CONSUMPTION, FINANCIAL AND REAL WEALTH IN THE G-5

Ray Barrell and E Philip Davis [1]

NIESR and Brunel University
London

16 February 2004

Abstract

Financial assets are generally chosen for encapsulating wealth effects in empirical work on aggregate consumption, but there is growing interest in tangible wealth, notably housing, as a potential determinant. We estimate consumption functions for the G-5, country-by-country and on a panel basis, which encapsulate roles for both tangible and financial wealth. Results suggest that tangible wealth plays a distinctive role in the determination of consumption in the short- and long-run. We also detect a marked negative effect of real interest rates. Results are of particular relevance to monetary policy, as well as being of importance for modelling and forecasting.

Keywords: Consumption, Housing and Financial Wealth, Cross country panel data
JEL Classification E21

---

1 Barrell (corresponding author): Senior Fellow, NIESR, 2 Dean Trench Street, Smith Square, London SW1P 3HE e-mail rbarrell@niesr.ac.uk. Davis: Professor of Economics and Finance, Brunel University, Uxbridge, Middlesex, UB8 3PH and Visiting Fellow, NIESR. e- mails: philip.davis@brunel.ac.uk and e_philip_davis@msn.com The authors thank Ali Al-Eyd for helpful suggestions and Laurence Boone (OECD) for assistance with data provision. The work was undertaken as part of the ESRC Programme on The Evolving Macro Economy under grant number L138250122.

Introduction

Most empirical studies of aggregate consumers' expenditure which test for wealth effects have used aggregate financial wealth definitions, and have been estimated on a single country basis. However, an increasing focus is being placed on the potential role of tangible wealth, and in particular the housing component, as a potential determinant of aggregate consumption. For example, in the wake of the crash in the stock market after 2000, the strength of consumption in a number of countries has been linked to the strength of house prices. In this article, we seek to estimate consumption functions for the G-5, country-by-country and on a panel basis, which encapsulate a role both for tangible and financial wealth. We estimate over 1980-2001, a period during which most of these countries were generally more financially liberalised than they had been in the 1970s and previously[2]. Our results suggest that tangible wealth plays a distinctive role in the determination of aggregate consumption. Furthermore, we find a marked negative effect of real interest rates on consumption. All of these results are of particular relevance to monetary policy makers, as well as being of general importance for modelling and forecasting.

1 Theoretical and empirical background

The case for including wealth generally in the consumption function is based on the concept of the life cycle, whereby planned consumption is a function of total wealth, based on human wealth and non-human wealth. Non human wealth comprises both financial and non financial wealth. This can be seen in the version of the Life-Cycle Hypothesis of Ando and Modigliani (1963) 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), net financial wealth (FW_{t-1}) and tangible wealth (TW_{t-1}). Planned consumption can accordingly be expressed as a function of H_t, FW_{t-1} and TW_{t-1}

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

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 weights on financial and non financial nonhuman wealth could plausibly vary, given their varying liquidity and the possibility of liquidity constraints on households in general. In the case that households are constrained in their borrowing, the direct liquidity of the components of wealth will be crucial for their effect on consumption. A lower weight would accordingly be anticipated for less liquid assets, including both illiquid financial assets (equities, bonds, life insurance and pension funds) and a fortiori for tangible wealth. Illiquid assets are not just capital uncertain but also subject to higher transactions costs, in some cases restrictions on transactions (e.g. cashing pension rights) and indivisibilities (e.g. housing).

[2] Discussions of the evolution of the impacts of financial liberalisation on consumption can be found inter alia in Blundell-Wignall et. al. (1995) and Campbell and Mankiw (1991).

When there are no credit constraints, as in a liberalised financial system, ability to consume out of illiquid wealth is enhanced. This affects both illiquid financial and non financial tangible wealth. The incidence of liquidity constraints will be shown inter alia by the relative size of income and wealth terms in the consumption function. In particular we might expect to see a relatively larger role for recent changes in income in systems with more liquidity constrained consumers. Note that housing may be used as collateral just as readily as less liquid financial assets, as well as being more widely distributed, while mortgages facilitate the release of housing equity without moving home. Hence there seems no reason for tangible assets 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. This argument could also extend to those wishing to increase their housing stock either for rental or for consumption, since the nominal amount of borrowing or saving needed will increase when house prices rise sharply.

