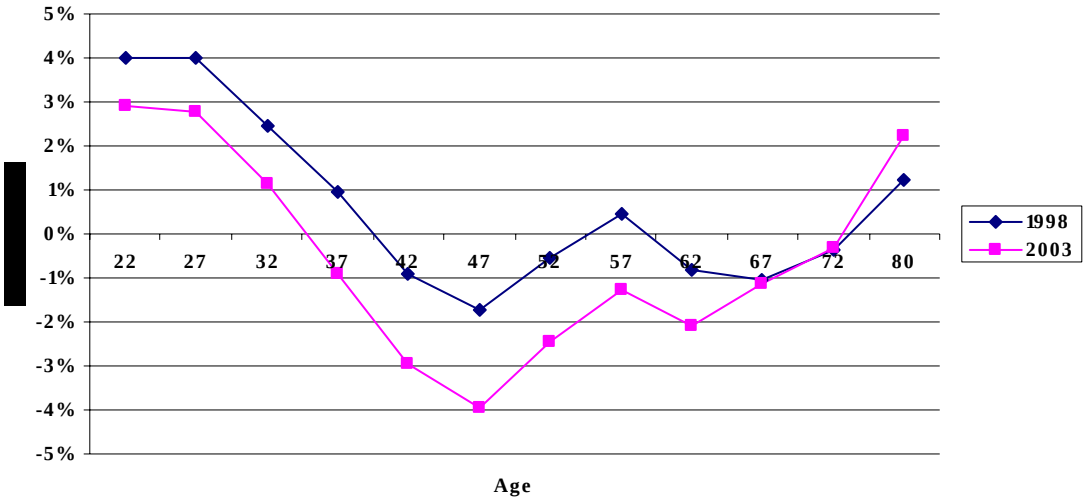
The coefficient for “poverty” indicates that the savings rate was lower for households with an income below 60 % of the median even after the effects of income are taken into account. The saving of home owners is slightly higher than that of people who do not own their own homes. Households where the head was employed tended to save more, at any level of actual and normal income than did households whose heads were not working. This effect is consistent with the idea that heads of non-working households have the prospect of raising their incomes by taking up employment- implying an effect over and above that represented by the permanent income terms. The effect was stronger in 1998 than in 2003 but was not sensitive to age. Direct effects of uncertainty on saving were not statistically significant.

We can obtain an impression of the implications of the equations for saving as a function of age by looking at fitted values for the savings ratio for particular types of household. We look at a standard household consisting of a married couple. They acquire two children at the age thirty. These children age and then leave home when the household head has an age of fifty. We look at families with incomes after adjusting for family size at the mean values of the incomes of i) those households with incomes after adjusting for size below 60% of the median, ii) those households with incomes between 60% and 140% of the median and those families with incomes of more than 140% of the median. The families in the top income group are assumed to be headed by graduates and to have mortgages from the age of twenty-five to forty-nine, owning houses from

the age of twenty-five onwards[20]. The heads of households in the other two groups are not home owners or graduates. When calculating saving a fitted value for normal income is calculated using the equation shown in table 43.

In figure 42 we show how saving various by age an average household with income below 60%of median income.

Figure 42: Fitted Savings Ratio – Germany. Representative Family with Income < 60% of Median

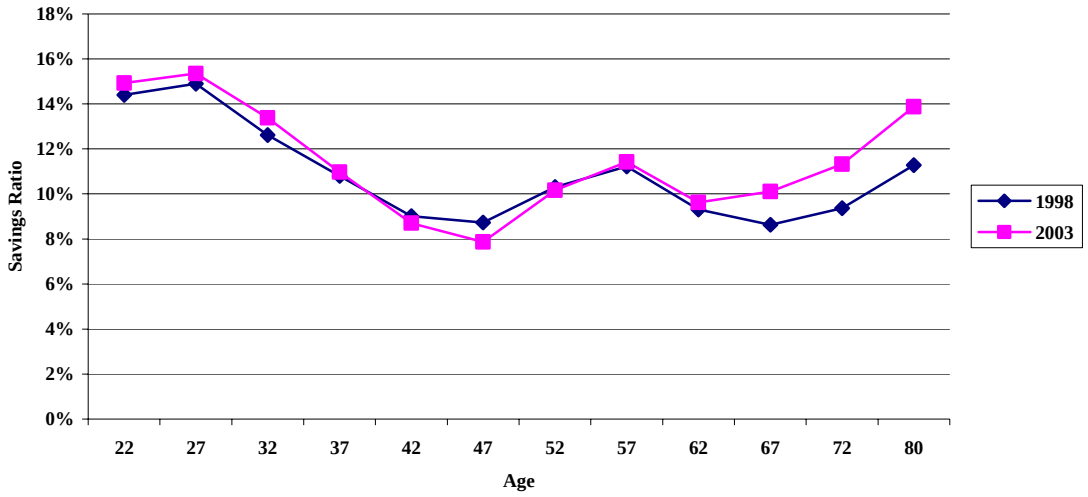


We see, around an overall savings rate which is close to zero, a relatively high savings rate by young households, a dip in middle age and a saving rate which rises again in old age. For this sort of household saving was generally higher in 1998 than in 2003.

Figure 43 shows the saving pattern of a middling household, with income of between 60% and 140% of the median. The profile itself is not very different from that for the household with income below 60% of median but position the curves has shifted so that at most ages for this group of households saving is higher in 2003 than in 1998.

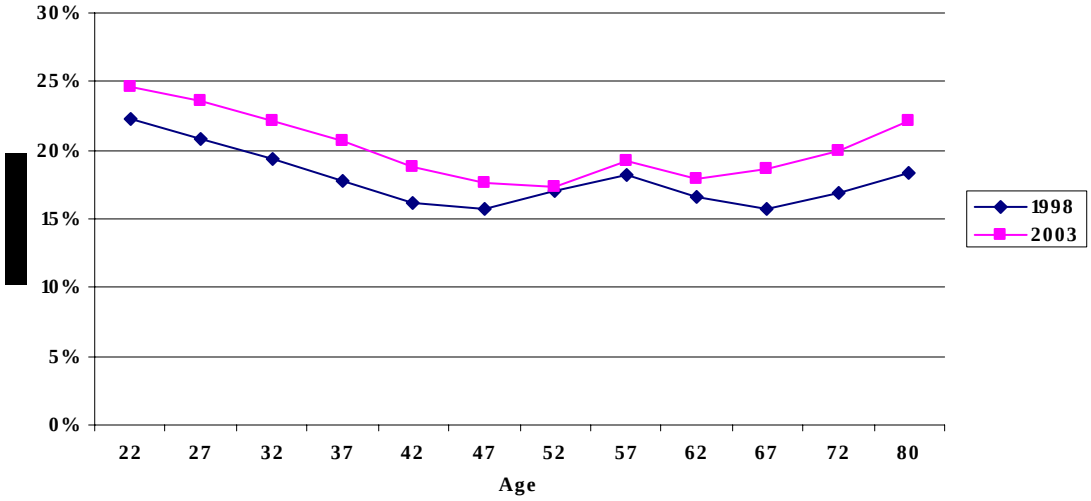
[20] In calculating fitted values the coefficients show the marginal effects of the various influences after correcting for sample selection bias. However the average position of the curve depends on the value of λ. We sidestep this problem by giving λ a value of zero (the value it would have for a household certain to be included in the sample) and adjusting the position of each savings curve so that its mean averaged across the ages shown is the same as the means of the curves shown in figures 1.6 to 1.8. We assume that households with heads aged 75+ have household heads aged 80. We use a similar approach for Spain and the United Kingdom.

Figure 43: Fitted Savings Ratio – Germany. Representative Family with Income 60%-140% of Median



Finally, in figure 44 we look at the savings of a household with income at the mean of those receiving more than 140%of the median after adjusting for household size. Here too the same underlying profile is present with high saving by young people and old people but with a dip in middle age. However for this group of households the savings rate is generally higher in 2003 than in 1998. This reflects the fact that the coefficient on actual log income is higher in 2003 than in 1998, depressing the saving of low-income households and raising that of high income households.

Figure 44: Fitted Savings Ratio – Germany. Representative Family with Income > 140% of Median



The key findings of the analysis of saving in Germany are i) that saving by young people is probably higher than would be expected from a life-cycle model and that old people also continue to save. The simulation suggests that the rise in the overall savings ratio between 1998 and 2003 is attributed mainly to increased saving by high income people although the data also

show that among young middle-income people saving has risen.

