**THE ROLE OF THE DEBT-SERVICE RATIO AS A LEADING INDICATOR OF HOUSEHOLDS CONSUMPTION**

NICHOLAS APERGIS

*University of Piraeus,* *napergis@unipi.gr*

*and*

*University of Derby*

**Acknowledgements**: The author needs to express his deep gratitude to two referees of this journal whose comments and suggestions enhanced the merit of this work. Special thanks also go to the Editor who gave him the opportunity to revise his work. Needless to say, the usual disclaimer applies.

**THE ROLE OF THE DEBT-SERVICE RATIO AS A LEADING INDICATOR OF HOUSEHOLDS CONSUMPTION**

Given that household debt raises certain concerns about the resilience of the economy, against this backdrop, this paper explores whether household debt service matters as a leading indicator for consumption. Employing data from 32 countries, spanning the period 1999-2017, the empirical analysis provides fresh information on the fact that the debt-service ratio strongly predicts consumption expenditure. The results also document that the effect of the debt-service ratio on consumer expenditure differs across types of consumer spending (durables vs nondurables vs services). In particular, the impact is strong for the case of the durable goods and weaker in the other two cases. The findings imply that debt service may serve as an important channel, running from debt to consumer spending. Finally, the results survive a number of robustness tests, while liquidity constraints seem to dominate the drivers of household consumption decisions.

*Keywords*: debt-service ratio, consumer spending, panel country data

*JEL Classification*: E21; C33

1 INTRODUCTION

This paper is linked to the strand of the literature that explores the demand side of macro-financial linkages. In particular, this literatures examines how sharp fluctuations in asset prices, credit and capital flows impact on the financial position of households, firms and sovereign countries (Solimano, 2010; Caprio, 2011; Gertler and Kiyotaki, 2011; Borio, 2014; Morlev, 2016). Moreover, the recent financial crisis event of 2008 has inspired a debate on the role of financial market imperfections in explaining macroeconomic fluctuations. The majority of the literature support that these imperfections tend to intensify fluctuations both on the financial and on the real side of the economy. Financial market imperfections are closely linked to information asymmetries and enforcement problems. The presence of such asymmetries incurs large costs for lenders, which leads them to abstain from lending. Moreover, such asymmetries generate incomplete financial markets, which results in high transaction costs and adverse selection phenomena, thus, resulting in higher costs of external financing and rationing schemes from lenders (Stiglitz and Weiss, 1981).

 Strong research efforts have examined the above arguments on the role of imperfections in the link between internal cash flows and investment flows (Kaplan and Zingales, 1997, 2000), for small firms, especially during times of financial stress (Campello et al., 2010; Fort et al., 2013), in the link between internal cash flows and asset prices (Gan, 2007; Chaney et al., 2012), credit constraints for firms and households (Gertler and Gilchrist, 1994), the inability of household to borrow (Jappelli and Pistaferri, 2010 for a review), house prices and households’ borrowing (Almeida et al., 2006; Claessens and Kose, 2017), housing prices and local credit and growth developments (Mian and Sufi, 2010; Benmelech et al., 2017), the ability of sovereign nations to borrow from international markets (Obstfeld and Rogoff, 2002; Ferraris and Minetti, 2013; Korinek and Mendoza, 2014), the impact on countries’ exchange rates (Aghion et al., 2000; Cook, 2004), the transmission process of business cycles (Guerrieri et al., 2012), and finally, in explaining the synchronized nature of the 2008 financial crisis (Kalemli-Ozcan et al., 2013; Quadrini, 2014). The likelihood that higher levels of household debt could induce deeper or longer recessions has important implications for the overall course of the business cycle, as well as for its components, such as consumption. Therefore, a better understanding of the dynamic relationship between a household's spending decisions, income process, and debt ratios seems to be imperative to accurately describing the drivers of business cycles.

 However, given the abundance of empirical work on studying the role of the demand side of macro-financial linkages, a number of questions remain open. The goal of this paper is to explore one of those questions and in particular what is the role of the debt-service ratio as a leading indicator of household consumption. Debt-service ratios provide important information on the interaction between debt and the macroeconomy. More specifically, they indicate the amount of income used for interest payments and amortizations, while they are a direct outcome of previous borrowing decisions. They move slowly as they depend on the duration and other terms of credit contracts. As a result, they have a direct impact on borrower’s budget constraint and, therefore, they are capable of affecting consumption expenses. In other words, debt-service ratios can capture the link between debt-related payments and consumption expenses. Elevated ratios can provide an indication of increased vulnerability in the financial system and, consequently, in the entire real economy. Furthermore, this increased vulnerability could make the financial system further less stable to rises in interest rates, especially in cases that borrowers have not allowed for interest rate increases in their financial planning. Borrowers faced with elevated debt-service ratios may have the option to ease financial pressures, primarily through reduced consumption or lengthier tenures of loans, but in cases of rising interest rates, combined with weakening macroeconomic environments, this option could be unavailable, leading to a likely rise in defaults. In general, prudent borrowing can enhance the overall economic welfare of households, by ‘smoothing’ consumption across different stages of households’ life cycle. Borrowing can also act as a ‘buffer’, allowing households to maintain a relatively stable level of consumption during a temporary loss of income. Sustaining household consumption this way can help support overall activity in the economy during stressful times. Moreover, given that households are such an important component of the economy, the strength or weakness of households’ finances has a significant effect on the overall economic well-being and financial stability. Therefore, excessive debt can make households more vulnerable to shocks and increase risks to the financial system and the economy

The above discussion on the DSR has generated substantial interest because it could potentially cause households to change their spending behavior. The evidence in the literature to date is not only contradictory, but hard to interpret because of the number of different channels through which debt payments affect consumption. According to the first channel, interest rates jointly determine debt payments and consumption. More specifically, when interest rates fall, households borrow more to pull forward a portion of future consumption, leading to a positive relationship between debt payments and consumption. For given levels of debt, a decline in interest rates also reduce debt payments, but given the maturity of most household loans, this effect is small relative to the effect of a rise in debt on payments. The second transmission channel argues that debt payments may be correlated with household consumption because they act as an indicator of expected future income growth. As households become more confident that their income is expected to rise, they become more open to commit themselves to future debt repayments. Under this hypothesis, the relationship between debt payments and future consumption is also positive. In terms of the third and fourth channels, the link here is the role of durable goods. In particular, a rise in a household’s debt payments raises the probability that a household may find herself in financial distress and need to sell her durables for less than their full value. Thus, households with higher debt payments should be less open to hold durables and more open to hold liquid financial assets, generating a negative relationship between debt payments and durable goods expenditures. Moreover, many households finance durable goods purchases through consumer credit, which allows them to better match their payment streams with the consumption of their services. Given that durable goods purchases are lumpy, a surge in expenditures in one period, leading to higher debt payments, will likely result in a decline in expenditures in the following period. In that sense, debt payments and durable goods expenditures are negatively associated. Finally, household debt payments may also be associated with household consumption, because certain households face serious borrowing constraints. The presence of such constraints can generate either a positive or a negative relationship between DSRs and consumption. However, a rise in DSRs may indicate that certain households have reached their borrowing limit and cannot increase their consumption as rapidly as they had done it before, or a rise in DSRs may denote a relaxation of credit constraints so that certain households can increase their consumption more than in the past.

These hypothesized links have been studied in the literature, with the results being mixed. Some researchers examine the link between aggregate household debt and consumption (Bachetta and Gerlach, 1997; Ludvigson, 1999); their findings illustrate that a rise in the growth of household debt raises the growth of consumption. By contrast, Johnson (2007) documents that rises in the growth of revolving consumer debt reduce the growth of consumption. Others focus on the link between aggregate payments on debt and consumption. Within this strand of research, Mishkin (1976) and McCarthy (1997) provide evidence that a rise in debt payments leads to lower consumption expenditures on durables; by contrast, McCarthy (1997) and Maki (2002) show that it does not lead to lower overall spending. Finally, others explore this link at the household level, studying the effect of exogenous changes in debt payments on household consumption, albeit their findings turn out to be inconclusive. Stephens (2008) concludes that nondurable expenditure respond to the repayment of a vehicle loan, whereas Coulibaly and Li (2006) document that only durable goods expenses (i.e., household furnishings) respond to the repayment of a mortgage loan. Our work explores how DSRs affect households’ consumption expenses. This work is characterized by two primary novelties. First, it develops a panel dataset featuring DSRs data from 32 countries. The evidence documents that balance sheet data are an important mechanism driving consumption expenses, thus, lending less than full support for the permanent income hypothesis (Agarwal et al., 2007). Second, it shows that household consumption elasticities can be substantially explained by borrowing and liquidity constraints. This result is consistent with relevant studies of constrained consumers when approaching borrowing limits (Shea, 1995; Blundell et al., 2008). The strong relationship between household balance sheet positions and consumption behavior stresses the importance of models that include aspects, such as borrowing constraints or simultaneous asset and debt holdings. Overall, to provide new evidence, the paper uses, for the first time to the author’s best of knowledge, an extended country sample which contains data on household-level debt-service ratios. This extended country sample is the first serious look at DSRs, which vary substantially both across time and countries and indicates a considerable amount of heterogeneity that can be studied through panel data methods. In that sense, we can better understand the relationship between household debt and consumption on a more global basis.

