Government debt and the excess sensitivity of private consumption to current income: an empirical analysis for OECD countries [(*)]

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Abstract

Empirical studies typically find that private consumption is much more sensitive to changes in current disposable income than is predicted by Hall's (JPE, 1978) permanent income hypothesis. Standard explanations for this "excess sensitivity" of private consumption refer to liquidity constraints and/or myopia. Elaborating on existing literature, which suggests that the incidence of liquidity constraints and the degree of myopia may be affected by the government debt ratio, this paper investigates the role of government debt in the degree of excess sensitivity. Using a panel of OECD countries in the 1990s, we estimate a consumption function with the degree of excess sensitivity depending on the government debt ratio and the degree of financial liberalization. We find that a higher government debt leads to more excess sensitivity. This result supports the idea that a higher debt induces private lenders to tighten credit conditions, which raises the incidence of liquidity constraints. As to individual countries we find a higher degree of excess sensitivity in many EMU countries, whereas the US show a higher degree of consumption smoothing. For the effects of financial liberalization on the excess sensitivity of private consumption in the 1990s, we obtain no clear evidence.

Key words : fiscal policy, private consumption, liquidity constraints, government debt, panel data, consumption smoothing
JEL : E21, E62, C33

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1. Introduction

Assuming rational forward-looking consumers and perfect capital markets, Hall (1978) has demonstrated that under the permanent income hypothesis consumption should follow a random walk. Most studies during the past two decades have, however, rejected this prediction. In particular, they have concluded that private consumption is more sensitive to current disposable income than is consistent with the permanent income hypothesis. In the literature several explanations for this "excess sensitivity" have been put forward. Typically these explanations come down to dropping one or more of Hall's assumptions. For example, some authors have referred to myopic behavior from a significant part of the consumers, i.e. a deviation from the basic postulate of rational forward-looking agents (e.g. Flavin, 1985; Romer, 2001). Many others have attributed excess sensitivity to credit market imperfections and liquidity constraints, preventing rational consumers from realizing their desired consumption (see e.g. the seminal work by Flavin, 1981 and 1985 and Campbell and Mankiw, 1990). Other potential explanations for observed excess sensitivity to income relate to precautionary savings (Barsky et al., 1986; Carroll, 1992), imperfect information (Goodfriend, 1992; Pischke, 1995) and misspecification of the estimated consumption function (Campbell and Mankiw, 1990). The focus of this paper is on myopia and liquidity constraints.

Building on the idea of liquidity constraints, several authors have more recently endogenized the degree of "excess sensitivity". *Cross-sectionally*, Jappelli and Pagano (1989) and Campbell and Mankiw (1991) find that countries with better developed capital markets and easier access to credit have lower excess sensitivity of private consumption. Haliassos and Christou (2000) cannot reject that countries with high concentration and low efficiency in the banking sector have higher excess sensitivity. Evans and Karras (1998) show for 66 countries that the excess sensitivity of consumption to disposable income is lower in countries with the highest savings rate. A higher savings rate implies that consumers accumulate more wealth, which makes them less vulnerable to liquidity constraints. A number of papers have investigated the hypothesis that the deregulation of credit markets in many countries during the last decades has *over time* lowered the fraction of credit constrained consumers and the excess sensitivity of private consumption. Bayoumi and Koujianou (1990), Blundell-Wignall et al. (1995), McKiernan (1996) and Girardin et al. (2000) can confirm this hypothesis for several OECD countries (e.g. US, France). However, Campbell and Mankiw (1991) cannot. Finally, Bacchetta and Gerlach (1997) have demonstrated the role of (endogenous) liquidity constraints for private consumption from a different perspective. They show excess sensitivity of consumption to credit aggregates in the US, Canada, the UK, France and Japan. As to the evolution of excess sensitivity *over time*, they only observe a clear tendency of decline in the US. Despite financial liberalization, they do not observe this tendency in the other countries.

This paper focuses on the role of government debt for the excess sensitivity of private consumption. To the best of our knowledge, the empirical literature on excess sensitivity has until now disregarded government debt. Theoretically, however, a number of obvious channels have been suggested. On the one hand, a (very) high or (rapidly) increasing government debt ratio may alert unaware citizens and, as a consequence, reduce the fraction of myopic consumers. Excess sensitivity of private consumption to current income should

then fall. On the other hand, high or rising government debt ratios imply an increase in households' future liabilities. Banks or other lenders may then reduce the amounts they lend, thereby raising the incidence of liquidity constraints and excess sensitivity of private consumption. Alternatively, highly indebted governments may rig the financial system so as to generate an artificially large demand for government bonds. This also will make it less interesting or more difficult for banks to extend credit to individuals. In section 2 we develop these theoretical channels somewhat further and put them into a workable econometric framework. In particular, we derive an equation for the change in private consumption, with the degree of excess sensitivity being a function of the government debt ratio (and the degree of financial liberalization). In section 3 we estimate this consumption equation for 15 to 19 OECD countries. We make use of panel estimation methods that allow us to correct for simultaneity and heterogeneity. Our results support the idea that a higher government debt ratio implies tighter credit conditions and an increase of excess sensitivity. This unfavorable effect of rising government debt on credit conditions seems to exist especially when debt is already at a high level. Section 4 summarizes our main results and their policy implications.

2. Government debt and the excess sensitivity of private consumption: a theoretical framework

Like many before, we take Campbell and Mankiw's (1990) methodology as our starting point. Campbell and Mankiw have extended Hall's (1978) Euler equation approach to consumption by allowing for two groups of consumers. One group consists of forward-looking permanent income consumers, the other consists of rational liquidity constrained consumers. In this paper we also take into account the possibility of myopic consumers.

The standard model of consumption behavior considers the optimal consumption path of a representative rational consumer who can lend and borrow freely. Assuming that the real interest rate is constant and equal to the subjective rate of time preference, one obtains that in the optimum

$$U'(C_{t-1}) = E_{t-1}U'(C_t) \qquad (1)$$

where C_t is the level of consumption in t, $U'(C_t)$ the marginal utility of consumption and E_{t-1} the expectations operator, conditional on information available at time $t-1$. If the marginal utility of consumption is linear, the change in consumption is unpredictable. Alternatively, if the utility function is iso-elastic and consumption levels are log-normally distributed, the growth rate of consumption cannot be forecasted (see also Girardin et al., 2000). One then obtains that

$$\Delta c_t = \alpha + \varepsilon_t \qquad (2)$$

where $\Delta c_t = lnC_t - lnC_{t-1}$ and ε_t is uncorrelated with lagged variables.

