Housing Wealth and UK Consumption

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Abstract

There is widespread disagreement about the role of housing wealth in explaining consumption. However, much of the empirical literature is marred by poor controls for the common drivers both of house prices and consumption, such as income, income growth expectations, interest rates, credit supply conditions, other assets and indicators of income uncertainty (e.g. changes in the unemployment rate). For instance, while the easing of credit supply conditions is usually followed by a house price boom, failure to control for the direct effect of credit liberalization on consumption can over-estimate the effect of housing wealth or collateral on consumption. This paper estimates an empirical model for UK consumption from 1972 to 2005, grounded in theory, and with more complete empirical controls than hitherto used.

1. A Brief Review of Evidence on the Effects of Housing Assets on Consumption.

Simple life-cycle consumption theory suggests that a permanent rise in house prices has both a positive wealth effect and negative income and substitution effects on consumption. For renters, only the negative effects operate: intuitively, renters need to save more to get onto the housing ladder and in anticipation of higher rents. Moving outside of the simple life-cycle theory of consumption, other effects operate through the collateral role of housing: higher house prices raise consumption by relaxing the credit constraints faced by owner-occupier households. As a result, variations in credit market and tax regimes as well as in transactions costs can affect the house price to consumption transmission[2].

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[2] See Muellbauer and Lattimore (1995), Maclennan et al (1998, 2000) and Muellbauer (2003) for further discussion.

The housing-consumption link has received renewed attention in recent empirical research with macro data.[3] The latest view from the Bank of England, in Benito et al (2006), argues that there is no long-run effect of house prices on consumption. This is reflected in the Bank's model, which contains only a short-term effect of house price changes on consumption. However, this effect is very unstable, falling to one third of its 1998 estimated value by 2005, causing difficulties for the forecasting ability of the model.[4]

Case, Quigley and Shiller (2005) in contrast claim that for, a panel of US states and a panel of 14 countries, the housing wealth effect is larger than the stock market wealth effect. However, the econometrics of this paper is questionable. Their equilibrium correction model (ECM) used on a panel of US states and 14 OECD countries takes the form

$$\begin{aligned}\Delta \log c_t = {} & \alpha \Delta \log c_{t-1} + \beta_1 \Delta \log y_t + \beta_2 \Delta \log \text{ stock}_t + \beta_3 \Delta \log \text{ house}_t \\ & + \gamma \left[\log c_{t-1} - \log y_{t-1} \right] + \beta_4 \Delta \log \text{ stock}_{t-1} + \text{ fixed effects} + \varepsilon_t \end{aligned} \tag{1.1}$$

where y is real income, stock is stock market wealth, and house is owner-occupied housing wealth. A 1986 dummy interacted with Δ log house checks for shifts.

Among the omitted controls in this study are long-run housing asset and stock market wealth, interest rates, the unemployment rate, and income growth expectations effects. For the OECD part of their study, pooling 14 countries denies the heterogeneity between countries implied by their institutional differences. Shifts in credit conditions are also omitted from the OECD country data though, for example, Finland, Norway, Sweden, the UK and the Netherlands all went through revolutions in credit availability. The rise in house prices is highly correlated with the shift in credit conditions. Not surprisingly, the supposed housing wealth effect is larger for the OECD countries, where credit conditions went through larger changes than for US states.

Barrell and Davis (2004) estimate equations for the G-5 countries with a long-run net wealth effect and real interest rate effects, but no controls for shifts in credit conditions, unemployment rates or expected income growth. They estimate both single country equations and pooled equations imposing common long-run coefficients. Byrne and Davis (2003) estimate equations for G-7 countries with no controls for shifts in credit conditions, interest rates, unemployment rates or expected income growth. They do not distinguish housing wealth but test for differences between liquid and illiquid assets effects. For most countries

[3] These empirical studies include Case, Quigley and Shiller (2005), Catte et al (2004), Iacoviello (2004), Barrel and Davis (2004), Dvornak and Kohler (2003), Byrne and Davis (2003), Ludwig and Sloek (2002) and Boone et al (2001). Earlier studies include Brodin and Nymoen (1992), Kennedy and Andersen (1994) and Muellbauer and Murphy (1995).

