Household Debt and Uncertainty: Private Consumption after the Great Recession[1]

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Abstract

Household debt in many advanced economies has increased significantly since the 1980s and accelerated in the years previous to the Great Recession, resulting in an aggregate reduction of saving rates in the developed economies. Now, some of those economies are deleveraging, which may be affecting their recovery. We try to disentangle how these financial developments work for private consumption in a panel of OECD countries, after controlling for the traditional determinants (income, net financial and non-financial wealth and interest rates). We find that consistent with the perceived changes in the distribution of financial constrains across countries, aggregate consumption is also driven by the dynamics of housing debt accumulation and deleveraging. Precautionary savings, due to labour income uncertainty, have also influenced household decisions especially during the 2007-2009 period.

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1. Introduction

Household debt in most advanced economies has increased significantly since the 1980s and accelerated in the years previous to the Great Recession that started in 2007-2008 (see left-hand panel of Figure 1). In fact, since 2000 the rapid debt growth has allowed consumption to grow faster than income, entailing a reduction in the saving rates of the majority of developed countries during the expansionary phase of the business cycle (see right-hand panel of Figure 1). Although this process has been heterogeneous across countries (Denmark and United Kingdom reduced their household saving rate by 6 pp, while it increased by 4 pp in New Zealand and Austria), the overall saving rate of the OECD countries declined by almost 1 pp between 2001 and 2007 (and the lending capacity by more than 2 pp).

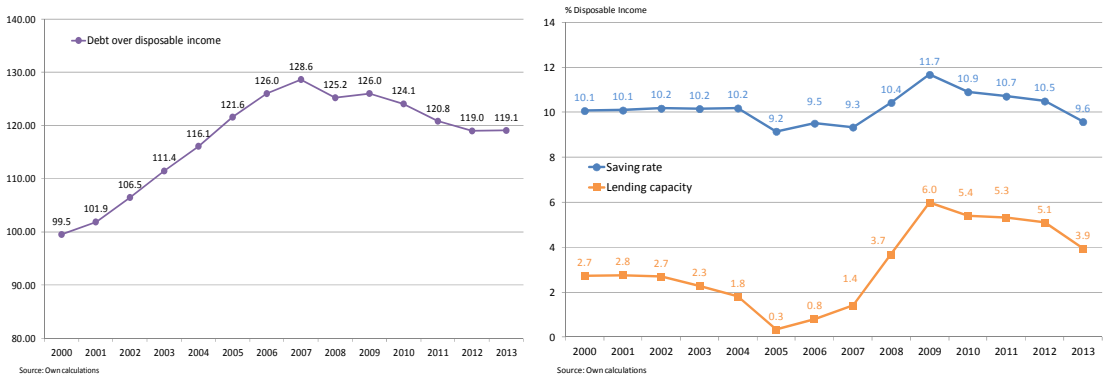


Figure 1. Household Debt, Saving Rate and Lending Capacity in the OECD Countries: 2000-2013

Some of those economies are currently deleveraging to achieve a sustainable level of debt relative to income and this balance-sheet restructuring may be affecting their recovery. In the initial phase after the financial shock, the aggregate OECD household saving rate increased by more than 2 pp since 2007 (and the lending capacity by almost 5 pp), involving an adjustment in private consumption. Afterwards, there has been a downward correction, although they are still above those observed in the Great Moderation period.

Many analysts have said that household "debt overhang" and the increase in house prices observed in many countries before 2007 could play an important role in explaining the consequences of the current financial crisis over the business cycle. In fact, we know that historically housing busts and credit crunches are associated with deeper and longer-lasting recessions in advanced economies (Claessens et al., 2009). Moreover, this time the recovery process is taking place in a very uncertain environment with persistently high unemployment rates. This paper studies the empirical influence on consumption of these factors.

In fact, there is considerable heterogeneity across countries regarding changes in the composition of assets and debt. In some of these countries, debt levels rose until 2007 in parallel with the increase in household wealth. In fact, the rise in gross household debt and the subsequent correction has been associated with the developments in the housing market and, specifically, with the boom-bust of housing prices. That is the case for countries like the US, the UK, Ireland or Spain, where house prices have been declining more (e.g., Garrote et al. 2013). Whereas in Italy or Korea, the increase in household debt has been associated with consumer loans, which have very different characteristics to mortgages. And, at the other extreme, households in Germany and Japan have reduced their debt level since the 2000s. Figure 2 compares the notable differences since the 2000s between developments in debt, wealth, income and consumption in the US and Germany.

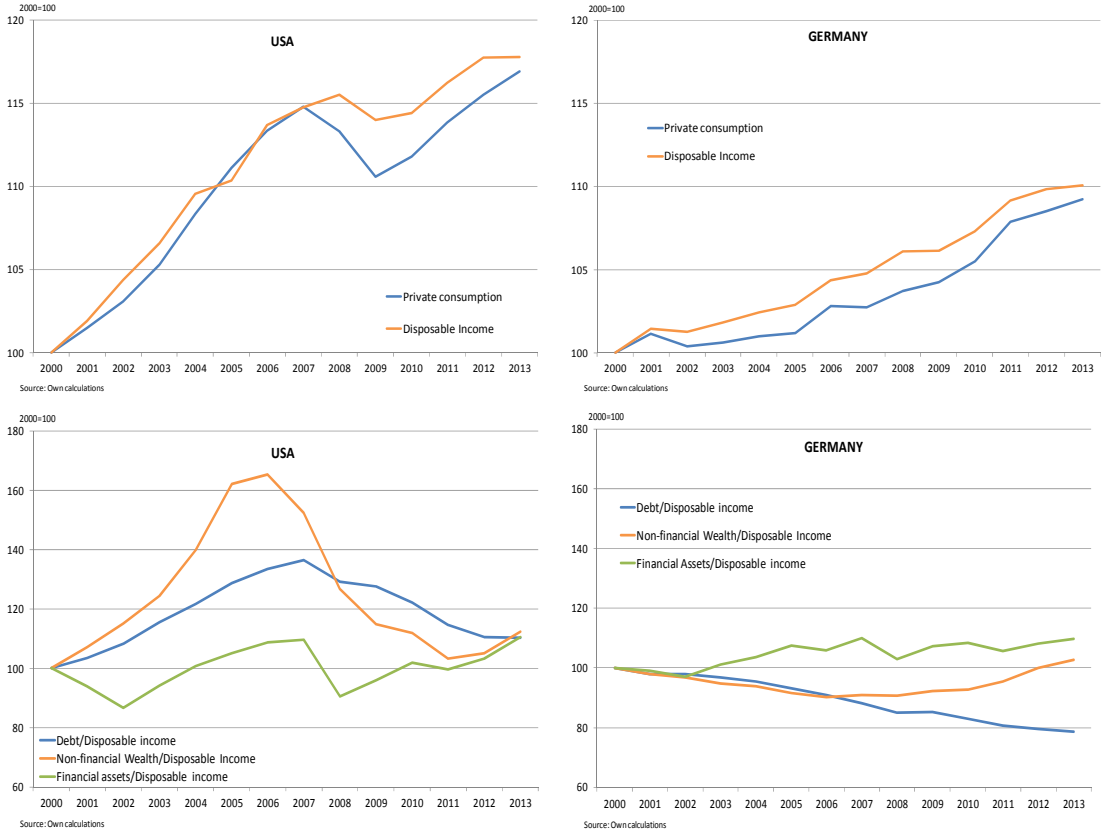


Figure 2. Household Consumption, Income and Balance Sheets in the US and Germany: 2000-2013