In order to understand the factors leading to the life-cycle profile visible in figure 14 it is necessary to understand how the incomes of particular households change over time, as well as looking at the sort of snap-shot we have here. If households tend to start with relatively low incomes and these then rise over time, it is perfectly possible to generate the picture shown in figure 14 from the fitted profiles generated here.

5.2 Spain

For Spain we do not have any means of estimating income uncertainty from panel data since, as reported, we were unable to link the successive observations of the ECPF. We therefore proceed to a discussion of the determinants of normal income and follow this with an account of influences on saving. Finally we present fitted savings profiles for households in three different income bands.

5.2.1 Normal Income

Table 46 shows the sample selection equation which distinguishes those households providing income data from the rest of the ECPF. It is clear that a wide range of deterministic factors influences the provision of income data. The income equation itself is shown in table 47. Age is an influence on income but the pure linear effect is small, at only 0.014 for someone who is unmarried or 0.017 for someone who is married. There are important interactive effects; the most important one is that with size; this adds a coefficient of 0.015 for a household with two adults (size=1). The implication of this term is, perhaps not very surprisingly, that a large household adds more to income when the household head (and therefore probably the other household members) are old rather than when they are young. Young household heads with large households are likely to have non-earning children. Old household heads with large households are more likely to have adult children present who add to household income. Education effects themselves are very powerful. However, the effects of income growth with age tend to decline as the educational standing of the household head increases; the control category- special adult education- results in a low initial income level and a high slope. Sample-selection effects are shown to be statistically significant.

Table 46: Probit Estimation for computing the Inverse Mills ratio for the Normal Income Equation

Dependent variable takes value 1 if household has income data and 0 otherwise	Coefficient	Z
Married	0.230	5.01
Single	0.375	19.14
Divorce	0.320	7.61
Separated	0.381	13.67
Hown	-0.266	-6.79
Morg	-0.233	-5
Size	1.216	16.5
No education	2.997	2.24
Primary	2.869	2.15
Secondary	2.968	2.22
Further Secondary	2.889	2.16
After High School	2.856	2.13
Degree	2.852	2.13
Age × Married	-2.600E-05	-0.04
Age	0.006	0.3
Age^2	3.484E-04	7.44
(Age>=65)	0.017	8.01
$(Age>=65)^2$	-2.458E-04	-7.25
Age×No Education	-0.047	-2.23
Age × Primary education	-0.048	-2.3
Age × secondary school	-0.050	-2.4
Age × Further Secondary school	-0.052	-2.49
Age × After High School	-0.051	-2.44
Age × 1st cycle University	-0.050	-2.38
Age × 2nd cycle University	-0.054	-2.57
Age × Size	-0.033	-26.39
Age × Hown	0.004	6.02
Age × Mortgage	0.005	4.95
Constant	-3.079	-2.3

Variable definitions: Married, Single, Divorced, Separated dummy variables indicating marital status of household head. Hown home ownership (1 if home owner). Size Household size measured by McClements scale. No education, Primary, Secondary, Further secondary, After high school, Degree, 1st cycle university, 2^{nd} cycle university dummies indicating education attainment. Age age of household head. Time dummies for 1999, 2000, 2001, 2002 were included.

Table 47: Determinants of Normal Income – Spain

Dependent Variable is log Real Household Income per person	**Unrestricted** Coefficient	Z	**Restricted** Coefficient	Z
Married	0.216	8.22	0.216	8.22
Single	0.109	5.63	0.110	5.69
Divorced	0.082	2.65	0.082	2.67
Hown	0.444	8.81	0.444	8.81
Morg	0.429	8.16	0.429	8.15
Rent	0.283	5.29	0.283	5.29
Reduce Rent	0.296	3.62	0.295	3.61
Semi Free	0.195	3.08	0.195	3.08
Size	-0.322	-3.48	-0.320	-3.48
No education	-0.212	-0.2		
Primary	0.216	0.2	0.428	9.31
Secondary	0.279	0.26	0.490	9.78
Further Secondary	0.358	0.34	0.569	10.05
After High School	0.360	0.34	0.571	7.01
Degree	0.717	0.67	0.928	15.83
Age x Married	0.003	7.28	0.003	7.31
Age	0.014	0.89	0.017	3.61
Age^2	-6.800×10^{-5}	-1.82	-6.750×10^{-5}	-1.81
(Age>=65)	-0.003	-1.83	-0.003	-1.82
(Age>=65)^2	5.370×10^{-5}	1.99	5.340×10^{-5}	1.98
Age × No Education	-3.780×10^{-5}	0	-0.003	-1.23
Age × Primary	-0.005	-0.32	-0.008	-3.07
Age × secondary	-0.004	-0.28	-0.008	-2.82
Age × Further Secondary	-0.002	-0.11	-0.005	-1.75
Age × Non Univ High Education	-0.003	-0.17	-0.006	-1.91
Age × 1st cycle University	-0.003	-0.17	-0.006	-2.12
Age × 2nd cycle University	-0.001	-0.04	-0.004	-1.35
Age × Size	0.015	6.97	0.015	6.99
Age × Hown	-0.004	-4.51	-0.004	-4.51
Age × Mortgage	-0.003	-2.56	-0.002	-2.56
Age×Rent	-0.002	-2.57	-0.002	-2.57
Age× reduced Rent	-0.002	-1.94	-0.002	-1.94
Age×Semi Free	-0.001	-0.64	-0.001	-0.64
λ	0.395	5.35	0.397	5.43
Constant	1.669	1.55	1.456	14.14
R^2	0.502			
Standard Error	0.456			
F-test of restriction	F(1,29633)	0.842		

Variable definitions: Married, Single, Divorced, Separated dummy variables indicating marital status of household head. Hown home ownership. Morg mortgage, Rent, Reduced Rent, Rent Free other forms of housing tenure. Size Household size measured by McClements scale. No education, Primary, Secondary, Further secondary, After high school, Degree, 1st cycle university, 2nd cycle university dummies indicating education attainment. Age age of household head. λ, the inverse Mills' ratio. Year dummies were also present

5.2.2 Determinants of Savings

Fewer data are used in the estimation of the saving equation than in the estimation of the income equation, because we truncate the sample. Looking only at households where the savings ratio lies in the range [-0.5, 0.5]. This is in order to remove potentially distorting effects arising from outliers. We therefore need to estimate a sample selection equation specific to those observations

used in the savings equation. The equation is shown in table 48.

Table 48: Probit Estimation for computing the Inverse Mills ratio Test to be used in the Saving Ratio Equation

Dependent Variable is 1 if Household Savings Ratio lies in interval [-0.5, 0.5], 0 otherwise	Coefficient	z
Log Y	-0.450	-11.29
Log Y×Time99	-0.247	-4.64
Log Y ×Time00	-0.239	-4.42
Log Y ×Time01	-0.164	-3.1
Log Y ×Time02	-0.181	-3.48
Married	-0.144	-1.21
Married×Time99	0.298	1.97
Married×Time00	0.185	1.17
Married×Time01	-0.067	-0.41
Married×Time02	0.034	0.22
Primary×Time99	0.119	2.77
Primary×Time00	0.074	1.65
Primary×Time01	0.089	1.89
Primary×Time02	0.003	0.05
Secondary×Time99	0.273	4.4
Secondary×Time00	0.286	4.45
Secondary×Time01	0.300	4.49
Secondary×Time02	0.207	3.18
Further Secondary×Time99	0.531	7.25
Further Secondary×Time00	0.421	5.22
Further Secondary×Time01	0.629	7.85
Further Secondary×Time02	0.403	5.36
After High School×Time99	0.286	2.47
After High School×Time00	0.473	3.67
After High School×Time01	0.314	2.46
After High School×Time02	0.226	1.88
Age × Married	0.012	6.27
Age × Married×Time99	-0.006	-2.41
Age × Married×Time00	-0.003	-1.4
Age × Married×Time01	-0.001	-0.26
Age × Married×Time02	-0.002	-0.92
Age×Size	0.013	9.88
Age×Size×Time99	-0.004	-2.61
Age×Size×Time00	-0.001	-0.29
Age×Size×Time01	-2.408×10^{-4}	-0.13
Age×Size×Time02	-0.003	-1.87
Age ×Income	-3.110×10^{-5}	-0.09
Degree	0.537	7.86
Degree×Time99	0.331	3.17
Degree×Time00	0.319	2.99
Degree×Time01	0.275	2.51
Degree×Time02	0.308	2.93
Hown	0.325	4.93
Mortgage	0.181	6.33
Age ×Hown	-0.004	-4.24
Time99	0.522	3.11

Time00	0.503	2.94
Time01	0.396	2.34
Time02	0.496	2.98
$(Y/Y_P)^2$	-0.122	-1.52
Age $\times(Y/Y_P)^2$	-0.003	-2.01
Constant	1.038	8.56

Variable definitions: Y, real household income per person, Y_p normal household income per person. Married, Single, Divorced, Separated dummy variables indicating marital status of household head. Hown home ownership. Morg mortgage, Rent, Reduced Rent, Rent Free other forms of housing tenure. Size Household size measured by McClements scale. No education, Primary, Secondary, Further secondary, After high school, Degree, 1st cycle university, 2nd cycle university dummies indicating education attainment. Age age of household head. Time99, Time00, Time01, Time02 year dummies

In table 49 we show our explanation of the household savings ratio itself. Once again we test for the effects of stability over time. The fact that we are considering five years rather than just the two we had for Germany creates a large number of dummy variables and we do not show the unrestricted equation in full. We eliminate sixty-six variables from the initial equation, showing in table 49 the restricted and unrestricted values of the variables which remain in the equation. There is evidence that some of the coefficients are time-varying, with the interaction of age and log household size being the most important of these.