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).

Empirically, there is a significant literature investigating the impact of wealth on consumption, albeit mainly focusing on financial wealth. A recent example is Davis and Palumbo's (2001) study of the US consumption function, which attempted to determine whether changes in wealth affect the growth rate of consumer spending. They examined quarterly aggregate US data from 1960 to 2000 and following the critique of Euler approach above, modelled long-run relationships to investigate whether (logged) consumption, income and wealth share a common trend. They found that there is a statistically significant long run wealth effect on consumer spending. Ludvigsen and Steindel (1999) also examined wealth effects in a loglinear long-run consumption relationship and found a statistically significant wealth and income effect. They also showed that these variables share a common trend, using quarterly US data

Outside the US, Barrell, Byrne and Dury (2003) found evidence of an effect of wealth and 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. 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.

As regards work using tangible wealth, this has mainly been on a single country basis, such as Murata (1994) for Japan and Barrell et al (2003) for the UK. The outcomes have nonetheless been promising for an effect of tangible wealth on consumption. One international study worthy of note is Boone et al (2001) who obtained some significant long and short run effects on consumption in the G-7 when disaggregating wealth into financial, housing and other wealth. There is also a 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)). However, it can be argued that it is clearly better to utilise data on the value of the asset stock, 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.

With the exception of Euler equation estimates, most of the empirical literature[3] has not used real interest rates as a determinant of consumption. Indeed, reviewing the earlier literature in the mid 1990s, Muellbauer and Lattimore (1995) suggested that "there is little empirical evidence of a strong and stable negative real interest rate effect on consumption that many economists expect". We would argue this and other less favourable results in the empirical literature on consumption in part results from the use of data sets including the financially constrained 1970s with little data from the less constrained 1990s.

2 Estimation results

Against the background of earlier work cited above, we aimed to assess international experience, using both disaggregated tangible and real wealth and also a real interest rate. We extend the long run specification of Byrne and Davis (2002), Ludvigson and Steindel (1999) and Davis and

[3] One exception is De Bondt (1999) who includes real interest rates as well as the difference of real income in a hybrid "modified Euler model" giving a purely short term specification for EU countries (i.e. with no long run cointegration). Real rates were only found significant in two of six countries, Germany and the Netherlands. His main focus is to test for a "credit channel" effect arising from the household sector "external finance premium", the difference between relevant mortgage borrowing rates and bank deposit rates.

Palumbo (2001) to allow for tangible as well as net financial wealth and a separate effect of real interest rates to allow for intertemporal substitution. This means we adopt a relationship based on the cointegrating vector containing logs of the non-stationary variables - consumption, income and net wealth measures. Deaton and Campbell (1989) inter alia have argued that relationships of this nature help explain asset market behaviour through their impact on the equity premium, besides their qualities for data description. They also point out that 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. Hence we adopt a logarithmic approximation to ensure that income, in natural logs, is difference stationary and hence that our long-run relationship can be non-spurious. Note that in all cases we include wealth per se and not a proxy based on asset prices. Meanwhile, to capture dynamics we complement the cointegrating relationship with differences of the I(1) variables. Since it is I(0), the real interest rate set in levels also stands outside the cointegrating relationship.

We assume that planned consumption does not always equal actual consumption so taking into account the above discussion of the necessity of taking logs, as well as desire to test for real interest rate effects, we can first derive the following long run relationship (2) for desired consumption (C_t), and then set this into an equilibrium correction form (3).

$$\log C_t = a * \log RPDI_t + b * \log(NFW_{t-1} + NTW_{t-1}) + c * RR_t + e_t \tag{2}$$

We initially sought to estimate country-by-country consumption functions with the relationship between consumption (C) and income (RPDI) augmented by a split between changes in real tangible wealth (NTW) and financial wealth (NFW) in the short term but common coefficients on both components of real net total wealth (W) in the long term. The equations also test for a real interest rate effect (RR), consistent with the Euler approach. For the long run, we constrained the income and wealth coefficients (a and b above) to sum to one[4].