Private consumption has increased more than disposable income in the US since 2001, involving a decline in the saving rate in the years previous to the recession (upper left-hand panel). Subsequently, an adjustment in consumption was recorded jointly with a significant increase in the saving rate. By contrast, German households have expanded their saving rate over the whole period (upper right-hand panel), and did not reduce consumption during the recession.

The lower panel of Figure 2 shows the enormous differences between the behaviour of household balance sheets in these two economies. Household debt increased in the US until 2007 and declined during the recession. These developments were anticipated by housing wealth, although the adjustment during the recession has been stronger on the assets than on the liabilities side. Since 2012, both net financial assets and housing wealth have recovered, while debt has continued to decline, closing the gap among them to the relative levels of 2000. By contrast, housing wealth in Germany declined during the expansionary period, stabilised afterwards and begun to increase by 2011, while debt has continued to diminish. A similar analysis could be made looking at residential investment instead of consumption given the strong correlation between household debt, residential investment and housing prices.

These changes in savings and balance-sheet composition have been influenced by technical and institutional changes in the financial sector during the last thirty years. Financial liberalisation made it easier the availability of credit, especially in presence of borrowing constraints. For example, depending of the countries, households could borrow more easily against their wealth (mainly housing) significantly reducing their saving rate (Muellbauer, 2007). And the pro-cyclicality of the financial system for real decisions is already well documented in the literature (for example, in the financial accelerator model of Bernanke and Gertler, 1989).

Moreover, the sudden reversal of the credit-loosening conditions after 2007 may have also exacerbated the consequences of the crisis. High leveraged households may want to downsize their mortgage or default. Others may want to reduce their obligations paying down their current debts and reducing new borrowing. For example, Mian and Sufi (2010) have documented that the regions of the U.S. that have experienced the largest swings in household borrowing have also experienced the largest declines in employment and output. And at the theoretical level, Eggertsson and Krugman (2012) have shown that in the presence of a deleverage shock, the level of debt matters. Highly indebted households face different constraints to low indebted households and they emphasise that the distribution of debt has real effects especially in the presence of a zero bound interest rate constraint.

This paper tries to disentangle how these financial developments have influenced aggregated household consumption in the advanced economies considering the most recent period of house price boom-bust. In particular, we analyze empirically if the presence of credit constraints could make the debt ratio to have a relevant role explaining consumption dynamics across countries. For that purpose we use a panel of OECD countries in the 1980-2013 period,

controlling for the traditional determinants of private consumption: income, net financial and non-financial wealth, and interest rates.

A second factor closely related to the financial sector is the existence of households' uncertainty about their future expected income. Precautionary savings models show that the saving rate climbs (consumption falls) in response to an increase in uncertainty (see Carroll et al., 2012). It is clear that many advanced economies are experiencing sudden rises in the unemployment rate after the financial crisis in 2007 that may be considered by households as a permanent and unexpected shift in their labour income. Thus, we investigate the relevance of this precautionary effect on consumption once we have considered the wealth and debt effects to account for possible income and financial shocks.

Thus, the second section of the paper presents the empirical tests for these two additional financial factors in a (solved out) specification of private consumption. It also introduces the construction of the database and the empirical counterparts of the theoretical determinants of household decisions. The third section presents the econometric results where a dynamic consumption equation includes as additional factors the credit-channel and labour uncertainty. As robustness exercise we will investigate in section fourth whether these results may depend on the existence of non-Ricardian effects on private consumption given the recent rise in the public deficits and debt of many advanced economies. Fifth section analyses the period after the financial crisis, 2008-2013, and whether these additional financial factors are having a differentiated effect on consumption across countries. Finally, section six summarises the main conclusions and possible future research.

2. Empirical considerations

Taking into account the policy analysis objectives of the paper, we follow Muellbauer (2007) and adopt the solved out consumption function approach, which integrates the intertemporal Euler condition and the budget constraint in just one equation. Besides, this will allow us to incorporate long-run information on household decisions, which could be important currently, when departures from steady state may be very large in some countries. The most simple solved out consumption equation can be specified as follows:

$$LnC_{it}^{N} = \alpha_i + \beta LnY_{it} + (1-\beta)LnW_{it-1} + \gamma r_{it} + \varepsilon_{it}^{N} \qquad [1]$$

C^N being the non-durable consumption of households, Y their labour income, W their net wealth (including both financial and real assets) and r the real interest rate. This specification implies that in the long run, permanent income is

captured through a weighted average of current income and non-human wealth. Note that the elasticity of consumption out of income and out of wealth is constrained to add up to one. Thus, this could be interpreted as households trying to balance two ratios at the same time: consumption over income (the saving rate) and wealth over income. The additional explanatory variable, the interest rate, will attain a negative effect ($\gamma<0$) on current consumption due to intertemporal substitution effects.

The empirical counterparts for the variables in this model are difficult to obtain for a broad sample of advanced economies since the 1980s, even though the frequency of information is annual. In particular, labour income is proxied with disposable income, which is a more homogeneous measure of income, as it is directly obtained from National Accounts.[2] This implies that we are including part of the revenue generated by wealth, biasing upwards the parameter β. Financial assets and liabilities are taken from the financial accounts of the different countries and non-financial assets are proxied with the housing stock at market prices. The real interest rate corresponds to the 10-year yields of government debt minus annual consumption inflation; therefore, it does not include the possible spread applied by financial institutions to consumers' loans.

With respect to consumption, it is also difficult to obtain a homogeneous measure of non-durable consumption for the whole sample. Furthermore, the classification of durable goods can change depending on the frequency of the data considered. This compels us to use total private consumption (C) obtained from the National Accounts as the dependent variable in [1]. Recent empirical evidence shows this does not need to be a limitation at all. On the contrary, durable consumption reacts much more than non-durable consumption both to expected and unexpected shocks to households' resources (Coulibaly and Li, 2006, Aaronson et al. 2012, Browning and Crossley, 2009). Durable goods act as insurance against unexpected shocks, and it is important to take them into account when we want to analyse the role of uncertainty. Moreover, this approach also controls for possible non-separabilities between both types of consumption.

