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Financial Liberalisation and Consumption Behaviour

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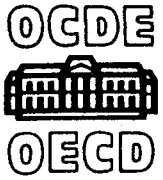

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ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

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ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

The paper addresses the question of whether financial liberalisation and innovation has significantly altered consumption behaviour by reducing liquidity constraints as capital markets become more flexible. A consumption model in which the permanent income hypothesis and extreme Keynesian consumption functions are nested as special cases is the starting point for this analysis. Estimated values for the sensitivity of consumption to current income for different time periods and for several OECD countries are assessed and compared in the light of various econometric properties, country specific liberalisation measures and a variety of proxies reflecting changing liquidity constraints.

Le présent document traite de la question de savoir si le processus de libéralisation et d'innovation financières, en réduisant les contraintes de liquidité du fait de la plus grande souplesse apportée au fonctionnement des marchés de capitaux, a modifié de façon significative les comportements relatifs à la consommation. Un modèle de consommation dans lequel l'hypothèse de revenu permanent et les fonctions de consommation purement Keynésiennes sont considérées comme des cas particuliers constitue le point de départ de la présente étude. Des valeurs estimées de la sensibilité de la consommation au revenu courant pour des périodes différentes et pour plusieurs pays de l'OCDE sont calculées et comparées à la lumière de plusieurs propriétés économétriques, des mesures de libéralisation spécifiques à chaque pays et de diverses variables indicatrices des modifications des contraintes de liquidité.

FINANCIAL LIBERALISATION AND CONSUMPTION BEHAVIOUR

by

Adrian Blundell-Wignall
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and
Stefano Cavaglia

The authors, respectively principal administrator and administrator, Money and Finance Division, and administrator, Foreign Trade and Investment Division, wish to thank Janice Owens for her assistance in preparing the supporting statistical material. The views expressed reflect the opinions of the authors and do not necessarily represent those of the OECD or of the governments of its Member countries.

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I. INTRODUCTION

The last ten to fifteen years have seen substantial deregulation in the financial sectors of most OECD economies. Early innovation in financial markets was motivated in part by the large incentives to circumvent official regulations. Subsequently, financial change has been facilitated by the progressive dismantling of these same regulations. While liberalisation policies have been motivated mainly by the desire to improve efficiency within the financial system, important implications for the functioning of the macro economy also arise.

The financial liberalisation process, both at the national and international levels, has been piecemeal and diffuse. Attempts to encapsulate such an irregular process in some quantitative time-series measure with a view to examining the effects on selected components of aggregate demand are not likely to be fruitful exercises. A more promising alternative route is to use an approach which does not require a direct measure of the extent or intensity of the liberalisation process. This is the strategy adopted here. The purpose of the paper is to examine if the process of financial market liberalisation has altered the pattern of household consumption over time. The presumption is that financial market liberalisation has eased liquidity constraints facing households and has therefore allowed consumption to be smoothed over time. If households have rational expectations and consume from permanent income (the RE-PIH hypothesis) then consumption can be shown to follow a random walk (see Hall, 1978). This model of consumption behaviour has been widely rejected in empirical tests, however.

These rejections, based on the finding that consumption behaviour is excessively sensitive to current disposable income, are frequently attributed to the failure of one particular maintained hypothesis of the PIH, namely that individuals with access to perfect capital markets can borrow or lend at the same interest rate to smooth consumption over their lifespans. If financial liberalisation has rendered capital markets somewhat less imperfect, and if the above interpretation for the failure of the RE-PIH to be supported by the data is correct, we should observe that the sensitivity of current consumption to current income has fallen over time and is lower in countries that deregulated earlier and more thoroughly.

In following this approach, the interpretation of the results is subject to some ambiguity. Several hypotheses, some maintained, underlie the random walk model of consumption, notably that households are not liquidity constrained and that they do not behave myopically. We attempt to determine which of these hypotheses has failed by examining the random walk model both across time and between countries. Our results suggest that the sensitivity of current consumption to current income can be related to the degree of financial deregulation. We show that liquidity constraints have played a role in the departures of consumption behaviour from the random walk pattern predicted by the RE-PIH, and that financial deregulation has tended to reduce the importance of liquidity constraints in several countries particularly in the 1980s.

The plan of the paper is as follows. Section II sets out the Hall model of consumption and discusses the reasons that have been offered for it's rejection in empirical tests. Modifications to the Hall model are made to reflect the fact that a certain proportion of households experience

difficulties in borrowing against the collateral of future labour income, and hence may be unable to attain the optimal profile of consumption over time implied by the PIH. A variation on the Hall model is used as a basis of the tests for liquidity constraints. Testing the model over periods in which the degree of financial regulation was thought to have implied different degrees of liquidity constraints is the main criterion used to distinguish the possibly changing nature of the latter. Further discrimination between the competing explanations of liquidity constraints or myopia in accounting for deviations from the random walk model can be obtained from the econometric results by examining the potential role of asymmetries. If consumers are in fact rationed in credit markets, then an increase in disposable income may impose less of a constraint on consumption than a decrease in disposable income. The model is also modified to allow for intertemporal substitution in consumption in response to real interest rate changes. Section III presents the results of the tests described in Section II. In Section IV the cross country and intertemporal pattern of liquidity constraints suggested by the results are briefly discussed against the background of other, albeit somewhat ad hoc, measures of national capital market imperfections. These patterns largely corroborate the interpretation of the consumption function parameters as reflecting liquidity constraints.

II. THE HALL MODEL AND MODIFICATIONS

A. Theoretical background

Over the last decade or so most research on aggregate consumption has taken the Hall (1978) model as a starting point of analysis. Hall argued that the PIH implies that consumption behaviour should obey the first-order conditions for life-time utility maximisation of a representative individual. If one is prepared to maintain the following somewhat strong assumptions:

i) individuals have identical, time-separable preferences with either a quadratic or logarithmic representation for instantaneous utility;

ii) they cannot die in debt;

iii) they have access to perfect capital markets in which the constant real rate of interest is equal to the subjective rate of time discount; and

iv) they form expectations of future income rationally,

then consumption can be shown to follow a random walk. The present level of consumption is the optimal forecast of its future level or, alternatively, changes in consumption are unforecastable.

Using variants of the Hall model, several researchers have found that current aggregate consumption is significantly more sensitive to changes in current disposable income than the PIH predicts. This excess sensitivity is frequently rationalised as arising from the presence of liquidity constraints. In terms of the life-cycle model, individuals make labour supply and consumption decisions over a known lifetime. Income will typically fall short

of desired consumption in youth, exceed it in middle age, and again fall short of it in retirement. With perfect capital markets, individuals should be able to smooth consumption relative to income by borrowing when they are young and lending in middle age. In the presence of liquidity constraints, however, consumption cannot be fully smoothed because, for example, households cannot borrow when they are young against their future labour income.