2 DATA

Data on the debt-service ratios are obtained on a quarterly basis from the BIS database (www.bis.org/statistics/dsr.htm); they are related to the total aggregate household sector for 32 countries, i.e. Australia, Belgium, Brazil, Canada, China, Czech Rep., Denmark, Finland, France, Germany, Hong Kong, Hungary, India, Indonesia, Italy, Japan, Korea, Malaysia, Mexico, Netherlands, Norway, Poland, Portugal, Russia, South Africa, Spain, Sweden, Switzerland, Thailand, Turkey, UK, US, spanning the period 1999-2017. The debt-service ratio is defined as the ratio of interest payments plus amortizations to income. Thus, the ratio provides information on the flow of debt-service payments divided by the flow of income. The formula on which these ratios have been provided yields:

DSRj,t = ij,t / [1-(1+ij,t)-sj,t] x Dj,t/Yj,t

where Dj,t denotes the total stock of debt, Yj,t shows aggregate income available for debt-service payments, ij,t displays the average interest rate on the existing stock of debt, and sj,t is the average remaining maturity across the stock of debt. This formula captures amortizations through the non-linear interest rate term in the denominator of the above first component of the formula. Figure 1 illustrates the evolution of those ratios across time based on the average ratios across all countries, while Figure 2 illustrates through the average ratios across countries, the difference that reflects that certain country groups have lower debt-service ratios relative to the other country group. The group country classification is based on the median of those two country groups and provides the following two groups: Low (less than the median), i.e. Belgium, Czech Rep., Germany, Spain, Finland, France, Indonesia, India, Italy, Japan, Mexico, Poland, Portugal, Russia, US, South Africa and High (above the median), i.e. Australia, Brazil, Canada, Switzerland, China, Denmark, UK, Hong-Kong, Humgary, Korea, Malaysia, the Netherlands, Norway, Sweden, Thailand, Turkey. Finally, Figure 3 illustrates those ratios with respect to selected countries. It is worth pointing out that the ratios illustrated denote the rising trend of those ratios, as well as the limited deleveraging since the financial crisis (this is also supported by Buttiglione et al. (2015)). For the cases of Belgium, Denmark, France, Germany, Hong-Kong, and the US, these ratios have been rising. According to Juselius and Drehmann (2015), these ratios took several years to return to normal levels, which is a rational explanation of the weak post-crisis recovery.

Two second-generation panel unit root tests are also employed to determine the degree of integration in the respective variables. The Pesaran (2007) panel unit root test does not require the estimation of factor loading to eliminate cross-sectional dependence. Specifically, the usual ADF regression is augmented to include the lagged cross-sectional mean and its first difference to capture the cross-sectional dependence that arises through a single-factor model. The basic model underlying this test is:

p

ΔYit = αi + ρi Yi,t-1 + Σβi,k ΔYi,t-k + vt

 k=1

for i = 1, …, N and t = 1, …, T, with αi indicating fixed effects. The null hypothesis is a unit root, i.e. H0: ρi=0 for all i = 1, …, N. The test uses the cross-sectional ADF statistics (CADF), which is denoted as a cross-sectional augmented Im et al. (2003) test (CIPS):

 N

CIPS = 1/N Σ ti (N,T)

 i=1

where ti(N,T) is the t-statistic of the OLS estimate in the ρi estimates above.

The bootstrap panel unit root tests by Smith et al. (2004) utilize a ‘Sieve’ bootstrap scheme to account for both the time series and cross-sectional dependence in the data through bootstrap blocks. The method considers four alternative tests: t, LM, max and min, where t is the bootstrap version of the well-known panel unit root test by Im et al. (2003), LM is the mean of the individual Lagrange Multiplier (LM) test statistics introduced by Solo (1984), max is the test offered by Leybourne (1995), and min is the mean of a more powerful variant of the individual LMs. All four tests by Smith et al. (2004) are constructed with a unit root under the null hypothesis. The results of these panel unit root tests are reported in Table 1. More specifically, the Pesaran (2007) CIPS test rejects the presence of unit roots only in the first differences of the variables under consideration and, thus, validates the stationarity properties of those first-differenced variables. Similarly, the results of the Smith et al. (2004) tests clearly document that all series under study are stationary in their first differences.

**[Insert Figures 1, 2 and 3 about here]**

**[Insert Table 1 about here]**

The analysis uses final consumption expenditure, measured in PPP terms, which includes durable goods, purchased by households, and services. It also includes payments and fees to governments to obtain permits and licenses. Data are on a quarterly basis and are sourced from Datastream. Disposable income remains at the core of the determinants behind consumption. Such income is measured by the net sum of wages and salaries, again in PPP terms. Both consumption and income are expressed in real terms (constant 2005 prices). Stock and house price indices are used as proxies for financial and housing wealth, respectively, with data for housing indices being available from the FRB of Dallas, while those for stock prices from Datastream. The stock and housing indices are deflated using the GDP deflator index. Finally, all data are expressed in logarithms.

3 EMPIRICAL ANALYSIS: BASELINE RESULTS

Before turning into the empirical part of the paper, it is considered as highly useful to expose the link between consumption expenditure and the debt-service ratio through a very simple theoretical model that justifies the nexus between the two underlying variables (plus a number of other control variables that drive consumption). More specifically, this theoretical part starts with a standard model of the sensitivity of consumption to income changes. In that sense, households maximize their expected discounted sum of lifetime utility:

∞

max E Σ βt U(Ct, θt) (1)

t=0

subject to an income constraints:

At+1 = At (1+rt) + Yt – Ct (2)

with -∞<At<∞

and a transversality condition:

limAT≥0

T→∞

where β<1 is the discount factor, Ct is period t consumption, θt is a scalar function of a household’s other consumption drivers vector that would affect the marginal utility (such as interest rates, housing prices and stock prices), At describes net assets, which are negative if the household is a net borrower, and Yt is labor income. Next, we further assume that households have constant relative risk aversion preferences, with the utility function being given as:

U(Ct, θt) = Ct(1-ρ) / (1-ρ) x eθt (3)

Under complete information and perfect financial markets, the first-order condition of households can be written as the following Euler equation:

ΔlogCt = a0 + a1 Δlogθt (4)

Although the above condition implies that consumption growth is correlated only with the changes of the other drivers of consumption and not with income growth, econometricians have typically studied the model that nests equation (4) as a special case:

ΔlogCt = a0 + a1 Δlogθt + α2 ΔlogYt + εt (5)

The coefficient a2 reflects the degree that consumption is sensitive to fluctuations in current income. Next, we assume that households’ consumption can react to changes in current income for various reasons and ask whether the size of this reaction depends on the household’s current debt payments. The literature has suggested that increases in debt render households more sensitive to shocks to income (Debelle, 2004). As a household increases unalterable expenditures on debt payments, a smaller share of her income is discretionary, and it must cut back consumption in response to even small drops in income. Although the household borrowed to finance consumption in the past, this hypothesis presumes it has reached a borrowing limit. The presumption that some households are approaching a borrowing limit is not unreasonable (Gross and Souleles, 2002; Cagan, 2007). Have a certain number of households reached a level of borrowing that hinders their ability to smooth through future income fluctuations? To answer this question, we modify the consumption equation (5) by including the fact that changes in income are interacted with a variable that measures the household level of debt payments:

 Q

ΔlogCt = a0 + a1 Δlogθt + Σ[γq(Dq ΔlogYt) + εt (6)

. q=1

where Dq is a dummy variable that is equal to one if and only if the debt-service ratio of households belongs to the qth ranked group, and equal to zero otherwise. γq is the qth debt-service ratio group-specific sensitivity to current income changes.