However, the inclusion of durability has implications for the solved out consumption function and for the random walk result of Hall (Mankiw, 1982). In particular, assuming that the services of the durable goods enter into the utility function, and that these services are proportional to the stock of durables,

[2] The list of countries as well as the sources of variables used in the empirical analysis is detailed in Appendix 1.

it can be shown that not only are current shocks relevant to taking decisions today, but so are past shocks. That would suggest the inclusion of lagged consumption in the empirical specification. An "observable equivalent" conclusion would be reached if we were to consider instead the existence of habits in non-durable consumption.

One of the most popular tests on consumption theory was that of excess sensitiveness; whereby several researchers found that changes in current income had informational content to forecast the growth rate of consumption. One explanation for this result was the existence of financially constrained consumers, which cannot be debtors, so they do not consume according to their permanent income but according to their current income. Therefore, for these type of households, consumption will be linked to current income (i.e., $LnC_{it}^{c} = \rho LnY_{it}^{c} + \varepsilon_{it}^{c}$).

Denoting by λ the percentage of total consumption of constrained agents (this parameter may change over time) and assuming that the income of constrained and unconstrained households move in parallel, it is possible aggregate both formulations to obtain the consumption function for both types of households (Muellbauer and Lattimore, 1995). The expression, taking into account durable consumption, would be:

$$\Delta LnC_{it} = \alpha'_i + \phi\,\Delta\,LnC_{it-1} + \lambda\theta\,\Delta\,LnY_{it} + \mu\,\Delta\,LnY_{it}^{exp} + \eta\,\Delta\,LnW_{it-1} + \psi\,\Delta\,r_{it} - \theta_2(1-\lambda)[LnC_{it-1} - \beta LnY_{it-1} - (1-\beta)LnW_{it-2} + \gamma r_{it-1}] + \mu_t + \varepsilon_{it} \qquad [2]$$

This expression resembles the traditional error correction model for private consumption. It establishes that private consumption growth will depend on the increase in their basic determinants (including some inertia) and the progressive correction from long-term desired consumption. Both country and time effects are included in the specification.

Focusing on the short-term determinants of private consumption growth, there are three additional regressors considered by the literature that we will control for in the baseline specification. First, it is convenient to introduce a variable which captures household income growth expectations (Y^{exp}) to complement current income and wealth.[3] Both expected income growth and current income growth could be jointly determined with consumption at this aggregate level; therefore, they will be instrumented with lags of the other variables in our preferred specification. Second, we consider the possible impact on aggregate

[3] This variable is taken from data of an OECD survey on households' economic sentiment (see Appendix 1).

consumption of income distribution, by including the Gini index (*G*). That takes into account that different subgroups of population could present a different propensity to consume out of income and wealth; we expect it to be negatively signed. And third, it has been argued that the elasticity out of net wealth should be different depending on the liquidity of the assets included in the portfolio. But besides the liquidity differences, the work among others of Aron et al. (2011) recognises also the importance of credit conditions in the mortgage boom preceding the financial crisis and the subsequent significant drop. In order to control for those effects and because of the varying impact of institutional changes on the financial sector, the empirical analysis will distinguish between net financial assets (*NFA*) and housing wealth (*HW*). We would have liked to separate also shares and pension funds from the other financial assets, but sample limitations meant that this was not feasible.

Substantial empirical research with micro data during the last two decades has shown that different types of households respond differently to given changes in economic environment. Moreover, the crisis has shown that the responsiveness of different groups to shocks has changed. And in the presence of a debt shock, highly indebted households respond differently than low indebted ones (see Eggerston and Krugman, 2012). In order to incorporate some of these composition effects in our aggregate analysis, we include the debt dynamics in our specification. Thus, our first testable hypothesis is that, once we have considered the traditional determinants, debt accumulation (*D*) first and deleveraging latter reflects changes in the credit conditions affecting households' decisions. It would indicate that both credit availability and the "excessive" household debt affects consumption once we have considered the net wealth effect. If that is the case, adding current debt accumulation in the baseline model should favour consumption ($\omega_1 > 0$) whereas past household debt accumulation should be negatively related to consumption ($\omega_2 < 0$).

$$\Delta LnC_{it} = \alpha'_i + \varphi\,\Delta\,LnC_{it-1} + \theta_1\,\Delta\,LnY_{it} + \theta_2\varphi\,\Delta\,LnY_{it}^{exp} + \theta_3 G_{it} + \eta_1\,\Delta\,LnNFA_{it-1} + \eta_2\,\Delta\,LnHW_{it-1} + \psi\,\Delta\,r_{it} + \omega_1\Delta d_{it} + \omega_2\Delta d_{it-s} + \omega_3\,\Delta\,std(\Delta U_{it}) - \vartheta'[LnC_{it-1} - \beta LnY_{it-1} - (1-\beta)LnW_{it-2} + \gamma r_{it-1}] + \mu_t + \varepsilon_{it} \quad [3]$$

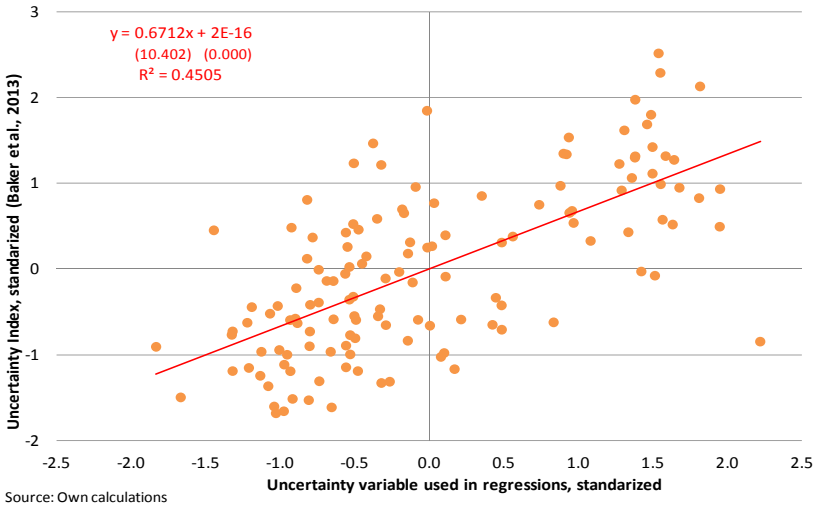
Obviously, contemporaneous changes in households' debt, our proxy for credit conditions, is an endogenous variable in this context, as long as it capture both demand side (jointly determined with consumption) and supply side developments in the credit market. Therefore, in order to check if credit constrains perform a role it is necessary to instrument this variable. We chose two instruments. The first one is a predetermined demographic variable, the dependency ratio (percentage of population over 65), as long as data of

households finances shows that at this age households start the process of wealth reduction, in line with life-cycle hypothesis. Second, we make use of the financial reform index constructed by Abiad et al. (2008), after being enlarged to take into account recent developments in the financial sector, in order to isolate the changes in the regulatory environment which can be crucial in determining the credit supply conditions of every economy.