[4] The MPC seems to have placed more weight on other information and the suite of other models used at the Bank so that its interest rate decisions have been hard to fault.

they find liquid asset effects smaller than those from illiquid assets, and typically negative for the US and especially the UK. Since they define liquid assets as gross liquid assets minus debt, this is a classic symptom of omitted variable bias: credit market liberalization is associated with rises in debt relative to income and relative to gross liquid assets. The omitted variable has a positive effect on consumption but is negatively correlated with net liquid assets, and so biases the latter's effect in a negative direction.

In contrast to Case et al. (2005), Catte et al. (2004) note institutional differences and find major heterogeneity for the parameters in different OECD economies. They estimate models which do have long-run wealth effects, as well as interest rate and unemployment effects. However, they do not control for income expectations explicitly or for the effects of financial liberalization, and this is liable to bias up the estimated housing wealth or collateral effects on consumption. This is also true of Kennedy and Andersen (1994) who study consumption in the form of saving ratios. Nevertheless, this study confirms the heterogeneity of wealth effects across countries, including an apparently negative housing wealth effect for Italy, which could be the result of an ill-functioning mortgage market there. As noted above, the need by the young to save more for a housing deposit with higher house prices, could dominate the wealth effect minus income and substitution effects for owner-occupiers.

Boone et al (2001) are sensitive to the potential importance of credit market liberalization and find some evidence for shifts in long-run relationships, particularly for the UK, US and Canada using dummies for credit market liberalization. They control for interest rate and unemployment dynamics. They also find a negative housing wealth coefficient for Italy. However, they do not attempt to control for income growth expectations or the effect of credit market liberalization on the long-term consumption/income ratio.

Muellbauer and Murphy (1995) study UK regional panel data for 11 regions and include a more complete set of controls than earlier studies. They handle income growth expectations through the fitted values from parsimonious income forecasting equations, and check for interaction effects of these with uncertainty indicators. The shifts in credit conditions are proxied using an indicator derived from data on loan-to-value ratios for mortgages to first-time buyers, a fore-runner of the indicator discussed below. They include interest rate and unemployment effects. Assets are aggregated into liquid and illiquid categories (measured at the end of the previous year), where the latter includes housing wealth, and shifts in wealth effects with credit conditions are tested. As a check on the aggregation of physical and financial illiquid wealth, a separate allowance is made for a real house price effect, but this always proves insignificant. One problem with the study is the omission of the direct effect on consumption of credit conditions discussed below. The other concerns the accuracy of the regional accounts income data. Subsequently, Cameron and Muellbauer (2000) established that these data seriously understated the rise in relative

incomes in the South East in the 1980s, probably resulting in an upward bias in the housing wealth effects being estimated.[5]

Using UK micro data, Campbell and Cocco (2005) and Attanasio et al. (2005) reach diametrically opposite conclusions to one another. The latter use micro data from the Family Expenditure Survey for 1978-2001 to explain consumption spending in terms of age and cohort dummies, household demography, housing tenure, regional house price growth rates and the level of house prices. They find the biggest house price growth rate effects for the young, with the middle-aged next and the old last, and similar effects for home owners as for renters. Attanasio et al argue that since housing wealth increases with age, these findings suggest that house prices are just a proxy for omitted income expectations and have no *independent* role to play in explaining consumption. However, since consumption is likely to be strongly influenced by current income, and also influenced by financial asset ownership (also increasing with age and differing by region), access to credit and variations in unemployment rates and interest rates, the failure to control for these other variables implies that no conclusions about the effects of housing assets on consumption can be drawn. The young's consumption is likely to be more sensitive to current income, and regional house prices are correlated with current income. Moreover, the relaxation of credit constraints in the 1980s would have had the largest effects on the consumption of the young while at the same time driving up house prices, so inducing the correlation found puzzling by Attanasio et al. Further, the collateral role of housing wealth suggests that young house owners, who are more likely to be credit constrained, could well be as sensitive as older owners to rises in house prices.