We express these ideas as the standard equilibrium correction consumption function

$$\begin{aligned} d\log(C_t) &= a + b*(\log(C_{t-1} - c*\log(RPDI_{t-1}) - (1-c)*\log(NFW_{t-1} + NTW_{t-1})) + d*RR_t \\ &\quad + d1*d\log(RPDI) + d2*d\log(NFW) + d3*d\log(NFW) + other - dynamics \end{aligned} \tag{3}$$

Our country-by-country results estimated by non-linear least squares are reported in Table 1, with a common data period for estimation from 1980q1 to 2001q4. Broadly consistent results are obtained for all of the G-5 with the error correction term being significant, suggesting the

[4] Here we differ from Boone et al (2001), who impose a long run unit elasticity between consumption and income which we would regard as a misspecification for our consumption functions, although it might be appropriate if one were to investigate the factors affecting the saving ratio. In addition Boone et. al. (2001) use the nominal interest rate, whilst we would consider the real rate to be more appropriate.

presence of cointegration although cointegration is shown to be borderline in the case of France. Long run total-wealth effects are highest in the US and Japan, intermediate in the UK and lowest in France and Germany. The impacts of wealth on consumption may reflect the relative importance of liquidity constraints, and our results are consistent with previous estimates. Blundell-Wignall et. al. (1995) found that 66% of German consumers were liquidity constrained at the start of our data period, and that figure did not decline in the 1980s. They also found that 32% of French consumers were so constrained at the same time as compared to 17% in the UK. Campbell and Mankiw (1991) found similar results on the evolution of liquidity constraints over time, and suggest that the UK and the US had similar numbers unconstrained at the start of the 1990s.

Table 1: Estimates of consumption function with total wealth and real interest rates (non-linear least squares estimation)

Data period 1980q1 - 2001q4

	US	UK	Germany	Japan	France
Constant	-0.143 (2.3)	-0.092 (2.6)	-0.083 (1.3)	-0.131 (2.7)	-0.033 (1.1)
ECM	-0.117 (3.0)	-0.12 (4.0)	-0.18 (3.2)	-0.101 (3.6)	-0.0553 (2.0)
ln RPDI (-1) ln W (-1)	0.798 (22.5) 0.202 /	0.899 (26.1) 0.101 /	0.951 (21.6) 0.049 /	0.842 (22.6) 0.158 /	0.914 (9.8) 0.086 /
D ln RPDI	0.161 (3.4)	0.122 (2.5)	0.759 (15.2)	0.469 (3.1)	0.344 (3.5)
D ln RPDI (-1)	0.149(2.9)				
D ln C (-1)	-0.267 (3.2)		-0.133 (2.2)		-0.414 (4.6)
D ln NFW	0.049 (4.3)				
D ln NFW (-1)		0.02 (2.1)			0.022 (2.0)
D ln NTW	0.247 (5.0)				0.102 (3.4)
Dln NTW (-1)		0.21 (6.8)			
RR	-0.0013 (5.1)		-0.00077 (2.0)		-0.0011// (4.6)
RR(-1)		-0.0006// (1.8)		-0.0015 (3.7)	
R-bar-2	0.705	0.62	0.83	0.68	0.64
SE	0.0034	0.0052	0.005	0.0056	0.0044
DW	2.38	2.08	2.29	2.11	2.13
LM (4)	6.7	5.5	5.5	9.4	2.4
RESET (1)	2.9	0.9	3.3	3.1	0.05
NORM (2)	1.9	1.4	0.4	2.1	0.4
HET (1)	1.1	1.6	1.4	2.3	0.3
Dummies	81Q4, 82Q4, 83Q1-Q4, 87Q1, 90Q4, 91Q1, 91Q4	86Q1, 88Q3, 92Q2	86Q1-Q2, 88Q1, 83Q1, 87Q2 90Q3 93Q2, 99Q1	87Q1, 89Q2, 97Q1, 97Q2, 99Q1	83Q1, 83Q3, 84Q4, 96Q1, 96Q4-97Q3

Notes: ECM error correction term on lagged log of consumption; C consumption, RPDI real personal disposable income, W total net wealth; NTW tangible wealth; NFW net financial wealth; RR real short term interest rate; LM Lagrange multiplier test for serial correlation; NORM Jarque Bera test for normality; HET ARCH (1) test for heteroskedasticity; RESET Ramsey's RESET test for parameter stability.