Clearly a breakdown of one or other of the maintained hypotheses underlying the derivation of the random walk model, such as perfect capital markets; rational expectations of future labour income; additive time-separable preferences; separability between consumption, leisure and other goods (Mankiw, Rotenberg and Summers (1985)); or constant real rates of interest and discount rates (Mankiw (1981)), could cause current income to be sensitive to current consumption. Furthermore, if durables and non-durables are non-separable in consumption, and if durables are subject to gradual adjustment to optimal levels, then this will have a bearing on the pattern of consumption for non-durables. Bernanke (1985) has suggested that the illusion of excess sensitivity could consequently be created by the failure to account properly for durables expenditures. Another factor which could potentially explain the observed "excess" sensitivity has been emphasised by Zeldes (1989a and b). If there is uncertainty about future labour income, then consumers will self-insure by engaging in precautionary savings. An increase in such uncertainty will increase savings and reduce consumption relative to income. In other words, relative to a world of certainty, individuals' current consumption is "too" low and expected consumption growth "too" high, again creating an impression of "excess" sensitivity.

B. The nested model and econometric issues

A procedure for evaluating the PIH is to postulate a general model within which both it and the Keynesian model (emphasising current income) are nested as special cases (as in Flavin (1985), DeLong and Summers (1986), Jappelli and Pagano (1988), Campbell and Mankiw (1989) and Bayoumi and Koujianou (1989)). The significance of transitory income in explaining consumption is contrary to the implications of the PIH. Such a rejection would constitute evidence against one or all of the hypotheses listed above. However, since most attention has focused on the last two (no liquidity constraints and rational expectations) as the ones most likely to be responsible for rejection of the random walk model of consumption, the first two will, for the rest of the paper, be assumed to be true. Augmenting the nested specification by including a variable which causes consumers to experience liquidity constraints may permit the data to reject one or other of these competing explanations. Flavin suggests that the unemployment rate is such a variable, since it can be interpreted as a proxy for the proportion of the population subject to liquidity constraints. Although a much greater fraction of the population than those who are unemployed probably experience liquidity constraints, nevertheless an increase in unemployment will increase the fraction of the population who are constrained to consume from current disposable resources. However, to facilitate ease of comparison across countries and over time we focus exclusively on a simpler model derived below (1).

Hall has demonstrated that consumption for permanent income consumers with rational expectations follows a random walk possibly with drift (μ) i.e.:

$$\Delta c_{pt} = \mu + \omega_t \qquad (1)$$

where c is consumption, subscript p indicates permanent consumers and ω is the error in forecasting permanent income. Keynesian consumers are assumed to consume all their current income, i.e. $c_{kt} = y_{kt}$, where y is income and subscript k denotes Keynesian consumers. A fraction λ of total income is assumed to accrue to Keynesian consumers and the rest to permanent income consumers. Therefore the change in total consumption is given by:

$$\Delta c_t = \mu' + \lambda \Delta y_t + (1-\lambda)\omega_t \qquad (2)$$

where $\mu' = (1-\lambda)\mu$.

According to the nested model, changes in consumption are a weighted average of changes in current income and in the unforecastable component of permanent income. Equation 2 can be estimated by instrumental variables with any lagged variables being valid instruments since the revision to permanent income (ω_t) is, by the assumption of rational expectations for permanent income consumers, uncorrelated with previously available information. Instrumental variables are used to control for the possibility that changes in current income might signal changes in permanent income (2).

Current income should not, according to the null permanent income hypothesis, feature as an argument in the consumption function except to the extent that it provides information about permanent income. Changes in current disposable income within a time interval of a quarter will evidently convey much less new information about permanent income than corresponding changes for, say, a year. The shorter the sampling interval, the closer is transitory income (Δy_T), the desired variable in equation 2, to the actual change in income (Δy), the variable employed. Thus employing a quarterly sampling interval, rather than an annual one, provides a more rigorous test of the Hall and competing consumption models.

Under the joint null hypothesis of rational expectations and the permanent income theory of consumption (RE-PIH) aggregate consumption follows a random walk with drift (μ). If the <u>desired</u> change in consumption this period (based on Δyp_t) is greater than the actual change in consumption this period, then the latter is constrained by the actual change in income (Δy_t), i.e., $\lambda > 0$. This is interpreted as a rejection of the null hypothesis in favour of the alternative that the consumer is unable to borrow using his current permanent income as collateral and/or that he is myopic (3).

To examine whether the degree of excess consumption sensitivity (which is measured by the λ parameter in equation 2) is linked to imperfect capital markets two approaches are taken. First, financial liberalisation has progressed over time, particularly in the 1970s and 1980s. If the liberalisation process seen in financial markets has caused liquidity constraints to be progressively relaxed, then estimating equation 2 for successive time periods should tend to indicate a generally reduced size and significance of the λ parameter. Three time periods are chosen, the decades of

the 1960s, 1970s and most of the 1980s. These, of course, may not be the economically most relevant time periods. However, since the liberalisation process itself has been gradual and diffuse, clear structural shifts at particular historical dates are virtually impossible to identify a priori.

Second, econometric findings between countries and over time can be cross checked with a direct investigation of the characteristics of national and international credit markets, which are the origin of the putative liquidity constraints, and their behaviour over time. Jappelli and Pagano (1988) suggest a variety of indicators of the degree of capital market imperfection. These, they generally find, reveal the same ranking of capital market imperfection across countries as do their parameter estimates on current disposable income. Despite this, their proxy indicators are far from ideal. A discussion of their shortcomings and some suggested alternatives is the subject matter of section IV.

Equation 2 is estimated for both total consumption and total consumption less purchases of consumer durables. However, the latter are available for only a subset of the OECD countries. Therefore, to provide a reasonably broad international comparison, equation 2 was estimated for total consumption for eight OECD countries (4). It was also estimated for total consumption less the purchases of durables for the subsample of the countries for which such data are available (5). The ideal consumption variable is the consumption of nondurables and services plus the service flow from durables. This latter variable is not available, and would have to be imputed using some assumption about the average rate of depreciation of consumer durables. Given the arbitrariness involved in such a procedure, it was decided not to pursue this option (6).

C. Asymmetries

Implicit in the above tests is the proposition that liquidity constraints encountered will have the same effect regardless of the direction of movement in disposable income. This assumption may be unrealistic, since reductions in income are likely to be more constraining than increases. If the consumer is rationed in credit markets and current income falls simultaneously then consumption must fall. If income increases under the same credit market conditions, consumption may or may not increase. This asymmetry may be important for individuals with little or no non-human wealth, for whom necessary expenditure is a very large percentage of disposable income. Therefore, the presence of this type of asymmetry can be taken as further evidence of liquidity constraints. Moreover, as these constraints unwind over time with financial liberalisation, so should the magnitude of the asymmetry.

To test this proposition, the current values of the change in disposable income are transformed as follows:

$$\Delta \hat{y}_t^{+} = \begin{cases} \Delta \hat{y}_t \text{ if } \hat{y}_t > y_{t-1} \\ \text{zero, otherwise} \end{cases},$$

$$\Delta \hat{y}_t^{-} = \begin{cases} \Delta \hat{y}_t \text{ if } \hat{y}_t < y_{t-1} \\ \text{zero, otherwise} \end{cases},$$

The hats indicate instruments obtained on the level of y using the exogenous variables already noted (see footnote (2)). The test equation 2 is now rewritten as follows:

$$\Delta c_t = \mu' + \lambda_1 \Delta y_t^+ + \lambda_2 \Delta y_t^- + (1-\lambda)\omega_t \qquad (3)$$

Tests for asymmetric behaviour based on equation 3 are carried out with a simple t-test. The null hypothesis is assumed to be:

$$\lambda_2^* > \lambda_1$$

and the alternative that:

$$\lambda_2 \leq \lambda_1$$

D. Intertemporal Substitution

An attempt to add more realism to the nested consumption model in equation 2 is made by relaxing one of its more implausible maintained hypotheses, namely that the real interest rate is constant. This allows for intertemporal substitution in consumption which is, of course, consistent with the permanent income hypothesis. The exclusion of the real interest rate from the test equation could conceivably be leaving real disposable income growth to pick up this intertemporal substitution effect, i.e. if real income growth and real interest rates are correlated over time.