A large number of empirical studies (see section 1) have rejected equation (2), however. Typically, the evidence supports an alternative specification in which consumption displays "excess sensitivity" to disposable income, that is

$$\Delta c_t = \alpha + \lambda_t \Delta y_t + \varepsilon_t \quad (3)$$

with Δy_t the change in the log of current disposable income and λ_t the "excess sensitivity" parameter. As we have mentioned before, standard explanations for excess sensitivity refer to the existence of liquidity constrained and myopic consumers. The larger the fractions of these two groups, the higher λ will be. Furthermore, building on the idea of liquidity constrained consumers, several authors have emphasized the possibility of a time-varying λ due to financial deregulation in many countries (see the subscript t for λ in equation 3). In this paper we also endogenize λ, putting the role of government debt at the center. Equation (4) summarizes. For a specific functional form to be estimated, we refer to section 3.

$$\lambda_t = \lambda(\overset{?}{b_t}, \overset{-}{FL_t}) \quad (4)$$

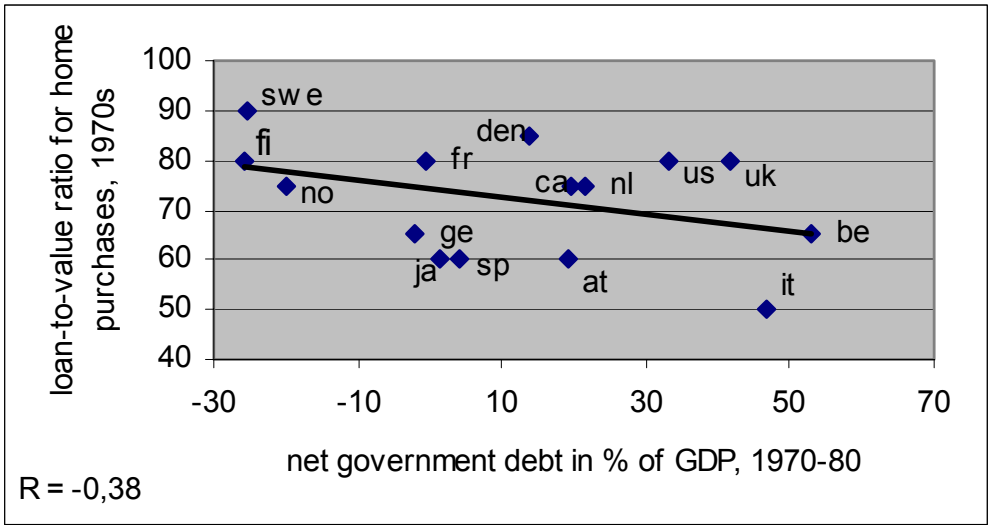
In this equation FL_t stands for the degree of financial deregulation and b_t for the government debt to GDP ratio, both measured at the beginning of t. The sign above a variable indicates the expected effect of increases in that variable on λ_t. Equation (4) first reflects the hypothesis that financial liberalization reduces λ because it implies a smaller fraction of liquidity constrained consumers. As we have described in section 1, a majority of studies confirm this hypothesis. The effect of changes in the government debt to GDP ratio is theoretically ambiguous. On the one hand, a higher government debt may raise the fraction of liquidity constrained consumers, on the other hand it may reduce the fraction of myopic consumers. The fraction of liquidity constrained consumers may rise for two reasons. First, highly indebted governments may rig the financial system so as to create an artificially large demand for government bonds. One way of doing that is to require banks to hold large amounts of bonds, for example by introducing various “liquidity” or “prudential” requirements. As an alternative, indebted governments may provide favorable (non market) conditions to banks when they buy bonds. In turn, banks will be less able or less willing to extend credit to private consumers. Second, a growing stock of government debt raises the households' future liabilities. This is unambiguously true if (part of) the debt is foreign-held. It will also be true for domestic households without government bonds[1]. Banks or other lenders may then reduce the amounts they lend (Hayashi, 1987; Yotsuzuka, 1987).

Figure 1 provides some preliminary support for the idea that higher government debt implies tighter credit conditions for consumers. It shows that in the 1970s, for which data are available, the loan-to-value ratio for home purchases was typically higher in countries with a lower net government debt ratio[2].

[1] Note that considering households with different amounts of government bonds is fully consistent with our Campbell and Mankiw (1990) approach of modeling different groups of consumers.

[2] Romer (2001, p. 540) however raises doubts about the proposition that high government debt induces tighter credit conditions. In his view it only arises when taxes are lump-sum. In the more realistic case of income taxes, borrowers will typically have to pay less taxes when they face difficulties to repay their (bank) loans, i.e. in bad times. Banks consequently know that their borrowers' share in repaying the government debt will be low, precisely at times when they may face trouble repaying their bank loans. Bond issues by the government are therefore likely to have only a small effect on borrowers' probabilities to repay private loans, and hence only a small effect on the amount that they can borrow.

Figure 1. Net government debt and the loan-to-value ratio in 15 OECD countries in the 1970s



Data sources: Loan-to-value ratio: Japelli and Pagano (1994); net government debt : OECD (2001).
Note: Included countries are Austria, Canada, Belgium, Denmark, Finland, France, Germany, Italy, Japan, The Netherlands, Norway, Spain, Sweden, UK and US. For four countries the data series for net government debt in 1970-1980 is incomplete: Austria (1980 only), Denmark (1980 only), Norway (1979-1980) and Spain (1976-1980). If we drop these four countries, correlation in figure 1 becomes –0.46.