/ coefficients on ln RPDI (-1) and ln W (-1) constrained to sum to one;

// UK and French interest rate terms are for the 1990s only

The short run effect of income growth is small in the US and UK compared with the other countries, consistent with an absence of liquidity constraints. The impact of changes in current income is highest in German where, as noted, the proportion of liquidity constrained consumers may be larger than elsewhere. In the US, Germany and France, additional dynamics terms in the lagged dependent variable were significant, but were found to be absent elsewhere. Dynamic terms in wealth can be expected to be stronger in countries where markets are financially liberalised and hence changes in illiquid financial and (also illiquid) non-financial wealth can be transformed into their liquid form quickly.

As regards the structure of wealth effects in the short run, the change in tangible wealth enters positively, except for Germany and Japan where it is insignificant. This implies that there is a short as well as long run effect of house prices on consumption, which especially in the US and UK is sizeable. The change in net financial wealth enters with a significant positive effect, again for the UK, US and France. In all of these three countries, the short run tangible wealth effect exceeds the financial one. We note that there may be institutional reasons for these differences, as households in Germany are less likely to own their houses[5] than in the UK, US or France, while in Japan "equity extraction" is not common. Meanwhile, it is in the US that households are most aware of their financial wealth, leading to an immediate response of consumption.

Negative real interest rate effects, implying intertemporal substitution, are also significant at the current level or first lag in all countries, contrary to earlier work summarised as noted above in Muellbauer and Lattimore (1995). The real interest rate effects vary between around -0.0006 and -0.015, implying that a sustained 1% rise in real interest rates reduces consumption by 0.5% to 1.5% in the long run. The most powerful effects are in the US and Japan. Note that in the UK and France, interest rate effects were only found to be significant in the period from 1990 onwards. This is consistent with an effect of financial liberalisation on intertemporal substitution, which emerges after the initial adjustment of balance sheets to liberalisation is complete. The negative interest rate effect in Japan contrasts with earlier work suggesting a positive coefficient (Murata 1994) – interest rate effects were also omitted from earlier work on the UK from Barrell, Choy and Riley (2003).

The statistical properties of the equations are generally satisfactory, with no problems at the 5% level of autocorrelation, heteroskedasticity, non normality, or structural instability. Dummies have been included for specific events, and the German data has been adjusted to allow for the impact of unification.

Developing the work above, we estimated comparable equations using panel data techniques. Given that we are working with N (number of cross section observations) far below T (time series observations) we can employ SUR as a regression method, and given likely contemporaneous correlations due to common economic shocks we are likely to improve our estimates as a result. We tested a general encompassing framework for the dynamics, including all of the variables in Table 1, even where they are not significant for individual countries. The estimates in Table 2 show that the long run results of single equation estimation stand up when we employ a panel. The long run coefficients on the mean group estimate (the average of the SUR-based single equation estimates), the pooled mean group (PMG) (where the error correction and income term are constrained to be identical, see Pesaran et al (1999)) and the fixed effects estimator are comparable. We note that the pooling of the long run coefficients in the pooled

[5] Owner occupation is well below the proportion of the housing stock owned by the personal sector as a whole, given the prevalence of rental homes also owned by households.

mean group equation is accepted by the likelihood ratio test[6]. On the other hand, although the averaged-out mean group coefficients are broadly similar to those in the fixed effects, the likelihood ratio test decisively rejects pooling for the full range of independent variables in the fixed effects column[7]. This result is perhaps unsurprising in the light of the differing dynamics shown in Table 1.