Next, moving to the empirical part, Arellano and Bover (1995) developed a generalized method of moments (GMM) estimator which allows us to consider country specific effects or any time invariant country specific variable. Additionally, it also solves the endogeneity issue that may be due to the correlation of the country specific effects and the independent variables. The methodology generates an equation estimable by instrumental variables:

 q1 q2 q3 q4

ΔlogCi,t = b0 + Σbi1ΔlogCi,t-j + Σb2iΔlogDSi,t-j + Σb3iΔlogYi,t-j + Σb4iΔlogSi,t-j +

 j=1 j=0 j=0 j=0

q5

Σb5iΔlogHi,t-j + b4 DUM 2008 + b5 ΔDSi x develop + Δεi,t (7)

j=0

where Δ is the first difference operator, Ci,t stands for the consumption of country i at time t, DSi,t denotes the debt-service ratio, Yi,t represents labor income, Si,t is stock prices, Hi,t denotes housing prices, the bs are parameters to estimate, εi,t is the error term. DUM2008 defines a dummy variable in relevance to the 2008 financial crisis; it takes one in 2008 and 0 otherwise. Finally, Equation (7) explicitly includes an interaction terms (DS x develop), which captures the distinction between developed and developing countries and where the component develop takes 1 for the case of developed countries and 0 otherwise. For a better approximation and to minimize potential multicollinearity effects, all variables have been mean centered (including the dummy DSt x develop. The inclusion of lags of consumption in Equation (7) is aimed at capturing the presence of habit formation and simultaneously tests the permanent income hypotheses. Empirically, it also captures the high degree of persistence of consumption, as noted in Carroll et al. (2008). It is also in line with the findings of Flavin (1981), Campbell and Mankiw (1989) and Lettau and Ludvigson (2001), who document that consumption growth is somewhat predictable by its lag.

Estimate efficiency can be increased by adding the equation variables in levels to the system (7). If the first-differences of explanatory variables are uncorrelated with the individual effects, both lagged values of the first-differences of the explanatory variables and of the dependent variable can be used as instruments in the equation in levels. In this case, the estimation combines the set of moment conditions available for the first-differenced equations with the additional moment conditions implied for the levels equation. Blundell and Bond (1998) show that this system GMM estimator is preferable to that of Arellano and Bond (1991) and, for this end, the analysis uses an estimation methodology based on Blundell and Bond (1998).

We start by considering the GMM estimation of the dynamic panel defined in (7). In the set of strictly exogenous variables, the model also includes a constant. The moment conditions in the GMM model use the orthogonality conditions between the differenced errors and the lagged values of the dependent variable, which assume that the original disturbances in (7) are serially uncorrelated and that the differenced error is MA(1). In fact, two diagnostics are computed to test for first order and second order serial correlation in the disturbances. One should reject the null hypothesis of the absence of first order serial correlation and not reject the null hypothesis of the absence of second order serial correlation. The baseline estimation results are summarized in Table 2. Column 1 presents only the bivariate model, while both a constant and the 2008 crisis dummy are also included; Column 2 considers the multivariate model (7). The estimates feature as the dependent variable changes in non-housing consumption and they document a number of interesting findings: i) across both specifications, the lag of consumption is statistically significant, therefore, reflecting the strong persistence of consumption growth. More specifically, the persistence of consumption growth may be due to: household inattention; evaluation of household finances at periodic intervals (i.e., annual tax reporting times), adjustment costs to change consumption, and habit formation. All these factors can lead to a sluggish response of consumption (Kennickell and Starr-McCluer, 1997; Dynan and Maki, 2001), ii) the two different components of wealth are statistically significant across both modeling specifications, reflecting that both types of assets, i.e. stock prices and housing, exert a significant effect on consumption, thus, validating the presence of the wealth effect, iii) given that current income affects consumption stronger that past income, the findings directly violate the implications of the lifecycle/permanent income hypothesis of consumer behavior, iv) the 2008 crisis effect has had a negative impact on the debt serving ratio, indicating that stressful events (i.e., financial crises) have a negative impact on households’ capacity to serve their undertaken debt obligations, v) the interaction dummy term turns out to be positive and statistically significant, indicating that in the case of developed countries the DS ratio is positively impacted consumption expenses, with the explanation provided later in terms of the DS variable, vi) given that the focus of our results is on the link between consumption expenses and the debt-service ratio, the results illustrate that the sign turns out to be positive. At face value, the point estimates, 0.531 and 0.472, respectively, suggest that the effect of debt-service ratios on consumption could be material: for instance, one percent increase in the DSR leads to an increase in consumption by 0.53 and 0.47 percent, respectively in the two modeling specifications. These findings point out certain potential explanations. In particular, the positive association between the debt-service ratio and consumption expenses clearly reflects that households have a stronger ability to affect and smooth consumption (Bostic, 2002; Johnson, 2005). In addition, the positive sign indicates the strength of the interest rates, the expectations of future income and the relaxation of liquidity constraints mechanisms driving the course of the debt-service ratio. These findings are similar to those provided by certain studies in the literature, such as Bachetta and Gerlach (1997), Ludvigson (1999) and Maki (2002).

Finally, all the relevant diagnostics are reported in the bottom part of Table 2. For the validity of the instruments, the results need to reject the test for second-order autocorrelation, AR(2) in disturbances. It is evident that the test for AR(2) of disturbances fails to reject the respective nulls. Thus, this test supports the validity of the instruments used. The diagnostics also report the Hansen test for overidentifying restrictions. In the estimation process, 7 to 23 instruments have been used in the two model specifications, respectively. In particular, for Model (1) specification the analysis chose as instruments a constant, three lags (-1, -2, -3) for the DS ratio and three leads (+1, +2, +3) for the same variable, while for Model (2) specification the analysis chose a constant, three lags (-1, -2, -3) and three leads (+1, +2, +3) for the DS ratio, two lags (-2, -3) and two leads (+1, +2) for consumption, two lags (-2, -3) and two leads (+1, +2) for income, two lags (-2, -3) and two leads (+2, +3) for stock prices, and two lags (-3, -4) and two leads (+1, +2) for housing prices. As the number of instruments was by far lower than the number of observations, it did not create any identification problem as reflected in Hansen test. Reported Hansen test results fail to detect any problem in the validity of the instruments used in the estimation approach.

 **[Insert Table 2 about here]**

Moreover, we explore whether the baseline results hold by explicitly separating the consumption expenses into durable goods, nondurable goods and services. There has been less discussion of expenditure on durables even though they contribute substantially to cyclical changes in consumption/savings and in economic activity. The demand for durables partly depends primarily on the relative prices of those goods, as well as on the disposable income and wealth of households. Moreover, households need to take out loans to buy high-value durable goods. Therefore, financing conditions are also important determinants. Fluctuations in consumption are not distributed proportionately across the different types of goods and services. For instance, reductions in expenditure usually affect durable goods to a greater extent, since households do not derive their utility directly from the current expenditure incurred, but from the consumption services obtained from the products acquired. Thus, households can reduce these purchases in periods when their current income is low, with a relatively small decline in their utility, and postpone them to periods in which this income has recovered. Furthermore, the adjustment in the consumption of durables may be sharper when there are adverse financial conditions, which make it more difficult to obtain credit (Arce et al., 2013). This part of the empirical analysis investigates how the debt-service ratio affects changes in private consumption from the standpoint of its breakdown by type of consumer goods, i.e. durables, nondurables and services. Data on the three types of consumer goods are obtained from Datastream and they are on a quarterly basis as well.

 Faced with negative income shocks, such as those experienced during the recent crisis, household spending does not decrease proportionately all types of goods and services. Parker (1999) finds that reductions in expenditure caused by a decrease in income are concentrated on luxury goods and services, which are usually those that show higher intertemporal elasticity of substitution. Charles and Stephens (2006) focus on those expenses which, for various reasons, it is difficult to reduce in the short run. Browning and Crossley (2009) emphasize the durable nature of certain goods as an important determinant in aggregate fluctuations of expenditure on consumption. Since durables provide consumption services not only when they are acquired, but also in subsequent periods, a notable reduction in the expenditure on these goods may entail only modest decreases in the utility of consumers. Thus, consumers may find it optimal to notably reduce purchases of this type of goods following a sufficiently large unfavorable shock to disposable income.