Campbell and Cocco study micro data from the FES from 1988-2000, after credit market liberalization had largely occurred. They explain changes in consumption per head for different cohorts classified by region, controlling for income growth, regional unemployment, interest rates as well as housing tenure, mortgage debt and regional house prices. They find by contrast with Attanasio et al. that the largest house price effects are for the *older* homeowners, and the lowest for renters. The fact that the national house prices affect the consumption of renters, clearly not a wealth effect, suggests that house prices contain a general 'confidence' or expectations effect. Their research suggest that the findings of Attanasio et al. may be due to poor economic controls.

The failure to control for shifts in credit conditions is often likely to be critical, using aggregate time series data. Although the implications of financial liberalization have aroused interest, controversy, and a growing literature (such as Bayoumi 1993a, 1993b; Schmidt-Hebbel and Serven 1997; Bandiera et al 2000; Honohan 1999), there has not been an entirely

[5] This was the reason the authors did not publish the study.

satisfactory applied analysis of these implications in the consumption literature. One major difficulty has been to find an indicator of credit market deregulation with which to model the direct and interaction effects of financial liberalization.

2. A New UK Consumption Function

Aron, Muellbauer and Murphy (2006) study consumption in the UK and South Africa using sophisticated indicators of credit market liberalization. The contrast between the two countries is interesting since South Africa is almost unique in experiencing an easing of credit conditions without the usual house price boom. This section summarizes our findings for the UK. We use the consumer credit conditions index, CCI, estimated by Fernandez-Corugedo and Muellbauer (2006). This is derived from modeling data on ten credit indicators, from which a common credit indicator and a risk indicator are extracted, after controlling for standard economic and demographic variables. Before 1976, the credit conditions index explained in Muellbauer (2002) is used (see Figure 1 below).

As in Aron and Muellbauer (2000), we distinguish three facets of financial liberalization, a distinction which the previous literature does not bring out clearly. Financial liberalization reduces credit constraints on households engaging in smoothing consumption when they expect significant income growth. This is the standard mechanism addressed in the literature on credit constraints. Second, credit liberalization reduces deposits required of first-time buyers of housing, see Engelhardt (1996) for micro evidence. This involves a rise in the long-term consumption/income ratio, particularly for younger households. Thirdly, it increases the availability of collateral-backed loans for households which already possess collateral, see Poterba and Manchester (1989). This should make housing assets effectively more spendable. The three facets thus imply both a rise in the average propensity to consume and important interaction effects, for example with housing wealth, income growth expectations, interest rates and indicators of uncertainty.

In the absence of shifts in credit conditions, a sensible time series specification for a consumption function, following Muellbauer and Lattimore (1995), can be written as follows:

$$\Delta \log c_t \approx \alpha \Big[\alpha_0 - \alpha_1 r_{1t} - \alpha_2 \theta_t + \alpha_3 E_t \Delta \log ym_{t+k} + \gamma_1 NLA_{t-1}/y_t + \gamma_2 IFA_{t-1}/y_t + \gamma_3 HA_{t-1}/y_t + \log y_t - \log c_{t-1} + \beta_1 \Delta \log y_t - \beta_2 (DB_{t-1}/y_t) \Delta \log nr_t + \varepsilon_t \Big]$$

(1.2)

Here c is consumption, r is the real interest rate, θ is an indicator of income uncertainty, $E_t \Delta \log ym_{t+k}$ is a forecast[6] of the growth rate of non-property income[7], NLA/y is the ratio of liquid assets minus debt to non-property income, IFA/y is the ratio of illiquid financial assets to non-property income, and HA/y is the ratio of housing wealth to non-property income. The speed of adjustment is α and the term in square brackets can be thought of as reflecting the behaviour of households not facing immediate credit constraints.