We find that saving is a function of actual income relative to normal income but cannot identify further income effects. It does, however, also depend on age and marital status. The large coefficients on divorce are almost certainly generated by a small number of outlying observations. Home ownership and mortgage status have an influence on saving behaviour and these may be an influence behind the high savings rates of young households hinted in figure 25. Certainly people under twenty-five are less likely to be buying houses with mortgages than are other people.

The term, $(Y/Y_P-1)^2$, has a significant but negative influence which we find difficult to interpret, at least in the standard modelling framework. As with Germany the effects of age and income need to be explored in a way which takes account of all of the interactive effects, and also that income is itself a function of age.

Table 49: The Saving Equation, Spain

Dependent Variable is	Unrestricted		Restricted	
Household Savings Ratio	Coefficient	Z	Coefficient	Z
Log Y_p	-0.679	-1.700		
Log Y/Y_p	0.118	5.330	0.079	14.830
$(Y/Y_p-1)^2$	-0.024	-1.920	-0.051	-6.870
Log $Y_p \times 99$	0.569	1.780		
Log $Y_p \times 00$	0.553	1.700		
Log $Y_p \times 02$	0.595	1.840		
Log $Y_p \times 01$	0.760	2.370		
Log $Y/Y_p \times 99$	-0.004	-0.160		
Log $Y/Y_p \times 00$	-0.008	-0.300		
Log $Y/Y_p \times 01$	0.024	0.930		
Log $Y/Y_p \times 02$	-0.004	-0.150		

Employed	0.080	1.900		
Employed×99	-0.054	-1.210		
Employed×00	-0.064	-1.360		
Employed×01	-0.067	-1.420		
Employed×02	-0.088	-1.900		
Age 20-24	0.054	0.480	-0.013	-0.180
Age 25-29	0.033	0.300	-0.054	-0.890
Age 30-34	0.024	0.210	-0.081	-1.390
Age 35-39	0.056	0.480	-0.062	-1.080
Age 40-44	0.049	0.410	-0.083	-1.430
Age 45-49	0.053	0.440	-0.088	-1.510
Age 50-54	0.082	0.680	-0.068	-1.170
Age 55-59	0.091	0.770	-0.058	-0.990
Age 60-64	0.100	0.850	-0.052	-0.900
Age 65-69	0.107	0.930	-0.043	-0.740
Age 70-74	0.112	0.980	-0.042	-0.720
Age >=75	0.153	1.280	-0.023	-0.390
Married	0.346	3.010	0.051	8.270
Single	0.129	2.350	0.042	4.540
Divorced	0.643	3.590	0.450	2.600
Primary School	-0.059	-1.170		
Secondary School	-0.053	-1.370		
Further Secondary School	0.133	1.860		
After High School	0.073	1.430		
Married× 99	-0.343	-3.030		
Married×00	-0.247	-2.210		
Marr×01	-0.240	-2.370		
Marr×02	-0.280	-2.590		
Single×99	-0.043	-0.750		
Single×00	-0.062	-1.050		
Single×01	-0.095	-1.710		
Single×02	-0.108	-1.830		
Divorce×99	-0.881	-3.630	-0.634	-2.780
Divorce×00	-0.545	-2.290	-0.402	-1.790
Divorce×01	-0.676	-2.160	-0.444	-1.430
Divorce×02	-0.745	-2.630	-0.473	-1.700
Primary School×99	0.177	2.390		
Primary School×00	0.167	2.300		
Primary School×01	0.043	0.570		
Primary School×02	-0.024	-0.310		
Secondary School×99	0.201	2.860		
Secondary School×00	0.005	0.070		
Secondary School×01	0.039	0.540		
Secondary School×02	0.072	0.980		
Further Secondary×99	-0.139	-1.270		
Further Secondary×00	-0.087	-0.750		
Further Secondary×01	-0.164	-1.420		
Further Secondary×02	-0.088	-0.800		
After High School×99	0.044	0.280		
After High School×00	-0.093	-0.550		

After High School×01	-0.134	-1.060		
After High School×02	0.045	0.350		
Age × Mar	-0.001	-1.230		
Age × Mar× 99	0.003	2.620		
Age × Mar× 00	0.001	0.840		
Age × Mar× 01	0.000	0.240		
Age × Mar× 02	0.000	-0.190		
Age × Divorce	-0.012	-3.430	-0.009	-2.820
Age × Div× 99	0.016	3.570	0.012	2.750
Age × Div× 00	0.012	2.620	0.010	2.340
Age × Div× 01	0.010	1.860	0.008	1.360
Age × Div× 02	0.014	2.680	0.011	2.110
Age × Widow	0.000	0.270		
Age × Wid× 99	0.001	1.590		
Age × Wid× 00	0.000	0.350		
Age × Wid× 01	0.000	-0.110		
Age × Wid× 02	-0.001	-1.260		
Size	-0.298	-1.900		
Age×Size	0.014	1.880	0.002	5.280
Age×Siz× 99	-0.009	-1.750	-0.001	-1.990
Age×Siz× 00	-0.008	-1.600	-8.250E-05	-0.180
Age×Siz× 01	-0.009	-1.800	-3.328E-04	-0.750
Age×Siz× 02	-0.012	-2.540	-0.001	-2.990
Age×Primary× 99	-0.002	-2.140		
Age× Primary× 00	-0.001	-1.460		
Age× Primary× 01	0.000	0.080		
Age× Primary× 02	0.001	1.390		
Age × Sec Educ× 99	-0.003	-2.330		
Age × Sec Educ× 00	0.001	0.690		
Age × Sec Educ× 01	0.000	-0.080		
Age × Sec Educ× 02	0.000	-0.340		
Age × Further Sec Educ× 99	0.001	0.420		
Age × Further Sec Educ× 00	0.000	-0.050		
Age × Further Sec Educ× 01	0.000	0.270		
Age × Further Sec Educ× 02	-0.002	-0.930		
Age×High sch× 99	-0.002	-0.600		
Age×High sch× 00	0.001	0.370		
Age×High sch× 01	0.001	0.580		
Age×High sch× 02	-0.003	-1.120		
Age×Degree× 99	0.001	0.520	-2.712E-04	-0.710
Age×Degree× 00	0.001	0.840	-5.480E-05	-0.150
Age×Degree× 01	0.001	0.520	4.030E-04	1.130
Age×Degree× 02	-0.002	-1.600	-2.469E-04	-0.730
Time99	-1.894	-1.800	-0.021	-2.180
Time00	-1.812	-1.710	-0.014	-1.370
Time01	-1.900	-1.800	-0.022	-2.120