 With respect to debt servicing, Mishkin (1976, 1977, 1978) argues that the composition of household balance sheets influences the spending decisions of households, especially on illiquid assets, such as durables and house purchases. For example, household obligations, such as a high debt burden, would depress the demand for consumer durables even if the net worth remains constant. Betti et al. (2007) argue that excessive debt accumulation based on erroneous beliefs about the future would result in adjustments in consumption expenditures if the beliefs or expectations about future incomes were shown to be false by actual outcomes. Moreover, close to the current study, based however on a different conceptual framework, are the studies by Ogawa and Wan (2007) and Kim and Kim (2012). The first explores the debt-consumption relationship based on Japanese household data and argues that debt-asset ratios have negative effects on household consumption, mainly through borrowing constraints. Kim and Kim (2012) analyze the time frame of 2000-07 from the Korea Labor and Income Panel Study (KLIPS) and argue that household debt accumulation increases consumption by relaxing credit constraints.

 Table 3 displays that the findings remain consistent across all three types of consumer goods. Moreover, they document that debt service ratios have a stronger effect on durable goods than nondurable goods and services consumption. In fact, the impact on services turns out to be statistically insignificant, while the one on nondurables turns out to be statistically significant only at 10%. This emphasizes that since purchases of durables are more likely to be financed through consumer loans than purchases of nondurable goods or services, the debt burden of households turns out to be relatively more important in determining spending on durables. These findings also indicate that the positive sign for durables supports the strength of the interest rates, the expectations of future income and the relaxation of liquidity constraints mechanisms driving the course of the debt-service ratio.

**[Insert Table 3 about here]**

Finally, in this sub-section, we repeat the baseline estimates by introducing a dummy related to the year 2001 (this point was raised by a referee and the look at Figure 1). In the beginning of the 2000s the majority of developed countries experienced the most dramatic boom in household debt since the Great Depression. A number of reasons have been put forward to explain this substantial rise in debt undertaking exemplified in the early 2000s. First, it is the importance of loosened borrowing and lending constraints, as well as stronger financial innovations (Midrigan and Philippon, 2011; Favilukis et al., 2013; Justiniano et al., 2014), the reduction in macroeconomic uncertainty which lessened the need for precautionary reserves and boosted borrowing and increased expected future income (Debelle, 2004), increases in house prices (Amromin et al., 2007), and changes in demographics (e.g., increases in educational attainment and increases in the share of young people in the population), that boosted aggregate debt (Dynan and Kohn, 2007). The new findings (after considering a dummy variable that takes one across all quarters in 2001 and zero otherwise), reported in Table 4, clearly display that the 2001 event has had a positive impact on consumption expenses, while the debt-service ratio also exerts a positive effect on consumption. These findings provide strong support to all the factors mentioned above that contributed and justified the substantial debt undertaken by households in the early 2000s. Once again, the positive sign provides similar support to the role of the interest rates, the expectations of future income and the relaxation of liquidity constraints mechanisms driving the course of the debt-service ratio. Finally, the relevant diagnostics provide similar support to the statistical adequacy of the estimates.

 **[Insert Table 4 about here]**

4 ROBUSTNESS CHECK: THE ROLE OF CONSUMER CREDIT AND MORTGAGE DEBT

Given that credit facilitates consumption, household spending becomes disconnected from household income. In keeping with the insights of the relative income hypothesis (Duesenberry, 1949), one source of the disconnection between consumption expenses and income is the propensity of households to emulate contemporary standards of consumption established by others. Cynamon and Fazzari (2008, 2013) provide a detailed explanation of this behavior based on the fact that consumer preferences endogenously evolve in a world of social cues. In that sense, households use credit and debt to consume in excess of what their current income and wealth allow, in the pursuit of consumption standards set by other (wealthier) households.

 As a result, household credit and debt play a substantial role in affecting households’ ability to smooth out consumption. Overall, there exist three strands of mechanisms that could potentially explain the relationship between household indebtedness and consumption. First, Schularick and Taylor (2012) and Jordà et al. (2013, 2015, 2016) document that high debt is the key determinant of both consumption and growth, while Mian et al. (2015) suggest that increased household debt-to-GDP ratios reduce consumption across countries. Second, studies focusing on the behavior of US households following the US housing bubble’s burst (Dynan, 2012; Mian et al. 2013) show that the financial exposure of households plays a central role in depressing US consumption. Finally, further evidence comes from papers highlighting the supply-side effects of debt (Cecchetti and Kharroubi, 2015; Borio et al. 2016).

 Therefore, the new set of estimates repeats the baseline approach, but this time it includes two additional variables, consumer credit and mortgage debt. By defining consumer credit as the level of consumer credit held by households and nonprofit organizations, and the housing debt as the level of mortgages held by households and nonprofit organizations, with data being obtained from the International Financial Statistics of the IMF database, we rerun the baseline modeling specifications of (7) and the new results are reported in Table 5. The new findings indicate that the impact of both consumer credit and housing debt is positive and statistically significant. In relevance to the debt-service ratio, the estimates are similar to those reported in Table 2, with the estimates retaining not only their sign, but also their statistical significance across the same modeling specifications. Once again, one percent increase in the debt service ratio leads to 0.59 and 0.51 increase in consumption growth, respectively.

**[Insert Table 5 about here]**

5 ROBSUTNESS CHECK: AN ALTERNATIVE WAY OF CAPTURING THE STOCK MARKET WEALTH EFFECT

This part of the robustness analysis explores the validity of the baseline results reported in Table 2 by considering an alternative definition of the stock price index as a predictor of future economic activity. A number of studies attribute the apparent ability of the term spread to forecast economic activity to actions by monetary authorities to stabilize output growth. Monetary policy explanations usually have been stated with little underlying theory. However, as noted by Feroli (2004), Estrella (2005), and Estrella and Trubin (2006), the extent to which the term spread is a good predictor of output growth depends on the monetary authority’s policy objectives and reaction function. Alternatively, theories of intertemporal consumption also derive a relationship between the slope of the yield curve and future economic activity explicitly from the structure of the economy (Harvey, 1988; Hu, 1993). After obtaining quarterly data on the three-month bond rates and the ten-year government bond yields from the International Monetary Fund’s International Financial Statistics database, the new robustness results (only for the multivariate model) are reported in Table 6 and clearly highlight the supportive evidence to those in Table 2, with the terms spread providing a stronger impact on consumption.

**[Insert Table 6 about here]**

6 IDENTIFYING THE MECHANISMS THROUGH WHICH THE COMPONENTS OF DEBT AFFECT CONSUMPTION DECISIONS

The evidence above has documented that the positive impact of the DSR on consumption comes through a number of potential mechanisms, such as the role of interest rates and financial or liquidity constraints. Following a reviewer’s recommendation, this part of the paper attempts discern which mechanisms seems to be more responsible for explaining consumption patterns, something that is expected to bolster the analysis’ contribution. Therefore, the objective of this part is to expose the role of those mechanisms, using a simple Vector Autoregression (VAR) modeling. The relevant analysis here considers the role of interest rates and liquidity constraints. Interest rates here proxy the opportunity cost of consumption and are measured as the interest rate on 3- to 5-year government bonds. The choice of this maturity is based on the existing literature, which indicates that most of the interest-bearing assets and financial liabilities in the household sector’s balance sheet consists of medium- and long-term fixed-rate instruments. In this manner, the interest rates associated with these maturities are likely to exert the most influence on households’ consumption decisions (Ragan, 1994; Montplaisir, 1997; OECD, 1998). The literature also highlights that the presence of financial (borrowing) constraints decrease consumption in anticipation that such decisions cannot be financed through credit (Jappelli and Pagano, 1994). Therefore, households undertake serious debt burdens in tranquility periods, because in stressful times (e.g., financial crisis), the presence of such constraints gets uglier with a substantial impact on consumption decisions (Lau, 1997). In this part, we use the ratio of consumer credit to personal disposable income as a rough indicator of financial constraints. Developments in consumer credit reflect changes not only in borrowing constraints, but also in the demand for loans (Lau, 1997).

 Data on interest rates, consumer credit and household disposable income are obtained from Datastream. After identifying a VAR model with three lags (through the Akaike criterion), the analysis makes use of variance decompositions. Such decompositions, by partitioning the variance of the forecast error of consumption into the proportions attributable to innovations (or shocks) in interest rates, liquidity constraints and its own, can provide an indication of these relativities and may be termed as out-of-sample causality tests (Kling and Bessler, 1985). The variable that is primarily forecast from its own lagged values (i.e., consumption) will have all its forecast error variance explained by its own disturbances (Sims, 1982). The variance decomposition results are reported in Table 7. They clearly indicate that in the medium- to log-term horizon both factors are capable of explaining more than 70% of household consumption decisions, with liquidity constraints dominating interest rates.