A higher government debt ratio may on the other hand reduce the fraction of myopic consumers (Dalamagas, 1993a, 1994). The intuition is simple. To the extent that a very high or exploding government debt ratio gets more attention in political debate and/or the media, it may raise consumers' awareness of the future (future taxes). As a consequence, the share of myopic consumers will fall. So will excess sensitivity. This relationship is consistent with the results of existing empirical work that at high or exploding debt levels consumption behavior will be more Ricardian (e.g. Nicoletti, 1988; Nicoletti, 1992; Dalamagas, 1993b, 1994; Slate et al., 1995)[3]. Nicoletti (1988) has estimated private consumption functions for eight OECD countries over the 1961-85 period. He finds that expected future taxes are discounted much more strongly in consumer behavior in highly indebted countries (Belgium, Italy) than in countries where the fiscal stance is sustainable. Whereas the traditional Keynesian view seems to be appropriate in low debt countries, there is some support for the Ricardian view on consumption in high debt countries. Nicoletti (1992) shows for Belgium that tax discounting is time-varying and increasing with the debt ratio. Dalamagas (1993b, 1994) provides evidence that in low debt countries consumers respond to a reduction in the ratio of taxes to the government deficit by increasing consumption. In high debt countries they don't. They may

[3] Giavazzi et al. (2000) and Heylen and Everaert (2000), however, provide evidence that is inconsistent with this hypothesis. Furthermore, note that the results of Nicoletti (1988) and others do not prove that high government debt ratios raise consumer awareness of the future effects of fiscal policy. These results can also be derived from other hypotheses. For example, it may be that consumers are perfectly aware of the government budget constraint and the future tax implications of debt accumulation. But they may discount these future taxes only when the debt rate is very high. Only at a high debt rate they may rationally feel that the "day of reckoning" will still arrive during their lives.

even reduce consumption. Finally, Slate et al. (1995) have carried out a number of experiments to test Ricardian equivalence under uncertainty. The results of these experiments suggest that the response of people to fiscal deficits tends to be Keynesian when the probability of debt repayment is low. If, on the other hand, the probability of debt repayment is high, people act much more in a Ricardian way.

3. Government debt, financial liberalization and the excess sensitivity of private consumption: an empirical analysis

3.1. Basic set-up

In this section we test the model described by equations (3) and (4) using panel data for 15 to 19 OECD countries in the period 1990-99. Equation (5) reflects this panel data set-up. Equation (6) describes a specific functional form for λ_t. We adopt a straightforward linear specification.

$$\Delta c_{jt} = \alpha_j + \lambda_{jt} \Delta y_{jt} + \varepsilon_{jt} \tag{5}$$

$$\lambda_{jt} = \beta_0 + \beta_1 b_{jt} + \beta_2 FL_{jt} \tag{6}$$

In these equations the index j refers to individual OECD countries (j=1,…,15 or 19) and the index t to time (t=1990,…1999). As we have mentioned before, b_t and FL_t refer to the beginning of period t. Following the majority of studies on the effects of financial deregulation and liberalization, one may expect that $\beta_2<0$. The sign to be expected for β_1 is unclear. If the liquidity constraints effect of government debt dominates, β_1 should be positive. If the effect on myopia dominates, it should be negative. Substituting (6) into (5), it follows that:

$$\Delta c_{jt} = \alpha_j + \beta_0 \Delta y_{jt} + \beta_1 b_{jt} \Delta y_{jt} + \beta_2 FL_{jt} \Delta y_{jt} + \varepsilon_{jt} \tag{7}$$

3.2. Preliminary econometric considerations

Data and data sources.

Table 1 below describes our data and data sources. We use annual data for the OECD countries in the 1990s. All data are standard, except our indicator for financial liberalization. Although we will consider alternative indicators in section 3.4., our main results include the per capita number of credit cards issued by Visa (see also Callen and Thimann, 1997). This approach deviates from existing work, where typically the stock of outstanding consumer credit is used (e.g. Girardin et al., 2000; Bachetta and Gerlach, 1997). For our purpose this variable is inadequate because it may be highly endogenous to the evolution of government debt, which is another variable in (6). Indeed, as we have argued before, one of the reasons for the government debt ratio to affect the excess sensitivity of private consumption to disposable

income may be that it makes banks less willing to lend. We prefer the number of credit cards outstanding because it can reasonably be expected to be more of an exogenous nature than other variables. If there were still an element of endogeneity involved, one would expect it to concern mainly the size of the credit line, rather than the number of cards issued.

Some people might want to take this discussion one step further and argue that (high) government debt may inhibit the development in general of consumer credit markets (e.g. Favero and Giavazzi, 1999, p. 3). However, as far as we know, there is no hard evidence in the literature on the relevance of this effect. Furthermore, in our data set the correlation over all countries and years between the (net) government debt ratio and the per capita number of Visa cards is totally insignificant. The correlation coefficient is 0.08. Our empirical results in section 3.3. (table 2) are fully in line with these findings. Estimating equation (7) with or without FL_{jt} as an explanatory variable hardly affects the estimated coefficient for the government debt ratio (β_1).

To estimate equation (7) we employ two alternative series for the government debt ratio. Interestingly, if a higher government debt operates by affecting the banks' willingness to lend (liquidity constraints effect), the net debt ratio may be the more relevant variable. To calculate households' future tax liabilities one can expect rational banks to take into account the government's financial assets. On the other hand, if a higher government debt operates by alerting unaware, myopic consumers, the gross government debt ratio may be more relevant. If government debt is discussed in politics or the media, the numbers typically refer to gross government debt.

Table 1. Data and data sources

C_{jt}	Private consumption in real per capita terms. Available from OECD Statistical Compendium on CD-rom (2001-II). Available for all countries.
Y_{jt}	Household disposable income in real per capita terms. Deflated by index for private consumption. Available from OECD. Available for all countries except Greece. For Greece we proxy disposable income through GDP minus net taxes. The latter are calculated as the sum of government consumption and government savings, both available from OECD.
bg_{jt}	Ratio of gross government debt to GDP. Available in 19 OECD countries: Australia, Greece, Ireland, Portugal and the 15 countries that occur in figure 1. For Finland observations are only available starting in 1989.
bn_{jt}	Ratio of net government debt to GDP. Available in each of the 15 countries that occur in figure 1. Not available for Australia, Greece, Ireland and Portugal.
FL_{jt}	Per capita number of credit cards issued by Visa International (Visa, inc.). Available in all 19 countries since 1989 (or earlier for some countries).
Note:	Since the theoretical variables bg_{jt}, bn_{jt} and FL_{jt} refer to the beginning of year t, we will in our empirical work use data for the previous year.

Estimation method.

