Consumption, household portfolios and the housing market: a flow of funds approach for France

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Abstract

This paper analyses the links between French household consumption and household portfolios of assets, including housing, and debt. A four-equation system for consumption, house prices, consumer credit and housing loans uses latent variables to represent the crucial shifts in the availability of the two types of credit to households and measures their impacts. Qualitative evidence on credit market liberalisation supports the interpretation of the latent variables. Changes in housing loans conditions account for a substantial part of the pronounced increase in real house prices and in the ratio of housing loans to income in France from 1996 to 2008. Once controls for credit conditions are introduced, the remaining parameter estimates are broadly in line with estimates for other countries. In France, unlike in the Anglo-Saxon economies, there was no consumption boom since home equity loans are not available in France and down-payment ratios remain substantial. Higher real house prices require households to save more for their down-payment if they wish to become home-owners, while permanent tenants can expect rents to increase in the future and so need to save more also. Controlling for credit conditions, income, income growth expectations, debt and financial wealth, the estimates suggest that a 10% rise in real house prices reduces consumption by 0.7%, down from the 1% that held before housing loans conditions relaxed. The rise in debt itself constrained consumption because of debt-servicing and repayment obligations. The models suggest the main downside risks to French house prices could come from weaker income growth or higher interest rates rather than from unsustainable credit conditions or an over-supply of housing.
1. Introduction

After the global financial crisis, much greater attention is being paid to flows of funds data. Credit, portfolio balances and asset prices are now suspected to have far more prominent roles in business cycle developments as well as for financial stability than previously popular New Keynesian Dynamic Stochastic General Equilibrium Models allowed. Nothing could illustrate this more clearly that the role played by liquid and illiquid wealth, credit availability, and for some countries, housing wealth in explaining variations in the largest single component of aggregate expenditure, namely consumption. In this paper, French consumption, household debt and house prices are endogenised as an important step towards a more comprehensive macroeconomic model. One important question is whether France resembles the Anglo-Saxon economies in that higher house prices translate into higher consumption. The literature reviewed in section 3 gives contradictory answers to this question. Another is whether credit market liberalization raised consumption and debt levels and whether it had an impact on the housing market. An important feature of this paper is that the marginal propensities to consume are estimated for a three-way split of assets, liquid, illiquid and housing wealth, to emphasise the different “spendability” of such assets. This ‘credit-augmented’ life-cycle consumption function also includes an innovative measure of consumer credit conditions, and its interactions with housing wealth, interest rates, proxies for income uncertainty, and income growth expectations generated by a forecasting model.

France has experienced substantial credit market liberalization as documented in this paper, rising real house prices and debt to income ratios and large swings in the consumption to income ratio. Three effects of credit liberalization on consumption are distinguished in this paper. Credit liberalization reduces the credit constraints on households engaging in smoothing consumption when they expect significant income growth. It also reduces deposits required of first-time buyers of housing. Finally, if home equity loans are permitted, it increases the availability of collateral-backed loans for households already in possession of collateral, see Miles (1992, 1994). The three facets imply a shift in the average propensity to consume, and potentially important interaction effects.

There are no available data to measure credit conditions directly in France before 2003. This paper adopts a “latent variable approach”, where a credit conditions indicator is
proxied by a spline function. Joint debt, decomposed in consumer credit and housing loans, consumption and house price equations are estimated and the (unobservable) credit supply indicator enters all four equations. Duca and Muellbauer (2013) name this type of equation system a *Latent Interactive Variable Equation System* (LIVES). The latent variable enters interactively as well as additively. It is indeed estimated jointly in the four equations and the estimates are compared to information on credit market liberalization. The empirical evidence suggests substantial credit liberalization has taken place in France but finds no evidence that in France higher housing wealth increases consumption. Indeed the evidence points to the opposite conclusion.

The four-equation sub-system needs to be inserted into a larger econometric model to fully explore the shifting manner in which monetary policy, external and technology shocks are transmitted to output and inflation in a general equilibrium setting. In particular, another major structural change overlapped with financial deregulation, namely adopting a disinflationary monetary policy. Thus, to trace through fully the causal effects of credit market liberalization on consumption, it would be necessary to track potential channels through house prices and housing volumes, liquid asset holdings, current income as well as other asset prices. The paper examines the direct positive effects on consumption, the indirect negative effect via household debt, the indirect effect through house prices, negative in the French case, and the positive indirect effect via income growth expectations, only part of the full effects.

The outline of the paper is as follows. Section 2 provides a theoretical background for the econometric specifications. Section 3 discusses the French institutional background and previous literature for models of consumption debt and house prices for France. Section 4 sets out the specification of the empirical models and discusses the estimation results. Section 5 concludes. A brief appendix contains the details of the construction of the Credit Conditions Indices and some further institutional background.
2. Theory Background to the Consumption, Debt and House Price Models

2.1 Consumption

We follow the exposition in Aron et al. (2012) in setting out the modernization of the textbook life-cycle or permanent income consumption function required to analyse an economy where shifts in credit market conditions have been important. This solved-out Friedman-Ando-Modigliani basic aggregate life-cycle/permanent income consumption function has the form:

\[ c_t = \gamma^* A_{t-1} + \omega^* y_t^p \]  

(1)

where \( c \) is real per capita consumption, \( y^p \) is permanent real per capita non-property income \(^1\) and \( A \) is the real per capita level of net wealth. This consumption function requires an income forecasting model to generate permanent non-property income. Unlike the Euler equation, see Hall (1978), it does not ignore long-run information on income and assets, though in the formulation above the distinction between types of assets is ignored. This general approach also has a basic robustness feature missing in the Euler equation. Euler equations require well-informed households continuously and efficiently trading off between consuming now and consuming next period without any credit constraint. They fail basic empirical tests. \(^2\) In contrast, the extension of equation (1) discussed below is consistent with a fairly rudimentary comprehension of life-cycle budget constraints. Any household with some notion of wanting to sustain consumption will realize that not all of its assets can be spent now without damaging future consumption, and that future income has a bearing on sustainable consumption. As we shall see, practical applications of extensions of equation (1) capture these basic ideas.

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\(^1\) Non-property income is the relevant income concept in standard life-cycle models where property income is defined by rates of return on assets, and assets are choice variables. Income is therefore measured by non-property (labour plus net transfer) income, which omits dividends and interest earned on wealth that are embodied in assets.

\(^2\) The extreme assumption in the Euler equation is one of full rationality: consumers are assumed to face linear budget constraints (they can borrow as much as they like at a given interest rate) and to continuously optimise their spending and portfolio decisions taking full account of all publicly available information. See Campbell and Mankiw (1991) for international evidence rejecting the central prediction of the Euler equation, that consumption growth should be unpredictable given past information.
Since consumption and income tend to grow exponentially, formulating the consumption function in logs has advantages. The log approximation of equation (1) is: 
\[ \ln c_t = \alpha_0 + \ln y_t + \gamma A_{t-1} / y_t + \ln \left( y^p_t / y_t \right) \]  
(2)

where \( \gamma = \gamma^* / \omega^* \) and \( \alpha_0 = \log \omega^* \). The log ratio of permanent to current income \( \ln \left( y^p_t / y_t \right) \) reflects expectations of income growth and in practice can be proxied by functions of forecasted income growth rates.

The difference between log permanent income and log current income in equation (2) can be closely approximated by an expression in logs of expected future non-property incomes:
\[ \ln \left( y^p_t / y_t \right) = \left( \sum_{s=1}^{k} \delta^{s-1} E_t [\ln y_{t+s}] \right) \left( \sum_{s=1}^{k} \delta^{s-1} \right) - \ln y_t \]  
(3)

Here \( \delta \) is a discount factor, for example 0.95, so that future expected incomes are discounted more and more heavily as the horizon extends. This expression is also equivalent to a weighted moving average of forward-looking income growth rates. A dynamic specification of the static form, for instance to introduce habits or adjustment costs, implies a partial adjustment form of equation (2).

If real interest rates are variable, standard consumption theory suggests the real interest rate \( r_t \) enters the model with the usual interpretation of inter-temporal substitution and income effects. Extending the model further to include probabilistic income expectations suggests the introduction of a measure of income uncertainty, \( \theta_t \). With income uncertainty, the discount factor, \( \delta \), in expected income growth as measured by \( \ln \left( y^p_t / y_t \right) \) should incorporate a risk premium, allowing the possibility that households may discount the future more heavily than by the real rate of interest.

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3 After taking logs, two approximations are used: first, the fact that \( \ln(1 + x) \approx x \) for small values of \( x \), and then the further approximation, \( (y^p - y) / y \approx \ln (y^p / y) \), see Aron et al. (2012).

4 One important advantage of equation (2) is that it avoids the log assets formulation employed in many studies of consumption. The log formulation is a poor approximation when asset levels are low, as is true for many households. It is also a poor approximation when testing hypotheses on disaggregated assets.
This gives the following generalisation of the canonical permanent income model of consumption in equation (2):

\[
\Delta \ln c_t \approx \lambda (\alpha_0 + \alpha_1 y_t + \alpha_2 \theta_t + \ln y_t + \alpha_3 E_t \ln \left( \frac{y_{t+1}^\rho}{y_t} \right) + \gamma A_{t-1} / y_t - \ln c_{t-1}) + \varepsilon_t
\]  

(4)

where \( \lambda \) measures the speed of adjustment. In principle, the coefficients: \( \alpha_1, \delta \) and \( \gamma \), could depend upon the real interest rate, \( r_t \) and on \( \theta_t \), since discount factors applied to expected incomes will increase with income uncertainty. For simplicity, this complication and the associated potential non-linearities are ignored here.\(^5\)

In practice, there are a number of reasons why income growth expectations embodied in \( \ln \left( \frac{y_t^\rho}{y_t} \right) \) are likely to reflect a relatively limited horizon. With aggregate data it is difficult to forecast income beyond about three years except by reversion to a trend. Furthermore, shorter horizons are suggested if households anticipate future credit constraints, according to the buffer-stock theory of saving explained in Deaton (1991). Precautionary behaviour also generates buffer-stock saving, as in Carroll (2001a,b), where it is argued that plausible calibrations of micro-behaviour can give a practical income forecasting horizon of about three years. This horizon was originally suggested by Friedman in his application of the permanent income hypothesis to aggregate consumption data.

The formulation in equation (4) still needs to split up assets into different types with different spendibilities. One reason is that owner-occupied housing wealth differs fundamentally from financial assets since a roof over one’s head gives shelter (has utility value) as well as having an asset value. The second reason is that, with credit constraints, housing wealth has a collateral role see Muellbauer (2007) or Aron et al. (2012) for further discussion.\(^5\) A third reason is that illiquid financial assets, subject to asset price volatility are

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\(^5\) Note that household heterogeneity in equation (1) would make \( \gamma^* = \sum \gamma^*_h A_{h,t-1} / \sum_A_A_{h,t-1} \) and \( \omega^* = \sum \omega^*_h y^\rho_{ht} / \sum y^\rho_{ht} \) where the h subscript indicates household h. With a slowly evolving distribution of permanent income and of assets and of the age distribution of the population, this could generate some time drift in \( \gamma = \gamma^* / \omega^* \) and in \( \alpha_0 = \log \omega^* \). In the application below, we allow \( \alpha_4 \) to evolve with the age distribution.