The specification comes from a log approximation of a consumption function where consumption depends on human capital and other wealth and where habits or adjustment costs induce lagged adjustment, see Muellbauer (1988). Asset to income ratios give a better approximation to the underlying linear additive structure of human and non-human capital than does the more conventional log-assets formulation. The γ's are marginal propensities to consume for the different assets, which are allowed to differ[8]. If they are equal, assets can be combined into net worth, here an easily testable hypothesis. The specification enforces long-run homogeneity in that doubling real income and real assets doubles consumption. A higher propensity to spend for liquid assets is consistent with Carroll's (1997, 2001) buffer stock theory of saving, and with reasoning and evidence by Zeldes (1989).

The terms on the second line of (1.2) can be thought of as arising from credit or liquidity constraints: the rate of growth of income will tend to dominate consumption growth of such households. The rate of change of the nominal rate of interest on debt, nr, weighted by the debt to income ratio, DB/y, measures the short-term impact of higher debt service costs on those with debt.

If credit conditions ease, one can expect shifts in a number of these parameters. The following should increase: α_0 , α_1 , α_3 , γ_3 ; and the following parameters should decrease: α_2 , β_1 , β_2 . To explain these shifts, note that α_0 increases with the average propensity to spend; α_1 and α_3 increase with the increased role for inter-temporal substitution; and γ_3 with the increased spendability of housing assets as their collateral role is enhanced. Under the buffer-stock saving theory of Deaton (1992) and Carroll (1997, 2001), α_2 should fall as short-term income uncertainty matters less when credit is readily available. A fall in β_1 would reflect short-term income changes constraining consumption less, while a fall in β_2 means

[6] The forecast has horizon k and near future growth rates are more heavily weighted than more distant growth rates.
[7] Permanent income theory emphasises the respective roles of permanent non-property income and of wealth, hence the use of non-property income.
[8] Micro-foundations for a greater marginal propensity to spend out of liquid assets are provided in Otsuka (2006).

that with easy credit availability, many households can refinance more easily to ease the short-term cash flow pressures of higher nominal interest rates.

We allow these parameters to shift for the UK with the index of credit conditions, CCI, mentioned above. The expected shifts in parameters all occur (though both β_1 and its shift are insignificant)[9]. In Table 1, we show a parsimonious version of the model. The housing wealth to income ratio is insignificant, while its interaction effect of CCI is strongly significant, and so we omit the former. The marginal propensity to spend out of housing assets at the maximum value of CCI (of 0.25) is estimated to be similar to that of illiquid financial assets, of around 0.03, which, in turn, is below that of net liquid assets, at around 0.13. These results for the housing assets effect are lower than commonly found in the literature. We find that a 4-quarter moving average of observations on illiquid financial assets fits far better than the end of previous quarter value, consistent with findings by Lettau and Ludvigson (2004).[10] Since much of illiquid financial assets lies in pension funds, this plausibly reflects the slow adaptation of contribution and pay-out rates to changes in asset values.

The real interest rate effect is negative and significant and the evidence is that it strengthens as CCI rises, while the debt-weighted nominal interest rate change, also negative, weakens as CCI rises. With easier access to credit, inter-temporal substitution should play a bigger role, explaining, as noted above, the enhanced role for income growth expectations, for which there is also strong empirical evidence. Indeed, we find income growth expectations to be insignificant when CCI is zero, as it was for most of the 1970s. Income uncertainty is represented by the 4-quarter change in the unemployment rate, which has a negative effect on consumption. The interaction effect with CCI is positive, but not significant, suggesting only small weakening of the uncertainty effect with credit liberalization.

The speed of adjustment is 0.34 meaning that 80 percent of the adjustment of consumption to income and the other explanatory variables is complete after four quarters. Table 1 also shows estimates up to 1997Q4, revealing that the parameters are stable over this shorter sample.