Empirically, a number of econometric issues and complications have to be dealt with. First, Δy_{jt} being correlated to shocks in consumption (ε_{jt}), an instrumental variables approach is needed. Second, as shown by Campbell and Mankiw (1990), variation of λ over time and across countries implies heteroskedasticity in the error term ε_{jt}. Another element of cross-country variation concerns the unobserved country-specific effects α_j. Moreover, given that consumption growth is a major component of output and income growth in macroeconomic data, correlation between α_j and Δy_{jt} is obvious. An appropriate way to deal with these problems of endogeneity and heterogeneity is the use of GMM after first-differencing equation (7)[4]. A third complication is related to time aggregation in available consumption and income data. Theoretically, this induces an MA(1) component in ε_{jt} (Working, 1960). So does the inclusion of expenditures on durables in our measure of consumption (Mankiw, 1982)[5]. Consistent estimation would then require an instrument set with at least a two period gap between the regressors and the instruments. Our first-differenced GMM approach reinforces this problem. Since this approach comes down to estimating an equation for the second difference of consumption, it implies an MA(2) process in the error term. Reliable instruments should then be lagged three times. Weak forecasting power is to be expected. The use of weak instruments may result in biased coefficients in small samples (see Loayza et. al., 2000). Empirically, the problem need not be that big though. For example, also estimating a consumption function, Lopez et al. (2000) cannot reject the hypothesis that ε_{jt} does *not* contain an MA(1) component in a panel of 19 OECD countries. Actually, this is also what we shall find (see below). Twice lagged instruments are in that case reliable. Further details about these instruments are discussed in the next section.

3.3. Empirical results

Table 2 presents our main results. As a measure for government debt we use the net debt ratio. Data are available for 15 countries in 1990-99 (see table 1). In table 4 we include the gross government debt ratio. Although data are then available for more countries, for reasons to be discussed below we consider the results in table 4 to be somewhat less reliable.

As shown by Hansen (1982), the optimal GMM estimator is obtained in two steps. In our discussion, we focus on the second-step results[6]. On the whole, the specification tests in table 2 (Sargan test for overidentifying restrictions and tests for first order and second order serial correlation) do not show evidence against our estimates. The absence of significant second order serial correlation justifies our use of twice lagged 'internal' instruments (shown

[4] See e.g. Bond (2002) for a general discussion. For an excellent description of this method applied to macroeconomic consumption or savings data, see Loayza et al. (2000) and Lopez et al. (2000).

[5] Furthermore, an MA(1) component in ε_{jt} may show up if consumption levels contain a transitory component.

[6] Bond (2002) argues that the asymptotic standard errors of the two-step GMM estimates may be a poor guide for hypothesis testing in certain cases. As noted by Bond and Windmeijer (2002) this problem is especially relevant when the number of instruments grows rapidly with the time dimension, which is not the case here since we choose a fixed number of instruments per time period (for reasons explained in Loayza et. al. 2000). We nevertheless report both the first and second step results.

at the bottom of table 2)[7]. The Sargan test does not reject their joint validity. Regarding the point estimates, regression (R1) imposes the restriction that the degree of excess sensitivity is constant over time and across countries. The result is consistent with the hypothesis that a significant fraction of consumers is either liquidity constrained or myopic. This confirms the existing literature, rejecting Hall (1978). Regression (R2) demonstrates the time-varying nature of this fraction. A new result is that this fraction is significantly affected by the level of the (net) government debt ratio. The positive sign of β_1 suggests that a higher government debt ratio raises the excess sensitivity of consumption because it reinforces the incidence of liquidity constraints, a result that is fully consistent with the relationship depicted in figure 1. Any effect of a higher government debt ratio on the fraction of myopic consumers, if it exists, is clearly dominated by the opposite effect on the fraction of credit constrained consumers. Regressions (R3) and (R4) introduce financial liberalization as an explanatory variable. As we have mentioned before, we follow Callen and Thimann (1997) using data on the per capita number of credit cards issued by Visa International. In contrast to many other studies (see section 1), we find no significant negative effect on excess sensitivity from (our proxy for) financial deregulation. The net government debt ratio, however, maintains a significant positive coefficient in regression (R4).

Table 2. Estimation results for equation (7) using the net government debt ratio, 1990-99 [a]

	One-step estimates with heteroskedasticity consistent standard errors			
Estimated parameter	(R1)	(R2)	(R3)	(R4)
β_0	0.35 (3.24)	0.24 (2.35)	0.34 (2.13)	0.29 (1.61)
β_1	-	0.48 (2.80)	-	0.41 (2.55)
β_2	-	-	0.12 (0.18)	-0.26 (0.35)
	Two-step GMM estimates			
Estimated parameter	(R1)	(R2)	(R3)	(R4)
β_0	0.35 (10.6)	0.23 (5.37)	0.40 (3.10)	0.30 (2.53)
β_1	-	0.63 (6.27)	-	0.56 (5.14)
β_2	-	-	-0.20 (0.31)	-0.37 (0.56)
N. Obs.	150	150	150	150
Sargan (p-value) [(b)]	0.60	0.98	0.95	0.99
Test for first order serial correlation (p-value) [(c)]	0.016	0.048	0.021	0.054
Test second order serial correlation (p-value) [(c)]	0.191	0.295	0.249	0.397
Instrument set	Δc_{jt-2}, Δy_{jt-2}	Δc_{jt-2}, Δy_{jt-2}, $bn_{jt-2}\Delta y_{jt-2}$	Δc_{jt-2}, Δy_{jt-2}, $FL_{jt-2}\Delta y_{jt-2}$	Δc_{jt-2}, Δy_{jt-2}, $bn_{jt-2}\Delta y_{jt-2}$, $FL_{jt-2}\Delta y_{jt-2}$

Notes: [a] Absolute t-statistics in parentheses; [b] Sargan is Sargan test of overidentifying restrictions. The null hypothesis is that the overidentifying restrictions are correct; [c] The null hypothesis is that there is no first (second) order serial correlation in the error term.

[7] Using instruments that are lagged three times also yields insignificant results for second order serial correlation in the error term. Although with these instruments - most likely due to their weak forecasting power - the precision of our estimates is affected, our main conclusions about the signs and significance of the parameters in table 2 are unaffected (results available upon request).