Besides the credit conditions, the existence of a risk perception about the household future expected income also affects their real decisions. In models of precautionary savings, households accumulate a larger stock of wealth to offset the increase in unemployment risk. And after a negative shock, consumption can overshoot the required downward adjustment (see Carol, 2012)

Therefore, in expression [3] we will also test if a measure of unemployment risk is quantitatively a relevant factor explaining the recent drop in consumption relative to income across advanced economies ($\omega_3 < 0$). We proxy this effect using the standard deviation of the changes in the unemployment rate (U) in 5-year windows ($std(\Delta U)$). By using the first differences we try to get rid-off of the structural component of the unemployment rate.

As can be seen in Figure 3, this indicator of households' uncertainty shows a very high synchronisation with more sophisticated measures of policy uncertainty such as those developed by Baker et al. (2013). In fact, for the countries (Canada, France, Germany, Italy, Spain, UK and US) and the period (1997-2013 for the European countries, 1990-2013 for Canada and 1985-2013 for US) where this economic policy uncertainty index is available, both indicators are positively correlated and the explanatory power is high. By country, the worst result is obtained in Germany, where the correlation is 0.26, compared to 0.85 in the case of the UK. Clearly, the variability of the changes in unemployment rate is determined by other factors in addition to changes in monetary, fiscal or regulatory policies, which are the variables considered by this economic policy uncertainty index.



Source: Own calculations

Figure 3. Economic policy uncertainty index and standard deviation of the first differences of the unemployment rate

3. Consumption and financial conditions

Before testing the hypothesis about the influence of financial conditions, Table 1 presents the estimation results for the baseline consumption equation. As shown in the previous section, one of the main advantages of the solved out consumption function is that it incorporates long-run information on household decisions. In fact, once the possibility has been considered that credit constrained households exist, the solved out consumption function can be understood as an error correction mechanism. From a statistical point of view, this is a very convenient representation, as private consumption and most of its determinants are non-stationary variables. Therefore, if they cointegrate, the deviations from that long-run relationship should provide valuable information for projecting the growth rate of consumption.

Thus, the estimation approach for the panel follows the traditional two-step procedure applied to single equation cointegrating relationships. It involves assuming, once we have included fixed effects to control for non-observable characteristics and time effect to capture, for example, common aggregate shocks to all the countries, an identical form of long-run consumption function for all countries and also a common function that measures the deviations from such a relationship.

Table 1a presents the panel estimation of the long-run relationship. The variables in the regressions appear in levels and, apart from the real interest rate, in logs and per capita. Therefore, the coefficients should be interpreted as elasticities. Reverse causality and endogeneity of regressors could be a relevant issue. However, as in most of the specifications the variables are integrated, the

superconvergence of the OLS guarantees the consistency of the parameters, even though their distribution is not a standard one.

TABLE 1A. LONG-RUN ESTIMATES OF SOLVED OUT CONSUMPTION FUNCTIONS.
Dependent variable: per capita consumption. Fixed Effects

	(1)	(2)	(3)	(4)
Constant	-0.404 (0.034)	-0.399 (0.035)	-0.304 (0.045)	-0.137 (0.012)
Current income	1.078 (0.009)	1.033 (0.014)	1.020 (0.014)	0.972 (0.007)
Net wealth (-1)	-	0.032 (0.007)	0.025 (0.007)	0.028[a] (-)
Real interest rate	-	-	-0.328 (0.101)	-0.529 (0.086)
Standard deviation×100	4.709	4.525	4.489	4.539
Residual stationary tests				
Fisher type (Inv. χ^2)	46.618 [0.288]	51.926 [0.140]	52.540 [0.128]	57.527 [0.056]
Imm-Pesaran-Shin	-2.867 [0.002]	-2.307 [0.011]	-2.354 [0.009]	-2.279 [0.011]
N. observations	714	693	693	693

Standard deviations in round brackets; P-values in square brackets; [a], restricted coefficient.

The first column considers current disposable income as the only determinant of consumption. The coefficient is statistically significant, positive and slightly higher than 1, reflecting a long-run downward trend in the saving rate, probably associated to the development of the financial sector and social safety nets in most of these countries. In fact, the Fisher type test checking for the stationarity of the residuals (see, for example, Baltagi [2008]) accepts the null hypothesis that all panels contain unit roots, implying disposable income is not enough to explain the evolution of private consumption in the long run.

Therefore, we add another variable to the regression: household net wealth (column 2). At this stage, net wealth is not disaggregated into its financial and non-financial counterparts, as long as the liquidity considerations that could justify different elasticities for these two components should not apply for a long enough time span. This variable is significant and the parameter is positive, showing gains in the fit of the model. As expected, the corresponding coefficient of current income diminishes but still the stationarity tests show that the residuals of, at least, some panels contain unit roots.

If we add the real interest rate, the results continue to improve (column 3). It is signed negative (i.e., an intertemporal substitution effect), and it is statistically significant, without changing the relevance of the other variables much. This interest rate is that of public debt, so it does not include the household risk premia but in the long run that premia should be stationary. In column 4 we check whether the parameters of current income and wealth add up to one, as implied by the theory. This constraint slightly worsens the fit of the model, but

the real interest rate coefficient becomes more robust and the stationarity tests of the residuals show no unit roots at the 94% of probability. Thus, that is the specification whose residuals will be included in the estimation of the solved out consumption functions, to capture the error correction term.

The previous specification imply an estimated long-run marginal propensity to consume of 0.4-1.1 cents out of one unit of wealth.[4] Although that value is below the estimates in the literature, some authors have argued that the "pure wealth effects" have been overestimated precisely so as not to consider precautionary or credit availability effects that are correlated with wealth (e.g., Carroll et. al 2012). We will analyse these effects in the short-run specification. Furthermore, it should be taken into account that our proxy for human wealth is disposable income, which includes part of the revenues of wealth.

Table 1b presents the estimation results for the basic specification of the per capita consumption growth (equation [2]). Besides the income expectations and the Gini index terms, we incorporate separated wealth effects for financial assets and housing stocks.

The first column presents the OLS estimates including as an additional regressor the deviation of the long-run relationship (the error correction term). This parameter is negatively signed and is very significant, confirming the cointegration of the long-run specification.