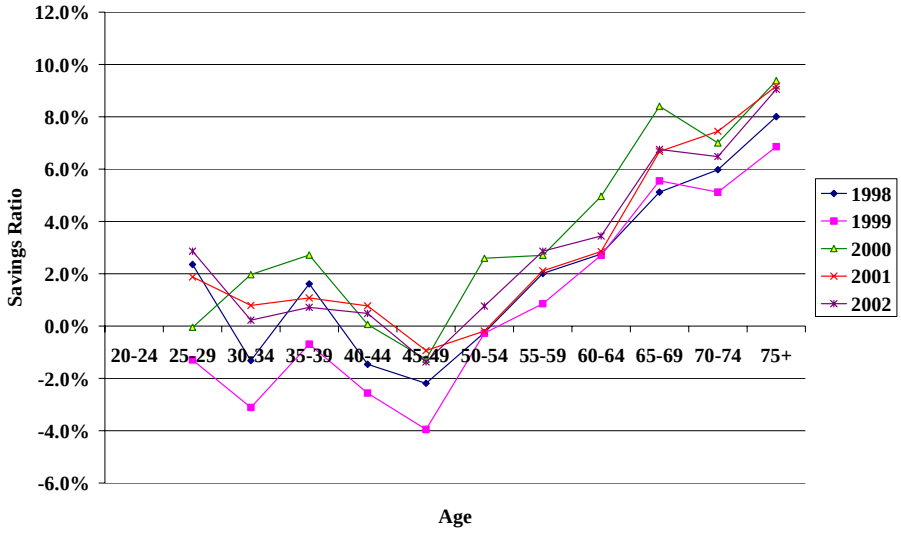
Time02	-2.395	-2.290	-0.025	-2.410
Hown	-0.012	-0.630	-0.034	-4.770
Mortgage	0.001	0.060	-0.022	-2.520
Λ	-0.194	-2.310		
Poverty	-0.024	-1.260		
Constant	2.318	1.850	0.139	2.370
R^2	0.026		0.026	
Standard Error	0.281		0.274	
F(66,12727)	1.230			

Variable definitions: Y, real household income per person, Y_p normal household income per person. Married, Single, Divorced, Separated dummy variables indicating marital status of household head. Hown home ownership. Morg mortgage, Rent, Reduced Rent, Rent Free other forms of housing tenure. Size Household size measured by McClements scale. No education, Primary, Secondary, Further secondary, After high school, Degree, 1st cycle university, 2^{nd} cycle university dummies indicating education attainment. Age age of household head. λ, the inverse Mills' ratio Time99, Time00, Time01, Time02 year dummies
The unrestricted equation included dummies for highest level of education achieved, marital status and the interaction of these with age. It also included terms in the product of the home ownership dummy and age and the poverty dummy and age. There were 12838 observation in the sample. The F- statistic relates the restricted and unrestricted models.

In figures 45 to 47 we present the fitted savings profiles of a representative household which consists of a married couple. Our dummy variables for age have been defined for ranges and we take the mid-point of these, with an assumed age of 80 for the category 75+. When the reference person has an age of 33, we assume that the family has two children aged three. These children age, with impact on family size until they reach 20 when the household head has an age of 50. The children leave home at the age of 20, so that by the age of 52 the family then reverts to being a couple. The family with an income below 60% of median is assumed not to own its own home or have a mortgage. Families with higher incomes are assumed to be home owners from the age of 25 with mortgages which last until the age of 50; this treatment of families in the middle income group which is different from Germany, is intended to reflect the high rate of home ownership in Spain. The families in the low income groups are assumed to have household heads educated to secondary level. In the middle income group the household head is assumed to be educated to upper secondary level while among the high income group the household head is assumed to be a graduate.

We are unable to calculate a reference income level for households with heads aged under twenty-five and incomes below 60% of the median. One explanation of why they do not crop up in the sample is that young people on low incomes tend to live with their parents instead of forming their own households. But exploration of this is outside the scope of the project. The saving pattern for people on low incomes is that savings rates are close to zero but start to rise when household heads are in their fifties with retired households showing the highest savings rates. Since there is no clear match between movements in the savings rate identified in the micro-economic data and that shown in the macro-economic data, there is little to be gained in focusing on the positions of the curves in different years.

Figure 45: Fitted Savings Ratio – Spain. Representative Family with Income < 60% of Median



We are able to identify income figures for households with heads aged under twenty-five and with incomes in the ranges 60-140% of the median and more than 140% of the median. Both graphs show that this group has a high saving rate compared to older people. An important explanation of this is that we have assumed that they are neither home-owners nor mortgagees. Inspection of table 49 shows that buying a home with a mortgage depresses identified saving by 5.6 percentage points. The mortgage is assumed to repaid at the age of fifty, raising the saving rate by 2.2 percentage points. However this smaller rise is part of a general increase in saving with age. Both figures suggest high saving in 1999 although we cannot see this in the macro-economic data.

Figure 46: Fitted Savings Ratio – Representative Family, Spain, Income 60%-140% of Median

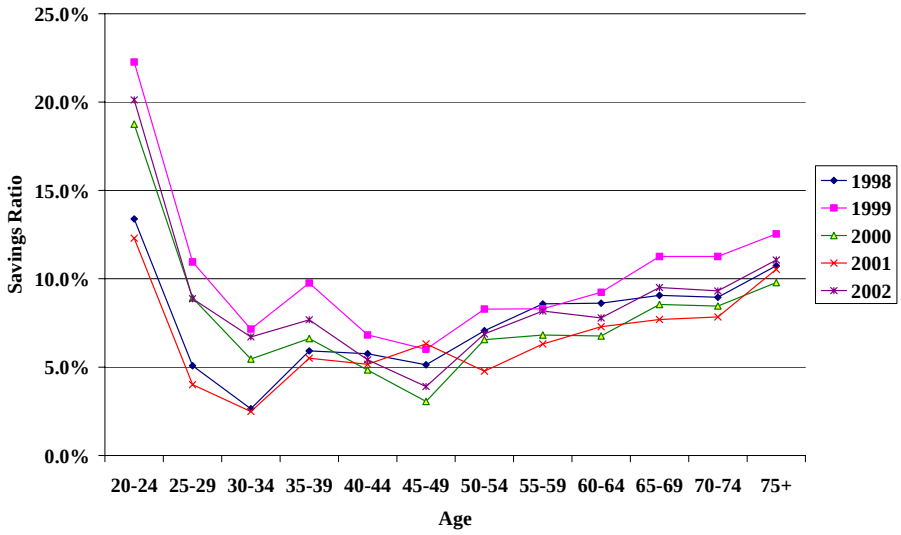
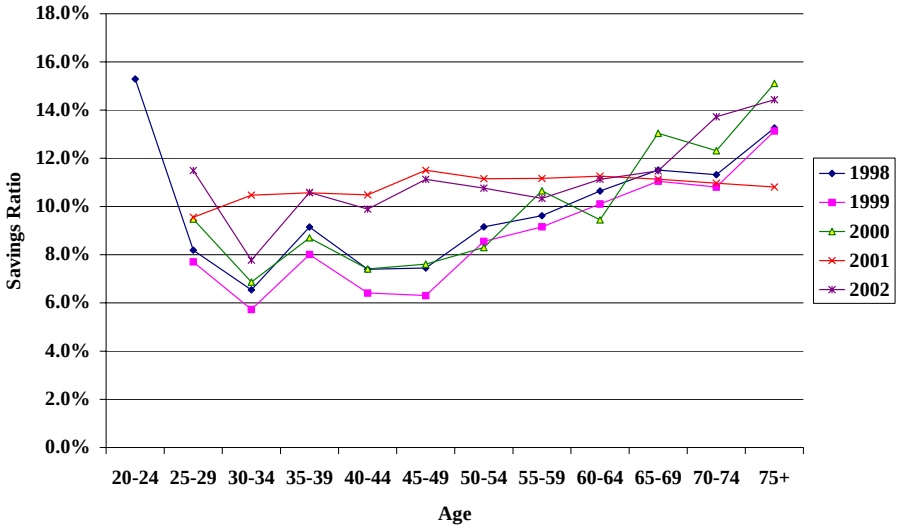


Figure 47: Fitted Saving Ratio – Representative Family, Spain, Income above 140% of Median



5.3 The United Kingdom

As with Germany we begin our discussion with the issue of income uncertainty. This is followed by an analysis of the determinants of normal income and of the influences on the savings ratio. We conclude with a presentation of the fitted savings ratios for three types of household at different income levels.

5.3.1 Income Uncertainty

We measure income volatility by looking as the variance of the annual change in the real income per effective household member calculated over the period for which we have panel data, 1996-2002. Since we can also observe household characteristics from the British Household Panel Survey, this allows us to estimate an equation explaining variance in terms of these socio-economic characteristics.

Table 50 indicates results from the estimation of equation (4). We find that volatility depends on average income over the period for which the income forecasting model was estimated. It also depends on the average over the period of a dummy which takes a value 1 if a household is " in poverty" , i.e. has an income after adjusting for household size below 60% of the median size-adjusted household income. This term implies a marked non-linearity in the relationship between income and income uncertainty. That there should be some sort of non-linearity of this type is not in itself very surprising. State benefits are usually a substantial source of income for people with low incomes and these are bound to be more stable than employment income. Unlike employment income they are designed to vary so as to smooth out the effects of changes in household size.