There are various possible explanations for the insignificance of the degree of financial liberalization. A first one may be that this paper only investigates the 1990s, whereas earlier studies also included earlier decades. This explanation may make sense. It suggests that after a decade of liberalization in the 1980s, the effect on bank lending to consumers of further liberalization in the 1990s weakened. Another reason may be our panel approach. For example, McKiernan (1996) and Girardin et al. (2000) only studied one particular country. Clearly, if this were the reason, our results have the advantage of being more general. A third explanation might be that our proxy for financial liberalization is inadequate. In that case, our results would be biased against the hypothesis that financial deregulation matters for private consumption and its responsiveness to current income. To assess the relevance of this potential problem, we employ several alternative proxies in section 3.4.

Using the results of regression (R4), table 3 shows the estimated excess sensitivity parameter λ_{jt} for each country in the beginning and at the end of the 1990s. Countries are ranked according to their net government debt ratio in 1989. Unsurprisingly, given the highly significant and positive β_1 in table 2, we observe typically higher excess sensitivity in the highest debt countries (Belgium, Italy) and typically lower excess sensitivity in the lowest debt countries (Finland, Norway,…). Another interesting observation is that, on average, the estimated λ_{jt} hardly changed between the beginning and the end of the 1990s. It was close to 0.40, both in 1990 and in 1999. This is surprising, observing that the (unweighted) average net government debt ratio in the countries included in table 3 increased from about 30% in 1989 to more than 40% in 1998. The obvious explanation for this paradox concerns further financial liberalization. In most countries the per capita number of Visa cards rose strongly in the 1990s. However, given the statistically insignificant result for Visa in table 2, we should be cautious in drawing this conclusion.

Table 3. Estimated excess sensitivity (λ_{jt}), using the results of regression (R4) in table 2.

	1990	1999		1990	1999
Net debt > 50% of GDP in 1989			Net debt < 25% of GDP in 1989		
Belgium	0.92	0.85	Finland	0.06	0.06
Italy	0.80	0.84	France	0.33	0.45
Canada	0.44	0.48	Germany	0.40	0.53
			Japan	0.31	0.28
Net debt between 25% and 50% of GDP in 1989			Norway	0.02	-0.12
			Sweden	0.27	0.26
Austria	0.50	0.53	UK	0.26	0.24
Denmark	0.47	0.41			
Netherlands	0.48	0.57			
Spain	0.40	0.39	All country average (unweighted)	0.403	0.395
US	0.39	0.16			

Table 4 presents estimation results for 19 OECD countries using the gross government debt ratio. For two reasons we believe that these results may be somewhat less reliable, despite the larger sample size. First, our findings up to now strongly suggest dominance of the liquidity

constraints effect of rising government debt. If this conclusion were confirmed (and it will), the gross government debt ratio may be not the most appropriate variable. As we have mentioned before, in their lending decisions one may expect rational banks to take into account net rather than gross government debt. The test results for second order serial correlation in the error term are another reason for caution. Although the null hypothesis of no second order correlation can never be rejected at the 5% level, it sometimes can at the 10% level. To be on the safe side, it might then be preferable to adopt a three times lagged instrument set. However, the forecasting power of these instruments being much lower, we would have to pay the price of biased and imprecise estimates. We have therefore chosen to stick to a twice lagged instrument set. Discussion of the (two-step) point estimation results in table 4 can be brief. They fully confirm those of table 2. We always obtain a positive and statistically significant β_1 and an insignificant (or only marginally significant) β_2. In regression (R3) β_2 even has the wrong sign.

Table 4. Estimation results for equation (7) using the gross government debt ratio, 1990-99 [a]

	One-step estimates with heteroskedasticity consistent standard errors			
Estimated parameter	(R1)	(R2)	(R3)	(R4)
β_0	0.30 (3.30)	0.06 (0.32)	0.24 (1.99)	0.15 (0.58)
β_1	-	0.45 (1.71)	-	0.38 (1.33)
β_2	-	-	0.40 (0.76)	-0.17 (0.28)
	Two-step GMM estimates			
Estimated parameter	(R1)	(R2)	(R3)	(R4)
β_0	0.28 (10.85)	0.09 (1.10)	0.30 (4.22)	0.23 (2.12)
β_1	-	0.42 (4.52)	-	0.44 (2.76)
β_2	-	-	0.02 (0.07)	-0.73 (1.69)
N. Obs.	189	189	189	189
Sargan (p-value) [(b)]	0.39	0.80	0.85	0.99
Test for first order serial correlation (p-value) [(c)]	0.006	0.008	0.011	0.008
Test second order serial correlation (p-value) [(c)]	0.111	0.065	0.115	0.080
Instrument set	Δc_{jt-2}, Δy_{jt-2}	Δc_{jt-2}, Δy_{jt-2}, $bg_{jt-2}\Delta y_{jt-2}$	Δc_{jt-2}, Δy_{jt-2}, $FL_{jt-2}\Delta y_{jt-2}$	Δc_{jt-2}, Δy_{jt-2}, $bg_{jt-2}\Delta y_{jt-2}$, $FL_{jt-2}\Delta y_{jt-2}$

Notes: [a] Absolute t-statistics in parentheses; [b] Sargan is Sargan test of overidentifying restrictions. The null hypothesis is that the overidentifying restrictions are correct; [c] The null hypothesis is that there is no first (second) order serial correlation in the error term.

3.4. Robustness tests

In this section we organize three robustness checks on our results. The first one introduces different proxies for financial liberalization. The second one allows for unobserved country-specific fixed determinants of the degree of excess sensitivity (equation 6). The third robustness check allows for asymmetries and non-linearities in the relationships between disposable income growth, private consumption growth and government debt.

Table 5 presents the results from re-estimating equation (7) with the net government debt ratio, but using three alternative indicators for financial liberalization. These are (i) the ratio of nominal M2 to GDP, (ii) the ratio of nominal M1 to M2 and (iii) the trend in the spread between the banks' lending and deposit rates. We also mention the included proxies at the bottom of table 5[8]. Appendix A describes the correlation between them. Interestingly, the majority of pairwise correlation coefficients is smaller than 0.33 in absolute value. This obviously strengthens the case for robustness checks. Also, it raises the power of our results if they survive these checks.