Table 2: Panel estimates of consumption function with unrestricted dynamics (using SUR estimation)

Data range 1980q1 – 2001q4

Fixed effects	Mean Group	Pooled mean group	Fixed effects
ECM	-0.093 (5.0)	-0.064 (6.1)	-0.063 (5.6)
ln RPDI (-1)	0.895 (36.9)	0.908 (32.9)	0.882 (32.7)
ln W (-1)	[0.105]	[0.092]	[0.118]
D ln RPDI	0.278 (2.2)	C	0.262 (8.6)
D ln RPDI (-1)	0.11 (4.8)	C	0.107 (3.3)
D ln C (-1)	-0.156 (1.6)	C	-0.182 (4.6)
D ln NFW	0.011 (0.7)	C	0.02 (0.4)
D ln NFW (-1)	0.0033 (0.3)	C	0.018 (3.1)
D ln NTW	0.024 (0.3)	C	0.079 (3.2)
Dln NTW (-1)	0.106 (3.0)	C	0.029 (1.2)
RR	0.00016 (0.3)	C	0.0001 (0.1)
RR(-1)	-0.00108 (2.0)	C	-0.0091 (5.3)
Log likelihood	1688	1683	1584
Likelihood ratio test		X2 (8) = 10 [P=0.237]	X2 (44) = 207 [P=0.000]

Notes: See Table 1; Likelihood ratios test impositions in sequence. In column 2 we reduce the number of long run parameters from 10 in SUR to 2 in the PMG panel, and have 8 restrictions. In column 3 we restrict all coefficients to be the same, and have 44 restrictions on the SUR C=individual country coefficients estimated freely. We do not report these. In Appendix Table A1 we report the significant coefficients for comparability with Table 1 .

We used the statistically acceptable pooled mean group specification to experiment with the long run, first freely estimating and then splitting out the long run wealth term. Hence the first column of Table 3 shows the pooled mean group equation shown above. The second column shows that when the wealth term is freely estimated, it has a significant coefficient of 0.13, comparable to the constrained value. With a log likelihood of 1683 it is clear that imposing the condition that the long tern parameters on income and wealth sum to unity is a valid restriction of the MGE equations. The third column seeks to test in a non nested manner the equality of coefficients between financial and tangible wealth in the long term. We do this by producing a specification that has a separate term for financial assets and also one plus the log of the ratio of tangible to financial wealth.

[6] On the other hand we were unable to accept pooling of a system with a common real interest rate effect along with a common long run.

[7] The MGE coefficients are the average of SUR coefficients where all dynamic terms were included for all countries. They are not the same as the single equation dynamic terms in Table 1 as some of these are restricted to be zero. It would not be appropriate to use those restrictions in this context.

Table 3: Panel (pooled mean group) estimates of consumption functions with unrestricted dynamics (using SUR estimation)

Data range 1980q1 – 2001q4

	Equation 1	Equation 2	Equation 3
Fixed effects			
ECM	-0.064 (6.1)	-0.063 (5.9)	-0.061 (5.4)
ln RPDI (-1)	0.908 (32.9)	0.822 (8.8)	0.794 (7.9)
ln W (-1)	[0.092]	0.128 (2.7)	
B1 (financial)			0.134 (2.8)
B2 (tangible/ financial)			0.8 (2.5)

Notes: see Table 1 and equation (1)

Algebraically the log of total wealth (with testable coefficients included) can be divided as follows. If

$$\ln W = \ln\left(W_{[FIN]} + W_{[TAN]}\right) = \ln(W_{[FIN]}(1 + W_{[TAN]} / W_{[FIN]})) \qquad (4)$$

then we may set out the separation of the two wealth terms in a testable form as

$$B1 * \ln W = B1 * [\ln W_{FIN} + B2 * \ln(1 + W_{TAN} / W_{FIN})] \qquad (5)$$

We embedded our nested long-run equation within our pooled mean group specification and tested for the value of the coefficients B1 and B2 where B1 indicates the long run wealth effect. If B2=1 the long run effects of real and financial wealth are identical. On the other hand, if B2=0 then only financial wealth matters in the long run. Intermediate values of B2 indicate a lower but still positive effect of real non financial wealth in the long run. As can be seen, B1 is comparable to the freely estimated long run wealth term, while B2 is significantly different from zero, and whilst it is below 1, at 0.8, it is not significantly different from 1.0. Hence on average we can conclude that real tangible wealth does have an impact in the long run, but it is possibly the case that in the G5 it has an impact that is smaller than that of financial wealth. This may reflect the income and substitution effects which reduce consumption for those members of the population who are not owner occupiers or who aim to increase their housing stock.