The results reveal the relevance of the net financial assets and the difficulty of finding a significant relationship between housing wealth and consumption when pooling all the countries and time periods. In fact, the lagged housing wealth was significant and negatively signed, implying that only progressive increases or decreases of housing wealth have effects on the consumption path. All the other coefficients, except the changes in the real interest rate and the Gini index, are statistically significant and have the signs predicted by the theoretical considerations.

When country dummies are included (column 2) or country and time dummies (column 3) we see a better fit and small changes in terms of the coefficients' significance. Finally, column 4 also tries to control for the endogeneity of income (current and expected) with lags of all the right-hand side variables as instruments. These instruments seem to be orthogonal with the residuals (see the Sargan test).

[4] This equation is specified in logs, so the estimated parameters represent elasticities. Therefore, the propensity to consume out of wealth would be equal to the elasticity multiplied by the ratio of consumption over net wealth, which, in our sample, shows a median of 0.20, the 10th percentile is 0.14 and the 90th percentile is 0.39.

TABLE 1B. ESTIMATION OF BASIC CONSUMPTION FUNCTION:
Dependent variable: per capita consumption growth

	(1)	(2)	(3)	(4)
	OLS	OLS	OLS	IV
Constant	0.007***	0.007**	0.014***	0.001
	(0.001)	(0.003)	(0.004)	(0.004)
Consumption growth (-1)	0.194***	0.154***	0.137***	0.191***
	(0.034)	(0.035)	(0.036)	(0.045)
Income growth	0.448***	0.373***	0.326***	0.214
	(0.031)	(0.031)	(0.032)	(0.150)
Income growth expectations	0.019***	0.051***	0.046***	0.028
	(0.004)	(0.006)	(0.006)	(0.023)
Gini index change (-1)	-0.102	-0.134*	-0.139*	-0.148**
	(0.078)	(0.075)	(0.073)	(0.076)
Net financial assets growth (-1)	0.035***	0.034***	0.022***	0.026***
	(0.005)	(0.005)	(0.006)	(0.007)
Housing wealth growth (-1)	0.026**	0.029**	0.033**	0.048***
	(0.013)	(0.013)	(0.013)	(0.015)
Housing wealth growth (-2)	-0.020*	-0.023**	-0.029**	-0.023*
	(0.012)	(0.012)	(0.012)	(0.013)
Real interest rate change (-1)	-0.005	-0.014	-0.061	-0.091**
	(0.038)	(0.036)	(0.040)	(0.046)
Error correction mechanism	-0.085***	-0.073***	-0.063***	-0.070***
	(0.014)	(0.014)	(0.014)	(0.024)
Country dummies	No	Yes	Yes	Yes
Time dummies	No	No	Yes	Yes
R^2	0.563	0.612	0.678	0.667
Standard deviation×100	1.514	1.427	1.299	1.364
Durbin Watson	1.838	1.830	2.079	1.899
Sargan test	-	-	-	16.342 [0.231]
N. observations	642	642	642	601

Standard deviations in round brackets; P-values in square brackets; *, **, ***, significant at 10%, 5% and 1%, respectively; Instruments: Variables lagged two to three periods.

Analysing the IV estimates, the current income and the income expectations coefficients become not significant. However, countries with an increase in income inequality (higher Gini index) have lower consumption growth. This indicates that societies where the share of income in the top deciles is high have a higher saving rate. Moreover, under this specification both financial assets and housing stocks are significant for consumption, but in the latter case is the acceleration effect that is relevant as opposed to the growth effect in the former case. Also the real interest rate change is relevant for consumption. The speed of adjustment of this cross-country equation (0.07) seems low compared with time series studies (Aron et al., 2012), even taking into account the relevance of the lagged consumption growth in our estimates.

The estimated wealth coefficients imply a short run marginal propensity to consume of 0.5-1.6 cents out of one unit of net financial wealth and 0.7-1.8 cents out of non-financial wealth. These results are difficult to compare with the work of Case, Quigley and Shiller (2005, 2013), that finds a higher MPC out of housing wealth than out of financial wealth with the data of 14 countries in the

period previous to the last housing boom (1975-1999). The main reason is that, unlike our work, they consider a financial wealth variable that excludes the least volatile components of financial wealth such as deposits, securities or insurance reserves. Our results are more similar to Ludwig and Sløk (2004), since they cannot conclude that the elasticity of housing is different to that of financial assets. But in this case, the study only consider the behaviour of stock and housing prices (and not the quantities) in the determination of the effect of both wealth components on consumption.

We are trying to determine whether the leverage process first and deleveraging latter on is a specific determinant of consumption growth, in addition to the traditional passive role the debt ratio plays through the wealth effect (Dynan, 2012). This active role could be the result of households targeting a particular leverage level, or financial institutions using leverage as an indicator of households' soundness. Thus, besides the consideration of net wealth, debt accumulation may reflect improving credit conditions. And similarly, households may want to reduce their leverage when house prices fall, especially when they see a high probability of job loss.

As initial evidence of the existence of such an effect in the most recent period we present a scatter plot with the average cross-country residuals of the consumption equation (Table 1b, column 4) between 2008 and 2013 and the change in (the log of) the ratio of household debt to income in the same period and in a previous expansionary period (2001-2007). In Figure 4 we see, first, that countries with higher negative (positive) residuals after the Great Recession have been also characterized by a reduction (increase) in the debt to income ratio during the same period. At the same time, these were the countries where the debt to income ratio increased the most (least) in the Great Moderation period. This suggests that countries with higher (and negative) consumption residuals are the ones with a higher debt ratio in the period previous to the commencement of deleveraging.

Figure 4. Consumption residuals (2008-2013) and household debt

However, these are a simple correlations calculated for a very specific sample period. It is necessary to check how debt works in a fully specified consumption equation over a longer horizon, to analyse any possible additional effect. Therefore, in Table 2 we re-estimate the last specification in Table 1B adding the contemporaneous and lagged growth of the household's debt.[5]

TABLE 2. ESTIMATION OF THE CONSUMPTION FUNCTION: Households' debt & uncertainty effects.