Since we expect M2/GDP to be positively related to the degree of financial liberalization, this variable should get a negative sign in equation (7). For M1/M2 and the interest rate spread the opposite applies. The results in table 5 are rather disappointing. Again

Table 5. Estimation results for equation (7) using the net government debt ratio and alternative proxies for financial liberalization, 1990-99 [a]

	One-step estimates with heteroskedasticity consistent standard errors		
Estimated parameter	(R1)	(R2)	(R3)
β_0	-0.21 (0.56)	0.36 (1.70)	0.20 (1.32)
β_1	0.29 (1.39)	0.44 (2.18)	0.43 (1.91)
β_2	0.94 (1.53)	-0.31 (0.94)	-0.0001 (0.004)
	Two-step GMM estimates		
Estimated parameter	(R1)	(R2)	(R3)
β_0	-0.36 (1.05)	0.57 (1.87)	0.15 (1.25)
β_1	0.35 (1.89)	0.50 (2.87)	0.56 (4.51)
β_2	1.23 (2.12)	-0.67 (1.23)	0.009 (0.34)
N. Obs.	150	150	139
Sargan (p-value) [(b)]	0.99	0.99	0.99
Test for first order serial correlation (p-value) [(c)]	0.009	0.035	0.088
Test second order serial correlation (p-value) [(c)]	0.130	0.163	0.212
Instrument set	Δc_{jt-2}, Δy_{jt-2}, $bn_{jt-2}\Delta y_{jt-2}$, $FL_{jt-2}\Delta y_{jt-2}$	Δc_{jt-2}, Δy_{jt-2}, $bn_{jt-2}\Delta y_{jt-2}$, $FL_{jt-2}\Delta y_{jt-2}$	Δc_{jt-2}, Δy_{jt-2}, $bn_{jt-2}\Delta y_{jt-2}$, $FL_{jt-2}\Delta y_{jt-2}$
Included proxy for *FL*	M2/GDP	M1/M2	Spread between lending and deposit rates (trend)

Notes: [a] Absolute t-statistics in parentheses; [b] Sargan is Sargan test of overidentifying restrictions. The null hypothesis is that the overidentifying restrictions are correct; [c] The null hypothesis is that there is no first (second) order serial correlation in the error term.

[8] The trend in (iii) has been obtained from a Hodrick-Prescott filter. Data for M1 and M2 in most countries have been taken from OECD, Statistical Compendium on CD-rom, 2001-II. For the UK and Sweden data for M1 are not available. As a proxy we use the money base, taken from IMF, International Financial Statistics. Data for the banks' lending and deposit rates have also been taken from IMF, International Financial Statistics. For Austria these data are not available, for the UK one observation is missing, which explains the lower number of observations in regression (R3) in table 5.

concentrating on the second step estimates, β_2 obtains the wrong sign in (R1) and (R2). In (R1) the positive β_2 is even statistically significant. In (R3) β_2 obtains the expected sign, but it is highly insignificant. The conclusion seems to be unavoidable that there is no evidence that financial liberalization contributed to a lower degree of excess sensitivity of private consumption in the 1990s. By contrast, our findings for the government debt ratio survive this first robustness check, especially in regressions (R2) and (R3). In (R1) β_1 is statistically significant only at the 10% level (second step estimate).

The regressions in table 6 allow for the possibility of unobserved country-specific fixed determinants of λ. More precisely, we include country dummies in equation (6) which should capture the influence of unknown or hard to measure institutional or structural differences across countries that affect the degree of excess sensitivity. Haliassos and Christou (2000) for example point to differences related to the structure of the banking industry that may affect lending policy and the incidence of liquidity constraints. To the extent that consumer wealth is related to age (e.g. Kennickell and Starr-McCluer, 1997), the age structure of the population may also matter for the incidence of liquidity constraints. Another issue concerns different consumer preferences for Visa versus other credit card institutions. If there are structural differences in these preferences across countries, the evolution of the number of Visa cards may be a good proxy for financial liberalization *in each country over time*, but their levels in a particular year may not be comparable *across countries*.

Ideally, country dummies are included for all countries, except one. Doing this, however, one runs into problems. Including dummies for all countries in equation (6) implies an enormous increase in the number of slope coefficients to be estimated on Δy in (7). The problem is that as the number of explanatory variables in that equation rises, so do the standard errors on all estimated coefficients, including those on the government debt ratio[9]. Gujarati (2003) also points to possible problems of imprecise estimation (multicollinearity) in panels when too many dummy variables are included. Underlying the results in table 6 is an alternative approach. We have added dummies for each country separately. Insignificant dummies were dropped, whereas dummies that showed up significant at 10% or better were kept in the regression. Any time a dummy "survived", we re-tested the significance of the others. In the end we have found significantly different values for β_0 only in Denmark, Germany and the UK. For all other countries we have imposed the restriction that β_0 is identical. As to the estimation results, the first and the second regression in table 6 include the net government debt ratio as an explanatory variable, the third one includes the gross government debt ratio. Further, (R1) and (R3) include the per capita number of Visa cards as a proxy for financial liberalization, (R2) includes the ratio of M2 to GDP. We pay special

[9] Another, even more serious problem occurs if one wants to include twice lagged values of the additional explanatory variables among the set of instruments. Given the relatively large time dimension of our sample we would end up in a situation with more moment conditions (instruments) than observations, which is clearly not feasible.

attention to the latter variable because of the results in table 5. In that table, the ratio of M2 to GDP obtained a significantly positive (wrong) sign. Moreover, including M2/GDP somewhat affected the statistical significance of the government debt ratio. The results from this second robustness check are reassuring. Again considering the second step estimates, controlling for unobserved country-specific fixed determinants of the degree of excess sensitivity does not at all affect our conclusions. The effect of the government debt ratio (β_1) remains robustly positive and significant. Our proxies for financial liberalization obtain the correct (negative) sign in each regression, but they are always statistically insignificant. The latter result is especially interesting for the ratio of M2 to GDP. Controlling for unobserved country-specific effects, both the sign and the degree of statistical significance of this variable change.