**[Insert Table 7 about here]**

6 CONCLUSION

This paper provided supportive evidence that the debt burden of households, as measured by the debt-service to income ratio, was helpful in explaining consumer spending. Moreover, the findings documented that the sign turned out to be positive, implying that this positive sign exemplified the strength of the interest rates, the expectations of future income and the relaxation of liquidity constraints mechanisms driving the debt-service ratio. The presence of loose monetary policies that contributed to an environment with lower interest rates, especially after the break out of the crisis, seems to have eased the households’ ability to lower their debt payment obligations by refinancing into loans with lower interest rates.

The results received robust support even when the analysis explicitly considered both consumer credit and mortgage debt as additional drivers in explaining consumer spending, while the results held especially for the case of durable goods. These results seem consistent with the role of debt service in affecting spending by constrained consumers who have some limited (but not zero) access to credit. Furthermore, the lack of a strong role for the debt-service ratio in explaining spending for nondurable goods, as well as the null role in explaining spending for services, seems consistent with the likely behavior of constrained consumers slowing their spending on discretionary items, rather than necessities. Finally, the empirical analysis identified the relative importance of certain debt mechanisms in affecting consumption decisions. In particular, the findings clearly reflected the dominant role of liquidity (borrowing) constraints in affecting such decisions, while the relative importance of the course of interest rates was also substantial.

Overall, household debt is shown to be a significant predictor of household consumption behavior, even after controlling for other drivers of consumption. This paper points to the importance of models which incorporate heterogeneous households and account for household balance sheet positions. Specific macroeconomic policies, such as fiscal transfers to favor household debt restructuring or cuts in interest rates to historic lows, have affected households’ debt-service ratios, as well as the households’ cash flows and they are relevant counterweights of consumption dynamics. Therefore, the restructuring of financial institutions that suffered significantly from the 2008 crisis event and onwards is more than a necessity, which is expected to substantially affect future credit conditions, the future course of consumer spending and the future itself of the real economy. Financial institutions are responsible for assessing the risk and the ability of their clients to service their debts. Regulatory authorities in many countries have taken measures to strengthen borrowing, especially, mortgage rules since 2008 and continue to monitor closely the financial situation of households. In addition, other government bodies have developed useful information to educate households and sensitize them to the risks of overindebtedness. In addition, policymakers should intensify their attempts to control high debt levels. It is also worth pointing out the role of monetary policy in contributing to reduced real debt burdens by raising inflationary expectations (Svensson, 2012), without of course ignoring the consequences for the central bank’s credibility. Moreover, financial policies could also affect the cost and availability of debt (credit) in a sense that consumers could lose any incentives to accumulate household debt (Mishkin, 1976, 1977, 1978). In other words, it is the role of macroprudential policies that could affect or limit credit expansions, along with certain institutional arrangements expected to impact the cost and availability of credit, such as the cost of defaults which is closely associated with consumption, especially during stressful economic conditions (Olney, 1999). Finally, more research is needed to discern the mechanism(s) through which consumers’ debt can be highly influential in impacting households’ consumption expenses.

REFERENCES

Agarwal, S., Liu, C. and Souleles, N.S. (2007). ‘The Reaction of Consumer Spending and Debt to Tax Rebates’, *Journal of Political Economy*, Vol. 115, pp. 986-1019.

Aghion, P., Bacchetta, P. and Banerjee, A. (2000). ‘A Simple Model of Monetary Policy and Currency Crises’, *European Economic Review,* Vol. 44, pp. 728-738.

Almeida, H., Campello, M. and Liu, C. (2006). ‘The Financial Accelerator: Evidence from International Housing Markets’, *Review of Finance,* Vol. 10, pp. 321-352.

Amromin, G., Huang, J. and Sialm, C. (2007). “The Tradeoff between Mortgage Prepayments and Tax-Deferred Savings’, *Journal of Public Economics*, Vol. 91, pp. 2014-2040.

Arce, O., Prades, E. and Urtasun, A. (2013). ‘Changes in Household Saving and Consumption in Spain during the Crisis’, Economic Bulletin, Banco de España.

Arellano, M. and Bover, O. (1995). ‘Another Look at the Instrumental Variable: Estimation of Error-Component Models’, *Journal of Econometrics,* Vol. 68, pp. 29-51.

Arellano, M. and Bond, S. (1991). ‘Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations’, *Review of Economic Studies,* Vol. 58, pp. 277-297.

Bacchetta, P. and Gerlach, S. (1997). ‘Consumption and Credit Constraints: International Evidence’, *Journal of Monetary Economics,* Vol. 40, pp. 207-238.

Benmelech, E., Meisenzahl, R.R. and Ramcharan, R. (2017). ‘The Real Effects of Liquidity during the Financial Crisis: Evidence from Automobiles’, *Quarterly Journal of Economics,* Vol. 132, pp. 317-365.

Betti G,, Dourmashkin, N., Rossi, M. and Yin, Y.P. (2007). ‘Consumer Over-Indebtedness in the EU: Measurement and Characteristics’, *Journal of Economic Studies,* Vol. 34, pp. 136-156.

Blundell, R. and Bond, S. (1998). ‘Initial Conditions and Moment Restrictions in Dynamic Panel Data Models’, *Journal of Econometrics,* Vol. 87, pp. 115-143.

Blundell R, Pistaferri L and Preston I. (2008). ‘Consumption Inequality and Partial Insurance’, *American Economic Review*, Vol. 98, pp. 1887-1921.

Borio, C. (2014). ‘The Financial Cycle and Macroeconomics: What Have we Learnt?’, *Journal of Banking and Finance,* Vol. 45, pp. 182-198.

Borio, C., Kharroubi, E., Upper, C. and Zampolli, F. (2016). ‘Labour Reallocation and Productivity Dynamics: Financial Causes, Real Consequences’, BIS Working Paper, No 534.

Bostic, R. (2002). ‘Trends in Equal Access to Credit Products’, in: *The Impact of Public Policy on Consumer Credit*. Durkin, T., Staten, M. (Eds), Kluwer Academic Publishers, Boston.

Browning, M. and Crossley, T. (2009). ‘Stocks, Shocks and Socks: Smoothing Consumption over a Temporary Income Loss’, *Journal of the European Economic Association,* Vol. 6, pp. 1169‑1192.

Buttiglione, L., Lane, P., Reichlin, L. and Reinhart, V. (2014). ‘Deleveraging? What Deleveraging?’, Geneva Reports on the World Economy.

Cagan, C. (2007). ‘Mortgage Payment Reset: The Issue and the Impact’, Research Study, First American CoreLogic.

Campbell, J. and Mankiw, G. (1989). ‘Consumption, Income and Interest Rates: Reinterpreting the Time Series Evidence’, in: Blanchard, O. and Fischer, S. (Eds.), *NBER Macroeconomics Annual*, MIT Press, Cambridge, MA.

Campello, M., Graham, J.R. and Harvey, C. (2010). ‘The Real Effects of Financial Constraints: Evidence from a Financial Crisis’, *Journal of Financial Economics,* Vol. 97, pp. 470-487.

Caprio, C. Jr. (2011). ‘Macro-Financial Linkages in IMF Research’, IEO Background Paper, No. 7, Washington DC: International Monetary Fund.

Cecchetti, S. and Kharroubi, E. (2015). ‘Why does Financial Sector Growth Crowd Out Real Economic Growth?’, BIS Working Paper, No 490.

Chaney, T., Sraer, D. and Themar, D. (2012). ‘The Collateral Channel: How Real Estate Shocks Affect Corporate Investment’, *American Economic Review,* Vol. 102, pp. 2381-2409.

Charles, K.K. and Stephens, M. (2006). ‘The Level and Composition of Consumption over the Business Cycle: The Role of ‘Quasi-Fixed’ Expenditures’, National Bureau of Economic Research, Working Paper, No. 12388.

Claessens, S. and Kose, M.A. (2017). ‘Asset Prices and Macroeconomic Outcomes: A Survey’, BIS Working Paper, No. 676, Basel: Bank for International Settlements.

Cook, D. (2004). ‘Experience and Growth’, *Economics Letters,* Vol. 85, pp. 53-56.

Coulibaly B. and Li, G. (2006). ‘Do Homeowners Increase Consumption after the Last Mortgage Payment? An Alternative Test of the Permanent Income Hypothesis’, *The Review of Economics and Statistics,* Vol. 88, pp. 10-19.