Nominal interest rate changes, in the absence of real interest rate changes, should of course have no effect on consumption unless households are prevented from consuming from their permanent income by imperfect capital markets. It has been argued that such an imperfection in personal credit markets is reflected in banks' practice of using virtually constant repayment-to-current income ceilings as criteria for loan qualification (7). An increase in the nominal rate of interest, for a fixed real rate, may cause this ceiling to be breached and the potential borrower to be denied a loan. Thus if the liquidity constraints theory is valid, consumption can be constrained by variations in both current disposable income and in nominal borrowing rates of interest. Unless nominal interest rate effects are controlled for, variations in the imperfectly measured real rates could capture liquidity constraint effects coming from changes in nominal rates.

To capture both intertemporal substitutions and liquidity constraints phenomena arising from interest rates changes, equation 1 is accordingly amended as follows:

$$\Delta c_t = \mu' + \lambda \Delta y_t + \alpha r_{t-1} + \gamma \Delta i_t + \omega_t \qquad (4)$$

An increase in last period's real borrowing rate of interest r_{t-1} reduces that period's consumption relative to that of the current period ($\alpha > 0$). An increase

in the nominal interest rate in this period i_t for a fixed real rate will tighten household liquidity constraints and dampen consumption expenditure ($\gamma<0$) if capital markets are imperfect.

III. EMPIRICAL RESULTS ON CONSUMPTION SMOOTHING AND LIQUIDITY CONSTRAINTS

A. Nested model estimates for total consumption

Table 1 presents the results from estimating equation 2 for eight large OECD countries. Overall, the results indicate rejection of the RE-PIH, particularly for the 1960s, less so for the 1970s and only in two cases (Germany and Australia) for the 1980s. The excess sensitivity parameter (λ) varies across countries as does its pattern over time. The magnitude of the λ parameter declines over successive decades for most countries, though not for the United Kingdom, where the parameters are poorly-determined in all cases (repeating the findings of Campbell and Mankiw (1989) and Bayoumi and Koujianou (1989)). For Germany, the λ parameter is significant at the 5 per cent level for all three subsample periods, and increases in value from 0.37 in the 1960s to 0.67 in the 1970s and to 0.98 in the 1980s. The failure to find any evidence of financial market liberalisation in Germany is in keeping with prior expectations. While interest rate and credit ceilings do not exist in Germany, "powers" regulations concerning the authorisation of various financial activities are important. For example, short-term money market securities have not been available in Germany to the time of writing. Strong cartel-like behaviour between German banks (e.g. price leadership patterns in "sticky" deposit pricing) have also been important. At the same time, however, it is difficult to discriminate between the importance of liquidity constraints and myopic behaviour, which may be related to the strongly conservative instincts of German households, in explaining our results. Given that German households are known to have a strong preference for saving, it may be difficult to maintain a liquidity constraints interpretation as opposed to one of straightforward myopia and/or increasing precautionary saving behaviour in the more uncertain environments of the 1970s and 1980s.

There is no evidence that liquidity constraints were lessened in the 1970s for the United States economy. The λ parameter falls from a significant value of 0.47 in the 1970s to a statistically insignificant value of 0.25 in the 1980s, which is consistent with reduced liquidity constraints. For Japan, the magnitudes of the estimated λ parameter suggest that liquidity constraints in the 1980s are less severe than they were in either the 1960s or 1970s. The picture that emerges here is consistent with the belief that financial reform in Japan has progressed significantly (e.g. there have been considerable advances with interest rate deregulation and new financial instruments).

When the model is estimated for the extended period of the 1960s and 1970s together (see final column of Table 1) a significant excess sensitivity parameter (λ=0.40) is estimated for France. The smaller insignificant λ estimate for the 1980s for France is therefore consistent with some easing of liquidity constraints in this period. The Italian results cannot be interpreted with any confidence because of the strong evidence of positive first order autocorrelation in the low Durbin Watson statistics. The size and pattern of estimated coefficients for Canada and Australia are quite similar. except that the λ estimate for Australia which, having become insignificant in

the 1970s, recovers significance (at the 10 per cent level) in the 1980s. The pattern for Canada conforms closely to expectations, since Canada was one of the first countries in the sample to deregulate its financial markets.

Campbell and Mankiw (1989) observe that an estimate of the excess sensitivity parameter close to zero, even if statistically significant, supports the permanent income hypothesis, while a large value of this coefficient suggests rejection. According to this criterion, the pattern of the λ parameters across decades generally suggests easing liquidity constraints in all countries except Germany, the United Kingdom (for which the RE-PIH could not be rejected for any subperiod) and possibly Australia. The results of a more rigorous test for declining λ coefficients in successive time periods based on the unit normal distribution are given in Table 2. Only in a few instances however (indicated by asterisks) does this test accept falling liquidity constraints.

A more definite picture emerges when data are pooled across selected countries. Two groups of countries were identified for pooling. In the first of these, the United States, Japan, the United Kingdom, Canada and Australia were included. These were chosen partly on the basis of the results in Table 1, but also on what is known about the pattern of financial deregulation over the sample period in those countries (8). The second group consists of the continental European countries, Germany, France and Italy. Having decided on this separation of countries the next step was to ascertain if each country belonged to the group to which it was assigned. This was done by estimating the equations for each group of countries as a system using a SURE technique and the instrumental variables for income already described above. If the cross-equation restriction $\lambda_i=\lambda$ for all i countries in the group cannot be rejected, then the pooling is considered valid. The further restriction that the drift terms be equal across countries ($\mu_i=\mu$ for all i) is considered of less importance for the purpose in hand, although this test is also carried out.

The results of this estimation procedure for group 1 are displayed in Table 3. No cross-equation parameter constraints are imposed in the top panel, and the results differ from those in Table 1 only to the extent that they take into account possible contemporaneous cross-correlation of residuals. Panel 2 of the table displays the results that emerge when the excess sensitivity parameter is constrained to be the same across countries in each subperiod. The validity of this constraint is tested using a likelihood ratio test. Finally, the joint constraint of equal slopes and intercepts is imposed across countries for each subperiod and again the validity of this constraint is tested using the chi-squared test based on likelihood ratios. This result is reported in panel 3 of the table.

Preliminary tests indicated that the United Kingdom belonged to neither of the two groups of countries, which is probably not surprising in the light of the Table 1 results above. The excess sensitivity parameters have changed slightly in value relative to the Table 1 estimates and, in all cases, the corresponding sample standard errors have fallen fractionally. The first constraint that λ be identical across countries cannot be rejected for any subperiod. However, the additional constraint that the drift parameter also be the same across countries is rejected for two of the four subperiods with the drift estimate for Japan being the culprit in both cases. Applying the unit

normal tests described in Table 2 to the pooled λ values in panel 2 of Table 3, significant liquidity constraint relaxation for this group of countries cannot be rejected for the 1980s compared to the 1960s (at the 5 per cent level) nor for the 1980s relative to the 1970s (at the 10 per cent level) However, no significant reduction in liquidity constraints is indicated for the 1970s compared to the 1960s, despite a substantial fall in the magnitude of the group excess sensitivity parameter Abstracting from issues of statistical significance, and focussing on the magnitude of the common Group 1 λ estimates (panel 2), the results say that the number of households which experienced liquidity constraints fell from 38 per cent in the 1960s to 29 per cent in the 1970s and to 14 per cent in the 1980s.