\(^6\) Attanasio et al. (2011) use a calibrated partial equilibrium model with a realistic treatment of mortgage constraints to simulate the impact of house prices and income on consumption. Our consumption function can be thought of as an empirical approximation for aggregate date to a micro-simulation model of this type with richness that comes from also distinguishing liquid from illiquid financial assets and linking unemployment and income uncertainty.
different from liquid financial assets\textsuperscript{7} and debt. Variations in household access to credit induce time variation in key parameters of the consumption function when not controlled for. This suggests the following ‘credit-augmented’ version of the Friedman-Ando-Modigliani consumption function:

\[
\Delta \ln c_t \approx \lambda (\alpha_{tt} + \alpha_{tr} r_t + \alpha_{t\varphi} \theta_t + \alpha_{tr} E_t \ln \left( y_t^p / y_t \right)) + \gamma_1 \text{NLA}_{t-1} / y_t \\
+ \gamma_2 \text{IFA}_{t-1} / y_t + \gamma_3 \text{HA}_{t-1} / y_t + \ln y_t - \ln c_{t-1} \\
+ \beta_1 \Delta \ln y_t + \beta_2 \Delta nr_t \left( DB_{t-1} / y_t \right) + \beta_3 \Delta \theta_t + \epsilon_t
\]  

(5)

The time variation in some of the parameters, seen in their time subscripts, and induced by shifts in credit availability, is discussed in a dedicated paragraph below.

The net worth to income ratio has been disaggregated into three elements: \text{NLA}/y is the ratio of liquid assets minus debt to non-property income, \text{IFA}/y is the ratio of illiquid financial assets to non-property income, and \text{HA}/y is the ratio of housing wealth to non-property income, all in real terms.\textsuperscript{8} The term \(\Delta nr_t \left( DB_{t-1} / y_t \right)\) is the change in the log of the debt service ratio, defined as the product of the nominal interest rate on debt and the end of previous quarter debt, scaled by current non-property income. The term thus measures the cash flow impact on indebted households from changes in nominal rates and from increases in debt burdens. The speed of adjustment is given by \(\lambda\), and the \(\gamma\) parameters measure the marginal propensity to consume (mpc) for each of the three types of assets. The evidence from several countries is that the change in the unemployment rate is a good proxy for income uncertainty, \(\theta_t\), or for a shift in income uncertainty (Aron et al., 2012).\textsuperscript{9} The term in the log change of income allows for the possibility that some households’ spending growth follows current income growth more closely than implied by equation (2), for example because they are credit constrained. This could also be because some, perhaps less sophisticated, decision-makers within households take current income growth as an indicator

\textsuperscript{7} Otsuka (2006) has formalised a model in which trading costs for illiquid assets imply a higher spendibility for liquid assets.

\textsuperscript{8} Liquid assets are deposits, banking accounts and money market funds in the financial national account, illiquid assets are the rest of the assets.

\textsuperscript{9} The multi-country empirical evidence favours the change, rather than the level of the unemployment rate, given the other controls in this formulation of the consumption function. The change in the unemployment rate makes less sense as part of the long-run solution for consumption.
for future income growth. Equation (5) has the most basic life-cycle model (i.e. equation (2)) as a special case\(^\text{10}\).

The credit channel is reflected in the consumption function through the different \(mpcs\) for net liquid assets and for housing; through the cash flow effect for borrowers; and by allowing for possible parameter shifts stemming from credit market liberalization (see paragraph dedicated below).

This consumption equation satisfies long-run homogeneity in income and assets: doubling both, doubles consumption. The long run coefficient on \(ln y\) is set to 1. This means that the income endogeneity issues which Hall (1978) highlights are not of concern for the measurement of the long-run income and asset effects: variations in asset to income ratios are dominated by movements in lagged asset prices, so that the endogeneity of income is practically irrelevant, except possibly for the estimation of the coefficient on \(\Delta \ln y\).\(^\text{11}\)

### 2.2 Mortgage Debt

In contrast to the vast literature on consumption, little systematic econometric work exists on household debt, see the reviews in Fernandez-Corugedo and Muellbauer (2006) and in Meen (1990). The canonical rational expectations permanent income model of the representative consumer has little to contribute to understanding the determination of aggregate household debt. In that model there is only a single asset, so that it can explain only the evolution of aggregate net wealth. In practice, consumers have multiple motives for holding debt. These include first, borrowing to finance the acquisition of consumer durables and housing, human capital investment through education or training, or portfolio investment in financial assets when return prospects look favourable; second, acquiring debt in anticipation of higher future income or for consumption-smoothing through temporary income downturns; and thirdly, using debt to offset what could otherwise be excessive amounts of saving implied by occupational pension rules. In practice, in France as well as most developed economies,

\(^{10}\) Note that \(\lambda = 1, \alpha_1 = \alpha_2 = 0, \gamma_1 = \gamma_2 = \gamma_3, \beta_{1t} = \beta_{2t} = \beta_{3t} = 0\) and \(\alpha_3 = 1\) are the restrictions which result in equation (2). Equation (5) also encompasses (is more general than, but has as a special case equation (4).

\(^{11}\) Note that since the long-run coefficient of income equals 1, given the asset to income ratios, and since it is not being estimated, endogeneity bias cannot arise. Instrumenting the income denominator makes virtually no difference to the estimated coefficients on asset to income ratios. In a wider system, income, asset prices and the portfolios households held at the end of the previous quarter are, of course, endogenous. Nevertheless, important insights for policy and for short-term forecasting are obtained from estimates of the partial system proposed here. Avouyi-Dovi et alii (2011) show in particular that the household portfolio composition in France depends on population structure and unemployment rate.
mortgage debt accounts for the major proportion, often 70 to 80 percent of total household debt. The term mortgage should be understood here in the broader sense of a housing loan. Indeed, mortgage loans in the strictly legal sense are a minority in housing loans in France. Most housing loans are indeed guaranteed by a specialised organisation that mutualised risks on incomes (62 % of new loans in 2011 according to the French Supervisory Authority for banks, ACPR). Thus, housing properties are not the guarantee for most loans; instead that role is played by households’ income. However when a housing loan is not repaid, households might be obliged to sell their home. Thus the impact on the housing market might not differ from that of a mortgage loan. Miles (1992) and Brueckner (1994) discuss the borrowing and saving decisions for housing and portfolio investment motives and discuss the consequences of the relaxation of mortgage rationing. Given asymmetric information between lenders and borrowers, assets have an important collateral role. Mortgage debt is backed by housing collateral. In a closed financial system, much of household saving in liquid asset form is recycled by the financial system into lending for other households, suggesting that at the aggregate level, current end-of-period mortgage debt should increase with liquid assets at the end of the previous period. With the internationalisation of finance, however, domestic liquid assets are likely to become less of a constraint at the domestic level. At the micro level, a household with high levels of liquid assets will be less in need of a mortgage. This leaves some ambiguity about what can be expected for the aggregate relationship between liquid assets and the mortgage stock.

Higher house prices or housing wealth should increase the demand for mortgages, partly because of the collateral role of housing and because for a given level of housing demand, higher house prices need greater levels of debt. However, this relationship is likely to be time varying: when large down-payment ratios are required, higher house prices could even reduce the demand for mortgages by excluding larger fractions of potential buyers from the mortgage market. Credit market liberalisation should reduce this potentially negative influence. Variables such as income, interest rates and proxies for income uncertainty, reflecting economic conditions during the period, will also influence current debt. We use a log formulation, linking the log mortgage debt to income ratio with log ratios to income of the various assets, and to the log of real income to obtain the following long-run equation for mortgage debt:

$$\ln mdebt_t = m_{0t} + m_{1t} \ln nmr_t + m_{2t} \ln user_t + m_{3t} \theta_t + m_{4t} \ln y_t + m_{5t} E_t \ln (y_t^p/y_t)$$
constraint on the ability to finance debt and both would be expected to have a negative coefficient. A second interest rate influence potentially enters via the user cost term, a kind of real interest rate, which subtracts the expected rate of house price inflation from the tax adjusted interest rate, discussed further in the next subsection. Alternatively, households may perceive as relevant the real interest rate burden corrected for the rate of inflation of total consumption. These are issues for empirical testing. The equation also incorporates income uncertainty, the log ratio of permanent to current income, log income, three log asset to income ratios and demographic composition since a younger age structure should be associated with higher levels of debt.

2.3 Consumer credit

The stock of consumer credit in the form of credit card debt, personal loans or overdrafts and loans for the purchase of durable goods other than housing would be expected to have similar drivers to those for consumption, and interest rate effects would be expected, given controls for increased credit supply. One might expect the long run income elasticity to be greater than one, for example, inheriting income elastic demand from the demand for durables. Income growth expectations should have a positive effect, greater with greater credit availability.

We propose the following long-run formulation for the log of consumer debt

\[
\ln \text{cdebt}_t = u_{0t} + u_{1t} \ln \text{ncr}_t + u_{2t} \ln \text{user}_t + u_{3t} \theta_t + u_{4t} \ln y_t \\
+ u_{5t} E_t \ln \left( \frac{y^p_t}{y_t} \right) + u_6 (\gamma_1 \text{NAL}_t - 1/y_t + \gamma_2 \text{IFA}_t - 1/y_t + \gamma_3 \text{HA}_t - 1/y_t)
\]

\[6\]

Note that the debt service ratio, defined by the product of the nominal mortgage rate and debt, scaled by current income, is a cash-flow measure of affordability. The log formulation makes sense since the dependent variable is in logs and plausibly depends on the log of the nominal interest rate and on log income.

13 In contrast to the linearization in terms of asset to income ratios not in logs chosen for the consumption function, the log linearization here adopted would be more consistent with proportional effects in the long run. However, it is simple to test the two alternatives.
Here, the intercept is time-varying and increases with \textit{CRCCI}, the credit conditions indicator applying to consumer credit. The nominal interest rate on consumer credit, \textit{ncr} is expected to have a negative sign and could be time-varying with \textit{CRCCI}. The user cost variable \textit{user} should have a positive coefficient since with high user costs for housing, one might expect some credit demand to be diverted into non-housing related credit. In this formulation, the same linearization and relative coefficients of the asset to income ratios as used for the consumption function is assumed, a testable hypothesis.\footnote{To anticipate the empirical results, the hypothesis is accepted.} The income and income growth expectations effects enter in similar form into the consumption and mortgage debt equations, though one would not necessarily expect similar coefficients across the three equations. In the early 1980s, aggregate consumer credit in France was so tiny relative to income, that it may well have been concentrated among an unrepresentative minority of households, making aggregate income growth expectations less relevant.

\textbf{2.4 House prices}

There are two basic theories of housing price determination. The first is based on supply and demand functions, and a price adjustment process which brings supply and demand into balance. The second is based on asset pricing theory from finance and assumes that arbitrage brings housing prices and rents into an equilibrium relationship, again after a price adjustment process. In both approaches, interest rates as well as shifts in access to credit for households provide an important link between the macro economy and housing prices. The main difference between both models lies in the way rents are taken into account. The supply and demand approach will be followed in this paper.