Table 50: Determinants of Income Uncertainty, United Kingdom

Dependent Variable is Variance of Growth of Real Income per Household Member	Unrestricted		Restricted	
	Coefficient	Z	Coefficient	Z
Log Y	0.086	3.450	0.097	4.110
Poverty	0.310	7.920	0.319	8.230
Degree	0.029	1.430		
Constant	-0.383	-2.880	-0.438	-3.430
R^2	0.072		0.071	
Standard Error	0.220		0.220	
Test of Restriction	F(1, 983)	2.050	P=15.3%	
Mean Dependent Variable			0.118	

Variable definitions: The dependent variable is the variance of the growth rate of real disposable income per effective household member over the period 1996-2002. Y is net real disposable income per effective household member. Poverty is a dummy which takes 1 if the size-adjusted household income is less than 60% of the median and 0 otherwise. Degree takes a value of 1 if the household head has a degree and 0 otherwise. The equation is estimated for 987 households with comprehensive records in the British Household Panel Survey. Explanatory variables are averages for the period 1996-2002.

5.3.2 Normal Income

Our normal income equations are estimated from the Family Expenditure Survey data which we also use to estimate saving. Our sample includes 19632 households with heads aged 64 or younger pooled from the 1997, 1999, 2001 and 2003 surveys. The determinants of income in table 51 are age marital status of the head of household, family size and age at which full time education was completed. We have also included interactive terms, computing the product of various indicators with age. This is so because the effects of these variables on normal income may be functions of age. We also include the square value of age to capture the hump-shaped behaviour of household earnings. Following Mincer (1974) we expect age to have a positive effect on household income and age squared a negative effect. We include time dummies to reflect the fact that real incomes tend to rise over time. However, since we aim to produce a picture of long-run normal incomes we do not look for interactions between time dummies and the other variables present in the equations.

Table 51 presents results from OLS income regressions. All parameters are consistent and the standard are computed using White's variance covariance matrix robust to heteroscedasticity. In the restricted equation we find that income is increasing in the age of the household head but decreasing in the square of the age of the household head, consistent with Mincer (1974). Not surprising the effect of size is negative; large households have lower incomes per member. A degree raises income by 34% relative to the rest of the population, but there is also an interactive effect with age; the value of a degree is greater for old than for young people. Home owners have incomes substantially higher than those who do not own their own houses.

The time dummies point to rapid real income growth between 1999 and 2001 but an overall growth rate of real income between 1997 and 2003 of 2.3% p.a. which is consistent with the macro-economic picture.

Table 51: Determinants of Normal Income: United Kingdom

Dependent variable is Log Real Household Income per person	Coefficient	Z	Coefficient	Z
Age	0.037	12.700	0.036	13.140
Age^2	-3.780×10^{-4}	-11.860	-3.751×10^{-4}	-11.960
Age>=65	-0.016	-9.060	-0.016	-9.180
(Age>=65)^2	2.420×10^{-4}	8.710	2.398×10^{-4}	8.830
Married	0.835	24.520	0.840	25.800
Divorce	-0.087	-2.040	-0.069	-5.560
Education	0.001	0.300		
Hown	0.591	23.010	0.596	24.510
Mortgage	0.000	0.460		
Size	-1.393	-29.860	-1.395	-30.050
Age×Married	-0.011	-17.230	-0.011	-18.010
Age×Divorce	3.577×10^{-4}	0.440		
Age×Education	3.902×10^{-4}	6.220	4.068×10^{-4}	14.080
Age×Size	0.020	20.810	0.020	20.890
Age×Hown	-0.004	-8.620	-0.004	-9.230
Age×Mortgage	3.670×10^{-5}	2.920	4.230×10^{-5}	15.440
Degree	0.307	21.060	0.308	22.170
Time97	-0.135	-13.640	-0.135	-13.680
Time99	-0.107	-10.980	-0.107	-11.000
Time01	-0.038	-3.950	-0.039	-3.960
Constant	-0.478	-6.400	-0.460	-8.210
R^2	0.309		0.309	
Standard Error	0.561		0.561	
F(3,26499)	0.160			
No Obs	26520			

Variable definitions: The dependent variable is the log of real household disposable income per effective household member; Hown indicates home owners; Size indicates log family size; Morg denotes home owners with mortgages; Age indicates the age of the head of the household; Education, age at which household head finished full-time education. The equation was estimated on pooled data from the Family Expenditure Surveys in 1997,. 1999, 2001 and 2003, with 26520 households in the sample. The F-test compares the restricted and unrestricted models. The coefficients presented here show the effects of age on income. The equation included dummy variables for home ownership, marital status (married divorced or widowed with single as reference), a degree and the presence of a mortgage. Time dummies were also included. Product terms were also included to identify interactions and the effects of age working through these is shown here. Only the mortgage dummy was statistically insignificant at a 5% level and the F-test is shown for the zero restriction on this; the mortgage dummy is suppressed in the restricted equation.

5.3.3 Determinants of Savings

Saving behaviour is studied using the same data sets involved in the calculation of normal income. However, in order to avoid the influence of outliers on the regression, we exclude those households whose saving ratio lies outside the interval [-0.5,0.5]. As a result the estimated equations include 20,785 households. There is obviously the risk that households used in the regression may not be representative of the population as a whole. We address the problem of selectivity bias following Heckman (1976). We estimate a probit equation where the independent variable is an indicator function that take the value of one when the household is included in the

initial sample and zero otherwise. Table 52 presents a restricted form of the probit equation used to construct the inverse Mills ratio. The coefficients of probit equation show the probability that any of the households of initial sample provides a full usable record with the data of saving ratio smaller in absolute terms than 0.5.

Table 52: Sample selection (probit) equations to explain whether households have savings rates within the ratio [-0.5 0.5]: United Kingdom

Dependent Variable is 1 if Household Savings Ratio lies in interval [-0.5, 0.5], 0 otherwise	Coefficient	Z
Log Y	0.722	17.770
Log Y x Time03	-0.042	-7.110
Age 20-24	0.273	2.000
Age 25-29	0.552	4.090
Age 30-34	0.674	4.890
Age 35-39	0.889	6.180
Age 40-44	1.008	6.620
Age 45-49	1.175	7.210
Age 50-54	1.281	7.320
Age 55-59	1.473	7.820
Age 60-64	1.655	8.200
Age 65-69	1.964	9.090
Age 70-74	2.156	9.370
Age >=75	2.286	9.030
Married	-0.381	-4.740
Married×Time03	0.054	0.560
Divorced	-0.250	-2.330
AgexMarried	0.006	4.930
Age× Married×Time03	0.003	1.510
Age×Divorced	0.006	2.810
Age×Y	-0.009	-13.700
Degree	-0.234	-8.290
σ^2	-2.209	-9.480
Age × σ^2	0.035	8.210
Constant	-1.764	-9.150

Variable definitions: The dependent variable takes the value 1 if the household's saving ratio lies between -0.5 and 0.5 and zero otherwise; Y denotes the actual household's income deflated by the consumption deflator; σ^2 denotes income uncertainty computed by Equation 6; Degree=1 if the household head left full time education after the age of 20 Time03 denotes a time dummy for 2003. Age 20-24 to Age>= 75 are dummy variables indicating the age band appropriate to the household head. Age indicates actual age of the household head. Married, Divorced indicate martial status of the household head. σ^2 indicates the fitted variance of household income. The equation was estimated on 26512 households from the pooled Family Expenditure Surveys for 1997, 1999, 2001 and 2003.

Table 53 shows the effect of income uncertainty in an equation which explains overall saving. We present results both from an unrestricted model and a model where insignificant variables are excluded on the basis of a χ^2 test. It is worth noting that in contrast to Miles (1997) whose empirical results based on regressions for each individual year we have pooled the data from four nonconsecutive waves in 1997, 1999, 2001 and 2003. Inclusion of time dummies both on their

own and multiplying key variables allows us to explore whether there have been time effects present and thus to identify whether there have been changes in behaviour such as those which might arise from reduced confidence about pension schemes over the period considered. An F-Test can be used to test whether any or all of these.

We have employed an instrumental variable regression to address the fact that normal income and income uncertainty are generated regressors. We use dummies for marital status and (years of) education in 1999, 2001 and 2003 as instruments. Note these dummies have not been used in the estimation of normal income.