For the second group of countries only one of the eight constraints imposed in Table 4 is rejected by the likelihood ratio test. The rejected constraint was the imposition of a common λ for the 1980s. This is hardly surprising given the unconstrained λ estimates of 1.11 for Germany and -0.005 for Italy. None of the remaining constraints can be rejected at the five, or even ten per cent level of significance. Therefore, applying the normal tests to examine the significance of changes in the constrained λ for the 1980s compared to the other subsamples is clearly invalid. The 1970s common λ value is fractionally higher though not signficantly different from that of the 1960s.

B Asymmetry results

The results of the asymmetry tests using the simpler model are presented in Table 5. The null hypothesis of significant asymmetries is accepted at the 5 per cent level for the United States, Germany and Canada for the 1960s; Japan, Italy and Canada for the 1970s; but is rejected for all countries other than France and Australia in the 1980s. Furthermore, when asymmetry was accepted, the magnitude of the response of consumption to a fall in income was, in most cases, several multiples of the effect of an equivalent increase in income. In no case was the effect on consumption of an increase in income significantly greater than that for a fall.

These results lend further support to the liquidity constraints interpretation of the excess sensitivity parameter. They also further corroborate the evidence already reported of easing liquidity constraints over successive decades. This conclusion is inferred on the basis of the magnitude of the average differences in the λ_1 and λ_2 estimates in successive subperiods (2.27, 0.29 and 0.16 for the 1960s, 1970s and 1980s, respectively: or 2.83, 0.46 and 0.15 if Germany and France, the two countries that seem to conform least to the general pattern, are excluded (9) (see the bottom panels of Table 5)).

C. Real and nominal interest rate effects

The cross-country results from estimating equation 4 are given in Table 6. They indicate support for significant intertemporal substitution effects for the United States (for the 1960s/1970s subperiod and also for the 1980s) and for the United Kingdom (for the 1970s and the 1960s/1970s subperiods). There is also some weaker evidence for Japan favouring intertemporal substitution effects. Note, however, that for Italy in the 1960s this effect was significantly negative. These results are of some interest in

the light of the failure of many recent empirical studies to uncover a significant positive intertemporal elasticity of substitution (see, for example, Mankiw, Rotemberg and Summers (1985), Hall (1988), Campbell and Mankiw (1989) and Bayoumi and Koujianou (1984)).

Nominal interest rate effects arising from liquidity constraints are significant for Japan (1960s/1970s), for Germany (1980s), for France (1970s), and for Italy and Canada (1960s). However, for both the United States and Italy, nominal interest rate increases promoted consumption in the 1980s. In the Italian case this may have something to do with the dramatic growth in public sector debt, with increases in interest rates having a net favourable effect on current household disposable income encouraging consumption expenditure.

There is, therefore, some evidence of both intertemporal substitution effects and liquidity constraint effects arising from real and nominal interest rate changes respectively. However, in no instance does the presence of these effects require any substantive amendment of the conclusions already arrived at with respect to the changing pattern of liquidity constraints across countries or over time. Hence liquidity constrained consumers cannot be explained away by allowing households to redistribute their consumption over time in response to changes in the intertemporal relative price.

IV. FUTURE ISSUES AND RESEARCH

A. Liquidity constraints and equilibrium credit rationing

Liquidity constraints may arise because of financial market imperfections resulting from official regulations, or because of information problems in liberalised markets that result in equilibrium credit rationing. Given the character of the official regulations in the 1960s and 1970s, loan rates are likely to have been lower than the levels desired by financial intermediaries. Consequently, equilibrium credit rationing (which arises when intermediaries, uninhibited by official controls, anticipate that a further increase in loan rates would reduce their expected profits -- see Stiglitz and Weiss, 1981) is unlikely to have arisen. Imperfect information by lenders about the intentions and economic circumstances of borrowers which give rise to moral hazard and adverse selection effects (the root causes of equilibrium credit rationing), is likely to have been of lesser importance during the era of interest rate regulation. This is because banks faced large queues of borrowers from whom they could select the least risky. Indeed it would not have been profitable for them to lend to more risky customers since they could not trade off higher loan rates for higher risks.

The liberalisation of financial markets in many OECD countries (especially outside of continental Europe) in the 1980s, is likely to have reduced these types of liquidity constraints, and evidence that this has been reflected in consumption behaviour was presented above. Banks moved from a situation in which the assumption of risky loan assets was unprofitable to one in which it became profitable. The deregulation of rates and the pre-existing excess demand for credit by households provide the background for the large growth in household debt relative to both consumption and income in the 1980s (see Table 7). It is important to bear in mind that the consumption-smoothing

results presented above may be heavily influenced by once-for-all portfolio re-adjustments over periods immediately following significant deregulatory moves. In other words, the evidence in favour of reduced liquidity constraints may be specific to the 1980s. While it is unlikely that significant official re-regulation will reverse these findings during the 1990s, liquidity constraints arising from equilibrium credit rationing by financial institutions themselves may well become more apparent.

The presence of equilibrium credit rationing could explain why liquidity constrains remain significant (albeit affecting a smaller proportion of households) in the 1970s and 1980s in countries that have experienced considerable financial market liberalisation (see pooled group 1 results in Table 3). It cannot be excluded that such constraints might remain, and may indeed increase as a consequence of credit market excesses during the 1980s. In the United States, for example, developments in financial markets appear already to have led to more stringent lending criteria by banks in 1990 and 1991.

A number of factors have contributed to this development. Financial market liberalisation has greatly intensified the pressure on banks. Competition between them has increased sharply (reducing their lending margins), while insurance companies (on the liabilities side) and securities houses (on the assets side) are increasing their share of the financial services industry at the expense of the banking sector. Banks have been pushed to increasingly risky assets, while their competitors have been able to take advantage of developments at the low risk end of the market -- from which banks have been partially excluded by the sequencing of deregulation. Bank balance sheets have deteriorated in quality and the recession in the U.S. economy has exposed this weakness with significantly increased loan losses -- including those related to the end of the commercial real estate boom and falling property values. Falling bank share prices and downgradings of credit ratings have forced them to adopt much tougher standards for new loans.

Similar issues may also be important in the United Kingdom and Australia, while in Japan banks may be forced to cut back their balance sheets to meet BIS capital adequacy guidelines. There will be a need to monitor these sorts of developments closely, and to investigate whether they lead to the re-emergence of more binding liquidity constraints in the 1990s -- albeit of a form quite different to those which arose out of official regulations in earlier decades.