In this approach, the supply – the stock of housing – is given in the short run. Then housing prices are determined by the inverted demand curve, that is, by the stock of housing and the factors driving demand. Let the log of housing demand, \( h \), be given by:

\[
\ln h = -\alpha \ln rhp + \beta \ln y + z
\]  

(8)

where \( rhp \) is the real housing price, \( y \) is real income and \( z \) represents other demand shifters. The own-price elasticity of demand is \(-\alpha\), and the income elasticity is \( \beta \). Solving for housing prices, \( rhp \), yields:

\[
14\text{To anticipate the empirical results, the hypothesis is accepted.}
\[ \ln rhp = (\beta \ln y - \ln h + z)/\alpha \] (9)

Note that forecast simulations of housing prices for this model would need a residential investment equation as well as assumptions on income, interest rates and credit availability. An advantage of the inverted demand function approach (i.e. expressing price as a function of quantity and the other factors shifting demand) is that it is well grounded theoretically, unlike many ‘ad hoc’ approaches. In addition, we have strong priors regarding the values of the key long-run elasticities, corresponding to the ‘central estimates’ set out in Meen (2001). For example, many time-series estimates of the income elasticity of demand suggest that \( \beta \) is in the region of 1, in which case the income and housing-stock terms in the above equation simplify to log income per property, i.e. \( \ln y - \ln h \). But the elasticity of housing prices with respect to income, given the stock, is \( \beta/\alpha \), which is typically substantially above 1 since the own-price elasticity, \( \alpha \), is below 1.

The demand shifters included in \( z \) cover a range of other drivers. Since housing is a durable good, inter-temporal considerations imply that expected or ‘permanent’ income and ‘user cost’ should be important drivers. The user cost takes into account that durable goods deteriorate, but may appreciate in price and incur an interest cost of financing as well as tax. The usual approximation is that the real user cost, \( uc \), is:

\[ uc = rhp(\delta + t - \Delta rhp^e / rhp) = rhp(uch), \] (9)

where \( r \) is the real after-tax interest rate of borrowing, \( \delta \) is the deterioration rate plus transactions costs and a risk premium, \( t \) is the property tax rate, and \( \Delta rhp^e / rhp \) is the expected real rate of capital appreciation.

There is much evidence in favour of a tendency of home buyers to extrapolate recent house price appreciation into future expectations, and some evidence favouring a four-year memory of relevant appreciation, see Muellbauer (2012). The formulation adopted in the present paper is to proxy expected appreciation by a weighted average of the lagged 1-year and 4-year appreciation rates. In countries such as France, where high rates of appreciation have at times been experienced, for plausible values of transactions costs and taxes, and a zero risk premium, measured user cost is sometimes negative. This suggests introducing a time-varying risk premium which is high when recent appreciation has been high. One
candidate for such a premium is a measure of house price volatility in recent years, and this is the approach adopted in this paper, see details in section 4.

The long-run solution for real house prices is then given by:

\[
\ln rhp_t = h_{0t} + h_{1t} \ln nmr_t + h_{2t} \lnusr_t + h_{3t} \theta_t + h_{4t} \ln(y_t/h_{s,t-1}) + h_{5t} E_t \ln(y_t^p/y_t) + h_{6t} \text{NL}_A_{t-1}/y_t + h_{7t} \text{IF}_A_{t-1}/y_t + h_{8t} \text{subs}_t + h_{9t} \text{trans}_t + h_{10t} \text{demog}_t
\] (10)

Here the intercept is time varying and increasing with MCCI, the credit conditions index for the mortgage market. The next term, the log of the tax adjusted nominal mortgage rate should have a negative coefficient and could be time varying, potentially with credit conditions. The log user cost term, defined as log uch from equation (9), should also have a negative coefficient, potentially becoming more important relative to the nominal mortgage rate with credit market liberalisation. The next two terms, the ratios to income of net liquid assets and of illiquid financial assets should have positive signs as for consumption. The next term, the log of income per house should have a positive coefficient, interpreted as minus the inverse of the price elasticity of the demand for housing. Income growth expectations and a measure of housing subsidies, scaled by income, should have positive effects on the price of housing. A measure of transactions costs, however, should reduce demand for housing and hence its price. Finally, demographic composition could have an effect on house prices analogous to its effect on mortgage demand.

2.5 Credit conditions on loans

Credit market liberalization should impact in several ways on the long-run relationships of the four jointly estimated equations. A direct, positive effect on debt should result from the different facets of credit liberalization, with less credit constraints on consumer credits, lower housing down-payments as a fraction of house values, and housing equity loans more freely available to existing owners (though in France, this second aspect of liberalisation appears not to have occurred). This is why the intercepts \( \alpha_0 \) in the consumption equation should increase with both CRCCI and MCCI, \( m_o \) (mortgage loans) and \( h_o \) (housing prices) should increase with MCCI and \( u_o \) (consumer credit) with CRCCI. There may also be other interaction effects from credit liberalization: for example, real interest rates may matter more.

15 The measure is of interest cost subsidies, and after scaling by income, varies in the sample between 0 and 0.008.
with liberalization, making $\alpha_1$, $m_2$, $h_2$ and $u_2$ more negative, while nominal ones perhaps matter less in loans, making $m_3$ and $u_3$ less negative. Income uncertainty may matter less after liberalization, lowering lower $\alpha_2$ and $h_3$. However, with larger levels of debt households may feel more vulnerable so that it is not clear whether and in which direction $m_3$ and $u_3$ might change. If households borrow more when they have positive income growth expectations, one might expect the effect of income expectations on housing debt and on housing prices, $m_5$ and $h_5$ to increase with $MCCI$ and that on consumer credit and consumption, $u_5$ and $\alpha_3$, to increase with $CRCCI$.

More liberal use of housing wealth as collateral for a mortgage should increase the coefficient on housing wealth to income, so that $m_8$ and $u_8$ increases with $MCCI$. In an alternative formulation, with log real house prices in place of the housing wealth to income ratio, an increase in the coefficient would also be expected, as the discouraging effect of high house prices on entry into the mortgage market diminishes.\textsuperscript{16} The impact of housing wealth on consumption and consumer loans, $\gamma_3$, should also increase with $MCCI$.\textsuperscript{17} An initially positive coefficient on liquid assets would be consistent with the availability of aggregate funding for debt, though at the micro-level, households with greater liquidity have less need to borrow. As bank access to funding becomes less domestically constrained, it seems plausible that aggregate liquid assets become less relevant for household debt, so that $u_6$ and $m_6$ might be expected to decrease with $CRCCI$ and $MCCI$ respectively. The effect of illiquid financial wealth on the mortgage stock is ambiguous. It is possible that higher share prices make possible larger cash injections by wealthy households, so reducing aggregate mortgage demand. With more dispersed share ownership, however, higher share prices could increase access to down-payments needed to enter the mortgage market. On the practical implementation, see below, we adopt an equilibrium correction formulation which adds some short term dynamics.

3. **Institutional background and previous literature for France**

Institutional features in banking and housing market vary a lot across countries, and the pace of changes has been very different since the 1970s. This has an impact on households’

\textsuperscript{16} One would also expect house price appreciation to affect the mortgage stock but this is incorporated in the user cost term.

\textsuperscript{17} The same linearization and relative coefficients of the asset to income ratios as used for the consumption function is assumed; a testable hypothesis. To anticipate the empirical results, the hypothesis is accepted.
behaviour, as can be seen from existing literature on topics such as financial institutions, households’ consumption and house prices.

3.1 Financial innovation and its impact on consumer and housing loans in France

Data on the ratios to annualised non-property income of stocks of housing loans and consumer credit are shown in Figure 3.1. The extent to which the evolutions of these ratios was due to financial innovation or other influences on credit availability or to interest rates, incomes, income expectations, asset prices, demographic changes and other economic factors is an open question.

Figure 3.1: Ratios to non-property income of housing loans and consumer credit

In the aftermath of the World War II, loans were mostly oriented to productive investment and housing because of the reconstruction effort. Thus, consumer credit might have been even more rationed than housing loans in this post-war phase of credit controls.

18 The term mortgage is deliberately not used in this section. Mortgage loans in the strictly legal sense are a minority in housing loans in France. Most housing loans are indeed guaranteed by a specialised organisation that mutualised risks on incomes (62 % of new loans in 2011 according to the French Supervisory Authority for banks, ACP). Thus, housing properties are not the guarantee for most loans, but households’ income. However when a housing loan is not repaid, households might be obliged to sell their home. Thus the impact on the housing market might not differ from that of a mortgage loan.
Financial innovation arrived in two steps in France. First, what was called financial deregulation was implemented in the mid-1980s. This had an impact on both consumer and housing loans. Then at the end of the 1990s, the securitisation of loans was reformed.

In the mid-1980s, the French financial system changed from a very strict monitoring of new loans by the government to a free determination by banks of the loans they provide (Melitz, 1990, Icard and Drumetz, 1994). At the same time, non-financial firms were allowed to finance themselves directly on stock and bond markets. Thus, at the end of the deregulation process in 1987, banks had more resources to be dedicated to households, whether as consumer or housing loans. Deregulation also impacted the way interest rates for consumer and housing loans were settled, as loans to households were mostly granted by institutions that were under the control of the government or via loans that were subject to a contract with the State (so-called “prêts conventionnels”). During this phase of financial deregulation, the ratio of the stock of consumer credit over income doubled from 7% in 1983 to 14% in 1987, admittedly from a low level, and never returned to its pre-deregulation level, see Figure 3.1. In percentage rates of growth, the stock of housing loans grew more slowly than consumer credit in the 1980s. Since consumer credits have far shorter average durations than housing loans, rapid growth in new advances translates into rapid growth in the stock.

**Box: timetable for financial deregulation (ECB, March 2009)**

1982: Liquid saving accounts benefitting from tax rebates can be opened in any bank.
1984: Bank specialisation requirements reduced.
1987: Elimination of credit controls.
1999: Reform of securitisation of housing loans.
1999: Reduced limits on early repayment fees for housing loans.
2008: Modernised framework for securitisation

The second step of financial innovation occurred in the late 1990s through a change in securitisation. The legal framework for securitisation was introduced in France by Act 88-1201 of 23 December 1988 that created the FCC (fonds communs de créances– a French equivalent to US ‘special purpose vehicles’). However, it was modernised by the Order of 13 June 2008 which extended its purpose and legal forms (Birouk. O. and L. Cassan, 2012). The new legal framework diversified the types of assets eligible for securitisation (originally only bank loans) to trade receivables, insurance risks, debt securities, etc. It also broadened
the scope of the eligible securitisation techniques (replenishment of vehicles, broader credit enhancement methods, active management of portfolios and resale of acquired assets) and the types of securities that securitisation vehicles can issue (in addition to units in FCCs – which are due to be phased out, units in securitisation funds, short-term debt securities such as commercial paper or other short-term securities, etc.).

From the end of 2009 to June 2012, the stock of residential mortgage backed securities (RMBS) increased by 18.4 billion euros (ie 1.4 % of households’ disposable income). Over the same period, the stock of securitised consumer loans decreased by 12.4 billion euros. However, these innovations occurred while housing loans remained very much regulated, see discussion in section 3.3. While Figure 3.1 is suggestive, it is difficult to disentangle the cyclical effects and those of the decline in interest rates due to the euro changeover from the effect of deregulation in a purely graphical analysis. The econometric model described below should help to separate the cyclical from other effects.