Table 6. Estimation results for equation (7) allowing for differences in β_0 across countries, 1990-99 [a]

	One-step estimates with heteroskedasticity consistent standard errors		
Estimated parameter	(R1)	(R2)	(R3)
β_0	0.31 (2.22)	0.02 (0.10)	-0.05 (0.23)
β_1	0.43 (3.53)	0.25 (1.37)	0.61 (1.99)
β_2	0.52 (0.84)	0.60 (1.32)	0.29 (0.52)
Countries with signif. different β_0 [(b)]	Denmark (-), Germany (+), UK (-)	Denmark (-), Germany (+), UK (-)	Germany (+), UK (-)
	Two-step GMM estimates		
Estimated parameter	(R1)	(R2)	(R3)
β_0	0.43 (1.72)	0.63 (1.18)	0.03 (0.14)
β_1	0.67 (3.22)	0.72 (2.24)	0.69 (3.72)
β_2	-0.22 (0.14)	-0.33 (0.36)	-0.30 (0.60)
Countries with signif. different β_0 [(b)]	Denmark (-), Germany (+), UK (-)	Denmark (-), Germany (+), UK (-)	Germany (+), UK (-)
N. Obs.	150	150	189
Sargan (p-value) [(c)]	0.99	0.99	0.99
Test for first order serial correlation (p-value) [(d)]	0.013	0.002	0.006
Test second order serial correlation (p-value) [(d)]	0.204	0.125	0.162
Instrument set	Δc_{jt-2}, Δy_{jt-2}, $bn_{jt-2}\Delta y_{jt-2}$, $FL_{jt-2}\Delta y_{jt-2}$, $\Delta y_{jt-2}dum_j$ *(for each j where* β_0 *is different)*	Δc_{jt-2}, Δy_{jt-2}, $bn_{jt-2}\Delta y_{jt-2}$, $FL_{jt-2}\Delta y_{jt-2}$, $\Delta y_{jt-2}dum_j$ *(for each j where* β_0 *is different)*	Δc_{jt-2}, Δy_{jt-2}, $bg_{jt-2}\Delta y_{jt-2}$, $FL_{jt-2}\Delta y_{jt-2}$, $\Delta y_{jt-2}dum_j$ *(for each j where* β_0 *is different)*
Included variables for *b* and *FL*	net debt ratio, visa	net debt ratio, M2/GDP	gross debt ratio, visa

Notes: [a] Absolute t-statistics in parentheses; [b] The positive or negative sign behind the name of each country indicates whether the included dummy for this country is negative or positive, that is whether β_0 for this country is significantly higher (+) or lower (-) than the reported β_0. Country dummies are included if they are significant at 10% or better in the two-step GMM regression; [c] Sargan is Sargan test of overidentifying restrictions. The null hypothesis is that the overidentifying restrictions are correct; [d] The null hypothesis is that there is no first (second) order serial correlation in the error term.

Table 7 tests for asymmetries and non-linearities in the relationships between disposable income growth, private consumption growth and (net) government debt. Our results until now support the liquidity constraints hypothesis for excess sensitivity. We find no evidence for the idea of myopia. The first part of table 7 contains an additional, more direct test to discriminate between both hypotheses. If liquidity constraints are dominant, one would expect an asymmetric response of consumption to disposable income. Consumption should respond more strongly to declines than to increases in income[10]. In the case of myopia one should observe no such differences. Regressions (R1) and (R2) follow from estimating

$$\Delta c_{jt} = \alpha_j + \beta_0 \Delta y_{jt} + \beta_{pos} D_{pos} \Delta y_{jt} + \beta_1 b_{jt} \Delta y_{jt} + \beta_2 FL_{jt} \Delta y_{jt} + \varepsilon_{jt} \qquad (7')$$

with D_{pos} a dummy variable that is 1 if $\Delta y_{jt} > 0$ and zero otherwise. The myopia hypothesis for excess sensitivity would predict the estimated β_{pos} to be zero, the liquidity constraints hypothesis would predict it to be negative. As can be seen, (R1) and (R2) in table 7 fully confirm the latter hypothesis. Falling disposable income feeds through strongly in falling consumption: β_0 is estimated to be 0.65 in (R1) and 1.06 in (R2) (two-step estimates). In both regressions it is highly significant. The sensitivity of consumption to rising disposable income ($\beta_0+\beta_{pos}$) is much weaker. It is estimated to be about 0.25. Additional calculation reveals that it is still statistically significant. As to the other variables, (R2) again confirms the significant and positive effect of (net) government debt on excess sensitivity. Interestingly, for the first time we obtain a negative effect from financial liberalization (visa) that is also statistically significant (at 10%, two-step estimates).

Regressions (R3) and (R4) model the relationship between the degree of excess sensitivity and the government debt ratio in equation (5) as a linear spline. This is a piecewise linear relationship between λ and b with the line segments joining one another at one or more breakpoints. We allow for one breakpoint at a debt ratio equal to 40%. The intercept and the slope (β_1) describing the effect of government debt on excess sensitivity can differ for both segments. Speculating that banks are more likely to restrict private credit when the government debt ratio is considered to be a problem, our intuition is that β_1 should be higher for high debt ratios. Regressions (R3) and (R4) confirm this intuition. For debt ratios below 40%, we do obtain a positive effect on excess sensitivity (β_1 is about 0.3), but is not statistically significant. For debt ratios higher than 40% this positive effect is not only stronger, it is also significant at about 5% or better. Highly similar results are obtained if we choose 30% or 50% as our "critical value".

[10] Blundell-Wignall et al. (1995) present earlier empirical results on this hypothesis for the G7 and Australia in the 1960s, the 1970s and the 1980s. They tend to confirm the hypothesis, although their evidence is not very strong.