Table 1: Estimates of the UK Consumption Function from 1972 to 1997 and 1972 to 2005

Regressors	1972:1-1997:4		1972:1-2005:4	
	Coeff.	***t-ratio***	***Coeff.***	***t-ratio***

[9] This is consistent with a buffer-stock saving interpretation of behaviour, see Aron, Muellbauer and Murphy (2006) for details.

[10] However, over a one or two year horizon, the estimated stock market effect on consumption of Lettau and Ludvigson is implausibly small.

Speed of adjustment	α	0.34	7.6	0.34	8.7
Intercept	α_0	-0.03	1.0	-0.05	3.1
CCI	CCI	0.30	4.5	0.26	4.7
Real rate	α_1	-0.16	1.5	-0.19	2.0
Real rate x CCI	α_{1c}	-1.1	0.6	-0.85	0.6
Uncertainty ($\Delta_4$ur), θ	α_2	-0.023	5.5	-0.019	7.6
$E_t \Delta \log ym_{t+k}$ x CCI	α_{3c}	0.90	0.8	2.4	4.3
Net liquid assets/income	γ_1	0.13	3.7	0.14	5.6
Illiquid financial assets/income[a]	γ_2	0.019	2.0	0.030	6.5
Housing wealth/income x CCI	γ_{3c}	0.111	3.3	0.120	4.6
Debt/income weighted change in log nominal interest rate	β_2	-0.061	4.7	-0.060	5.2
Debt/income weighted change in log nominal interest rate x CCI	β_{2c}	0.19	2.6	0.21	3.9
Diagnostics					
s.e		0.00659		0.00609	
Adj. R^2		0.713		0.693	
DW		1.97		1.91	
LM1 (*p* value)		0.89		0.59	
LM4 (*p* value)		0.01		0.02	

Figures 1 to 3 show the contribution of the explanatory variables from Table 1 to the variations in the log ratio of consumption to non-property income in the long run. Figure 1 plots the log ratio of consumption to non-property income against the credit conditions index, the real interest rate (measured by the annual moving average of the tax-adjusted building society mortgage rate) and the weighted combination of four-quarter log changes in interest rates (where the weights reflect both the debt to income ratios and the decline in the coefficient as CCI rises). All these variable are weighted by their estimated coefficients in Table 1. Part of the secular rise in the consumption to income ratio equivalent to a decline of 5 percentage points in the personal savings ratio, is thus explained by the revolution in credit supply, with a small offset from the higher real interest rate.

Figure 1: log ratio of consumption to income against CCI (LRCY), the real interest rate (VRABMRMA), and the weighted change in log nominal interest rates (VD4LR).