3.2 Consumption function

In the mid-90s, many papers were written on French household consumption behaviour. The traditional Keynesian consumption function conditioned consumption on income and inflation, so as to capture the real money balance effects: when inflation is higher, households need to save more if they have an objective in terms of purchasing power of wealth. This Keynesian consumption function fitted French data fairly well before about 1990, supported by the fact that most households held regulated savings accounts at that time in France (current accounts and savings accounts had accounted for 63 % of households total assets at the end of 1977 when the pension system was and is still nearly 100 % pay as you go19).

Ostry and Levy (1995) used the Campbell forward looking model of “saving for rainy days”, augmented by the volatility of income, to test the permanent income hypothesis and found it was still accepted by French data. Cadiou (1995) and Ostry and Levy (1995) find an increase in the impact of the interest rates on consumption following the financial deregulation. Bonnet and Dubois (1995) do not find any wealth effects but insist on the instability of the household consumption function. They find a significant impact of the

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19 As there are no time series available for state pension rights we do not take them into account, although they are not negligible. The median pension rights amounted to 149 300 euros whereas the median financial wealth amounted to 32 610 euros in 2004 (Buffard-Girardot, 2010). The first ones are much less concentrated than the second.
change in unemployment rate, as Cadiou (1995). Finally, a number of these papers and Sicsic and Villetelle (1995) test the impact of financial deregulation measured as the change in the ratio of consumer credit to disposable income over 1986-1990 and find it significant. Sicsic and Villetelle (1995) especially show that a simple model with financial deregulation performs as well as other models with the change in unemployment for example. Although the change in the ratio of consumer credit over income was the best indicator for the impact of financial deregulation at that time, it is not satisfactory because the endogeneity of consumer credits is not correctly treated. This paper is taken this problem into account.

For more recent evidence, consumption functions are published in the papers presenting the three macro-econometric models that are currently used by French institutions to forecast or analyse economic evolutions. In the Banque de France model (Baghli et al., 2003), the consumption function is estimated over a long time span and is very close to that of Sicsic and Villetelle (1995), the long term saving rate depends on an indicator of deregulation and real money balance effects. In the OFCE model (Chauvin et al., 2002), the saving rate depends on an indicator of deregulation and change in real income growth. In the model of the Ministry of finance (Cabannes et al., 2010), the estimation period is much shorter and starts after the financial deregulation (1992Q1). The equation includes the effects of the car scrapping premium in 1995-1996, a dummy in 1996q1, change in the unemployment rate and real income growth.

**Wealth effects**

Empirical work on the wealth effect in France came after the first previously cited strand of literature. They are not used in macro-econometric models on the grounds that they suffer from unstable coefficients, with what was not seen as a major determinant for consumption in France. They have been estimated mostly on macro-data, because there was no common survey of micro-data on household consumption, income and wealth, until recently. The estimates for the long term impact are presented in table 1. The various methodologies used across studies, as well as the sample chosen, may impact the results and are pointed out below.

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20 The recent exception is Arrondel, Savignac and Tracol “Wealth Effects on Consumption Plans: French Households in the Crisis” Banque de France working paper n°344
Table 3.2: Long term impact of wealth on consumption in France

<table>
<thead>
<tr>
<th>Wealth</th>
<th>Sample</th>
<th>MPC</th>
<th>Elasticity</th>
</tr>
</thead>
<tbody>
<tr>
<td>De Bonis and Silvestrini (2012)</td>
<td></td>
<td>Total 1.4</td>
<td>Financial 3.0</td>
</tr>
<tr>
<td>Chauvin and Damette (2010)</td>
<td>1987q1-2008q4</td>
<td>1.0</td>
<td>Financial 4.0</td>
</tr>
<tr>
<td>Aviat et al (2007)</td>
<td>1985q1-2006q1</td>
<td>0.4</td>
<td>Housing 2.0*</td>
</tr>
<tr>
<td>Barrell and Davis (2007)</td>
<td>1980q1-2001q4</td>
<td>3.1</td>
<td>Financial 10.0</td>
</tr>
<tr>
<td>Barrell and Davis (2007)</td>
<td>1980q1-2001q4</td>
<td>3.6</td>
<td>Housing 17.8</td>
</tr>
<tr>
<td>Slacalek (2006)</td>
<td>1970q2-2003q2</td>
<td>4.6*</td>
<td>Housing 5.5*</td>
</tr>
<tr>
<td>Fraisse (2004)</td>
<td>1971q4-2003q2</td>
<td>1.6</td>
<td>Financial 9.2</td>
</tr>
<tr>
<td>Boone et al (2001)</td>
<td>1970q1-1996q2</td>
<td>2.5</td>
<td>Financial 12.3</td>
</tr>
</tbody>
</table>

Notes:

i. According to Aviat et al, an increase in wealth by 100% implies an increase in consumption by 2.4%. Taking into account the average ratio of wealth over consumption during 1995-2005, this means that an increase by 1 euro of financial wealth induces an increase by 0.4 cents in annual consumption.

ii. Estimation results directly computed by the authors are in bold. The other results are derived, using elasticity = (MPC) x (wealth to consumption ratio). * indicates that estimates are not significant.

We do not consider here papers that estimated wealth effects on panel data, using cross-country dispersion to improve the precision of their estimates. Cross-country dispersion is of a different nature from inter-temporal one, which is what we want to compute here. Moreover, flows of funds data have existed since 1970 in France, so that time series for assets holdings, both financial and non-financial, are long enough to estimate wealth effects. Many papers estimate wealth effects for France in a context of international comparison by estimating a consumption function for each country separately, without taking into account the cross-country dispersion. To our knowledge, Boone et al (2001) were among the first ones. However, they estimate the co-integration vector between consumption, wealth and income without taking into account the potential endogeneity of the variables, which is also the case of Fraisse (2004). Bertaut (2002), Beffy and Monfort (2003), IMF (2004), Catte et al (2004), Slacalek (2006) and Aviat et al (2007) take this problem into account by using dynamic ordinary least squares (DOLS). Barrell and Davis (2007) and Byrne et al (2003) use unrestricted Error Correction Models (ECM) estimated via non-linear least squares. In most
cases, authors use total consumption and total disposable income, the exceptions being IMF (2004) which uses non-durable consumption; Aviat et al (2007) and IMF (2004) use non-property income, and Slacalek (2009) and Catte et al (2004) use labour income (respectively before or after tax). Authors estimate either marginal propensity to consume or elasticities (figures in bold in table 1), or semi-elasticities for Boone et al (2001). As mentioned before, estimation in elasticities might be mis-specified if the sum of the elasticities to income and to wealth is not equal to 1. The condition is usually imposed, but not in Bertaut (2002). Barrell and Davis used dummy variables to account for the impact of financial liberalisation. However, if they do consider the increasing outstanding amount of credit in the second half of the eighties, they do not take into account the reversal that came in 1991-1992, when banks restricted housing credits as bad loans increased too much. Byrne et al also test the impact of illiquid versus liquid wealth (elasticity of 2.5 %, significantly different from 0, for illiquid wealth and 2.6 %, not significantly different from 0, for liquid wealth). All these studies estimate only the impact of a permanent change in wealth on consumption. Most authors find a significant impact of wealth on consumption in France, albeit smaller than in the United States. The lack of robustness of the results is highlighted in Bertaut (2002) and Byrne and Davis (2003). This may be due to the fact that these papers were among the first ones and the dataset they used stops at the end of the nineties.

3.3 The housing market in France

In France, owner-occupiers represent 58 % of households, which is a medium position in Europe between Germany where they represent only 44 % of the population and Spain or Italy where they represent respectively 83 % and 72 % (ECB, 2009).

Housing loans are largely fixed rate loans and the self-discipline of banks to approve housing loans is tight in France. In practice, monthly repayments on loans (interest payments + capital reimbursement) cannot exceed 33% of current income. This often limits the capacity for households to borrow, so that the typical loan to value ratio for new housing loans was 78 % in 2005, at the lower hand of the range in the euro area.

Early repayments and renegotiation were very rare before 2000 because of fees due by owners when renegotiating their loans with their bank, by law. These legal fees have been cut in 1999. Finally, equity release is forbidden and housing is hardly ever used as a

\[21\] For more information, please refer to Laferrere and Le Blanc (2012).
guarantee for consumer credit. Thus, housing prices affect loans only through purchases of housing. However, from the late 1990s, the duration of housing loans increased substantially from 13 years in 1999 to 18 years in 2007 and stabilised afterwards.

Public expenditure on housing policies represented 1.1% of GDP in 1999 and this figure is among the highest in Europe (see ECB 2005, table 4.3). It is also characterized by its volatility. Measures may change from one year to another in a field where private agents’ decisions are taken over the long term (see appendix).

### 3.4 Models for housing prices in France

There has been an official house price index for all France, corrected for quality effects, only since 1996 from the notaries data (see Gourieroux and Laferrière, 2009). Before, the only official index is a Parisian index since 1980 built by INSEE. OECD publishes an index which is not well documented. The Parisian index has been very volatile, especially at the end of the 1980s and the beginning of the 1990. This phenomenon was not generalized to France but was limited to Paris and the area around (Île de France), see Moec (2004) and Friggit (2010). Paris represents 10% of overall French transactions in value and Île de France, around 30%. There could be difficulties to understand the aggregate behavior of house prices in a country with very different dynamics for two subparts, though this is a problem not confined to France.

Modelling French housing prices has been a daunting task recently. Bessone et al (2005) and Antipa and Lecat (2013) are the best examples for this. They both use a structural approach broadly comparable to that used in this paper. House prices are explained by housing stock in volume, a proxy for households’ income and user cost, and in addition by population or number of households in Antipa and Lecat. Both papers highlight the fragility of the results, because of measurement problems and omitted variables.

22 The index is linked to an earlier index from BIS, whose origins are obscure. One possible alternative is not suitable: the implicit price of flow of funds for real estate assets by INSEE is very close to the building cost index and to the housing GFC deflator. Thus, it is not the price of housing as an asset.
Table 3.3: Long term elasticities of different variables on house prices (in %)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing stock</td>
<td>-3.57</td>
<td>-5.04</td>
<td>-4.98</td>
<td>-7.51</td>
<td>-6.30</td>
<td></td>
</tr>
<tr>
<td>Households’ income**</td>
<td>8.26</td>
<td>1.02</td>
<td>1.68</td>
<td>1.24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Borrowing capacity***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.14</td>
<td>1.12</td>
</tr>
<tr>
<td>User cost</td>
<td>-0.07</td>
<td>-0.71</td>
<td>-0.45</td>
<td>-0.52</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Population</td>
<td>17.86</td>
<td>15.1</td>
<td></td>
<td></td>
<td>21.59</td>
<td></td>
</tr>
<tr>
<td>Number of households</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10.51</td>
<td>13.64</td>
</tr>
</tbody>
</table>

Notes:
i. * User cost takes into account the anticipation of downturn, revealed by the stock of unsold new houses.
ii. ** The proxy for household income is consumption of non-durables for Bessone et al (2005). As the trend in non-durables consumption is different from that in durables consumption, this might explain the large coefficient.
iii. *** Borrowing capacity is the maximum amount households can borrow, knowing that the housing debt service cannot exceed one third of the income in France and taking into account the duration of the loans actually observed.