Cynamon, B.Z. and Fazzari, S.M. (2008). ‘Household Debt in the Consumer Age: Source of Growth-Risk of Collapse’, *Capitalism and Society* 3, Article 3.

Cynamon, B.Z. and Fazzari, S.M. (2013). ‘The End of the Consumer Age’, in: Fazzari, S.M. Cynamon, B.Z. and Setterfield, M. (Eds.), *After the Great Recession: The Struggle for Economic Recovery and Growth*, pp. 129-157. Cambridge University Press.

Debelle, G. (2004). ‘Macroeconomic Implications of Rising Household Debt’, Working Paper, No. 13, Bank of International Settlements.

Duesenberry, J.S (1949). *Income, Saving and the Theory of Consumer Behaviors*. Cambridge, MA: Harvard University Press.

Dynan, K.E. (2012). ‘Is a Household Debt Overhang Holding Back Consumption?’, *Brookings Paper on Economic Activity*, pp. 299-362.

Dynan, KE. And Kohn, D.L. (2007). ‘The Rise in Household Indebtedness: Causes and Consequences’, Working Paper, Reserve Bank of Australia.

Dynan, K.E. and Maki, D.M. (2001). ‘Does Stock Market Wealth Matter for Consumption?’, Working Paper, Washington: Board of Governors of the Federal Reserve System.

Estrella, A. (2005). ‘Why does the Yield Curve Predict Output and Inflation?’, *Economic Journal,* Vol. 115, pp. 722-744.

Estrella, A. and Trubin, M.R. (2006). ‘The Yield Curve as a Leading Indicator: Some Practical Issues’, *Federal Reserve Bank of New York Current Issues in Economics and Finance,* Vol. 12, pp. 1-7.

Favilukis, J., Ludvigson, S.C. and Nieuwerburgh, S.V. (2013). ‘The Macroeconomic Effects of Housing Wealth, Housing Finance, and Limited Risk-Sharing in General Equilibrium’, SSRN Working Paper.

Feroli, M. (2004). ‘Monetary Policy and the Information Content of the Yield Spread’, *Topics in Macroeconomics* 4, Article 13.

Ferraris, L. and Minetti, R. (2013). ‘Foreign Banks and the Dual Effect of Financial Liberalization’, *Journal of Money, Credit and Banking* 45, 1301-1333.

Flavin, M. (1981). ‘The Adjustment of Consumption to Changing Expectations about Future Income’, *Journal of Political Economy,* Vol. 89, pp. 974-1009.

Fort, T., Haltiwanger, J., Jarmin, R. and Mirands, J. (2013). ‘How Firms Respond to Business Cycles: The Role of Firm Age and Firm Size’, *IMF Economic Review,* Vol. 61, pp. 520-559.

Gan, J. (2007). ‘The Real Effects of Asset Market Bubbles: Loan and Firm Level Evidence of a Lending Channel’, *Review of Financial Studies,* Vol. 20, pp. 1941-1973.

Gertler, M. and Kiyotaki, N. (2011). ‘Financial Intermediation and Credit Policy in Business Cycle Analysis’, in: *Handbook of Monetary Economics* 3, Friedman, B.M. and Woodford, M. (Eds.), pp. 547-599, Amsterdam: North Holland.

Gertler, M. and Gilchrist, S. (1994). ‘Monetary Policy, Business Cycles, and the Behavior of Small Manufacturing Firms’, *Quarterly Journal of Economics,* Vol. 109, pp. 309-340.

Gross, D. and Souleles, N. (2002). ‘Do Liquidity Constraints and Interest Rates Matter for Consumer Behavior? Evidence from Credit Card Data’, *Quarterly Journal of Economics*, Vol. 117, pp. 149-185.

Guerrieri, L., Iacoviello, M. and Minetti, R. (2012). ‘Banks, Sovereign Debt, and the International Transmission of Business Cycles’, in: *NBER International Seminar on Macroeconomics 2012*, Giavazzi, F. and West, K.D. (Eds.), pp. 181-213, Chicago: University of Chicago Press.

Harvey, C.R. (1988). “The Real Term Structure and Consumption Growth’, *Journal of Financial Economics,* Vol. 22, pp. 305-333.

Hu, Z. (1993). ‘The Yield Curve and Real Economic Activity’, *IMF Staff Papers,* Vol. 40, pp. 781-806.

Im, K.S., Pesaran, H., Shin, Y. and Smith, R.J. (2003). ‘Testing for Unit Root in HeterogeneousPanels’, *Journal of Econometrics*, Vol. 115, pp. 53-74.

Jappelli, T. and Pistaferri, L. (2010). ‘The Consumption Response to Income Changes’, *Annual Review of Economics,* Vol. 2, pp. 479-506.

Jappelli, T. and Pagano, M. (1994). ‘Saving, Growth, and Liquidity Constraints’, *Quarterly Journal of Economics*, Vol. 109, pp. 83-109.

Johnson, K.W. (2007). ‘The Transactions Demand for Credit Cards’, *The B.E. Journal of Economic Analysis and Policy,* Vol. 7, Article 16.

Johnson, K.W. (2005). ‘Recent Developments in the Credit Card Market and the Financial Obligations Ratio’, *Federal Reserve Bulletin*, pp. 473-486.

Jordà, Ò., Schularick, M. and Taylor, A. (2013). ‘When Credit Bites Back’, *Journal of Money, Credit and Banking,* Vol. 45, pp. 3-28.

Jordà, Ò., Schularick, M. and Taylor, A. (2015). ‘Betting the House’, *Journal of International Economics,* Vol. 96, pp. S2-S18.

Jordà, Ò., Schularick, M. and Taylor, A. (2016). ‘The Great Mortgaging: Housing Finance, Crises and Business Cycles’, *Economic Policy,* Vol. 31, pp. 107-152.

Juselius, M. and Drehmann, M. (2015). ‘Leverage Dynamics and the Real Burden of Debt’, Working Paper, No. 501, Geneva: Bank of International Settlements.

Justiniano, A., Primiceri, G.E. and Tambalotti, A. (2014). ‘Credit Supply and the Housing Boom’, Unpublished manuscript.

Kalemli-Ozcan, S., Papaioannou, E. and Peydro, J.L. (2013). ‘Financial Regulation, Financial Globalization, and the Synchronization of Economic Activity’, *Journal of Finance,* Vol. 68, pp. 1179-1228.

Kaplan, S.N. and Zingales, L. (2000). ‘Investment-Cash Flow Sensitivities and not Valid Measures of Financing Constraints’, *Quarterly Journal of Economics,* Vol. 115, pp. 707-712.

Kaplan, S.N. and Zingales, L. (1997). ‘Do Investment-Cash Flow Sensitivities Provide Useful Measures of Financing Constraints’, *Quarterly Journal of Economics,* Vol. 112, pp. 169-215.

Kennickell, A.B. and Starr-McCluer, M. (1997). ‘Retrospective Reporting of Household Wealth: Evidence from the 1983-89 Survey of Consumer Finances’, *Journal of Business and Economic Statistics,* Vol.15, pp. 452-463.

Kim, Y.I. and Kim, D.J. (2012). ‘Household Indebtedness in Korea: Its Causes and Sustainability’, *Japan and the World Economy,* Vol. 29, pp. 59-76.

Kling, J.L. and Bessler, D.A. (1985). ‘A Comparison of Multivariate Forecasting Procedures for Economic Time Series’, *International Journal of Forecasting*, Vol. 1, pp. 5-24.

Korinek, A. and Mendoza, E.G. (2014). ‘From Sudden Stops to Fisherian Deflation: Quantitative Theory and Policy’, *Annual Review of Economics,* Vol. 6, pp. 299-332.

Lau, H.H. (1997). ‘Recent Developments in the Personal Sector Financial Position and Savings in Canada’, Working Paper, Bank of Canada.

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

Leybourne, S. (1995). ‘Testing for Unit Roots Using Forward and Reverse Dickey-Fuller Regressions’, *Oxford Bulletin of Economics and Statistics*, Vol. 57, pp. 559-571.

Ludvigson, S. (1999). ‘Consumption and Credit: A Model of Time-Varying Liquidity Constraints’, *Review of Economics and Statistics,* Vol. 81, pp. 434-447.

Maki, D.M. (2002). ‘The Growth of Consumer Credit and the Household Debt Service Burden’, in: *The Impact of Public Policy on Consumer Credit*, Durkin, T. and Staten, M. (Eds.), Kluwer Academic Publishers. Boston.