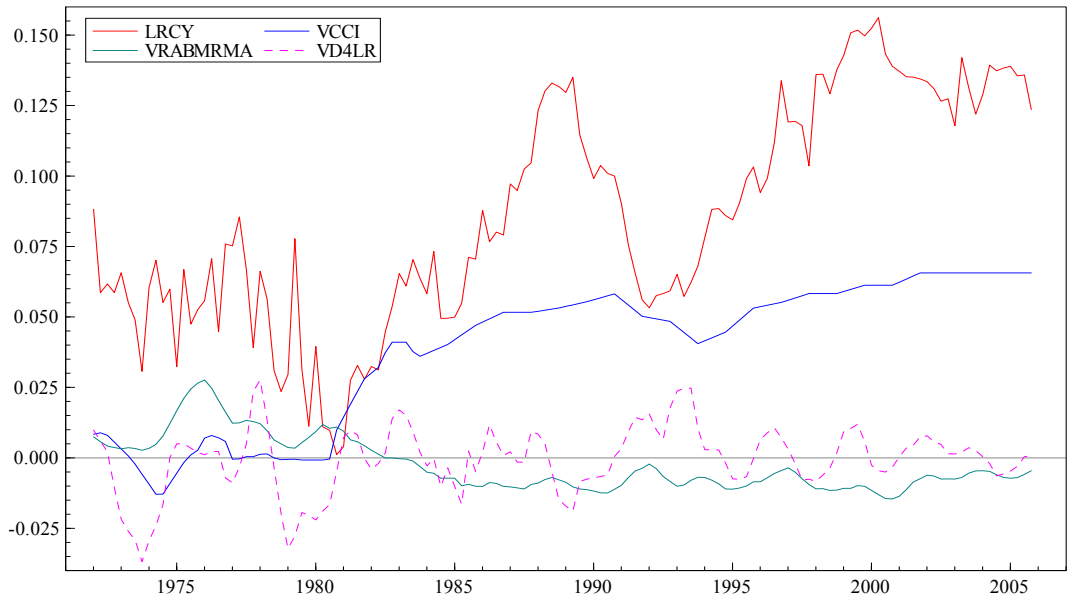


Figure 2 shows the large contribution to the explanation of the log consumption to income ratio of the four-quarter change in the unemployment rate and the increasing contribution made by forecast income growth rates.

Figure 2: log ratio of consumption to income (LRCY) against the change in the unemployment rate (VD4UR) and the CCI-weighted forecast rate of growth of income (VDLYPERM).

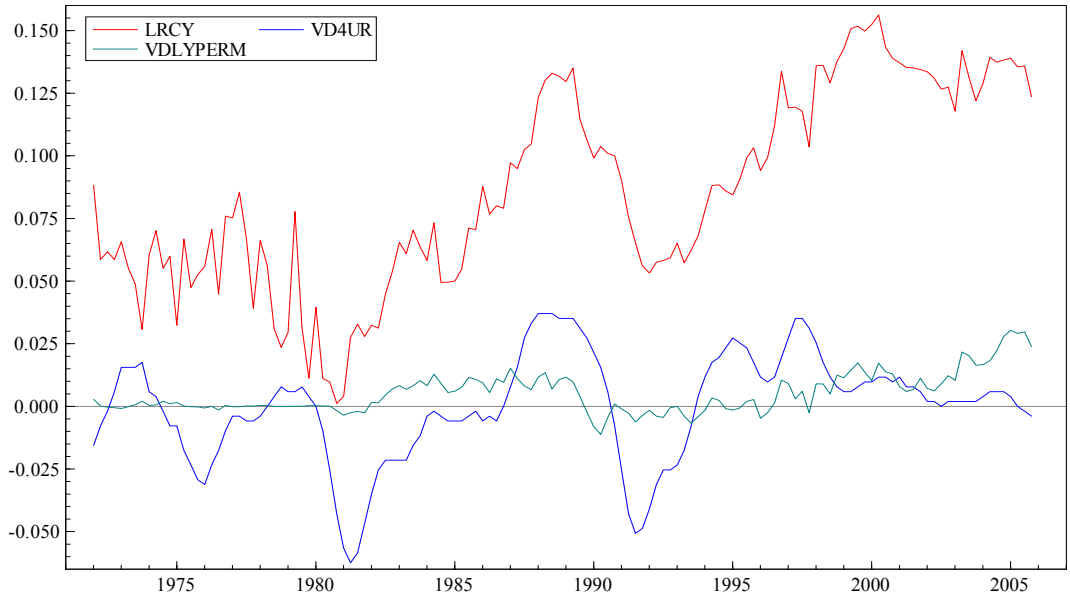
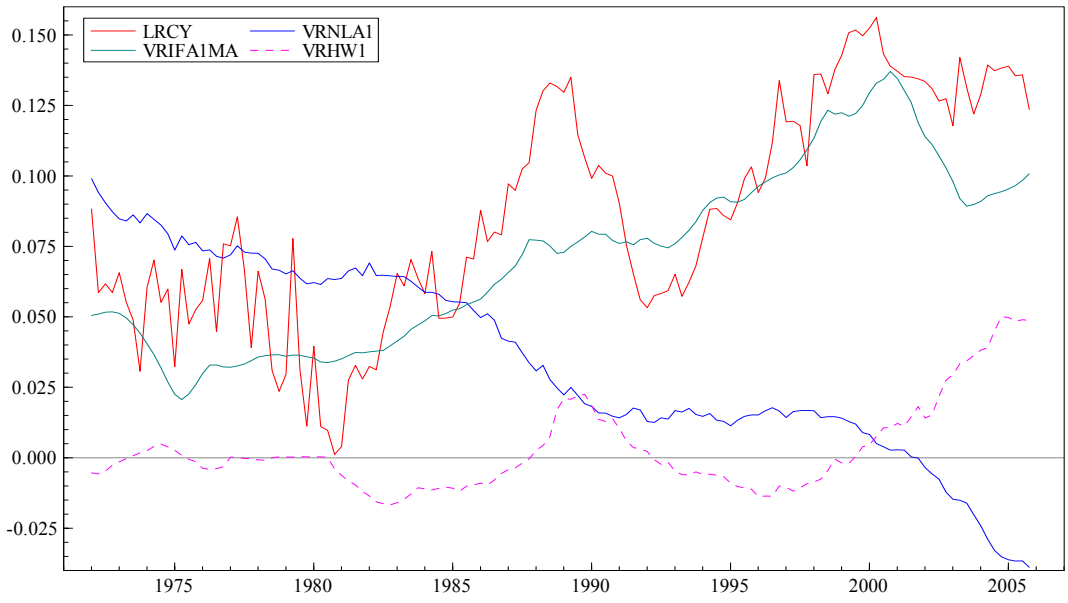