Both papers find that housing prices were around their equilibrium in 2005. Antipa and Lecat find a break in 2002 in the co-integrating vector. They blame it on financial changes and housing policies. In particular, the birth of the euro changed competition rules in the financing sector. In France, the duration of housing loans increased significantly, from 11.8 years in 1989 to 14.3 years in 1999 and 18.4 years in 2009 according of the Observatory of real estate and Banque de France. When they introduce the borrowing capacity of households in the co-integrating vector, the break in 2002 does not disappear but housing prices appear to be much nearer their equilibrium level in 2011. However, the implausible size of some of the estimated parameters and the evidence for parameter instability does not give confidence in these models. Friggit (2012) argues that there are no satisfactory quantitative explanations of the post-1995 French house price boom.

It might be the case that housing policies have had an important role since 2000. For example, Bono and Trannoy (2013) estimate on micro-data that the Scellier law implied an average increase by 7 % of land prices in the areas where it was applicable. However the fiscal regime for private rental sector changed a lot (6 regimes since 1996 for new investments, see table in annex). Sotura (2013) uses micro-data on the Parisian real estate market and finds that foreign investment was not the main origin for an increase in housing prices (at most +3 % over 1993-2008).

4. Empirical Findings
It must be made clear that ‘explain’ or ‘account for’ used afterwards are not meant here to be general equilibrium statements. A larger model would be needed for such deductions. However, these decompositions are very useful for short to medium term analysis and for understanding key trends in the economy, relevant for central bankers. For example, changes in asset prices, interest rates or in policies that affect the ability of banks to generate credit can be thought about in this framework.

4.1 Estimates for the two credit conditions indices

Both indices are latent variable and are determined by their impact on consumption, housing and consumer loans and housing prices when they are estimated jointly. They are specified as a linear combination of ogive dummies which make a smooth transition from zero to one over eight quarters. The ogive dummy takes the values 0.05, 0.15, 0.3, 0.5, 0.7, 0.85, 0.95, 1 over an 8-quarter interval. In all 16 dummies are used to describe the shape of the mortgage credit conditions index MCCI\textsuperscript{24} shown in Figure 4.1 and 9 dummies to describe the shape of the index for unsecured consumer credit, CRCCI.

\textsuperscript{24} The weighted version of the index scales the index by the proportion of adults in the age range 25 to 44 relative to the proportion in 1981. It enters the consumption equation thus weighted by the proportion of households most likely to be constrained by mortgage credit, but is un-weighted in the mortgage stock and house price equations.
The decline from 1981 to 1984 in the early 1980s in the housing MCCI needs to be seen in the context of a rise at the time in CRCCI, suggesting that banks were intentionally shifting lending strategy from housing loans to consumer and credit card loans. Credit controls were relaxed in 1984, when CRCCI rises strongly and MCCI stabilises, and further deregulation took place later in the 1980s, when both indices rise, see discussion in section 3 above. In the early 1990s, in common with many other countries, some French banks were in trouble with bad loans partly due to excess lending in the late 1980s, to nominal income deceleration following the disinflationary monetary policy and partly due to the stresses caused by interest rate rises resulting from German unification. In France, there was also a pension reform in 1993 which reduced pension benefits. While not a credit tightening, it is likely to have had common short-term negative effects on consumption, consumer credit, mortgage borrowing and demand for houses, and so house prices. It is likely therefore to show up as a temporary decline in MCCI estimated as the otherwise unobserved components in these four equations, but see a potential counter-argument below. Towards the end of the 1990s, as banks recovered, credit flows improved, competition in credit markets increased with the expected
arrival of the common currency and, as discussed in Section 3, conditions on securitisation of loans loosened, while terms of housing loans were extended from an average of 11.8 years in 1989 to 14.3 years in 1999 and 18.4 years in 2009. Given the maximum debt burden of loans, the level of interest rates and of income, this meant an increase by nearly 20% of the borrowing capacity of households. In the MCCI graph, this shows up as the largest and most sustained liberalisation on housing loans since 1980, reaching a peak in 2007 before stabilising.

Paradoxically, it is possible that the 1993 pension reform might have generated a new long-term demand element for housing and mortgages. Reduced pension entitlements might have persuaded households, including those in the growing pre-retirement age group 45 to 64, to invest more in property both as owner-occupiers and as landlords, increasing mortgage demand and house prices in the process. Doing so would improve long-term security, reducing outgoings for owner-occupiers and increasing income for landlords. If this was so, the rise in MCCI could reflect a mix of demand and credit supply shifts. Examining micro-evidence on the age-composition of mortgage holdings over time should throw further light on this hypothesis.

There is also a possibility that the latent variable MCCI might have been influenced by an increase in the proportion of total demand for French properties accounted for foreign demand, though, as noted above, Sotura (2013) suggests that for Paris the effect was small up to 2008. For 2003-4 UK survey evidence estimated that 47,000 UK households owned a property in France, though no data are available tracking the increase over time. Increased demand by foreign buyers would probably have had more of an effect on prices than on the domestic mortgage stock, but the possibility that this was a contributing factor cannot be entirely discounted.

4.2 Consumption

The general form of the consumption equation was set out in equation (5). The intercept effects of both credit conditions indices, for mortgages and consumer credit, consistent with the down-payments interpretation, are strongly significant, see Table 4.2 below. The mortgage credit conditions index is normalised by the house price equation so that when the MCCI has an impact of +1% on house prices, then its impact on consumption is +0.2%, everything else being equal. The consumer credit condition index is normalised on the consumer loans equation, so that when it makes consumer loans 1% higher, consumption
In the estimated equation, $MCCI$, the mortgage credit conditions indicator, rises by 0.04%. In the estimated equation, $MCCI$, the mortgage credit conditions indicator, is weighted by the proportion of adults in the main house buying age group, 25 to 44 relative to its 1981 value. The quantitative long-run contributions to the log-ratio of consumption to non-property income of the two credit conditions indices are shown in Figure 4.2a. The index for consumer credit, $CRCCI$, rose from 1983 to 1994, and then fell slightly, after which it has remained unchanged. Other things equal, it accounts for a rise in the consumption to income ratio of around 6% in this period. The index for mortgages is much more volatile, it rose in the late 1980s and then declined to 1995 and then experienced a sustained rise to 2007. From 1995 to 2007, it accounts for a rise in the consumption to income ratio of around 10%. However, as we shall see, there were major offsets.

It quickly became apparent that for France, consistent with the absence of home equity loans, no positive housing collateral effect could be found, given controls for income expectations, credit availability and other variables such as changes in costs of debt service. The practical restrictions on debt-service to income ratios in France suggest that mortgage credit could be more developed, with loan-to-value ratios for first-time buyers lower than in Anglo-Saxon countries and in Spain. With a substantial down-payment requirement, one would expect a negative effect of higher real house prices on consumption spending, albeit one which could become less severe if mortgage supply conditions are relaxed, for example by extending mortgage terms as occurred from 1999 onwards. This suggests introducing log real house prices and its interaction with $MCCI$ into the consumption function. The evidence is consistent with this argument and finds a negative effect on consumption of real house prices. There is also evidence of a partially offsetting positive effect on its interaction with $MCCI$. Whether the latter effect is included or not, the evidence is that towards the end of the sample a 10% rise in real house prices induces a 0.7 or 0.8% decline in consumption, given income, credit conditions and other asset prices. Figure 4.2a, which plots the quantitative contribution of this composite effect on the log-ratio of consumption to income, suggests that this was an important offset to the consumption effect of looser credit supply conditions in France.

The other major offset comes through the effect on the consumption to income ratio of liquid assets minus debt relative to income. The coefficient is around 0.1, broadly in line with evidence from the US and the UK reported by Aron et al (2012) for the UK and the US. This means that an extra 100 euros in net liquid assets results in about 10 euros of extra
The decline in the ratio due to the rise in mortgage debt helps to account for the lack of a consumer boom in the 2000s in France associated with the second phase of credit market liberalisation, see Figure 4.2a. Interestingly enough, the increased availability of consumer credit from about 1982 through to the early 1990s led to a pronounced rise in the consumption to income ratio. Partly, this was because the negative feedback via higher house prices was missing since non-housing consumer credit conditions have no effect on house prices. Indeed, for 1981-83, our estimates suggest a contraction of mortgage availability, associated with a decline in real house prices that lasted till 1985. The latter would have caused a rise in the consumption to income ratio. Further, the rise in the overall debt to income ratio in much of the 1980s was relatively mild so that the ratio to income of liquid assets minus total debt remained fairly constant, unlike in the 1996 to 2008 period when the ratio fell, with negative effects on consumption.

The estimated marginal propensity to consume out of illiquid assets is 0.023, broadly in line with estimates for the UK and Australia, see Muellbauer and Williams (2011), and a little higher than the US estimate. The ownership distribution of illiquid assets in France is less unequal than in the US, suggesting, on average, a higher marginal propensity to consume out of such wealth. The long-run contribution is plotted in Figure 4.2b. No significant real interest rate effect could be found. There is some support for an increasing role for income growth expectations with credit market liberalisation. This is coherent with theory as credit liberalisation allows consumer to project over a longer time horizon. The point estimate of the effect of the log-ratio of permanent to current income is 0.36 when the credit conditions indices are zero, rising to around 0.5 in recent years, see Figure 4.2b for a plot of the composite long-run effect.

The possibility than non-property income might be mis-measured, for example due to a problem in the estimation of the labour component of self-employment income, or that households do not quite follow the text-book model, was tested by including a linear combination of logs of different components of income. This takes the form of a weighted average of log conventional household disposable income (HDI) and log non-property income, with weights $1 - \omega$ and $\omega$. The estimated weight on log HDI is just over 0.5, but for simplicity is set at 0.5. Since HDI contains non-property income, the implied weight on

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25 The restriction of equal and opposite coefficients on liquid assets and debt is acceptable, though the point estimates suggest a larger (negative) coefficient on debt than on liquid assets.

26 France has no funded retirement system but life insurance assets are widely spread.
the property component of income is around 0.38 with 0.62 on the non-property component. Figure 4.2b plots the fitted contribution of this weighted average minus log non-property income: it shows an upward drift, which accounts for a little of the secular rise in consumption relative to non-property income.

Another element in the long-run solution is the measure of housing transactions cost which also enters house price and mortgage stock equation.\(^{27}\) When transactions costs are high, households in the relevant age brackets need to save a little more. The transactions cost variable is weighted by the proportion of the populations aged 25 to 44, and its long-run contribution is shown in Figure 4.2b.

The final element in the long-run solution is demographic composition. From the early 1990s to 2011, the changing age structure of the population, with rising proportions of adults in high-saving age brackets, would have raised the saving rate, other things being equal. This effect is calibrated drawing on a 2003 cross-section study of saving rates of households by age of household head. This found saving rates\(^ {28}\) lowest for the youngest households, peaking in the 50 to 59 age group but higher for the over 60s than for the under 40s. A demographic index is constructed which weights each saving rate by the share of the adult population in each age group. If these saving age-differentials are stable over time, this index should measure the rise in the average saving rate due to changing age composition. Correspondingly, this index scaled by 100 should have a coefficient of -1 in the log consumption function.\(^ {29}\) The index rises by 1.4 percentage points from 1990 to 2011, implying a 1.4 percentage point increase in the saving rate, or a 0.014 fall in log consumption/income. Given a relatively short sample and other trending variables, there is little scope for robust estimation of this effect, so a plausible calibration is preferable and its contribution is shown in Figure 4.2b.