Table 53 shows that income uncertainty enters with a positive coefficient. However, we note that the variance of income depends positively on the poverty dummy as well as on income, while the savings ratio depends positively on the fitted variance of income and negatively on the poverty dummy. This non-linearity makes the interpretation of the effects of income difficult. The problem of interpretation is further augmented by the fact that the savings rate depends positively on the (log) ratio of income to normal income[21] but negatively on the square of this minus 1. As we have noted above, other authors have interpreted this as an uncertainty effect; it is difficult to give it any other interpretation.

Home-owners tend to save less than other people, taking their educational status and income uncertainty as given. However, rather surprisingly, we see that whether they have a mortgage or not has little overall impact.

Table 53: Determinants of the Savings Ratio – United Kingdom

Dependent Variable is	Unrestricted		Restricted	
Household Saving Ratio	Coefficient	Z	Coefficient	Z
Σ^2	4.760	1.36	3.454	5.540
Log Y	-0.069	-0.48		
$LogY/Y_P$	-0.109	-0.31	0.013	0.240
$(Y/Y_P-1)^2$	3.970×10^{-8}	1.51	3.850×10^{-8}	1.440
$Log\ Y_P \times 97$	0.027	0.46		
$Log\ Y_P \times 99$	0.031	0.44		
$Log\ Y_P \times 01$	0.036	0.53		
$LogY/Y_P \times 97$	-0.019	-0.51		
$LogY/Y_P \times 99$	-0.016	-0.49		
$LogY/Y_P \times 01$	0.011	0.27		
Age 20-24	-0.017	-0.32		
Age 25-29	0.034	0.49	0.055	3.100
Age 30-34	0.041	0.49	0.066	3.560
Age 35-39	0.032	0.32	0.060	2.960
Age 40-44	0.036	0.33	0.066	3.110
Age 45-49	0.037	0.31	0.069	3.080
Age 50-54	0.030	0.25	0.063	2.600
Age 55-59	0.044	0.35	0.080	2.880
Age 60-64	0.042	0.31	0.083	2.570
Age 65-69	0.050	0.35	0.093	2.480
Age 70-74	0.079	0.54	0.123	3.000
Age >=75	0.111	0.74	0.158	3.350

[21] Although this term is not statistically significant in the restricted equation we could not accept that it had a zero coefficient when testing the overall set of restrictions.

Employed	-0.063	-1.5	-0.063	-7.610
Employed×97	0.013	0.22		
Employed×99	0.001	0.01		
Emplyed×01	-0.020	-0.33		
Degree	0.009	0.46		
Degree ×97	-0.012	-0.65		
Degree ×99	-0.007	-0.41		
Degree ×01	-0.010	-0.54		
Married	-0.156	-0.88	-0.163	-2.350
Maried×97	0.047	0.55	0.083	2.770
Married×99	0.067	0.86	0.051	1.810
Married×011	0.014	0.16	0.024	0.890
Age×Mar	0.003	1.18	0.002	2.100
Age×Married×97	-0.001	-1.55	-0.001	-1.960
Age×Married×99	-0.002	-1.99	-0.001	-1.880
Age×Married×01	-0.001	-0.63	1.640×10^{-5}	0.030
Age× Degree	-2.339×10^{-4}	-1.97	-2.176×10^{-4}	-3.500
Age× Degree× 97	9.400×10^{-5}	1.92	6.070×10^{-5}	2.910
Age× Degree ×99	1.584×10^{-4}	2.96	6.800×10^{-5}	3.620
Age× Degree ×01	3.750×10^{-5}	0.73	3.400×10^{-6}	0.200
Size	0.433	0.85	0.311	2.160
Age×Size	-0.005	-1.32	-0.004	-2.900
Age×Size×97	2.040E-05	0.02	-0.001	-2.270
Age×Size×99	4.601E-04	0.31	-3.756E-04	-0.820
Age×Size×01	-0.001	-0.56	-0.001	-2.470
Time97	0.114	0.49		
Time99	-0.038	-0.28		
Time01	0.054	0.29		
Age x σ²	0.004	1.07	0.003	2.010
Hown	-0.083	-1.29	-0.078	-3.610
Mortgage	-3.970E-04	-0.95	-0.001	-3.770
Poverty	-1.548	-1.43	-1.123	-6.130
λ	0.320	2.9	0.316	6.840
Constant	-0.286	-1.27	-0.237	-7.640
R^2	0.157			
Standard Error	0.305			
F(18, 20713)	1.010			

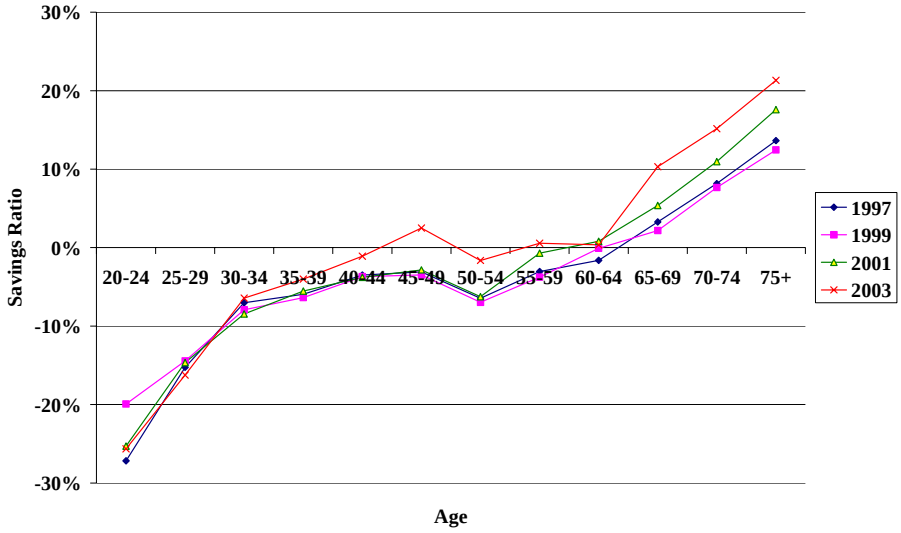
Variable definition: The dependent variable is saving divided by income. σ² denotes income uncertainty computed by equation 6; Y denotes the actual household's income deflated by the consumption deflator; $\hat{Y}_p$ *denotes normal income; σ² denotes income uncertainty computed by Equation 6; Degree=1 if the household head left full time education after the age of 20 Time03 denotes a time dummy for 2003. Age 20-24 to Age>= 75 are dummy variables indicating the age band appropriate to the household head. Age indicates actual age of the household head. Married, Divorced indicate martial status of the household head.* σ^2 *indicates the fitted variance of household income. The equation was estimated on 26512 households from the pooled Family Expenditure Surveys for 1997, 1999, 2001 and 2003. Size is the size of the household calculated using McClement's scale before housing costs. Poverty denotes dummy indicating size-adjusted income below 60% of median; λ denotes the Mills' ratio computed by a probit estimation in table 52;. Time dummies for 1997, 1999 and 2001 were also included. There were 20785 households in the sample with savings ratios in the range -0.5 to 0.5. The unrestricted equation included an additional 21 variables representing the level of education, the level of normal income and interactive terms between key variables.*

The equation shown in table 53 allows us to work out savings profiles for particular families as a function of age. As with the other countries, we look at a household consisting of a couple. They acquire two children at age 30 and the children leave home when the parents reach the age of fifty. The first household we consider lives with the average income of a household in its age group whose income, after adjusting for family size, is below 60% of overall median income. The head of this household is assumed not to be a home owner and also not to be a graduate. By definition the household lives in poverty.

The second household has the same family size but is a home owner from the age of 25 and has an income equal to the mean of households in each age group with incomes between 60% and 140% of the overall median after adjusting for family size. The third household has a head who is a graduate and also owns its own house beyond the age of 27. Its income is the mean of that of households in its age group with incomes greater than 140% of the population median.

In figure 48 we show the savings profile of our first household, with income below 60% of the median. We can see that such a household typically dissaves while its head is of working age, but becomes a saver once its head has retired. The equation generates high savings rates for old people, although we have already noted some reservations about the data which underpin this part of the model. The slope of the line is steep; however further investigation of the data (by the introduction of specific age dummies for households in poverty confirmed the existence of a powerful age trend for the saving behaviour of households with incomes below 60% of the median. An obvious reason why young households may dissave more than old households when their incomes are in this band is that they have more hope of higher income in the future. Indeed a general finding is that most households with incomes below sixty per cent of median do not experience such low incomes for very long. Mitchell, Mouratidis and Weale, (2005) found that, between 1991 and 2002 35% of households headed by people of working age had an income below the 60% threshold in at least one year but fewer than 5% had incomes below the threshold for nine or more years.