However, as its coefficient can be validly imposed at 1.0 then we may expand on the pooled mean group estimator and investigate whether the idiosyncratic differences in dynamics and in the timing of the interest rate effects we uncovered in the single equation regressions hold up in the pooled mean group estimator. Our pooled mean group has the same dynamic terms in every equation, not all of which are significant, and both the pattern of significant variables that can be included and the appropriate lag structure can be investigated further. We discuss the idiosyncratic dynamic elements in the Appendix and show that the pattern of dynamic effects remains essentially the same as in the individual country regressions, with any differences being attributable to imposing a common long run or to the use of SUR which utilises information on cross equation covariances in estimating standard errors.

Conclusions

Using data from 1980 to 2001[8], we have shown that within the context of SUR based panel estimation it is possible to impose the same structure and parameters on the long run determinants of consumption in the US, the UK, France, Germany and Japan. We have also shown that in the UK, US and France, short term effects of changes in tangible wealth on consumption can be detected separate from and typically larger than those of changes in financial wealth. The logic may be that tangible wealth is larger and more evenly distributed than financial wealth, which in the short run more than offsets the negative effects of house prices on consumption of those who are not owner occupiers.

There are however significant differences in dynamics across the G-5, which may link to institutional differences in credit and housing markets. The short term wealth effects are absent in Germany and Japan, and in these countries, and especially in Germany, the impact effect of changes in income are larger than in the more financially liberalised UK and US, much as we would expect. France exhibits both impacts from dynamics in assets that follow from liberalisation itself and larger effects from income growth than we see in the relatively more financially liberalised economies such as the UK and the US. The pattern of results is congruent with estimates of the proportion of liquidity constrained consumer in, for instance Campbell and Mankiw (1992) and Blundell-Wignall et. al. (1995), as we discuss above.

Panel estimation reveals that there is a significant long run wealth effect of around 0.1 in all countries, within which financial wealth possibly has a slightly larger effect than tangible wealth. It can be argued that in the long run, negative income and substitution effects become more important to non owners and those wishing to invest more in housing. In both single country and panel estimates, we also find strong negative real interest rate effects consistent with intertemporal substitution. However, the strong significance of the income and wealth terms shows again that the simple Hall (1978) Euler equation specification is an inadequate description of the determination of consumption. It can be argued that the results are of particular relevance to monetary policy makers, indicating as they do a direct effect of their policy lever on consumption, as well as calibrating the impact from variables under more tenuous control such as incomes and wealth.

---

[8] We argue that in this work, by using the most recent data and omitting the 1970s when credit constraints were marked – and diverse - in most countries, we have obtained the most relevant estimates for current conditions.

APPENDIX

Table A1: Dynamics of pooled mean group estimate (after testing down to significant lags), using SUR estimation

	US	UK	Germany	Japan	France
D ln RPDI	0.113 (2.7)	0.087 (2.0)	0.75 (16.2)		0.34 (4.2)
D ln RPDI (-1)	0.14 (3.1)			0.34 (2.4)	
D ln C (-1)	-0.303 (3.8)		-0.21 (4.2)		-0.43 (5.6)
D ln NFW	0.037 (3.7)				
D ln NFW (-1)		0.027 (3.0)			0.019 (2.1)
D ln NTW	0.22 (5.0)	0.199 (7.6)			0.103 (4.1)
Dln NTW (-1)	0.13 (2.9)				
RR	-0.014 (6.4)	0.0072 (2.5)	0.006 (1.9)	0.019 (4.7)	-0.013 (6.9)
RR(-1)		-0.0087 (2.9)	-0.007 (2.2)	-0.025 (6.4)	

In order to cast further light on dynamics, we show in Table A1 the dynamics for the pooled mean group equations (restricted to those variables which are significant). They are again diverse and are comparable to those in Table 1. The main differences are significant lagged change of logged real tangible wealth for the US, different lags on UK difference of tangible wealth and Japanese difference of RPDI, and in the UK, Germany and Japan we have significant positive levels and negative lags of real interest rates, albeit with a net negative effect as in Table 1.