The speed of adjustment is estimated at 0.48, suggesting a well-specified long-run solution for consumption. The short-run dynamics include three economic variables: the quarterly change in log real income enters with a negative coefficient, suggesting that a mix of current and last quarter’s income is relevant for consumption. The change in the unemployment rate, best represented by the change over three quarters, has a significant

\(^{27}\) The measure is expressed as a percentage of cost divided by 100 and has a mean of 0.065 and varies between 0.048 and 0.084 over the sample.

\(^{28}\) The saving rates in 2003, after private transfers, follow in parentheses after each age group: under 30 (2), 30-39 (10), 40-49 (18), 50-59 (23), 60-69 (16), 70 and over (22). Source: INSEE; national accounts.

\(^{29}\) This is because \(\log c/y\) is approximately \(\log (1-s)\), which is approximately \(-s\), where \(s\) is the saving rate.
negative effect, paralleling results for other countries, see Aron et al (2012). Finally, the change over 4 quarters of the log debt service ratio, also has a significant negative effect on consumption, an indication of cash-flow constraints. The specification also included six impulse dummies for outliers, some of which are connected with car scrapping schemes, but may also represent other shocks, e.g. due to major strikes or floods. The results are robust to the exclusion of the impulse dummies though the significance falls of illiquid wealth and of the log-ratio of permanent to current income.

The last two columns of Table 4.2 show estimates for the consumption function obtained when the two credit conditions indicators and their interaction effects are excluded. The speed of adjustment falls by about half and the equation standard error increases by about 50%. The most dramatic change in the parameter estimates is in the coefficient on log real house prices which switches from negative to positive, evidently because of its role as a proxy for credit conditions. In other respects, the remaining parameter estimates are remarkably robust, with a marginal propensity to spend out of net liquid assets of 0.1 and 0.021 out of illiquid financial assets. The effect of the log ratio of permanent to current income at 0.75 is a little above the peak value of the time-varying estimate for the model incorporating credit conditions indices. However, the estimated impact of transactions costs is lower than when the model includes credit conditions.

Table 4.2: Estimates of the long-run solution of the French consumption function

<table>
<thead>
<tr>
<th>Dependent Variable = $\Delta \ln c_t$</th>
<th>Symbol</th>
<th>1981Q2-2011Q4</th>
<th>1981Q2-2011Q4 Excluding CCIs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>coefficient</td>
<td>$t$- ratio</td>
</tr>
<tr>
<td>Long-run coefficients for log $c/y$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speed of adjustment</td>
<td>$\lambda$</td>
<td>0.48</td>
<td>9.5</td>
</tr>
<tr>
<td>Constant</td>
<td>$\alpha_0$</td>
<td>0.35</td>
<td>3.5</td>
</tr>
<tr>
<td>Mortgage credit conditions index: $MCCI$</td>
<td>$\alpha_{0c}$</td>
<td>0.198</td>
<td>8.4</td>
</tr>
<tr>
<td>Consumer credit CCI: $CRCCI$</td>
<td>$\alpha_{0c}$</td>
<td>0.036</td>
<td>6.7</td>
</tr>
</tbody>
</table>

30 For 1994 to 1998, Adda and Cooper (2000) have constructed a measure of these temporary subsidies. Excluding the impulse dummies, the current and lagged values of their measure are strongly significant, but three large outliers outside this period remain.

31 Using the housing wealth to income ratio instead produces a similar positive coefficient and similar estimates for the other parameters though a worse fit and lower speed of adjustment at 0.23.

32 For South Africa, where house prices are not a good proxy for credit conditions because of powerful other drivers, the omission of credit conditions completely destroys the long-run solution for consumption and the speed of adjustment even allowing for real house prices or the housing wealth to income ratio, see Aron and Muellbauer (2013).
Figure 4.2a: Effects of credit related variables on log consumption/non-property income in France.
Mortgage stock

In the long-run solution for the mortgage stock equation, credit conditions have a highly significant intercept effect. There is one highly significant positive interaction effect, with log ratio of housing wealth to income, and a more marginal interaction effect with the log ratio of permanent to current income (t=1.6). While, with the expansion of mortgage credit availability, the mortgage stock has become sensitive to housing wealth, there is evidence of an offsetting negative effect of real house prices. This is interpretable as the effect of high house prices in excluding potential buyers from access to mortgages given a substantial down-payment hurdle, even after credit conditions eased. This suggests that at the extensive margin, more demand might have been constrained from obtaining a mortgage by high house prices, than encouraged by higher house prices to get a bigger mortgage. The net effect of higher house prices, taking into account the positive interaction effect with housing wealth, suggests a switch from net negative to net positive in about 2003-4. Thus, with the loosening of credit conditions, the discouragement at the extensive margin is reduced so that the effect of higher house prices at the intensive margin eventually dominates demand overall.

The only significant interest rate effect is that of nominal rates, neither user cost nor a real interest rates being relevant. This would seem to be consistent with the operation of the
ceiling of 33% on debt service ratios, which has the implication that a fall in the nominal mortgage interest rate relaxes the credit constraint on marginal borrowers and so increases the volume of outstanding mortgages. Even for infra-marginal borrowers, the resulting decline in cash flow demands on the household budget appears to boost borrowing.

A demographic variable is included which weights different age groups in the population by the size of mortgage debt held by different age groups, which is also included in the housing price equation. This variable peaks in 1996 and declines fairly steadily thereafter.

No effects could be detected of liquid financial wealth on the stock of mortgages but there is a small negative effect of the log ratio of illiquid financial wealth on the mortgage stock. This suggests that a rise in such wealth reduces the scale of mortgages required by wealthier home-buyers to borrow in the form of a mortgage.

The speed of adjustment at 0.13 per quarter, is rather higher than corresponding findings for the UK, see Fernandez-Corugedo and Muellbauer (2006). It might be due to the fact that the term of loans was rather short over most of the estimation sample in France. No evidence of an increase in speed with CCI could be found. Short run dynamics include a negative short term reaction to increases in the mortgage stock in the previous two quarters, a positive effect from the annual rate of inflation, a negative effect from the change in the unemployment rate over the two previous quarters and a measure of lagged acceleration in log real house prices.

Figure 4.3a which decomposes the long-run solution shows that the loosening of housing loans conditions, the fall in nominal mortgage rates and the interaction of credit liberalisation with housing wealth are the key to understanding the rise in the mortgage stock to income ratio. The interaction of mortgage credit conditions and the log ratio of permanent to current income has only modest effects.

---

33 We are grateful to Luc Arrondel for making available data from the 2004 household survey, Patrimoine Insee, classified by 10-year age groups.

34 By contrast, in South Africa illiquid wealth in the form of pensions has a clear positive effect on the mortgage stock, partly because pensions can be used as part guarantee for mortgage borrowing, Aron and Muellbauer (2013). In Australia, where funded pension wealth plays a much more important part in the pension system than is the case in France, the effect is also positive, Muellbauer and Williams (2011).

35 The speed of adjustment for mortgages is stable, unlike that for house prices, which increased with MCCI. A potential reason is that an increase with MCCI was offset by the increase in loan terms, resulting in overall stability.

36 This is defined as the annual change at a lag of 1 minus the annual change at a lag of 5 quarters.

37 The effect shown is a composite of a small negative effect of real house prices and the larger positive interaction effect of credit conditions and the housing wealth to income ratio.
Table 4.3: Estimates of the long-run solution for the mortgage stock equation

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Symbol</th>
<th>1981Q2-2011Q4</th>
<th>1981Q2-2011Q4 Excluding MCCI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>coefficient</td>
<td>t-ratio</td>
</tr>
<tr>
<td></td>
<td></td>
<td>coefficient</td>
<td>t-ratio</td>
</tr>
<tr>
<td>Speed of adjustment</td>
<td>π</td>
<td>0.13</td>
<td>9.7</td>
</tr>
<tr>
<td>Constant</td>
<td>m₀</td>
<td>0.73</td>
<td>1.9</td>
</tr>
<tr>
<td>Credit conditions index: MCCI</td>
<td>m₀c</td>
<td>0.69</td>
<td>5.1</td>
</tr>
<tr>
<td>Log nominal mortgage rate</td>
<td>m₁</td>
<td>-0.24</td>
<td>-5.2</td>
</tr>
<tr>
<td>Log user cost</td>
<td>m₂</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Log (real income)</td>
<td>m₄</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>MCCI x log (yperm/y)</td>
<td>m₅c</td>
<td>2.4</td>
<td>1.6</td>
</tr>
<tr>
<td>Log (liquid assets/y)</td>
<td>m₆</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Log (illiquid financial assets/y)</td>
<td>m₇</td>
<td>-0.069</td>
<td>-2.5</td>
</tr>
<tr>
<td>Log real house prices</td>
<td>m₈</td>
<td>-0.22</td>
<td>-2.5</td>
</tr>
<tr>
<td>MCCI x log(housing wealth/y)</td>
<td>m₉c</td>
<td>1.03</td>
<td>6.0</td>
</tr>
<tr>
<td>Log demog</td>
<td>m₁₀</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Transactions cost</td>
<td>m₁₀</td>
<td>-1.98</td>
<td>-3.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-5.99</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-3.0</td>
</tr>
<tr>
<td>Diagnostics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equation standard error</td>
<td></td>
<td>0.00314</td>
<td>0.00468</td>
</tr>
<tr>
<td>DW</td>
<td></td>
<td>2.14</td>
<td>1.77</td>
</tr>
<tr>
<td>R-squared</td>
<td></td>
<td>0.912</td>
<td>0.805</td>
</tr>
</tbody>
</table>

Figure 4.3b plots the remainder of the long-run effects. There is a modest negative effect from the rise in the ratio to income of illiquid financial wealth, a modest positive effect from the decline in transactions cost and the small calibrated effect of age composition, positive up to 1996 and then negative, is also shown.

The combination of the Figures 4.3a and 4.3b suggests a slight puzzle regarding the apparently missing causes of the early 1980s rise in the mortgage stock to income ratio. The explanation is that the dependent variable in the model of dynamic adjustment is the change in the log of the per capita nominal mortgage stock. The rate of inflation fell from 1982 to 1985 and this was also a period of tight fiscal policy and declining real per capita incomes.\(^{38}\) Thus, growth in the nominal mortgage stock fell sharply even though the stock to income ratio was rising. To explain the decline in the dependent variable in the early to mid-1980s, the estimated long-run solution needs to be below the log mortgage stock to income ratio.

\(^{38}\) Real per capita non-property incomes did not regain their mid 1982 levels till 1988.
The estimated decline in the mortgage credit conditions index from 1981 to 1984 helps to account for this, though jointly estimated with input from consumption and house price equations also.

When the mortgage credit conditions index is omitted from the housing loans stock equation, the speed of adjustment more than halves and the equation standard error rises by more than 50%, similar to the consumption equation. As in the consumption equation, the most dramatic change is the switch in sign from negative to positive for the effect of log real house prices (or log ratio of housing wealth to income), clearly acting as a proxy for increased access to mortgage credit. Had they been included, log real income and the log ratio of permanent to current income would have had hard to interpret negative coefficients. The log illiquid asset to income ratio would also have had a negative coefficient. This could be interpreted as suggesting that households with more liquid assets require smaller mortgages. However, the speed of adjustment is still less than half and fits of the equation more than 50% worse than for the equation incorporating the mortgage credit conditions index.
Figure 4.3a: Long-run effects of credit related variables, interest rates and housing wealth on log mortgage stock/non-property income in France.