B. Inflation effects

A further issue that warrants investigation is the extent to which our results for the 1980s might be explained by the marked decline in inflation, as opposed to the removal of official regulations in financial markets. Falling inflation will ease liquidity constraints for a given financial market regulatory structure and accompanying capital market imperfection. This can best be demonstrated in the case of the design of the typical mortgage instrument in the 1960s and 1970s and, for some OECD countries, in the 1980s also. This was characterised by constant nominal repayments over the life of the mortgage. If there is an expectation of inflation, this necessarily implies the expectation of a diminishing stream of real repayments throughout the life of the loan. Consequently, the initial payment must be sufficient to

make up for this "tilt" effect so as to maintain unchanged, at the time of issue, the given real present value of the loan (see Appendix A for a technical treatment). This may force some borrowers into a suboptimal intertemporal reallocation of consumption The basic problem here is that this type of loan instrument requires the borrower to compensate the lender for inflation expected to occur in the future and which, if expectations are realised, will yield a gain to the borrower in terms of lower real repayments only progressively throughout the life of the loan This tilt effect may not be particularly severe for consumer loans, which are typically for a relatively short duration of two or three years. However, for mortgage loans it can have quite severe effects on the profile of intertemporal consumption, given that the amortisation period for most mortgages is in the region of twenty to thirty years.

The greater is expected (and subsequently realised) inflation, the more severe is the liquidity constraining effect of this type of constant-nominal-payment loan instrument on current household expenditures. With perfect capital markets (but conventional mortgage contracts) households could easily escape the tilt by borrowing against their (expected-to-be increasing) housing equity and using the money to finance consumption when the real payments on the mortgage are high in the early years of the mortgage. Thus for conventional mortgage contracts and a given unchanging level of capital market imperfection, an expected deceleration of the inflation rate will automatically relax household liquidity constraints. The second half of the 1960s (in some countries) and the 1970s were characterised by rising inflation, which may have exacerbated the liquidity constraints possibly identified in some of our earlier results. Conversely, an expected and subsequently realised reduction in inflation will reverse this process. Another factor, therefore, apart from deregulation, which may have contributed to a relaxation of liquidity constraints is the lower inflation experienced in the OECD area since the start of the 1980s. However, it should also be noted that any reversal of the "tilt" effect may also be related to financial liberalisation and innovation, which is changing mortgage instrument design in ways that greatly alleviate it. Further work will be required to determine the relative importance of inflation reduction and deregulation in explaining changes in consumption behaviour.

V. CONCLUSIONS

According to the econometric evidence presented in this paper, aggregate consumption in general seems to be less constrained by capital market imperfections in the 1980s than in the 1970s or 1960s. The favourite candidate for explaining this phenomenon is the combined and reinforcing effects of financial liberalisation (the progressive lessening of the extent and intensity of official regulations in both national and international capital markets) and innovation. This conclusion is based on empirical tests which hinge on a rather simple equation derived on the basis of several maintained hypotheses. A finding of excess sensitivity of current consumption to disposable income could be the consequence of a failure of one or more of those hypotheses. However, the broad pattern displayed by the excess sensitivity parameter, both across countries and over time, is best accounted for by the changing pattern of deregulation and financial innovation in most cases. This conclusion obtains further corroboration from tests that reveal some asymmetric household consumption behaviour in response to increases and decreases in income combined

with a tendency for the magnitude of these asymmetries to fall systematically over time. One of the main contenders for the rejection of the random walk consumption model is a failure of the rational expectations maintained hypothesis. But for many countries the results obtained herein would imply that consumers were becoming systematically less myopic over time. That this could occur independently of financial liberalisation seems unreasonable.

Another potential contender for rejection of the random walk consumption model is variation in real interest rates. Rejection of the random walk model might be due to a failure to account for intertemporal substitution in household consumption behaviour rather than to a significant deviation from the permanent income model. Variations over time in real rates, if not accounted for empirically, could make consumption appear excessively responsive to current income even though households are not subject to liquidity constraints and freely optimise over time. The results which emerge in this study suggest that for some time periods for some countries intertemporal substitution is an important phenomenon. However, allowing for this does not, in any substantive way, compromise the inferences already made about the evolution of liquidity constraints over time Furthermore, some of the supporting evidence for intertemporal substitution, albeit not very strong, may nevertheless suggest that recent failures to uncover an intertemporal substitution elasticity different from zero may in part be due to the exclusion of liquidity constrained consumers from these tests.

The conclusion of diminishing liquidity constraints implies that consumption behaviour is increasingly more accurately described by permanent income theory of consumption. Therefore, temporary or transitory shocks to the real economy, often considered to be the source of cyclical fluctuations in business activity, should have a significantly smaller impact on current consumption expenditure than before. This, in turn, could mean some reduction in the amplitude, if not the frequency, of business cycles. Another macroeconomic consequence of financial market liberalisation may be a reduced leverage of monetary policy over aggregate demand. Provided the changed nature of the transmission mechanism is well understood, this should present no obstacle to the effectiveness of policy, since the "dosage" of interest rate changes required to influence economic activity can always be increased.

The type of deregulation that has been occurring has only tended to reduce a particular type of capital market imperfection, namely that arising from interest rate and quantity ceilings, and from "powers" regulations (rules governing which services financial intermediaries are allowed to perform). There is a certain sense, however, in which financial markets are likely to remain imperfect. Asymmetries in the availability of information between borrowers and lenders give rise to equilibrium credit rationing in debt markets and "equity rationing" in stock markets These asymmetries necessitate costly "state verification" and monitoring of borrowers by lenders. This negates some of the conditions necessary for the Modigliani-Miller debt/equity irrelevance theorem to hold, and leaves open the possibility of non-neutral interactions between monetary and real factors. These type of imperfect information models have been subject to considerable development recently, and have been used by some to explain business cycle fluctuations (10)

The results obtained also raise issues about the optimal speed of financial liberalisation. If "financial repression" involves forced saving, the amount of which accumulates with time, then sudden complete deregulation

could release a wave of pent-up demand and give rise to major once-off consequences for the macroeconomy. Indeed, some of the economies which have been subject to rapid and radical liberalisation have manifested symptoms of overheating (for example, the United Kingdom and Australia). Our results may have been unduly influenced by such events, which were specific to the 1980s It cannot be excluded that equilibrium credit rationing may see liquidity constraints becoming relatively more important in the course of the 1990s.

NOTES

1. The full gamut of tests carried out below for a simpler model (focusing on current income) was also applied to the Flavin model. Since the overall conclusions based on the two models are essentially no different it was decided not to work with the Flavin model which proved somewhat unwieldly for examining some of the more subtle issue raised below.

2. The instruments actually employed for disposable income are three lags of this variable itself, as well as three lags on personal consumption, government expenditure, and total exports, all in per capita terms, as well as contemporaneous population and a time trend.

3. Another model which was subjected to extensive testing as part of the present exercise was that proposed by Japelli and Pagano (1988). In this model total income is again assumed to accrue to two types of households. A fraction λ goes to households that are liquidity constrained while the rest goes to households who consume out of permanent income. For simplicity, the liquidity constrained households are assumed to consume all their disposable income. Furthermore, for unconstrained households, it is not assumed that the real rate of interest equals the rate of time preference, in which case consumption follows an AR(1) process. These assumptions and some simple mathematical manipulation yields the following reduced form equation:

$$c_t = a_0 + a_1 c_{t-1} + \lambda[y^d_t - a_1 y^d_{t-1}] + e_t,$$

This equation incorporates a non-linear parameter constraint since the coefficient on y_{t-1} is the negative of the product of those on c_{t-1} and y_t. Consumption innovations (e_t) are likely to be correlated with transitory income, which calls for the employment of some instrumental variable estimation procedure. Ameniya's non-linear two-stage least squares estimator (NL2SLS) can cope with both of these problems, and is the estimator employed here. Many problems were encountered in trying to estimate this model. The major one was a failure of the iterative estimation process to converge to a stable solution. Different starting values or the addition or subtraction of a few observations frequently resulted in hugely implausible swings in the estimated coefficients for all countries in the sample. The use of alternative computer programmes did not help to alleviate this problem.