McCarthy, J. (1997). ‘Debt, Delinquencies and Consumer Spending’, Current Issues in Economics and Finance, Federal Reserve Bank of New York 3.

Mian, A. and Sufi, A. (2010). ‘Household Leverage and the Recession of 2007-2009’, *IMF Economic Review,* Vol. 58, pp. 74-117.

Mian, A., Rao, Κ. and Sufi, Α. (2013). ‘Household Balance Sheets, Consumption and the Economic Slump’, *Quarterly Journal of Economics,* Vol. 128, pp. 1687-1726.

Mian, A., Sufi, A. and Verner, E. (2015). ‘Household Debt and Business Cycles Worldwide’, NBER Working Paper, No 21581.

Midrigan, V. and Philippon, T. (2011). ‘Housing Leverage and the Recession’, New York University, mimeo.

Mishkin, F.S. (1976). ‘Illiquidity, Consumer Durable Expenditures, and Monetary Policy’, *American Economic Review,* Vol. 66, pp. 642-654.

Mishkin, F.S. (1977). ‘What Depressed the Consumer? The Household Balance Sheet and the 1973-75 Recession’, *Brookings Papers on Economic Activity,* Vol. 1, pp. 123-164.

Mishkin, F.S. (1978). ‘The Household Balance Sheet and the Great Depression’, *Journal of Economic History,* Vol. 38, pp. 918-937.

Montplaisir, M.C. (1997). ‘The Maturity Structure of Household Financial Assets and Liabilities’, *Bank of Canada Review*, pp. 33-46.

Morley, J. (2016). ‘Macro-Financial Linkages’, *Journal of Economic Surveys,* Vol. 30, pp. 698-711.

Obstfeld, M. and Rogoff, K. (2002). ‘Global Implications of Self-Oriented National Monetary Rules’, *Quarterly Journal of Economics,* Vol. 117, pp. 503-535.

OECD (1998). ‘The Retirement Decision in OECD Countries’, Working Paper, No. 2, Paris: OECD.

Ogawa, K. and Wan, J. (2007). ‘Household Debt and Consumption: A Quantitative Analysis based on Household Micro Data for Japan’, *Journal of Housing Economics,* Vol. 16, pp. 127-142.

Olney, M. (1999). ‘Avoiding Default: The Role of Credit in the Consumption Collapse of 1930’, *Quarterly Journal of Economics,* Vol. 114, pp. 319-335.

Quadrini, V. (2014). ‘Macroeconomic Effects of Asset-Price Shocks in a Globalized Financial Market’, *Scandinavian Journal of Economics,* Vol. 116, pp. 190-217.

Parker, J. (1999). ‘The Reaction of Household Consumption to Predictable Changes in Social Security Taxes’, *American Economic Review,* Vol. 89, pp. 959‑973.

Pesaran, M. (2007). ‘A Simple Panel Unit Root Test in the Presence of Cross-Section Dependence’, *Journal of Applied Econometrics,* Vol. 22, pp. 265-312.

Ragan, C. (1994). ‘Progressive Income Taxes and the Substitution Effect of RRSP’, *Canadian Journal of Economics*, Vol. 27, pp. 43-57.

Schularick, M. and Taylor, A. (2012). ‘Credit Booms Gone Bust: Monetary Policy, Leverage Cycles and Financial Crises’, *American Economic Review,* Vol. 102, pp. 1029-1061.

Shea, J. (1995). ‘Union Contracts and the Life-Cycle/Permanent-Income Hypothesis’, *American Economic Review*, Vol. 85, pp. 186-200.

Sims, C.A. (1982). ‘Policy Analysis with Econometric Models’, *Brooking Papers on Economic Activity*, pp. 107-164.

Smith, V., Leybourne, S. and Kim, T.H. (2004). ‘More Powerful Panel Unit Root Tests with an Application to the Mean Reversion in Real Exchange Rates’, *Journal of Applied Econometrics,* Vol. 19, pp. 147-170.

Solimano, A. (2010). ‘An Overview of IMF Research on Macro-Financial Linkages: Relevance, Diversity of Approaches and Context’, Paper prepared for the IEO of IMF, Santiago: International Center for Globalization and Development.

Solo, V. (1984). ‘The order of Differencing in ARMA models’, *Journal of the American Statistical Association*, Vol. 76, pp. 916-921.

Stephens, M. (2008). ‘The Consumption Response to Predictable Changes in Discretionary Income: Evidence from the Repayment of Vehicle Loans’, *Review of Economics and Statistics,* Vol. 90, pp. 241-252.

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

Svensson, L.E.O. (2012). ‘Monetary Policy, Debt, and Unemployment’, Speech at SNS, Stockholm.

FIG. 1. Average Debt-Service Ratios Across the 32 Countries

FIG. 2. Low and High Debt Service Ratios Country Groups

Belgium Denmark

France Germany

Hong-Kong U.S.

FIG. 3. Selected Debt-Service Ratios

TABLE 1

PANEL UNIT ROOT TESTS

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Variable** | **Pesaran** | **Smith et al. t-test** | **Smith et al. LM-test** | **Smith et al. max-test** | **Smith et al. min-test** |
| **CIPS** |
|  |  |  |  |  |  |
| DS | -1.24 | -1.28 | 2.94 | -1.35 | 1.39 |
| ΔDS | -5.36\*\*\* | -5.49\*\*\* | 20.24\*\*\* | -6.91\*\*\* | 7.02\*\*\* |
| C | -1.28 | -1.30 | 3.02 | -1.31 | 1.35 |
| ΔC | -5.40\*\*\* | -6.39\*\*\* | 21.03\*\*\* | -7.16\*\*\* | 7.32\*\*\* |
| Y | -1.24 | -1.28 | 2.86 | -1.35 | 1.38 |
| ΔY | -5.54\*\*\* | -6.11\*\*\* | 20.42\*\*\* | -6.39\*\*\* | 6.68\*\*\* |
| S | -1.25 | -1.34 | 2.76 | -1.34 | 1.42 |
| ΔS | -5.51\*\*\* | -5.48\*\*\* | 20.62\*\*\* | -6.53\*\*\* | -6.74\*\*\* |
| H | -1.24 | -1.31 | 2.79 | -1.34 | 1.42 |
| ΔH | -5.63\*\*\* | -5.82\*\*\* | 21.16\*\*\* | -5.32\*\*\* | 5.41\*\*\* |
| DS x develop | -1.28 | -1.30 | 2.96 | -1.39 | 1.43 |
| ΔDS x develop | -5.42\*\*\* | -5.58\*\*\* | 20.73\*\*\* | -7.04\*\*\* | 7.25\*\*\* |
| CR | -1.35 | -1.40 | 2.58 | -1.39 | 1.44 |
| ΔCR | -5.84\*\*\* | -6.01\*\*\* | 21.56\*\*\* | -6.04\*\*\* | 6.15\*\*\* |
| MD | -1.32 | -1.42 | 2.81 | -1.42 | 1.48 |
| ΔMD | -5.52\*\*\* | -5.62\*\*\* | 20.43\*\*\* | -5.47\*\*\* | 5.59\*\*\* |
| Durables | -6.12\*\*\* | -6.28\*\*\* | 21.39\*\*\* | -6.19\*\*\* | -6.38\*\*\* |
| Non-durables | -5.68\*\*\* | -5.74\*\*\* | 19.80\*\*\* | -5.48\*\*\* | 5.61\*\*\* |
| Services | -5.46\*\*\* | -5.69\*\*\* | 20.13\*\*\* | -5.31\*\*\* | 5.53\*\*\* |
| Term spread | -5.61\*\*\* | -5.71\*\*\* | 21.19\*\*\* | -5.38\*\*\* | 5.61\*\*\* |

Δ denotes first differences. DS = debt-service ratio, C = consumption, Y = income, S = stock prices, H = Housing prices, CR = consumer credit, MD = mortgage debt. A constant is included in the Pesaran (2007) tests. Rejection of the null hypothesis indicates stationarity in at least one country. Critical values for the Pesaran (2007) test are -2.40 at 1%, -2.22 at 5%, and -2.14 at 10%, respectively. Both a constant and a time trend are included in the Smith et al. (2004) tests. Rejection of the null hypothesis indicates stationarity in at least one country. For both tests the results are reported at lag = 4. The null hypothesis is that of a unit root. \*\*\*: p≤0.01.