Figure 4.3b: Long-run effects of illiquid financial wealth, transactions costs and age composition on log mortgage stock/non-property income in France.
4.4 Consumer credit

The estimated model for the stock of consumer credit has a long-run solution shown in Table 4.4 with a speed of adjustment of 0.83. No real interest rate could be found, though there is a small negative effect of the nominal short term interest rate, $t=-1.5$ and a small positive effect from user cost on housing, suggesting a modest switch away from consumer credit towards mortgage debt when user cost is low. More significant is the composite effect with relative weights from the consumption function of net liquid assets/income, illiquid financial assets/income and log real house prices and their interaction with mortgage credit conditions. The overall coefficient has a $t$-ratio of 4.1. This is consistent with the idea that consumer credit is, in major respects, a derived demand from consumption. However, the effect of log real per capita non-property income on the log ratio of consumer credit to income suggests that consumer credit has a scale elasticity of 1.73: in other words, a 1% rise in income and wealth would raise consumer credit by 1.73% in the long-run, whereas for consumption the elasticity is one. There is a marginal effect from the interaction of consumer credit conditions and the log ratio of permanent to current income, $t=1.3$. In the short term dynamics, no effect from inflation or from changes in the unemployment rate was detectable, but the lagged change in the log of nominal consumer credit per head has a significant positive effect, perhaps indicating some persistence in short term shocks on consumer credit.

The decompositions of the long-run solutions into the different components shown in Figures 4.4a and 4.4b reveal the dominant effect of the consumer credit conditions index, though there is some upward drift explained by higher real per capita non-property income. The effect of the composite wealth to income ratios and real house price terms with relative weights from the consumption function is slightly negative from around 2000: the decline in the ratio to income of liquid assets minus debt and the negative effect of higher real house prices dominates the higher illiquid financial wealth to income ratio.

Omitting the credit conditions index for unsecured consumer credit has drastic consequences for the consumer credit equation. The speed of adjustment collapses and the long-run solution makes little economic sense. It is incontrovertible that there was a significant consumer credit liberalisation in the 1980s, confirmed by a number of the papers on French consumption cited in Section 3.2. It is therefore important to take this into account in modelling the stock of non-housing consumer credit.
Table 4.4: Estimates of the long-run solution for the unsecured consumer credit stock equation for France

<table>
<thead>
<tr>
<th>Dependent Variable = $\Delta \ln cdebt_t$</th>
<th>Symbol</th>
<th>1981Q2-2011Q4</th>
<th>1981Q2-2011Q4 Excluding CRCCI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>coefficient</td>
<td>t-ratio</td>
</tr>
<tr>
<td><strong>Long-run coefficients for log (real cdebt/y)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speed of adjustment</td>
<td>$\mu$</td>
<td>0.83</td>
<td>9.8</td>
</tr>
<tr>
<td>Constant</td>
<td>$u_0$</td>
<td>-3.17</td>
<td>-17.9</td>
</tr>
<tr>
<td>Credit conditions index: CRCCI</td>
<td>$u_{0c}$</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Log nominal short rate</td>
<td>$u_1$</td>
<td>-0.009</td>
<td>-1.5</td>
</tr>
<tr>
<td>Log user cost</td>
<td>$u_2$</td>
<td>0.010</td>
<td>1.6</td>
</tr>
<tr>
<td>Log (real income)</td>
<td>$u_4$</td>
<td>0.73</td>
<td>3.8</td>
</tr>
<tr>
<td>CRCCI$log (yperm/y)$</td>
<td>$u_{5c}$</td>
<td>0.33</td>
<td>1.3</td>
</tr>
<tr>
<td>Composite wealth and house price effect</td>
<td>$u_6$</td>
<td>1.77</td>
<td>4.1</td>
</tr>
<tr>
<td>from consumption equation</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Diagnostics**

| Equation standard error                  | 0.0200 | 0.0288 |
| DW                                      | 2.08   | 1.91   |
| R-squared                               | 0.720  | 0.418  |

Figure 4.4a: Long-run effects of unsecured consumer credit conditions and interest rates on log consumer credit stock/non-property income in France
Figure 4.4b: Long-run effects of composite wealth to income ratios and real house prices, log real income and interaction of credit conditions with log-ratio of permanent to current income on log consumer credit stock/non-property income in France

4.5 House prices

In the house price equation, the intercept effect of the credit conditions indicator for housing is normalised at one. One of the three equations needs such a normalisation to identify the coefficients on time dummies in the spline function making up the credit conditions indicator. In this equation, see Table 4.5, the only detectable interaction effect with credit conditions concerns the speed of adjustment, which rises with CCI, reaching 22% at peak levels of CCI and is at 9.7% when CCI is zero. The smaller of the two interest rate effects in the long-run solution is that of the log nominal mortgage rate, with an interest elasticity of -0.08 (t=1.8). The second is the much more significant user cost effect also in logs, though this required some care in construction. This is to overcome the often encountered problem that user cost could be negative when recent house price appreciation is strong, where market participants tend to extrapolate recent gains. As noted earlier, expected real appreciation is measured as the average of lagged one-year and four-year rates of appreciation, both annualised, with respective weights of 0.6 and 0.4. The real after-tax mortgage interest rate (using annual consumer price inflation) plus assumed annualised transactions costs of 5% and a time varying risk premium minus expected appreciation defines the user cost term. The time-
varying risk premium is defined by the volatility of house price changes in the last four years, with declining weights going back in time. This long lag might be due to the very low mobility of owners in France, see ECB, 2005. In the event, the t-ratio on the log of this user cost measure is -8.1.

The effect of income relative to the stock of houses measured by the net capital stock measure from national accounts is strongly significant. The log of this measure has a coefficient of 1.53, implying that the price elasticity of demand for housing in France is \(-1/1.53 = -0.65\), comparable to UK estimates, see Cameron et al (2006). The hypothesis of an equal and opposite coefficient on log income and log housing stock, implying an income elasticity of demand for housing of one, is acceptable.

---

39 Computed as cumulated flows of real housing investment, from and back from 2005, where nominal stock is the reference.
Table 4.5: Estimates of long-run solution for French house price equation

<table>
<thead>
<tr>
<th>Dependent Variable = ( \Delta \ln hp_t )</th>
<th>Symbol</th>
<th>1981Q2-2011Q4</th>
<th>1981Q2-2011Q4 Excluding MCCI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>coefficient</td>
<td>coefficient</td>
</tr>
<tr>
<td><strong>Long-run coefficients</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speed of adjustment when MCCI=0</td>
<td></td>
<td>0.097</td>
<td>0.018</td>
</tr>
<tr>
<td>Variation of speed with MCCI</td>
<td></td>
<td>0.30</td>
<td>0.0</td>
</tr>
<tr>
<td>Constant</td>
<td></td>
<td>-13.0</td>
<td>-69.7</td>
</tr>
<tr>
<td>Credit conditions index: MCCI</td>
<td></td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Log nominal mortgage rate</td>
<td></td>
<td>-0.13</td>
<td>-0.65</td>
</tr>
<tr>
<td>Log user cost</td>
<td></td>
<td>-0.54</td>
<td>-0.41</td>
</tr>
<tr>
<td>Coefficient on risk premium in user cost</td>
<td></td>
<td>1.00</td>
<td>0.94</td>
</tr>
<tr>
<td>Log (real income/house)</td>
<td></td>
<td>1.53</td>
<td>6.78</td>
</tr>
<tr>
<td>illiquid financial assets/y</td>
<td></td>
<td>0.091</td>
<td>-0.21</td>
</tr>
<tr>
<td>Housing subsidy</td>
<td></td>
<td>13.9</td>
<td>55.8</td>
</tr>
<tr>
<td>Transactions cost</td>
<td></td>
<td>-1.78</td>
<td>-10.9</td>
</tr>
<tr>
<td>Log demog</td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>Diagnostics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equation standard error</td>
<td></td>
<td>0.0024</td>
<td>0.0409</td>
</tr>
<tr>
<td>DW</td>
<td></td>
<td>2.12</td>
<td>1.25</td>
</tr>
<tr>
<td>R-squared</td>
<td></td>
<td>0.971</td>
<td>0.920</td>
</tr>
</tbody>
</table>

Short-run dynamics include the annual change in transactions costs, which appear to induce short term demand shifts, two lags in quarterly house price acceleration, the change over the previous four quarters in the log nominal interest rate and four impulse dummies, including for the two quarters just after the collapse of Lehman Bros in 2008Q3.

The decomposition of the long-run solution for log real house prices shown in Figures 4.5a and 4.5b show the dominant effects of the mortgage credit conditions index, user cost and log income per house over trend and cycle. There are also smaller trend effects from the rise in household disposable income relative to non-property income, from the rise in the log ratio of illiquid financial assets to income, from the fall in nominal interest rates, from the combined effects of transactions costs and housing subsidy and the calibrated effect of the age composition of the population.\(^{40}\)

\(^{40}\) This uses the same calibrated effect as that used in the mortgage stock equation, using the cross-section shares of the mortgage stock for each age group as a proxy for the demand for housing associated with each age group.
Figure 4.5a Long-run effects of mortgage credit conditions, log user cost, log income per house and the log ratio of household disposable income to non-property income on log real house prices in France.

Figure 4.5b: Long-run effects of log nominal mortgage rate, log ratio of illiquid financial assets to income and combined effects of transactions costs and interest subsidies on log real house prices in France.
The long-run estimates come from the model with a time-varying speed of adjustment shown in Figure 4.5c. It is noteworthy that very similar estimates of the long-run solution are obtained from a model in which the speed of adjustment is constrained to be constant.

![Figure 4.5c: Estimated speed of adjustment of house prices in France](image)

Omitting the credit conditions index for housing loans from the house price equation has drastic consequences: the speed of adjustment collapses from an average of around 0.14 over the sample to 0.018 and key parameters of the long-run solution make little sense. For example, the long-run elasticity of house prices w.r.t. income per house is estimated at 6.8, implying a (negative) price elasticity of demand for housing of 0.15, far below estimates from other countries. The estimated impact of transactions costs and subsidies on real house prices jumps by a factor of 4 or 5. The fit of the equation is far worse and the residuals are now positively auto-correlated, even after including the lagged growth rate of house prices, a term excluded from the preferred specification. This evidence is consistent with that of the studies surveyed in Section 3.3 excluding credit conditions, which reveal extreme fragility of estimated parameters, and in many cases magnitudes of elasticities far from economically plausible values. It is clear that the model excluding credit conditions has little to contribute to an understanding of what drove the rise in real house prices in France from 1996 to 2007.
4.6 Estimates for the permanent income forecasting equation

The expression for the log ratio of permanent to current non-property income is given in equation (3). A quarterly discount factor of 0.95 is used and it is assumed that per capita real non-property income growth from 2012 onwards is a modest 0.6% per annum. The forecasting model exploits the idea that the deviation of permanent income from current income should be related to the deviation of current income around some trend (with a split taking into account the improvement in the growth rate of incomes after the oil shocks of the 1970s and the early 1980s disinflation) augmented by economic variables. These include household survey expectations of future living standards, the unemployment rate, the recent acceleration of the price level, liable to have negative short-term impact on real income, recent changes in the short-term interest rate and recent growth rates of real asset prices. The latter include both the stock and housing markets. Sceptics of the view that asset prices have a direct impact on spending through wealth or credit channels argue that they signal income growth expectations.41 It is therefore important to control for these potential influences in the measure of income growth expectations, though it is worth noting that positive effects from the levels of asset prices cannot be found in this forecasting model.