Dependent variable: consumption growth per capita. Country and time fixed effects

	(1) OLS	(2) IV	(3) OLS	(4) IV	(5) OLS	(6) IV
Constant	0.009**	0.001	0.010***	0.002	0.011***	0.002
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Consumption growth (-1)	0.047	0.151***	0.061*	0.129***	0.061*	0.124***
	(0.035)	(0.046)	(0.034)	(0.046)	(0.034)	(0.044)
Income growth	0.263***	0.229*	0.271***	0.315**	0.263***	0.298**
	(0.030)	(0.134)	(0.030)	(0.135)	(0.029)	(0.131)
Income growth expectations	0.035***	0.016	0.034***	0.006	0.034***	0.007
	(0.005)	(0.021)	(0.005)	(0.021)	(0.005)	(0.020)
Change in the Gini index (-1)	-0.111	-0.127*	-0.113*	-0.118*	-0.115*	-0.119*
	(0.068)	(0.073)	(0.067)	(0.071)	(0.065)	(0.069)
Net financial assets growth (-1)	0.021***	0.025***	0.020***	0.023***	0.015***	0.018***
	(0.006)	(0.007)	(0.006)	(0.007)	(0.006)	(0.007)
Housing wealth growth (-1)	0.025*	0.041***	0.025**	0.035**	0.016	0.027*
	(0.013)	(0.014)	(0.012)	(0.015)	(0.012)	(0.014)
Housing wealth growth (-2)	-0.030***	-0.024*	-0.018	-0.015	-0.014	-0.011
	(0.011)	(0.013)	(0.011)	(0.013)	(0.011)	(0.012)
Real interest rate change (-1)	-0.040	-0.078*	-0.051	-0.077*	-0.056	-0.075*
	(0.037)	(0.044)	(0.037)	(0.043)	(0.036)	(0.042)
Households debt growth	0.133***	0.060**	0.144***	0.093***	0.141***	0.092***
	(0.014)	(0.030)	(0.014)	(0.032)	(0.013)	(0.031)
Households debt growth (-2)	-	-	-0.049***	-0.038**	-0.045***	-0.036**
			(0.012)	(0.016)	(0.012)	(0.015)
Changes in uncertainty	-	-	-	-	-0.011***	-0.012***
					(0.002)	(0.002)
Error correction mechanism	-0.058***	-0.073***	-0.057***	-0.081***	-0.057***	-0.083***
	(0.013)	(0.022)	(0.013)	(0.022)	(0.013)	(0.021)
R^2	0.724	0.694	0.731	0.706	0.745	0.724
Standard deviation×100	1.204	1.291	1.188	1.255	1.156	1.221
Durbin Watson	1.808	1.937	1.886	1.981	1.862	1.919
Sargan test	-	21.449	-	17.251	-	20.751
		[0.207]		[0.438]		[0.238]
N. observations	642	601	642	601	642	601

Standard deviations in round brackets; P-values in square brackets; *, **, ***, significant at 10%, 5% and 1%, respectively; Instruments: Variables lagged two to three periods plus dependency ratio contemporaneous and lagged one period and financial liberalization index lagged one and two periods.

The debt growth coefficient is positive and significant when enters contemporaneously (columns 1 and 2) and negative and significant with a time lag of two years (columns 3 and 4). Thus, after controlling for net wealth and the other traditional determinants, an increase in the level of debt rises current

[5] In fact, we have chosen the lag of debt growth providing the lowest Sargan test among the first four lags, which were statistically significant on individual basis. When household debt to income growth was considered instead of household debt growth the estimation results did not change except for the coefficient of the current disposable income.

consumption growth whereas it has a negative effect in future consumption. The adjustment of the equations with debt is better and only the lagged growth of housing wealth is not statistically significant compared to the previous specification. Moreover, when the endogeneity of income and debt is considered, the expected income variable becomes insignificant and the lagged consumption variable coefficient becomes significant but less relevant than previously.

It is interesting that now, compared with the IV results in Table 1, the housing wealth effect becomes less significant and with a lower coefficient. The difference with the other wealth variable (net financial) is notorious, as in this case the coefficient remains unchanged and continue being very significant. Probably, part of the sensitivity of housing wealth in previous specifications was capturing the existence of credit constraints due to its role as collateral (see Mian, 2012). Also Muellbauer and his co-authors (e.g., Aron et al. 2011) have shown that the easing of credit standards during the 2000s was linked to the boom in house prices and that has influenced consumption behaviour in countries like the US or the UK.

The second additional financial factor considers a precautionary savings effect. Thus columns 5 and 6 in Table 2 incorporate our measure of labour uncertainty: the volatility of the change in unemployment. All else being equal, we find that an increase in income uncertainty reduces consumption as result of precautionary behaviour.[6] As expected, all the other estimated parameters remain with very similar coefficients apart from those of wealth, which diminish again. Therefore, in our dataset the volatility of the change in the unemployment rate seems to be a good proxy for the labour income risk. This result is similar to the one found by Mody et al. (2012) but in their case uncertainty is measured by the level of unemployment rather than its variability.

We can use these results to illustrate how housing debt has influenced the behaviour of consumption and saving in Germany and the US in the last decade, which we saw in the introduction were showing very different dynamics. Thus, Figure 5 presents the contribution of household debt to (per capita) consumption growth using the parameters estimated in Table 2. There has been a lack of synchronisation between these two economies in that respect and gives a partial explanation for the observed pattern of consumption. At the

[6] The empirical analysis suggests that it is the change in our proxy for uncertainty what is relevant for the change in consumption. This is consistent with theory, as if the level of uncertainty affects saving ratio, it should be the changes in uncertainty what influences the changes in consumption.

beginning of the 2000s Germany presented relatively high indebtedness, and its deleveraging process represented a moderate drag on its consumption rate. By contrast, debt accumulation by US households allowed them to support consumption growth. After 2008 the deleveraging process represented a drag to US consumption growth, although the situation was reversed by 2013. On the contrary, it seems that in Germany debt has not influenced private consumption growth after the financial crisis.

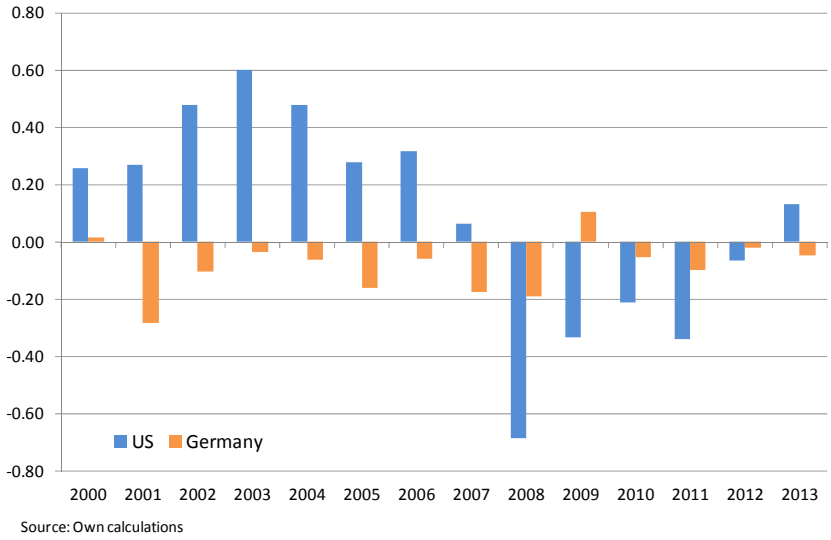


Figure 5. Contribution of household debt to the growth of (per capita) consumption: US and Germany

4. Robustness: the presence of non-Ricardian effects

The existence of credit constraints and uncertainty may also cause the appearance of non-Ricardian effects when considering government decisions. And the recent unprecedented increase in public debt during the financial crisis may have been a very relevant factor for consumption dynamics.