TABLE 2

DYNAMIC PANEL GMM (BASELINE) RESULTS

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Model (1) Model (2) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

ΔlogDebt-Service ratio 0.531\*\*\* 0.472\*\*\*

 [0.00] [0.00]

ΔlogConsumption(-1) 0.834\*\*\*

 [0.00]

ΔlogIncome 0.128\*\*

 [0.03]

ΔlogIncome(-1) 0.049\*\*

 [0.05]

ΔlogStock prices 0.163\*\*\*

 [0.01]

ΔlogStock prices(-1) 0.071\*\*

 [0.02]

ΔlogHousing prices 0.241\*\*\*

 [0.00]

ΔlogHousing prices(-1) 0.157\*\*\*

 [0.01]

ΔlogHousing prices(-2) 0.075\*\*

 [0.02]

D2008 -0.131\*\*\* -0.118\*\*\*

 [0.00] [0.01]

ΔDS x develop 0.486\*\*\*

 [0.00]

Constant 1.673\*\* 1.194\*

 [0.03] [0.07]

Observations 2,400 2,400

Countries 32 32

R2-adjusted 0.25 0.67

Instruments used 7 23

Hansen p-value 0.98 0.98

AR1 p-value 0.02 0.02

AR2 p-value 0.48 0.53

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Heteroskedasticity and serial correlation robust p-values in brackets. \*\*\*: p≤0.01, \*\*: p≤0.05, \*: p≤0.10.

TABLE 3

DYNAMIC PANEL GMM RESULTS: TYPES OF CONSUMPTION

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Durable goods Non-durable goods Services

 Model (1) Model (2) Model (1) Model (2) Model (1) Model (2)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

ΔlogDebt-Service Ratio 0.561\*\*\* 0.553\*\*\* 0.171\* 0.123\* 0.092 0.058

 [0.00] [0.00] [0.06] [0.08] [0.14] [0.17]

ΔlogConsumption(-1) 0.873\*\*\* 0.638\*\*\* 0.612\*\*\*

 [0.00] [0.00] [0.00]

ΔlogIncome 0.147\*\*\* 0.125\*\*\* 0.114\*\*\*

 [0.00] [0.00] [0.00]

ΔlogIncome(-1) 0.085\*\*\* 0.045\*\* 0.039\*

 [0.01] [0.05] [0.06]

ΔlogStock prices 0.168\*\*\* 0.135\*\*\* 0.129\*\*\*

 [0.00] [0.00] [0.00]

ΔlogStock prices(-1) 0.081\*\*\* 0.048\*\* 0.032\*

 [0.00] [0.05] [0.07]

ΔlogHousing prices 0.235\*\*\* 0.214\*\*\* 0.208\*\*\*

 [0.00] [0.00] [0.00]

ΔlogHousing prices(-1) 0.163\*\*\* 0.128\*\*\* 0.094\*\*\*

 [0.00] [0.00] [0.01]

ΔlogHousing prices(-2) 0.079\*\*\* 0.044\*\* 0.038\*\*

 [0.01] [0.04] [0.05]

D2008 -0.142\*\*\* -0.129\*\*\* -0.138\*\*\* -0.125\*\*\* -0.134\*\*\* -0.129\*\*\*

 [0.00] [0.00] [0.00] [0.00] [0.00] [0.00]

ΔDS x develop 0.578\*\*\* 0.241\*\*\* 0.166\*\*

 [0.00] [0.01] [0.05]

Constant 1.316\*\* 1.152\* 1.158\*\* 1.126\* 1.194\*\* 1.142\*

 [0.04] [0.08] [0.04] [0.09] [0.03] [0.07]

Observations 2,400 2,400 2,400 2,400 2,400 2,400

Countries 32 32 32 32 32 32

R2-adjusted 0.32 0.73 0.30 0.66 0.28 0.61

Instruments used 7 27 7 25 7 23

Hansen p-value 0.99 0.99 0.95 0.95 0.95 0.96

AR1 p-value 0.01 0.01 0.03 0.03 0.04 0.04

AR2 p-value 0.53 0.58 0.46 0.51 0.41 0.45

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Similar to those in Table 2.

TABLE 4

DYNAMIC PANEL GMM (BASELINE) RESULTS: THE ROLE OF THE YEAR 2001

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Model (1) Model (2) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

ΔlogDebt-Service ratio 0.509\*\*\* 0.458\*\*\*

 [0.00] [0.00]

ΔlogConsumption(-1) 0.816\*\*\*

 [0.00]

ΔlogIncome 0.122\*\*

 [0.03]

ΔlogIncome(-1) 0.043\*\*

 [0.05]

ΔlogStock prices 0.151\*\*\*

 [0.01]

ΔlogStock prices(-1) 0.058\*\*

 [0.03]

ΔlogHousing prices 0.229\*\*\*

 [0.00]

ΔlogHousing prices(-1) 0.135\*\*\*

 [0.01]

ΔlogHousing prices(-2) 0.053\*\*

 [0.04]

D2001 0.194\*\*\* 0.179\*\*\*

 [0.00] [0.00]

ΔDS x develop 0.437\*\*\*

 [0.00]

Constant 1.347\*\* 1.116\*

 [0.05] [0.09]

Observations 2,400 2,400

Countries 32 32

R2-adjusted 0.23 0.61

Instruments used 7 29

Hansen p-value 0.99 0.99

AR1 p-value 0.02 0.02

AR2 p-value 0.44 0.50

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Similar to those in Table 2.

TABLE 5

DYNAMIC PANEL GMM RESULTS: THE ROLE OF CONSUMER CREDIT AND HOUSING DEBT

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Model (1) Model (2)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

ΔlogDebt-Service Ratio 0.594\*\*\* 0.511\*\*\*

 [0.00] [0.01]

ΔlogConsumption(-1) 0.759\*\*\*

 [0.00]

ΔlogIncome 0.135\*\*

 [0.03]

ΔlogIncome(-1) 0.058\*\*

 [0.02]

ΔlogStock prices 0.155\*\*\*

 [0.01]

ΔlogStock prices(-1) 0.062\*\*

 [0.03]

ΔlogHousing prices 0.232\*\*\*

 [0.00]

ΔlogHousing prices(-1) 0.139\*\*\*

 [0.00]

ΔlogHousing prices(-2) 0.061\*\*

 [0.03]

ΔConsumer credit 0.246\*\*\*

 [0.00]

ΔMortgage debt 0.196\*\*\*

 [0.00]

ΔMortgage debt(-1) 0.084\*\*

 [0.02]

D2008 -0.122\*\*\* -0.106\*\*\*

 [0.00] [0.01]

ΔDS x develop 0.475\*\*\*

 [0.00]

Constant 1.538\*\* 1.085\*

 [0.04] [0.08]

Observations 2,400 2,400

Countries 32 32

R2-adjusted 0.29 0.70

Instruments used 7 27

Hansen p-value 0.99 0.99

AR1 p-value 0.01 0.01

AR2 p-value 0.54 0.58

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Similar to those in Table 2.

TABLE 6

DYNAMIC PANEL GMM RESULTS: THE TERM SPREAD AS AN ALTERNATIVE PROXY FOR THE WEALTH EFFECT

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Model (2) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

ΔlogDebt-Service Ratio 0.516\*\*\*

 [0.00]

ΔlogConsumption(-1) 0.845\*\*\*

 [0.00]

ΔlogIncome 0.136\*\*

 [0.03]

ΔlogIncome(-1) 0.058\*\*

 [0.05]

Term spread 0.197\*\*\*

 [0.00]

Term spread(-1) 0.118\*\*\*

 [0.01]

ΔlogHousing prices 0.228\*\*\*

 [0.00]

ΔlogHousing prices(-1) 0.142\*\*\*

 [0.01]

ΔlogHousing prices(-2) 0.064\*\*

 [0.03]

D2008 -0.139\*\*\*

 [0.00]

ΔDS x develop 0.529\*\*\*

 [0.00]

Constant 1.088\*

 [0.07]

Observations 2,400

Countries 32

R2-adjusted 0.71

Instruments used 29

Hansen p-value 0.99

AR1 p-value 0.01

AR2 p-value 0.49

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Similar to those in Table 2.

TABLE 7

VARIANCE DECOMPOSITIONS (%) FOR HOUSEHOLD CONSUMPTION

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Forecast horizon

 (Quarters) Consumption Interest rates Liquidity constraints

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 4 89 5 6

 (3.45) (3.01) (3.49)

 8 53 19 28

 (3.11) (2.68) (2.73)

 20 24 30 46

 (1.26) (0.86) (0.92)

The figures denote the proportion of forecast errors in interest rates and liquidity constraints. Figures in parentheses denote bootstrapped standard errors.