Figure 3 reveals the striking contribution of the ratios to income of the wealth components. Before 2000, the rise in illiquid financial wealth relative to income was significantly offset by the falling ratio to income of liquid assets minus debt – driven largely by the rising debt to income ratio. Since 2000, the contribution to consumption of the fall in the illiquid financial wealth to income ratio was offset by the rising contribution of the CCI-weighted housing wealth to income ratio. But with debt continuing to rise and hence the net liquid asset to income ratio declining, overall there was a decline in the consumption to income ratio.

These pictures make it clear why the simple correlation of consumption growth and real house price growth is doomed to be unstable, even though our model has a completely stable coefficient on the CCI-weighted housing wealth to income ratio. The shift in the correlation since 2000, which has puzzled the Bank of England, is mainly due to the decline in stock market wealth relative to income and the depressing effect of rising debt to income. However, the decline in real interest rates, temporary declines in nominal rates and the relative strength of the UK labour market helped support consumption in the 2001-2004 period. These are proximate causal stories rather than rigorous decompositions of fluctuations in the consumption to income ratio into the fundamental shocks from the world economy, global financial markets, domestic monetary and fiscal shocks and shifts in CCI and technology. Nevertheless, they are instructive and will lead the way to a future decomposition of this type.

Figure 3: log ratio of consumption to income (LRCY) against the ratios to income of liquid assets minus debt (VRNLA1), illiquid financial assets (VRIFA1MA) and CCI-weighted housing wealth (VRHW1).



The housing wealth effect also has a role to play through the income growth forecast, $E_t \Delta \log ym_{t+k}$. This variable is defined as a moving average of log non-property income over a three year horizon, where the weights decline geometrically, minus the current value of log non-property income.[11] The income forecasting equation is selected[12] from a specification including a linear trend, a second trend suggesting that from around 1983 the income growth trend improved and other regressors[13]. Various asset to income ratios and growth rates of real asset prices are also included to allow for the possibility that asset prices reflect income growth expectations, as Mervyn King and others have often observed. The interaction of CCI with the housing wealth to income ratio proves strongly significant in this equation. The fitted value of $E_t \Delta \log ym_{t+k}$ is significant in the consumption equation, and part of the effect of house prices on consumption operates through the income growth expectations channel.