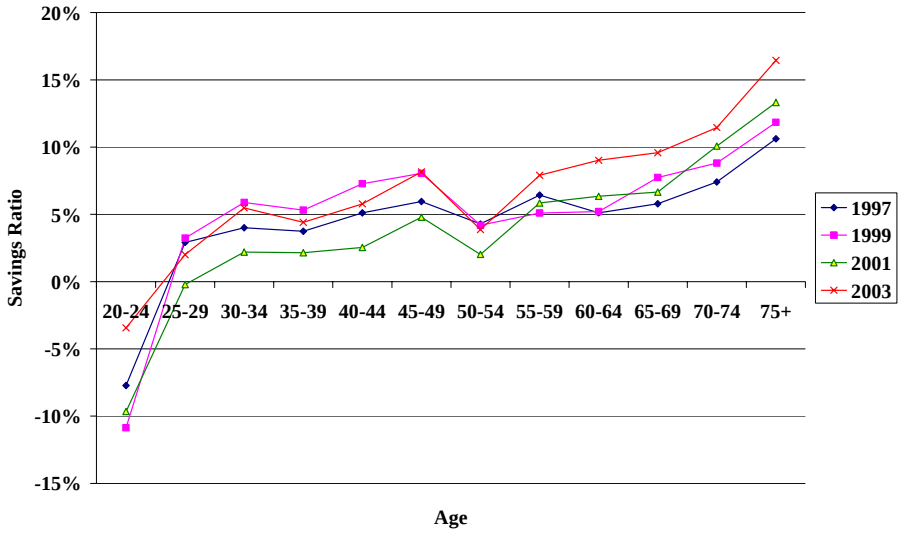
Figure 48: Fitted Savings Ratio – United Kingdom. Representative Family with Income < 60% of Median



In figure 49 we show the savings profile for a middling household. This again shows low saving by young people (despite the fact that the youngest households are assumed not to be home owners which tends to raise their savings rates) followed by a reasonably stable saving pattern in middle age and then once again saving rising among households headed by people over seventy. An implication of the low saving by young people is that, even though their incomes are those of the mean of the middling group, they nevertheless look forward to higher incomes in the future. Obviously there is less room for rises by people in this group than there is for those with incomes below 60% of the median.

It is difficult to attach any importance to the positions of the curves in different years. As we have noted earlier, the 2003 survey shows high saving at most age groups although the aggregate data show 1997 as the year with high saving.

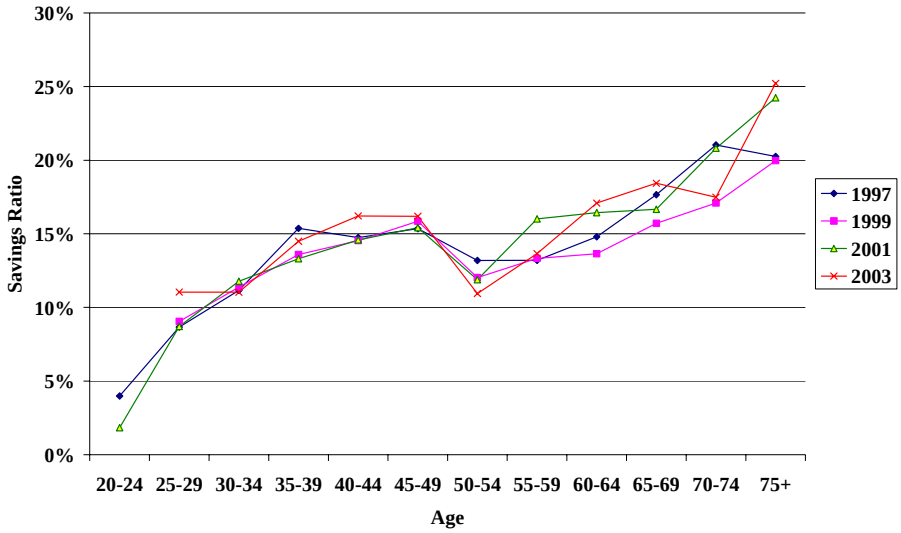
Figure 49: Fitted Savings Ratio – United Kingdom. Representative Family with Income 60%<140% of Median



Finally we look at the savings behaviour of a household whose income is more than 140% of the median and which accrues the average income of households in its age group and in this income category, with income measured after adjustment for family size. We could not estimate the equation for the youngest age group for two of the years because there were no households in this income category and therefore it was not possible to work out a mean income. The pattern shown in figure 50 is very similar to that of figure 49 although the position of the curves is generally higher reflecting the way in which saving rate rises with income. Given the UK equation this effect arises, as we have noted earlier, almost entirely through the effects of income on income uncertainty.

The low saving of young people once again deserves comment. People in this income band are, if there is any degree of regression to the mean, more likely to see their incomes fall than rise. It is hard to imagine that dissaving simply on grounds of youth is a rational decision. On the other hand the number of young households in this income band is very small (and none at all for two of the years) and the equation may not be at its best when describing this part of the population.

Figure 50: Fitted Savings Ratio – United Kingdom. Representative Family with Income >140% of Median



The general findings from the United Kingdom are that saving rises with income, although the effects are driving through the link between income and income variance. The fact that the equation for income variance includes a dummy for poverty in some sense creates the need for one in the saving equation as well. A reasonable conclusion, given figure 48 is that further work remains to be done on the saving habits of people on low incomes in the United Kingdom but it is unlikely that this has a great impact on overall saving, simply because only a small proportion of income accrues to people in poverty. We also find, in contrast to the figures for Spain and Germany that saving by young people is low. Analysis of the micro data does not provide a clue as to the decline in the aggregate savings ratio between 1997 and 2003 because this decline does not appear in the micro-economic data.

6 Conclusions

The general pattern provided by the saving equations is complex and in order to carry out a proper analysis of how various factors have influenced saving behaviour over time it would be best to incorporate them into a micro-simulation model. This would allow one to look at the fitted values of savings for households evolving, in their income and demographic characteristics in a realistic way over time. We can nevertheless draw some conclusions from a combination of the regression equations and the plots of the micro-economic aggregates in section 2.

First and perhaps most importantly the data shed some light on what has been happening in Germany, when the aggregate savings ratio rose slightly between 1998 and 2003. There we can see from figures 16 and 17 that saving by households on middling and high incomes rose between these two years, with the effect being particularly marked among young households on high incomes. In our simulations this effect is also present among households with high incomes. Such households can have a disproportionate influence on overall saving. The impression created from the fitted equations is that young people in Germany have a high savings ratio and this is

probably what lies behind the overall savings ratio which has to be described as high given that the pension scheme is not funded.

Another aspect of the same rise in savings rates is that savings rates of employed households in their thirties have risen. This is unlikely to be a consequence of life-cycle saving which tends to take place closer to retirement. However it may be precautionary saving associated with a fear of unemployment. It is not possible to assess whether that is in fact the case because we cannot observe fears from the available data. However further study would make it possible to assess unemployment risk as influenced by economic and demographic variables and to establish whether a latent variable describing this had any influence on saving behaviour. Even if this is not the case it is of course possible that fear of unemployment may still drive saving.

An effect which emerges very clearly from the German data- which are of the highest quality of the three countries we studied both because the sample sizes are large and because the income questions are very methodical- is that an important influence on the pattern of aggregate saving by age is the composition of the population. Saving as a function of income may not change very much with age, but if people tend to move through income categories aggregate saving will be affected. This can be seen in by comparing figure 14 with figures 16 and 17. Once again it points to the importance of looking at the implications of this in the context of a micro-simulation model.

Less important, but interesting nevertheless is the fact that employed households save more than non-employed households even after adjusting for income. This may again indicate saving driven by fear of unemployment.

The pattern for Spain and the United Kingdom is less clear. In neither case can we match the movements in the micro-data to movements in the macro-economic aggregates. For both countries and particularly for Spain the patterns shown in section 2 are much more volatile than are those for Germany. This results from much smaller samples and, in the case of Spain a survey which is much more focused on collecting consumption than income data. However the overall Spanish data in figure 25 given an impression of high saving by young households but declining with age unlike Germany where it is increasing with age. Simulating the results of the regression equations, particularly for low and middle income households in figures 45 and 46 re-inforces this impression and this may be a factor behind Spain's high overall savings rate.

The United Kingdom offers a contrast to this continental picture of high saving by young people. The data in figure 36 indicate a saving rate which rises up to the age of thirty at least with further rises up to the age of fifty or later. The simulations present this picture rather more strongly, with low saving by young people and even those on high incomes. Unless young people on high incomes expect further relative increases with the passage of time it is unlikely that the low savings rates can be attributed to life cycle effects; they are more probably an indication of a credit culture which has depressed saving in the United Kingdom for a long period.