4. The countries in question are the United States, Japan, Germany, France, Italy, the United Kingdom, Canada, and Australia.

5 These countries are the United States, Japan, France, Italy, the United Kingdom and Canada.

6. The results for total consumption less purchases of desirables do not yield overall inferences which are sufficiently different from those for total consumption to warrant reporting. These results are available however on request.

7. Wilcox (1989) refers to a recent American Bankers Association textbook on consumer lending which suggest that a borrower's capacity to repay a loan can be measured by the payment-to-income ratio Wilcox concludes that, in practice, this means the current payment-to-current income ratio

8. See Blundell-Wignall, Browne and Manasse (1990) and further references therein.

9. These apparently systematic patterns may be biased by the very large λ_2 estimate for Italy for the 1960s. If, in fact, there were very few observations on Δy^- it might be operating as a dummy variable picking up some other influence.

10. Bernanke and Gertler (1989) present a model in which cyclical variation in the level of economic activity are amplified via the effects of agency costs on the price of external funding. The greater the level of corporate net worth the lower are agency costs. But net worth generally varies procyclically, aggravating deadweight agency costs, reducing investment and magnifying the extent of the downturn in activity. This effect reverses itself for an upturn in activity. Similar models have been presented by Greenwald and Stiglitz (1986) and Williamson (1987). A present drawback of these equilibrium or endogenous rationing theories is that they have not as yet been subjected to rigorous econometric testing and therefore one lacks a feeling for their empirical relevance

Table 1. **Slope (λ) OLS (instrumental variables) estimates for equation (2) in text**

	1960s	1970s	1980s	1960s/70s
		Individual country results		
United States	0.50** (0.18) (2.13)	0.47** (0.12) (2.02)	0.25 (0.18) (1.90)	0.27* (0.14) (1.84)
Japan	0.42** (0.18) (1.93)	0.31** (0.08) (2.01)	0.13 (0.08) (1.83)	0.33** (0.08) (1.82)
Germany	0.37** (0.15) (2.68)	0.67** (0.19) (2.54)	0.98** (0.21) (2.56)	0.56** (0.14) (2.64)
France	0.48 (0.30) (2.12)	0.12 (0.16) (2.45)	0.31 (0.20) (2.48)	0.40* (0.21) (2.24)
Italy	0.47** (0.17) (0.43)	0.54** (0.18) (1.30)	-0.01 (0.01) (0.18)	0.66** (0.11) (1.64)
United Kingdom	0.08 (0.20) (2.72)	0.12 (0.12) (2.42)	0.14 (0.12) (2.00)	0.09 (0.12) (2.47)
Canada	0.30* (0.17) (2.84)	0.24 (0.17) (2.12)	0.16 (0.14) (1.32)	-0.07 (0.15) (2.31)
Australia	0.37** (0.08) (1.39)	0.24 (0.15) (1.86)	0.20* (0.11) (2.25)	0.20* (0.11) (1.65)

Note: Standard errors are shown in parentheses first and Durbin Watson statistics second. One and two asterisks indicate difference from zero at the 10 and 5 per cent levels.

Table 2. **Unit normal tests of the hypothesis of declining λ values in later relative to earlier periods**

	$\hat{\lambda}_{60} < \hat{\lambda}_{70}$	$\hat{\lambda}_{70} < \hat{\lambda}_{80}$	$\hat{\lambda}_{60/70} < \hat{\lambda}_{80}$	$\hat{\lambda}_{60} < \hat{\lambda}_{80}$
	Individual country results			
United States	0.14	1.02	0.09	0.98
Japan	0.56	1.59*	1.77**	1.47*
Germany	-1.24	-1.09	-1.66	-2.36
France	1.06	-0.74	0.31	0.47
Italy	-0.28	2.44**	5.88**	2.70**
United Kingdom	-0.17	-0.12	-0.29	-0.25
Canada	0.25	0.36	-0.44	0.64
Australia	0.76	0.22	0.00	1.25

Note: The test statistics presented in the table are calculated as follows:

$$Z = \frac{\hat{\lambda}_E - \hat{\lambda}_L}{\sqrt{\hat{\sigma}_E + \hat{\sigma}_L}}$$

where λ_E and λ_L are the estimated coefficients for the relevant earlier and later periods and σ_E and σ_L are the corresponding variance estimates. Z is approximately normally distributed with zero mean and unit variance for moderately large samples (a condition fulfilled here with 40 observations for most subperiods). The critical values for the normal distribution at the 5 per cent and 10 per cent levels are 1.65 and 1.29 respectively. Z values in excess of these lead to acceptance of the null hypothesis of declining λ's. One asterisk indicates that the null cannot be rejected at the 10 per cent level, and two that it cannot be rejected at the 5 per cent level. The absolute values of Z are presented in the table.

Table 3. **Pooled results: Group 1**
(United States, Japan, Canada and Australia)

		1960s	1970s	1980s	1960s/1970s
United States	μ'	0.003	0.002	0.005	0.004
		(0.001)	(0.001)	(0.001)	(0.001)
	λ	0.42	0.43	0.01	0.25
		(0.16)	(0.11)	(0.15)	(0.12)
Japan	μ'	0.010	0.008	0.005	0.009
		(0.003)	(0.002)	(0.001)	(0.002)
	λ	0.42	0.28	0.14	0.30
		(0.16)	(0.07)	(0.08)	(0.07)
Canada	μ'	0.003	0.004	0.004	0.005
		(0.002)	(0.002)	(0.002)	(0.002)
	λ	0.46	0.25	0.16	0.14
		(0.16)	(0.16)	(0.12)	(0.16)
Australia	μ'	0.004	0.003	0.002	0.004
		(0.001)	(0.001)	(0.001)	(0.001)
	λ	0.35	0.19	0.15	0.15
		(0.07)	(0.14)	(0.11)	(0.12)
Log likelihood		525.2	536.4	483.7	1012.6
United States	μ'	0.004	0.003	0.004	0.004
		(0.001)	(0.001)	(0.001)	(0.001)
Japan		0.010	0.008	0.005	0.010
		(0.002)	(0.002)	(0.001)	(0.002)
Canada		0.003	0.004	0.004	0.004
		(0.002)	(0.002)	(0.002)	(0.001)
Australia		0.004	0.003	0.002	0.004
		(0.001)	(0.004)	(0.001)	(0.001)
	λ	0.38	0.29	0.14	0.24
		(0.06)	(0.05)	(0.05)	(0.05)
Log likelihood		525.0	535.4	483.6	1011.8
United States	μ'	0.004	0.003	0.004	0.004
Japan		(0.001)	(0.001)	(0.001)	(0.001)
Canada	λ	0.47	0.33	0.14	0.34
Australia		(0.06)	(0.05)	(0.05)	(0.05)
Log likelihood		517.7	532.6	481.8	1002.5

Note: A SURE estimation technique and the same instrumental variables as for Table 1 results are used here. Standard errors are shown in parentheses.