When this channel is omitted from the forecasting model,, it is not surprising to find a larger apparent wealth effect attributed to housing wealth in the consumption model. Indeed, at the peak value of the credit conditions index, the estimated housing wealth effect then exceeds the stock market wealth effect (which dominates our measure of illiquid financial wealth). This emphasises the point that omitted controls, including income growth expectations, can bias up the wealth or collateral effect of house prices on consumption.

If equation (1.2) is estimated without CCI effects, the fit is worse, with a lower speed of adjustment, and the real interest rate effect drops out. This is to be expected, given the rise in real rates which took place as credit supply conditions eased from the end of 1980: the model without CCI thus suffers from an omitted variable positively correlated with the real interest rate and so biasing its estimated effect. The asset effects remain significant, with broadly similar illiquid financial and housing wealth effects.

If equation (1.1) of Case et al (2005) is estimated, the fit deteriorates sharply. The stock market effect then becomes insignificant, while the housing assets effects are between five and seven times as large as the stock market effect and jointly significant. In the long-run, income scarcely matters for consumption in equation (1), while by contrast our model finds it to be the key driver. We therefore interpret their findings as spurious: driven by large omitted variable biases and mis-specification. Note that their specification omits unemployment rate changes, real and nominal interest rates, the credit conditions index, level asset effects and income growth expectations.

[11] The discount factor used is 0.85 so that expected income four quarters ahead receives 52% of the weight of expected income one quarter ahead, and 27% for expected income eight quarters ahead.
[12] We used Hendry and Krolzig's PCGETS software to find a parsimonious model.
[13] These include the log level of income, the lagged growth rates of consumption and income, the growth rate of OECD industrial production, the growth rate of working age population, a measure of inflation volatility and changes in base rate.

The empirical models for South Africa (not presented here) and the UK have strikingly similar features, despite the very different macroeconomic histories. Credit market liberalization increases the average propensity to consume out of income in both countries and its inclusion brings clear benefits in finding significant negative real interest rate effects on consumption. The interaction effects of credit market liberalization in increasing the roles of expected income growth and of the real interest rate, and reducing the role of changes in the nominal interest rate and in uncertainty are confirmed in both countries, though the interest rate interaction effects are weaker in South Africa. The higher marginal propensity to spend out of wealth in South Africa compared to the UK probably reflects an underestimate of wealth, though it may also signal a missing confidence factor, not controlled for by our income expectations and uncertainty measures. However, time variations in wealth appear to be relatively well-measured, judging by the stability and significance of the coefficients. It appears that in the UK, the marginal propensity to spend out of housing wealth in recent years has been similar to that out of illiquid financial wealth, while in South Africa, it has been slightly greater. In neither country does the evidence support the claim by Case et al (2005) that housing wealth or collateral effects greatly exceed stock market wealth effects.

3. Conclusions

This paper has provided a clear demonstration that, with liberal credit markets, the level of housing wealth has an important long-run effect on consumption, given income, other asset stocks and other variables such as interest rates, unemployment and an indicator of credit supply. We find that the housing wealth effect largely works through the 'credit channel': high collateral values give better access to credit and so raise consumption, as Aoki et al (2002, 2004) have argued. However, the finding of an important long-run effect of house prices on consumption contradicts BEQM, the new Bank of England macroeconomic model, which lacks the theoretical foundations for a credit channel. Our model explains recent shifts in the simple correlation between consumption and real house price changes mainly through the effect of lower stock market values between 2001 and 2004, and the depressing effect on consumption of higher debt to income ratios.

Our paper puts the housing wealth or collateral effect on consumption into perspective, finding that studies such as Case et al (2005), much publicized for example by *The Economist,* have exaggerated the strength of the housing wealth effect and undervalued other important financial wealth effects. Moreover, in an international context, one can expect large differences in the size of the housing wealth or collateral effect with heterogeneous institutions.

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