Table 7. Estimation results allowing for asymmetries and non-linearities in equation (7), 1990-99 [a]

	One-step estimates with heteroskedasticity consistent standard errors			
Estimated parameter	(R1)	(R2)	(R3)	(R4)
β_0	0.65 (2.60)	0.64 (2.27)	0.20 (2.20)	0.25 (1.62)
β_{pos}	-0.41 (1.47)	-0.51 (1.93)	-	-
β_1	-	0.41 (3.19)	-	-
β_2	-	-0.24 (0.34)	-	-0.31 (0.53)
β_1 (for $bn_{jt} \leq 0.4$)	-	-	0.27 (0.57)	0.23 (0.51)
β_1 (for $bn_{jt} > 0.4$)	-	-	0.47 (2.15)	0.45 (1.98)
	Two-step GMM estimates			
Estimated parameter	(R1)	(R2)	(R3)	(R4)
β_0	0.65 (6.80)	1.06 (4.81)	0.18 (3.23)	0.27 (1.94)
β_{pos}	-0.42 (2.82)	-0.83 (3.73)	-	-
β_1	-	0.42 (2.38)	-	-
β_2	-	-0.94 (1.77)	-	-0.53 (0.83)
β_1 (for $bn_{jt} \leq 0.4$)	-	-	0.34 (1.26)	0.30 (1.10)
β_1 (for $bn_{jt} > 0.4$)	-	-	0.79 (2.15)	0.76 (1.94)
N. Obs.	150	150	150	150
Sargan (p-value) [(b)]	0.53	0.99	0.99	0.99
Test for first order serial correlation (p-value) [(c)]	0.024	0.097	0.069	0.08
Test second order serial correlation (p-value) [(c)]	0.437	0.814	0.405	0.624
Instrument set [(d)]	Δc_{jt-2}, Δy_{jt-2}, $D_{pos}\Delta y_{jt-2}$,	Δc_{jt-2}, Δy_{jt-2}, $D_{pos}\Delta y_{jt-2}$, $bn_{jt-2}\Delta y_{jt-2}$, $FL_{jt-2}\Delta y_{jt-2}$	Δc_{jt-2}, Δy_{jt-2}, $(bn*dum+0.4(1-dum))_{jt-2}\Delta y_{jt-2}$, $((bn-0.4)*(1-dum))_{jt-2}\Delta y_{jt-2}$	Δc_{jt-2}, Δy_{jt-2}, $FL_{jt-2}\Delta y_{jt-2}$,, $(bn*dum+0.4(1-dum))_{jt-2}\Delta y_{jt-2}$, $((bn-0.4)*(1-dum))_{jt-2}\Delta y_{jt-2}$
Included variable for *FL*	-	visa	-	visa

Notes: [a] Absolute t-statistics in parentheses; [b] Sargan is Sargan test of overidentifying restrictions. The null hypothesis is that the overidentifying restrictions are correct; [c] The null hypothesis is that there is no first (second) order serial correlation in the error term.[d] *dum* is a dummy variable that equals 1 if $bn<0.4$ and 0 otherwise.

4. Conclusions and implications

Empirical studies typically find that private consumption is much more sensitive to current disposable income than is predicted by Hall's (1978) permanent income hypothesis. Standard explanations for this "excess sensitivity" of private consumption refer to liquidity constraints and/or myopia. Building on the idea of liquidity constraints, several authors have more recently endogenized the degree of "excess sensitivity" as a function of the degree of financial liberalization. In this paper we demonstrate the crucial role of the government debt ratio for the degree of excess sensitivity of private consumption. Theoretically, this role can be rationalized from different angles. On the one hand, a high or (rapidly) increasing

government debt ratio may alert unaware citizens and, as a consequence, reduce the fraction of myopic consumers. Excess sensitivity of private consumption to current income should then fall. On the other hand, high or rising government debt ratios may induce banks to reduce the amounts they lend, thereby raising the incidence of liquidity constraints and excess sensitivity of private consumption. Empirically, we test the relevance of these hypotheses in a panel data study of private consumption in the OECD countries in the 1990s. To assess the influence of the government debt, we include both the net and the gross debt ratio. Furthermore, to estimate the effects of financial liberalization we include several proxies. Our results strongly support the idea that a higher government debt ratio implies tighter credit conditions and an increase of excess sensitivity. This unfavorable effect from government debt on credit conditions seems to be strong especially when the government debt is already at a high level. Any effect of a higher government debt ratio on the fraction of myopic consumers, if it exists, is clearly dominated by the opposite effect on the fraction of credit constrained consumers. As to the effects of financial liberalization, we find no convincing evidence that it reduced excess sensitivity, at least not in the 1990s.

What are the implications of our findings? First of all, our results suggest that stabilization policy may be more effective (Keynesian) at high debt rates. As is well known from macroeconomics textbooks, the responsiveness of private consumption to current income is a crucial determinant of the Keynesian multiplier. We show that at high debt rates the multiplier may be higher. For monetary policy makers this may be good news, especially in the euro area. As reported in table 2, we find a higher degree of excess sensitivity in many EMU countries, whereas the US show a higher degree of consumption smoothing. For fiscal policy, the implications of our results are somewhat less clear-cut. Although our findings suggest that – in contrast to Nicoletti (1988) or Sutherland (1997) – fiscal policy may become more effective at high debt rates, there is reason for caution. First, to the extent that lenders tighten credit conditions when government debt rises, fiscal impulses also have negative side effects. Tax reductions financed by bonds are not only good news for liquidity constrained consumers (who can spend more), they may also be bad news for initially unconstrained consumers who cannot borrow anymore (or can only borrow less) because banks tighten credit conditions. These consumers may then have to postpone, say, the purchase of a home or a durable, which undermines the effectiveness of fiscal policy. Second, at high debt rates the most likely fiscal stance is contractionary. If it is effective, its consequences for output will not at all be pleasant. Finally, it should be kept in mind that the reason for a higher Keynesian multiplier in this paper is that consumers are liquidity constrained, and therefore prevented from realizing their optimal consumption path. As a consequence, higher effectiveness comes with a welfare cost.

As a second major implication, our findings reveal a weakness in recent studies investigating the effects of fiscal policy on private consumption and savings (e.g. Evans and Karras, 1998; Perotti, 1999; Lopez et al., 2000). All these studies assume the existence of two or three groups of consumers, the fractions of which are taken constant (e.g. permanent income consumers, liquidity constrained consumers,...). Our results challenge this assumption. The stance of fiscal policy itself and the government debt ratio may change these fractions.

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Appendix A

Correlation over all countries and years between proxies for financial liberalization

Pairwise correlation matrix

	Visa	M2/GDP	M1/M2	Spread (trend)
Visa	1.000			
M2/GDP	0.066	1.000		
M1/M2	-0.307	-0.524	1.000	
Spread (trend)	-0.719	-0.291	0.243	1.000

Note : All correlations are based on data for 1990-99 in 15 OECD countries, except correlations with the spread between lending and deposit rates. For this variable data are not available for Austria.