Table 4. **Pooled results: Group 2**
(Germany, France and Italy)

		1960s	1970s	1980s	1960s/1970s
Germany	μ'	0.008	0.003	-0.003	0.005
		(0.002)	(0.002)	(0.002)	(0.002)
	λ	0.31	0.65	1.11	0.50
		(0.12)	(0.18)	(0.19)	(0 14)
France	μ'	0.005	0.006	0.003	0.004
		(0.003)	(0.002)	(0.001)	(0.002)
	λ	0.50	0.12	0.25	0.50
		(0.26)	(0.19)	(0.18)	(0.20)
Italy	μ'	0.006	0.006	0.005	0.006
		(0.002)	(0.002)	(0.001)	(0.001)
	λ	0.43	0.41	-0.005	0.55
		(0.15)	(0.16)	(0.010)	(0.12)
Log likelihood		257.4	409.4	401.2	651.8
Germany	μ'	0.007	0.005	0.002	0 004
		(0.002)	(0.002)	(0.002)	(0.001)
France		0.006	0.004	0.004	0.004
		(0.003)	(0.002)	(0.001)	(0.001)
Italy		0.007	0.007	0.005	0.006
		(0.002)	(0.001)	(0.001)	(0.001)
	λ	0.38	0.41	-0.010	0.52
		(0.09)	(0.11)	(0.01)	(0.08)
Log likelihood		257.2	407.3	392.5	651.8
Germany, France, Italy	μ'	0.007	0.006	0.005	0.005
		(0.001)	(0.001)	(0.001)	(0.001)
	λ	0.38	0.40	-0.01	0.53
		(0.09)	(0.11)	(0.01)	(0.08)
Log likelihood		257.1	405.7	390.8	650.6

Note: A SURE estimation technique and the same instrumental variables as for Table 1 results are employed here. Standard errors are shown in parentheses.

Table 5. **Asymmetric behaviour**

Test equation: $\Delta c_t = \mu' + \lambda_1 \Delta y_t^+ + \lambda_2 \Delta y_t^- + (1-\lambda)\omega_t$

Figures in parentheses are absolute values of standard errors

	1960s			1970s			1980s		
	λ_1	λ_2	H_0	λ_1	λ_2	H_0	λ_1	λ_2	H_0
United States	0.40**	1.89**		0.41**	0.60**		0.04	0.63	
	(0.18)	(0.88)	A	(0.18)	(0.23)	R	(0.23)	(0.48)	R
Japan	0.32	1.19		0.04	0.75**		0.04	0.22	
	(0.20)	(2.77)	R	(0.11)	(0.13)	A	(0.13)	(0.19)	R
Germany	0.15	1.37**		0.72**	0.43		1.31**	0.70**	
	(0.19)	(0.58)	A	(0.20)	(0.72)	R	(0.41)	(0.37)	R
France	0.60	0.54		0.22	0.07		-0.17	0.84*	
	(0.37)	(1.09)	R	(0.33)	(0.94)	R	(0.32)	(0.45)	A
Italy	0.39**	14.80		0.01	0.63**		0.02	-0.01	
	(0.19)	(13.42)	R	(0.21)	(0.25)	A	(0.04)	(0.01)	R
United Kingdom	0.59*	-0.34		0.06	0.27		0.33*	-0.07	
	(0.31)	(0.29)	R	(0.20)	(0.31)	R	(0.18)	(0.34)	R
Canada	0.11	1.37*		-0.07	0.79		0.05	0.21	
	(0.22)	(0.73)	A	(0.22)	(0.50)	A	(0.20)	(0.34)	R
Australia	0.42**	0.26		0.25	0.49		0.05	0.47*	
	(0.10)	(0.18)	R	(0.17)	(0.46)	R	(0.16)	(0.25)	A
Average λ_1 and λ_2 estimates across countries	0.37	2.64		0.21	0.50		0.21	0.37	
Average λs excluding Germany and France	0.37	3.20		0.12	0.58		0.09	0.24	

Note: The null hypothesis H_0 is $\lambda_2 > \lambda_1$ and the alternative that $\lambda_2 \leq \lambda_1$. A value of the Z statistic (see Table 2) in excess of 1.65 or 1.29 indicates acceptance (A) of H_0 at the 5 and/or 10 per cent levels respectively. R indicates rejection of H_0.

Table 6. **Estimates for equation (4) in the text, i.e.**

$$\Delta C_t = \mu + \lambda \Delta \hat{y}_t + \alpha r_{t-1} + \gamma \Delta \hat{i}_t + \omega$$

Absolute t values in parentheses

		1960s	1970s	1980s	1960s/1970s
UNITED STATES	$\hat{\lambda}$	0.36*	0.43**	0.20	0.23*
		(2.02)	(3.67)	(1.17)	(1.66)
	$\hat{\alpha}$	0.001	0.0007	0.001**	0.001*
		(0.75)	(1.31)	(2.54)	(1.93)
	$\hat{\gamma}$	0.003	-0.0005	0.003*	-0.0003
		(0.53)	(0.21)	(1.84)	(0.15)
	DW	2.15	2.10	1.96	1.99
JAPAN	$\hat{\lambda}$	0.44**	0.28**	0.16*	0.32**
		(2.57)	(3.35)	(1.90)	(4.15)
	$\hat{\alpha}$	0.001	0.0003	0.001	0.0004
		(1.55)	(0.71)	(1.34)	(1.49)
	$\hat{\gamma}$	-0.024	-0.01	-0.001	-0.015**
		(1.64)	(1.38)	(0.42)	(2.42)
	DW	1.88	1.96	2.11	1.87
GERMANY	$\hat{\lambda}$	0.36**	0.66**	1.07**	0.53**
		(2.48)	(3.20)	(5.13)	(3.51)
	$\hat{\alpha}$	-0.001	-0.0003	-0.001	-0.001
		(1.20)	(0.28)	(0.93)	(1.05)
	$\hat{\gamma}$	0.17	-0.0001	-0.006**	-0.0001
		(0.99)	(0.11)	(2.19)	(0.14)
	DW	2.61	2.58	2.54	2.65
FRANCE	$\hat{\lambda}$		0.16	0.28	
			(0.83)	(1.39)	
	$\hat{\alpha}$		0.001	0.001	
			(1.14)	(1.40)	
	$\hat{\gamma}$		-0.005**	0.001	
			(2.16)	(0.76)	
	DW		2.61	2.37	

For note see over.