This pattern of results is consistent with our results in Table 1 where the UK and the US look similar in terms of the significant variables in the dynamics, whilst Germany stands out as having a more noticeable contribution from the dynamic term in incomes, as we would expect if many consumers were constrained. Japan appears to have relatively few constrained consumers. France looks like a country somewhere between Germany and the US in terms of the number of constrained consumers and in the role of changes in current income

REFERENCES

Ando, A. and Modigliani, F. (1963). "The Life-Cycle Hypothesis of Saving: Aggregate Implications and Tests", *American Economic Review*, 103, 55-84.

Barrell, R., Byrne J., and Dury K., (2003) "The implications of diversity in consumption behaviour for the choice of monetary policy rules in Europe", *Economic Modelling*, 20, 275-299

Barrell R, Choy A and Riley R (2003), "Consumption and housing wealth in the UK", *National Institute Economic Review*, 186 (October 2003), 53-56

Blundell-Wignall, A., Browne, F., and Tarditi, A., (1975) 'Financial liberalisation and the permanent income hypothesis' *Manchester School*, 63, 125-144

Boone L., Girouard N. and Wanner I. (2001) 'Financial market liberalisation, wealth and consumption', Economics Department Working Paper No. 308, OECD, Paris

Byrne, J.P. and Davis, E.P. (2003). "Disaggregate Wealth and Aggregate Consumption: An Investigation of Empirical Relationships for the G7", *Oxford Bulletin of Economics and Statistics*, 65, 197-220

Campbell J and Deaton A (1989), "Why is consumption so smooth?", *Review of Economic Studies*, 56, 357-373

Campbell, J., and Mankiw, G., (1991) "The response of consumption to income: a cross country investigation", *European Economic Review*, 35, 723-767

Davis, M.A. and Palumbo, M.G. (2001). "A Primer on the Economics and Time Series Econometrics of Wealth Effects", *Finance and Economics Discussion Paper*, Federal Reserve Board Washington.

Deaton, A.S. (1992). *Understanding Consumption*, Oxford University Press, Oxford.

De Bondt, G.J. (1999). "Credit Channels in Europe – a Cross Country Investigation", *BIS Working Paper* No 69.

Hall R E (1978), "Stochastic implications of the life cycle/permanent income hypothesis; theory and evidence", *Journal of Political Economy*, 86, 971-987

Lettau, M. and Ludvigson, S. (2001). "Consumption, Aggregate Wealth and Expected Stock Returns", *Journal of Finance*, 56, 815-849.

Ludvigson, S. and Steindel, C. (1999). "How Important is the Stock Market Effect on Consumption?" *Economic Policy Review*, Federal Reserve Bank of New York, July.

Ludwig, A., and Sloek, T., (2002) "The impact of changes in stock prices and house prices on consumption in the OECD countries" *IMF working paper* WP/02/01

Muellbauer, J. and Lattimore, R. (1995). "The Consumption Function", in Pesaran, M.H. and Wickens, M. (eds.), *Handbook of Applied Econometrics: Macroeconomics*, Blackwell, Oxford.

Murata, K. (1994). "The Consumption Function in Japan", Oxford M. Phil. Thesis.

Pesaran M H, Shin Y and Smith R P (1999), "Pooled mean group estimation of dynamic heterogeneous panels", *Journal of the American Statistical Association*, 94, 621-634

Sarantis N and Stewart C (2003), "Liquidity constraints, precautionary saving and aggregate consumption; an international comparison", *Economic Modelling*, 20, 1151-1173