We explored the effects of income uncertainty in all three countries using the measures which were available. We found a strong positive influence of income uncertainty on saving in the United Kingdom. In Germany we did not identify a significant effect. In Spain, where the only indicator of income uncertainty was constructed from the ratio of actual to normal income, the variable entered the equation with the wrong sign. It is impossible to say whether exploration of alternative measures of uncertainty would shed further light on this.

Finally we should note that the pattern we have identified here is coherent with the findings from the macro-economic analysis that in Germany and to a lesser extent in Spain consumption is depressed when the proportion of young people in the population is high. The United Kingdom does not experience this and the difference between the United Kingdom and Germany in the behaviour of young households is likely to be one of the factors explaining why saving is higher in Germany.

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8 Appendix: Data

In this appendix we discuss our data sources.

In this appendix we show the number of households whose savings rate falls within the range -0.5 to 0.5 in each age group. It is clear that the German surveys are run on a scale much larger than those used in Spain and the United Kingdom.

8.1 Germany

The main data bases for the analysis are two waves of the German income and expenditure survey (*Einkommens- und Verbrauchsstichprobe*, EVS) for the years 1998 and 2003. The EVS is collected every five years and includes extensive information on household characteristics (general socio-demographic characteristics, income, expenditures, household wealth) as well as separate information on the individuals in the household. Households report on income and expenditures for a quarter of a year. The sample in each quarter is of nearly equal size. About 50,000 households have participated in the 1998 survey. Currently, the data for the year 2003 are available only for the first two quarters with about 26,000 participating households. The survey is conducted by the German Federal Statistical Office. Scientific use files are available for researchers.

The survey focuses on a detailed recording of income from different sources (wage income, investment income, ...) as well as the recording of expenditures. Income from the withdrawal of savings and expenditures for the accumulation of savings are recorded in detail. Expenditures on consumption goods are reported for a large number of consumer good categories including imputed rents for owner occupied housing. 1998 data in money values are converted to 2003 prices.

In addition to the EVS, we use the data of the German *Socio Economic Panel* (SOEP) for the years 1996 to 2003 to analyze the variance of income of households over time. The German Socio-Economic Panel is a representative longitudinal study of private households in Germany and is operated by DIW, Berlin. The panel started in West-Germany in the year 1984 with 5,921 households containing 12,290 respondents and in the year 1990 for East Germany with 2,179 households and 4,453 respondents. Since the start, the sample was refreshed drawing additional households and also extended for a better coverage of specific household groups such as immigrants and households with very high income. The data set covers a huge number of socio-demographic characteristics of the household as well the household members. Among these characteristics is also net household income. The analysis of the German data is applied to the whole survey population.

To assess the factors which may explain the degree of income uncertainty of households identified in the SOEP, we use the information on actual monthly net household income which is collected directly in the questionnaire. It is defined as gross household income including public transfers minus taxes and social security contributions.

Our analysis of savings behaviour was conducted using the EVS. Variable definitions[22] were

[22]Disposable Income and Saving are defined as:
Gross labour income (employees) (not including contributions of employers to social security, including

chosen to be as close as possible to the definitions used for Spain and the United Kingdom. It should be noted that imputed income for owner-occupied housing is not included in the gross income of the household and thus not in the disposable income. Monetary variables are deflated to 1998 prices using the consumer expenditure deflator. The number of households with saving lying in the range -0.5 to 0.5 is shown in table 54 classified by age of the household head.

Both German surveys are available only to authorized researchers.

Table 54: Number of Households by Age – Germany

Age	1998	2003
<=24	744	490
25-29	2385	995
30-34	5022	1624
35-39	6350	2788
40-44	5908	3130
45-49	4972	2790
50-54	3533	2443
55-59	3970	1864
60-64	3670	2002
65-69	2814	1919
70-74	2392	1168
75+	2325	1403

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grants from employers to certain private savings plans, but not including employer contributions to occupational pension schemes)

+ Gross self-employment earnings

+ Investment income (imputed income for owner-occupied housing not included)

+ Public transfers

+ Private Transfers (from private insurance companies, unions, private non-profit organizations, other households, occupational pensions)

+ Subletting

= Gross Income

- Taxes and social security contributions

= Net Income

+ income from selling goods (used or produced in the household, including jewelry), refunds for goods, reimbursements for example from insurance companies, specific benefits from private insurance companies (not included in " private transfers"), other kinds of income (for example lottery proceeds)

= Disposable Income

- private consumption: consumption including durables

- " other expenses" : contributions to private insurance companies (with some minor exceptions insurance with no capital building), transfers to other private households and organizations, voluntary contributions to the (public) social security system, " other taxes, for example specific taxes on cars, taxes on inheritances, mortgage interest

= Savings

8.2 Spain

The Spanish *Encuesta Continua de Presupuestos Familiares*, ECPF, has, as its name implies, run continuously since 1998 with the data available up to 2003. It provides information on households' income and expenditure and is, in principal, a panel survey with households taking part for eight quarters. However we were unable to link the panel in the time available during this project, and we were obliged to treat it as a cross-sectional survey. In each quarter the survey contains up to 8000 households; over the period 1998-2003 we have in total about 165,000 records.

It is plain that the main purpose of the ECPF is to measure expenditure; the survey gives the impression that the income data are used mainly to categorize households rather than to provide a firm basis of the relationship between income and expenditure. Households are nevertheless asked whether they receive income from a variety of sources and also to provide a figure for their monthly income. The components of income underlying this total are not spelled out in the questionnaire. Perhaps because the focus of the survey is on expenditure rather than income the majority of households do not report their incomes. Out of the 165,000 records only about 25,000 contain usable income data.

The overall total for expenditure includes imputed rent. However the aggregated file also shows the percentage of total expenditure which has been imputed and we calculate and then deduct the imputation in order to use a figure for cash expenditure which we compare with cash income. The survey provides only summary information on income. Real income is calculated by dividing nominal income by the consumer price index for the year in question. The age of the household head is specified but not for other household members. We are simply told to which age bands they belong. We assume that the people concerned have the ages given by the mid-points of the bands in order to calculate the effective household size based on the McClements scale. The Spanish survey is publicly available from INE.

The number of households in each age band with saving in the range -0.5 to 0.5 is shown in table 55.

Table 55: Number of Households by Age – Spain

Age	1999	2000	2001	2002	2003
<24	15	16	17	17	17
25-29	89	66	63	54	66
30-34	183	155	125	136	170
35-39	290	250	241	255	239
40-44	268	244	243	237	313
45-49	250	214	205	214	241
50-54	212	196	172	214	244
55-59	196	175	214	258	270
60-64	354	261	244	234	249
65-69	463	413	399	417	417
70-74	474	418	397	445	440
75+	694	742	740	725	797

8.3 United Kingdom

The United Kingdom *Family Expenditure Survey*[23], FES, is conducted annually; we have studied 1997, 1999, 2001 and 2003. It provides data on household income and expenditure. We estimate savings functions from the income and expenditure data provided by a pooled sample of 26512 households in four years of the *Family Expenditure Survey* mentioned above. We define income as net cash income excluding imputations, with imputations similarly excluded from expenditure. Real income is calculated by dividing nominal income by the consumer price index for the year in question. Household net income represents the gross weekly household earnings minus taxes and superannuation contributions while total expenditure includes housing maintenance, central heating, net rent, council taxes, water etc. The number of households in the pooled sample with income in the range -0.5 to 0.5 is shown, classified by age in table 56.

The data we use to calculate income variance cover the period 1996-2002 and relate to 987 households with complete records for this period in the *British Household Panel Survey*. We look at the uncertainty of income adjusted for household size; household income is divided by an indicator of size constructed from the McClements scale. All monetary data are converted to 2000 prices using the consumer expenditure deflator.

The UK surveys are available only to approved researchers.

Table 56: Number of Households by Age – UK Surveys

Age	1997	1999	2001	2003
<=24	201	75	80	46
25-29	455	412	373	303
30-34	602	552	552	507
35-39	535	603	580	568
40-44	492	503	496	585
45-49	496	475	496	496
50-54	405	448	503	465
55-59	323	409	376	441
60-64	309	350	343	375
65-69	353	356	370	423
70-74	387	364	360	387
75+	560	540	540	624

[23]This was combined with the *National Food Survey* to become the *Expenditure and Food Survey* in 2002