Given the sovereign debt crisis in the euro area after 2010 we have decided to consider the spreads of long term interest rates (with respect to a world GDP weighted average) in our regression analysis instead of the most traditional approach of including the public debt or the fiscal balance (see, for example, Mody et al., 2012). We prefer this variable as it is probably a more comprehensive measure of all the burdens (observed and contingent) public finances could support in the short and long run. Besides, this is an indirect way to check for the influence of an additional credit constrains factor in consumption given the severe sustainability problems in public debt in some of the advanced economies. For those countries, markets may require a higher interest rate to finance public and private activities. For example, in the euro area bank lending rates became very heterogeneous across certain countries after the sovereign debt crisis.

TABLE 3. ESTIMATION OF THE CONSUMPTION FUNCTION: Non-Ricardian effects.

Dependent variable: consumption growth per capita. Country and time fixed effects

	(1) OLS	(2) IV	(3) OLS	(4) IV
Constant	0.014*** (0.004)	-0.001 (0.004)	0.012*** (0.004)	0.001 (0.004)
Consumption growth (-1)	0.166** (0.072)	0.237*** (0.050)	0.080** (0.034)	0.144*** (0.050)
Income growth	0.296*** (0.032)	0.177 (0.141)	0.247*** (0.029)	0.262** (0.132)
Income growth expectations	0.047*** (0.006)	0.027 (0.022)	0.035*** (0.005)	0.009 (0.020)
Change in the Gini index (-1)	-0.163** (0.072)	-0.186** (0.078)	-0.130** (0.065)	-0.140* (0.072)
Net financial assets growth (-1)	0.025*** (0.006)	0.030*** (0.007)	0.017*** (0.006)	0.020*** (0.007)
Housing wealth growth (-1)	0.037*** (0.013)	0.046*** (0.015)	0.019 (0.012)	0.026* (0.014)
Housing wealth growth (-2)	-0.027** (0.012)	-0.020 (0.013)	-0.015 (0.011)	-0.010 (0.012)
Real interest rate change (-1)	-0.102** (0.041)	-0.144*** (0.054)	-0.079** (0.037)	-0.102** (0.050)
Households debt growth	-	-	0.135*** (0.013)	0.098*** (0.030)
Households debt growth (-2)	-	-	-0.039*** (0.012)	-0.044*** (0.014)
Changes in uncertainty	-	-	-0.010*** (0.002)	-0.011*** (0.002)
Sovereign spread changes	-0.293*** (0.064)	-0.343* (0.202)	-0.172*** (0.059)	-0.196 (0.195)
Error correction mechanism	-0.059*** (0.014)	-0.067*** (0.023)	-0.056*** (0.013)	-0.078*** (0.021)
R^2	0.689	0.672	0.749	0.731
Standard deviation×100	1.276	1.356	1.147	1.208
Durbin Watson	1.895	1.911	1.860	1.909
Sargan test	-	20.898 [0.231]	-	21.487 [0.205]
N. observations	642	601	642	601

Standard deviations in round brackets; P-values in square brackets; *, **, ***, significant at 10%, 5% and 1%, respectively; Instruments: Variables lagged two to three periods plus dependency ratio contemporaneous and lagged one period and financial liberalization index lagged one and two periods.

Thus, as a robustness exercise, we want to see if the previous credit-channel and uncertainty factors survive in the presence of another financial factor as it is a high public debt ratio. Table 3, columns 1 and 2 once we consider the disaggregated net financial wealth effect, check whether the interest rate spread has a differential impact on private consumption. Under the hypothesis that deficit finance affects current household behaviour we would expect consumption to respond negatively to an increase (observed or contingent) in the public debt ratio. Such a response would be consistent with a negative impact of the sovereign spread. As this variable is included jointly with the real interest rate, this channel is not contaminated by a substitution effect. When the regression is estimated by OLS the sovereign spread is negatively signed and

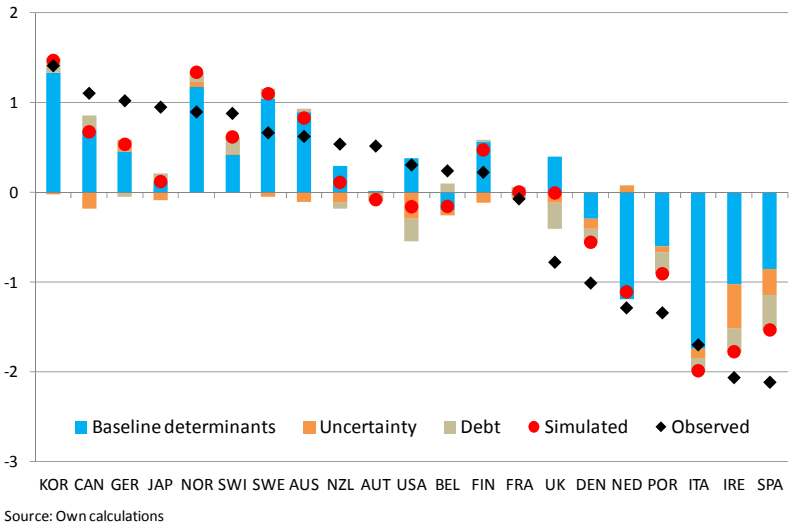
very significant. However, when it is instrumented, the statistically significance drops substantially, to 9%. Compared to the results in column 4 Table 1B, the most significant change in the other coefficients is that of the real interest rate, that now is higher in absolute terms, becoming significant at 0.9%. Columns 3 and 4 of Table 3 add the other financial factors considered in previous section: household's debt and uncertainty. Again the sovereign spread is negatively signed but it losses all statistical relevance. Other checks with a different set of instruments did not provide favourable results. As a consequence, this could imply that non-Ricardian effects identified elsewhere could be the consequence of the presence of more general credit constrains effects. In fact, when we added public debt in the specification including household's debt and uncertainty it was also not significant.

5. Consumption 2008-2013: a country comparison

This section makes a cross-country comparison of the determinants of consumption between 2008 and 2013 using the previously estimated behavioural equations. We are interested in an assessment of the countries for which the non-traditional determinants may be more relevant. In particular, we are interested first, in the relevance of the increase of household debt level before 2007 and the debt deleveraging afterwards for dampening consumption behaviour in the most recent period, and second, on how the increase in labour income uncertainty has also influenced that behaviour.