The parameter estimates are shown in Table 4.6 below and the fit is visualised in Figure 4.6. Given the overlapping nature of the dependent variable, the residuals are highly auto-correlated, though the model does seem to capture reasonably well cyclical fluctuations. Goodness of fit, however, is not necessarily an unmixed blessing since households are bound to make serious forecast errors: rather the aim is to capture what their views might have been given the kind of information to which households would have ready access.

Table 4.6: Estimates for the income growth forecasting model

<table>
<thead>
<tr>
<th>Dependent Variable = log (permanent income/current income)</th>
<th>1978Q1-2011Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>coefficient</td>
</tr>
<tr>
<td>Variables</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>0.76</td>
</tr>
<tr>
<td>Time trend</td>
<td>0.00157</td>
</tr>
<tr>
<td>Split time trend from 1983</td>
<td>0.00096</td>
</tr>
<tr>
<td>Log (real per capita non-property income)</td>
<td>-0.87</td>
</tr>
<tr>
<td>Survey expectations of future conditions</td>
<td>0.00030</td>
</tr>
</tbody>
</table>

41 See for example discussion by King and Pagano of Muellbauer and Murphy (1990).
Unemployment rate (t-4) | -0.0071 | -4.4
--- | --- | ---
Rate of acceleration of log price level (t) | -0.32 | -1.5
Rate of acceleration of log price level (t-1) | -0.41 | -1.7
Rate of acceleration of log price level (t-2) | -0.40 | -1.6
Rate of acceleration of log price level (t-3) | -0.33 | -1.5
4-quarter change in T-bill rate | -0.0067 | -1.4
4-quarter change in log real stock market index (t-1) | 0.0093 | 2.3
4-quarter change in log real stock market index (t-5) | 0.010 | 2.7
4-quarter change in log real house price index (t-1) | 0.090 | 5.4

**Diagnostics**

<table>
<thead>
<tr>
<th>Equation standard error</th>
<th>0.0081</th>
</tr>
</thead>
<tbody>
<tr>
<td>DW</td>
<td>0.16</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.849</td>
</tr>
</tbody>
</table>

Figure 4.6: Plots of fitted and actual values of the log ratio of permanent to current income.

5. **Conclusions**

This paper throws new light on the important policy question: what effects do changing house prices have on aggregate consumption? The answer depends greatly on the institutional characteristics of the economy. In the case of France, the absence of home equity loans and
relatively large down-payment requirements for housing loans suggest that higher house prices should reduce consumption, other things being equal. This is because potential home buyers need to save harder for their deposit and because renters can expect future rents to be higher, so increasing their desire to save. This paper finds strong support for this proposition but establishes that greater credit availability, which in France has occurred on a substantial scale, attenuates this negative effect. Controlling for credit conditions, income, income growth expectations, debt and financial wealth, the estimates suggest that a 10% rise in real house prices in France reduces consumption by 0.7%, down from the 1% that held before housing loans conditions relaxed. France is therefore very different from the Anglo-Saxon economies where home equity loans produced large collateral effects of housing wealth on consumption. Given the results for France, one would expect even more negative effects of higher house prices on consumption in Germany, which has not undergone much of a credit liberalisation. This is of considerable policy significance since the boom in house prices now occurring in Germany will not produce a German consumption boom to lead the Eurozone out of recession. This is contrary to the expectation of some journalists and even some economists.

The model for French house prices suggests that downside risk for France is far more limited than for Spain, given that debt levels are far lower, the supply of housing has been stable and the banking system is in far better shape. Overshooting of French house prices due to extrapolative expectations has been on a relatively limited scale but house prices are quite sensitive to interest rates and, of course, to income and the supply of houses. Clearly, interest rates and income are potential sources of fragility for the French housing and housing loans markets.

The estimated consumption function for France suggests that credit liberalisation for France which increased consumption at given debt levels, also increased debt. Thus, there was a double offset: increased debt levels, with repayment and debt service obligations, and higher house prices produced an offsetting negative effect on consumption. As a result, despite higher house prices, France did not experience an Anglo-Saxon style consumption boom in which the financial accelerator via home equity loans proved powerful and destabilising. Financial wealth effects for France are relatively similar to those in other

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42 Preliminary findings from the German part of this project support this conjecture.
43 It is smaller on consumption because housing loans are mostly agreed at fixed interest rates, so that the impact on household income of interest rates is smaller than in Spain, where both the debt to income ratio and the proportion of changing interest rates are higher.
economies as far as estimated marginal propensities to consume are concerned. With rather lower financial wealth levels than the US, however, these effects may be somewhat less pronounced.

Models excluding the two credit conditions indicators perform badly, particularly as far as house prices, consumer credit and housing loans are concerned. The interpretation of the two latent variables in the system as credit availability indicators is a strong one. In principle, they could reflect other factors in addition. It was already noted that the downturn in the mortgage credit indicator in the early to mid-1990s could also have been influenced by the 1993 pension reform which might have caused households to increase the saving rate. However, as discussed above, some households looking to augment their pensions might have become investors in rental housing, with a positive effect on house prices. If so, there seems to have been a considerable delay before house prices pick up at towards the end of the 1990s. It is possible that the rise in both housing loans and house prices from the late 1990s might have had a rental investor demand component induced by pension reform as well as being driven by institutional changes on the credit supply side and housing policy, reflected for example in greatly increased duration of housing loans. These changes included increased securitisation, as well as the improvements in the capital base of banks as they worked off the bad loans, which had peaked as a fraction of total loans in 1993.

This research also illuminates some general issues. It confirms that the correlation between debt, asset prices and consumer spending is complex: an increased supply of credit tends to raise all three; but high levels of debt, given supply conditions, constrain consumption and can lead to other negative feedbacks. Standard VAR methods cannot capture this complexity because they omit shifts in credit availability and the parameter shifts they induce. Country panel VARs with homogenous slope coefficients are liable to produce nonsense.

The role of money, in the form of household liquid assets is significant but limited. The rise in the ratio to income of household liquid assets between 1981 and 1993 can account for about one quarter of the rise in the log ratio of consumption to income over that period. However, the later rise in the ratio to income of household debt accounts for a rather larger fall in the log ratio of consumption to income, given credit conditions and other controls.

This approach in this paper respects institutional heterogeneity and demonstrates the value of flow of funds data. It occupies a constructive middle ground between the extremes of DSGE models without money, credit and causal role for asset prices, and monetarism, with its exaggerated claims for role of money.


Bono P.-H., Trannoy A. “Impact du dispositif Scellier sur les prix des terrains a batir” presented at Seminaire Fourgeaud, March 2013


Chauvin, V. and O. Damette « Effets de richesse: le cas français” Economie et statistique n°438-440
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Melitz J. “Financial deregulation in France” European economic review, pp394-402


Appendix 1: Further institutional background

Public expenditure on housing policies represented 1.1% of GDP in 1999 and this figure is among the highest in Europe (see Table A1). They increased further afterwards as can be seen below. Measures on housing market are of different kinds:

- tax deduction for owners, whether they are home owners or landlords, including tax deduction for interest payments;
- allowances to renters, whether in the private or social sector;
- direct subsidies to lower interest rates (for 0% loans since 1995, but subsidized interest rates were common practice at the beginning of the 1970s, as loans for social ownership and contractual loans);
- direct subsidies to social housing.

Figure A1: Housing policies in % of GDP

Sources: Satellite account of housing, Ministry of housing, National accounts, INSEE

Direct subsidies on interest rates were never a major component of housing policies over the period we study (Figure A1). Indeed, the peak in 1984 is due to policies adopted at the beginning of the 1970s. Nowadays, they rather relate to social ownership, as the agreement...
for the loans that benefit from these subsidies is conditioned on the income level of the beneficiaries. Thus, their marginal impact may differ from that of other measures that boost demand. The bulk of those measures that boost demand for housing service are allowances to renters. They increased a lot in 1992-1994, thanks to the broadening of the potential beneficiaries. Laerrere and le Blanc (2002) show on micro-data that this reform induced an increase by nearly 9% of the rents for the tenants newly beneficiaries of the subsidy at the time of the change, at least in the short term.

Recently, tax deduction increased greatly. The step in 2000 is mostly due to a reduced rate of VAT on major repair work on housing that came into force in 15 September 1999 which would have increased investment in housing. As for other measures, the market for new houses and private renting has benefited from various tax incentives for more than twenty years, with 7 different laws (Table A1). After a period when it scarcely existed or was not generous (before 1996), the fiscal framework for private renting has been very volatile (see Table A1).
Table A1: Tax deduction for household landlords

<table>
<thead>
<tr>
<th>Law</th>
<th>Period</th>
<th>Subsidee as a % of the value of the property</th>
<th>Cut on property income declared</th>
<th>Mandatory renting period</th>
<th>Level of rents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quilès-Méhaignerie</td>
<td>1984 - 1997</td>
<td>5 % over 2 years (below 30 489 € for a single, 45 734 for a couple)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Since 1986</td>
<td>10 % over 2 years (below 45734 € for a single, 91469 for a couple)</td>
<td>35 % over 10 years, compared to between 15 % and 8 % outside this program</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perissol</td>
<td>1996 to August 1999</td>
<td>10 % over 4 years and 2 % over 20 years (80% over 24 years)</td>
<td>6% compared to 14 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Besson</td>
<td>January 1999 to December 2002</td>
<td>8% over 5 years and 2,5 % over 4 years (50% over 9 years)</td>
<td>6 % compared to 14 %</td>
<td>9 years</td>
<td>According to area + capped resources for the renter</td>
</tr>
<tr>
<td>Robien</td>
<td>January 2003 to August 2006</td>
<td>8% over 5 years and 2.5 % over 4 years (50% over 9 years)</td>
<td>6 % compared to 14 %</td>
<td>9 years</td>
<td>Higher rents (up to 90 % of market rents), no conditions on the income of the renters</td>
</tr>
<tr>
<td>Robien II-Borloo</td>
<td>September 2006 to December 2009</td>
<td>6% over 7 years and 4 % over 2 years (50 % over 9 years)</td>
<td>(30 % compared to 0% for Borloo)</td>
<td>9 years</td>
<td>Lower rents compared to previous law (lower rents for Borloo law)</td>
</tr>
<tr>
<td>Scellier</td>
<td>January 2009 to December 2012</td>
<td>2.77 % (=25%/9 years) per year for investment made in 2009 and 2010, 1.66% (=20/9) per year for investments made in 2011 and 1.11 (=10/9) for investments made in 2012</td>
<td>30% under certain conditions on rents and renter income</td>
<td>9 years</td>
<td>According to area, exceptions in France</td>
</tr>
<tr>
<td>Duflot</td>
<td>January 2013 to December 2016</td>
<td>2 % over 9 years (high environmental quality housing)</td>
<td></td>
<td>9 years</td>
<td>According to area + capped resources for the renter</td>
</tr>
</tbody>
</table>