Table 6. (continued)

		1960s	1970s	1980s	1960s/1970s
ITALY	$\hat{\lambda}$	0.73**	0.30	-0.02	0.86**
	λ	(4.92)	(1.30)	(1.40)	(5.00)
	$\hat{\alpha}$	-0.002**	0.0003	0.0003	-0.0002
	α	(4.72)	(1.02)	(1.16)	(1.07)
	$\hat{\gamma}$	-0.024*	0.001	0.004**	0.001
	γ	(3.83)	(1.20)	(2.45)	(0.61)
	DW	1.35	1.87	0.45	1.86
UNITED KINGDOM	$\hat{\lambda}$	0.06	0.102	0.17	0.08
	λ	(0.32)	(0.82)	(1.34)	(0.71)
	$\hat{\alpha}$	0.001	0.001*	0.0002	0.001*
	α	(0.32)	(1.85)	(0.40)	(1.70)
	$\hat{\gamma}$	-0.012	-0.004	-0.001	-0.005
	γ	(0.81)	(0.87)	(0.72)	(1.13)
	DW	2.97	2.75	2.11	2.70
CANADA	$\hat{\lambda}$	0.28*	0.23	0.17	0.15
	λ	(1.68)	(1.33)	(1.19)	(0.93)
	$\hat{\alpha}$	0.0003	-0.0002	0.001	-0.0002
	α	(0.31)	(0.34)	(0.71)	(0.38)
	$\hat{\gamma}$	-0.01*	-0.002	-0.0004	-0.002
	γ	(1.80)	(0.72)	(0.33)	(0.92)
	DW	2.98	2.22	2.08	2.26

Note: One and two asterisks indicate difference from zero at the 10 and 5 per cent levels. Interest rate data for Australia were not available for a sufficiently long time period to complete the tests, nor were interest rate data available for France for the 1960s.

Table 7. Ratio of households total financial liabilities to total private final consumption expenditure

	United States	Japan	Germany	France	United Kingdom	Italy	Canada
1970	0.77	0.72	0.09	0.31	-	-	0.87
1975	0.77	0.79	0.11	0.72	0.62	0.14	0 93
1980	0.86	0.91	0.17	0.75	0.65	0.10	1 01
1981	0.84	0.95	0.17	0.73	0 69	0.10	0 93
1982	0.83	0.97	0.17	0.70	0.74	0.10	0.88
1983	0.85	1.00	0.18	0.69	0.81	0.09	0 86
1984	0.87	1.03	0.18	0.74	0.88	0.10	0.83
1985	0.92	1.05	0.19	0.74	0.94	0.11	0.85
1986	0.97	1.09	0 19	0 73	1.00	0.12	0 88
1987	0.97	1.19	0.19	0.80	1.07	0.13	0 93
1988	0.99	1.25	0.20	0.86	1.15	0.14	0.98
1989	1.01			0 89	1.21		

Note: Data on the total financial liabilities of households were obtained from John Fallon and OECD Financial Statistics: Non-Financial Enterprises Financial Statements. The sources for total private consumption expenditures were OECD National Accounts or OECD Country Studies.

APPENDIX

INFLATION AND THE TILT PHENOMENON

This tilt phenomenon can best be understood by appealing to the related concept of the duration (i e. Macauley duration) of the stream of real mortgage repayments. Macauley duration means the number of years necessary to pay off half the real value of the debt if the expected inflation rate, incorporated fully as an inflation premium in the nominal mortgage rate, is subsequently realised. Mathematically it is given by:

$$Rdur = \int_0^T te^{-Rmt}dt \; / \; \int_0^T e^{-Rmt}dt$$

$$= 1/Rm - T\,e^{-RmT} \; / \; (1 - e^{-RmT}) \qquad (A1)$$

where Rm is the mortgage rate of interest and T is the amortisation period in years. With zero expected inflation, a 3 per cent mortgage rate and twenty year amortisation period, duration is approximately nine years. As expected inflation goes from zero to twenty per cent, to take an extreme example, and the mortgage rate from three to twenty-three per cent, the half life of the mortgage falls from nine to a fraction over four years. So, instead of having nine years in which to pay off half the real value of the mortgage, the mortgage holder has now only got about four years in which to do so.

Thus a flat nominal payment stream implies that an increase in the inflation premium incorporated in the mortgage rate will tilt the distribution of the real repayments stream toward the beginning of the amortisation period. This, of course, is accompanied by faster growth of house equity. If mortgage and other capital markets are imperfect, however, then those increased equity stakes will not be realisable and this tilting effect will consequently impose a severe reprofiling of intertemporal consumption expenditures.

A corollary of the above is that an expected, and subsequently realised, reduction in the expected inflation rate will reverse this process leading to an increase in duration and a reduction in the tilt. Thus a reduction in the expected inflation rate, which is subsequently realised, will cause an automatic relaxation of liquidity constraints. The reduced consumption sensitivity to disposable income in the 1980s may also in fact be attributable to the very substantial inflation reductions experienced for the countries in question throughout this decade.

REFERENCES

Bayoumi, T and P Koujianou (1989), "Financial Deregulation and Consumption", IMF Departmental Memorandum.

Bernanke, B. (1985), "Adjustment Costs, Durables and Aggregate Consumption", Journal of Monetary Economics, Vol. 15, pp. 41-68 (January)

Bernanke, B. and M. Gertler (1989), "Agency Costs, Net Worth and Business Fluctuations", American Economic Review, Vol. 79, pp. 14-31 (March)

Blundell-Wignall, A., F.X. Browne and P. Manasse (1990), "Monetary Policy in Liberalised Financial Markets", OECD Economic Studies, No. 15, Autumn.

Campbell, J.Y. and N.G. Mankiw (1989), "Consumption, Income and Interest Rates: Re-interpreting the Time Series Evidence", NBER Working Paper, No. 2924 (April).

Delong, J.B. and L. Summers (1986), "The Changing Cyclical Variability of Economic Activity in the United States" in R.J. Gordon ed , The American Business Cycle: Continuity and Change, Chicago, University of Chicago Press.

Flavin, M. (1985), "Excess Sensitivity of Consumption to Current Income: Liquidity Constraints or Myopia?", Canadian Journal of Economics, Vol. XVIII, pp. 117-136, (October).

Greenwald, B.C. and J.E. Stiglitz (1989), "Financial Market Imperfections and Productivity Growth", NBER Working Paper, No. 2945 (April).

Hall, R. (1978), "Stochastic Implications of the Life Cycle-Permanent Income Hypothesis: Theory and Evidence", Journal of Political Economy, Vol. 86, pp. 971-987 (October).

Jappelli, T. and M. Pagano (1989), "Consumption and Capital Market Imperfections: An International Comparison", American Economic Review, Vol. 79, pp. 1088-1105 (December).

Mankiw, N.G. (1981), "The Permanent Income Hypothesis and the Real Interest Rate", Economic Letters, Vol. VII.

Mankiw, N.G., J.J. Rotemberg and L. Summers (1985), "International Substitution in Macroeconomics", The Quarterly Journal of Economics, pp 225-251 (February).

Stiglitz, J. and A. Weiss (1981), "Credit Rationing in Markets with Imperfect Information", American Economic Review, Vol 71, pp. 393-410 (June)

Wilcox, J.A. (1989), "Liquidity Constraints on Consumption: The Real Effects of "Real" Lending Policies", Economic Review, Federal Reserve Bank of San Francisco, No. 4.

Williamson, S.D. (1987), "Financial Intermediation, Business Failures and Real Business Cycles", Journal of Political Economy, Vol. 95, pp. 1196-1216 (December).

Zeldes, S. (1989a), "Consumption and Liquidity Constraints: An Empirical Investigation", Journal of Political Economy, Vol. 97, pp. 305-346.

Zeldes, S. (1989b), "Optimal Consumption with Stochastic Income: Deviations from Certainty Equivalence", The Quarterly Journal of Economics, pp. 275-298 (May).

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