Figure 6 analyses the determinants of (per capita) consumption growth in the period 2008-2013 taking as a benchmark the estimated equation that takes into account both financial factors (i.e. Table 2, column 6). The countries are grouped according to their average growth in consumption during that period.

Korea showed the highest increase in consumption in this sample whereas Spain, followed by Ireland, experienced the largest decline. The bars represent the estimated annual average private consumption growth rate during the period 2008-2013. These bars are divided into the contribution from the traditional determinants (country fixed effects, inertia, income, expected income, gini index, disaggregated wealth, interest rate and error correction mechanism), changes in uncertainty and household debt growth (the sum of the contemporaneous and the lagged effects). All these factors add to the estimated value (the red bullet) that may be compared with the observed value (the black diamond).



Source: Own calculations

Figure 6. Contributory factors to the private consumption growth rate after the financial crisis (2008-2013)

The equation seems to capture relatively well the changes in private consumption during the recession. It successfully predicts the sign of the average growth rate in most countries, and the residuals are relatively low. On average, the traditional determinants of private consumption are the major explanatory factors of its behaviour during the recession.

The two additional financial factors considered in the paper also play a relevant role in constraining consumption in some countries and that effect seems to be more relevant in countries where consumption fell. For example, in the countries reducing debt in this period (US, UK, ESP, POR, ITA, IRL, GER, DEN and AUS) it explains an average reduction of around 0.2% in per capita private consumption out of an average decline of 0.8%. In the case of the US economy, its recent favourable recovery explains that even though past deleverage process still weighs negatively on consumption it has recorded a positive average growth figure since 2008.

Finally, the contribution of uncertainty is of a minor order, except in countries like Ireland and Spain (and to a lower extent US and Canada). For these two countries the variability of unemployment explains an average decline of per capita private consumption of 0.4%, out of the 2.1% reduction observed. However, in specific periods it could be very important for all countries. For example, in the period 2007-2009 the aggregate saving ratio of this sample of countries increased by 2.3 percentage points, of which 1 pp (40%) is explained by the variability in unemployment. This effect is in the lower part of the range encountered by Mody et al., 2012; which estimate that at least two-fifths of the

increase in saving in this period in the OECD countries can be attributed to unemployment risk and the GDP volatility.

6. Conclusions and future research

The empirical literature on consumption behaviour has emphasised the importance of financial innovation and deregulation to explain the shifts in wealth and credit conditions for understanding the boom in consumption preceding the crisis and the weakness in the recovery period. And recently, some authors have mentioned that "debt overhang" linked especially to the mortgage developments in some advanced economies, may have an independent role besides more traditional financial factors in explaining this weakness in consumption.

This paper has presented the first cross country evidence of the importance of the household balance-sheet composition to explain the slow recovery of consumption after 2008. Using the panel data of 21 OECD countries from 1980 to 2013 we estimated a traditional dynamic consumption equation that considers wealth composition in addition to the standard effect of income (observed and expected) and interest rates. Once we take into account the endogeneity, there are relevant effects of both financial assets and housing stocks, reinforcing the influence of credit conditions on consumption through the housing market.

Moreover, we find a better specification when unemployment volatility and household debt dynamics are considered as additional determinants. Both a positive leverage effect and a negative debt overhang effect are significant explaining per capita consumption growth. This debt dynamics' significance is consistent with the perceived changes in the credit constraints and the overestimation of housing wealth effects when that is not taken into account in aggregate consumption equations. And uncertainty is crucial in explaining the saving behaviour of households, especially at the turning points of the cycle (2007-2009). Overall these results highlight the relevance of uncertainty capturing the precautionary savings effect and the balance-sheet composition measuring households' financial soundness.

Looking at the balance sheet's relevance across sectors, we measure the possible public debt effect through the changes in the long term interest rate spread. That does not have a significant effect on private consumption once we take into account the household's debt dynamics. Therefore, it seems that non-Ricardian effects do not seem relevant once a general credit constrain effect is considered.

Our findings imply that the deleveraging process in countries like the US, the UK or Spain after 2008 explains around 25% of the drop observed in consumption. Furthermore, the uncertainty arising from the increase in unemployment in some European countries (Spain and Ireland) has been an additional factor which explains their consumption dynamics relative to other OECD countries. The increase in uncertainty is also crucial to explain savings in all countries in specific periods of time; in particular, 40% of the increase in savings in this sample of countries between 2007 and 2009 can be explained by the increase in uncertainty.

However, more robustness exercises are needed to understand the interaction of aggregated consumption and financial variables before we extract policy implications or try to anticipate the expected movement of household spending in future. Note that current macroeconomic policies, such as fiscal transfers to favour household debt restructuring or cuts in interest rates to historic lows, are having an impact on the aggregate household debt reduction and on the household cash-flow and they are relevant counterweights of consumption dynamics. Similarly, the restructuring process of financial institutions in some countries is affecting credit conditions. Thus, it is relevant to analyse how that specific set of policies may have affected the consumption dynamics of certain countries. From a technical perspective, we leave for further research higher dimensional frameworks, like panel VAR, which consider the heterogeneity of the parameters and the interactions among regressors.

Appendix 1. The dataset[7]

The 21 OECD countries are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Korea, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, the UK and the US.

Real consumption: Obtained from the OECD database and Datastream.

Population: OECD.

Nominal consumption: Obtained from the OECD, Datastream and national statistical sources.

Gross disposable income: OECD.

Consumer confidence (income growth expectations): Obtained from the OECD and national statistical sources.

Gini Index: The Standardized World Income Inequality Database and the OECD.

Financial assets: Obtained from the OECD, enlarged by the year-on-year growth rate of Stock Exchange Index, adjusted by the regression coefficient between both variables, at country-level.

Household debt: See previous variable. Missing values were generated with information from bank credit.

Non-financial wealth: defined as real housing stock times housing prices. The initial condition for real fixed capital stock is obtained from the EU-KLEMS database, if available. For the other countries, the initial condition is calculated dividing real housing investment (obtained from the OECD and AMECO) in 1980 by a country specific estimated ratio between real housing investment and real housing stock. This estimated ratio depends on per capita GDP at PPP in 1980, from the IMF. The depreciation rate of the housing stock is estimated at 2% per year. Finally, housing prices are obtained from the International House Price Database, provided by the Federal Reserve Bank of Dallas.

Long-term interest rate: Obtained from the OECD, Datastream and AMECO data base. It corresponds to that of 10-year government debt yields.

[7] The full data set is available upon request.

Long-term interest rate spread: It is obtained as the difference between the long-term interest rate for each country and the world one, obtained as the PPP-weighted average of the corresponding interest rates of this sample of countries.

Unemployment: Obtained from OECD and Datastream.

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