

BALANCE SHEET EFFECTS ON HOUSEHOLD CONSUMPTION: EVIDENCE FROM MICRO DATA

Oleksandr Movshuk
University of Toyama
movshuk@eco.u-toyama.ac.jp

12TH MACRO CONFERENCE
Hitotsubashi \ Keio \ Osaka University
December 18, 2010

Major topics in this presentation

- What's wrong with wealth effects on consumption?
- We know very little about balance sheet effects on consumption. What are 'deleveraging' effects on consumption, when households reduce their excessive debts, as they do now in the U.S.?
- Using a life-cycle model of consumption, I found that increase in net debt has large effects on expenditures of durables, and much less – nondurables.
- I will report 'a wealth effect puzzle': *i.e.*, the correlation between net wealth and consumption is completely different in micro and the aggregate data.

Representative studies of wealth effect

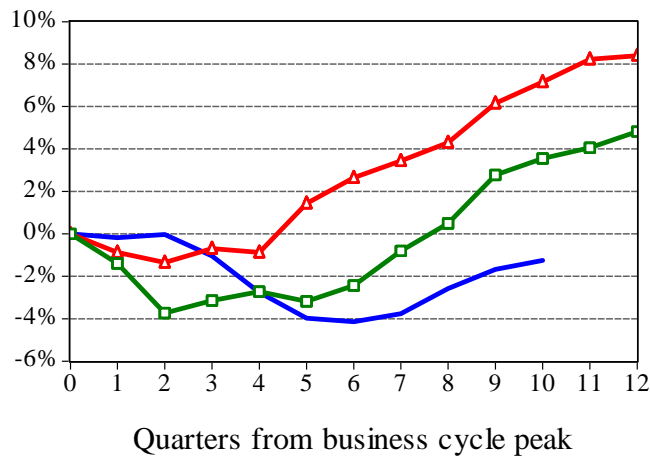
Table 3. Wealth Effects in Survey Data.

	Country/Data	Sample period	<i>mpc</i>	Elasticity
Parker (1999) Total wealth	USA/PSID ^a and CEX ^b	1984–1994	0.04	–
Dynan and Maki (2001) Equity	USA/CEX ^b	1983–1999	0.05–0.15	–
Maki and Palumbo (2001) Total wealth	USA/FFA ^c and SCF ^d	1989–1998	0.03–0.05	–
Bostic <i>et al.</i> (2005) Financial wealth	USA/SCF ^d and CEX ^b	1989–2001	–	0.02
			0.02 ^e	0.06
Juster <i>et al.</i> (2006) Equity	USA/PSID ^a	1984–1994	0.19	–
			0.03 ^f	–
Morris (2007) Housing	USA/PSID ^a	1989–2003	0.01–0.15	–
Disney <i>et al.</i> (2007) Housing	UK/FRS ^g	1993–2001	0.09–0.14	–
Attanasio <i>et al.</i> (2005) Housing	UK/FES ^h	1978–2001/ 2002	–	0.04–0.21
Campbell and Cocco (2007) Housing	UK/FES ^h	1988–2000	–	1.2

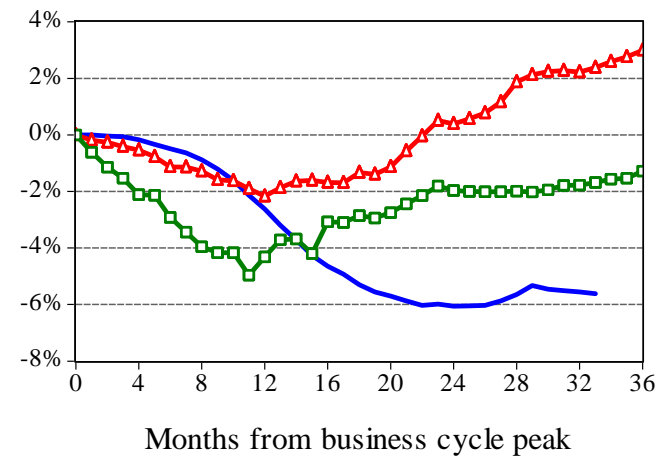
Source: Paiella M. (2009) “The Stock Market, Housing And Consumer Spending: A Survey Of the Evidence On Wealth Effects”, *Journal of Economic Surveys*, 23, 947-973.

Relative severity of the 2007-2009 recession in the U.S.

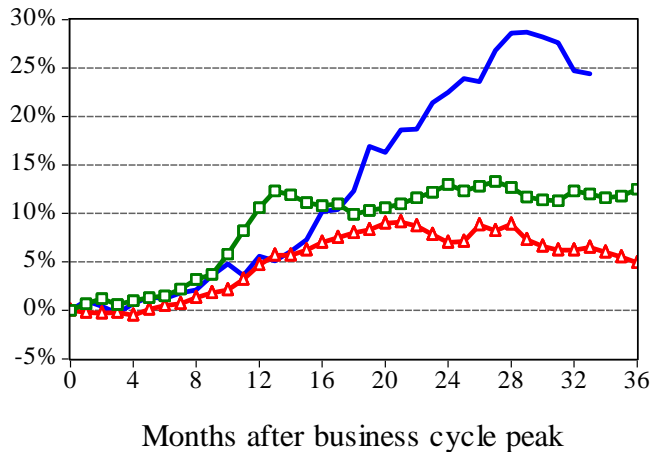
(a) Change in GDP (%)



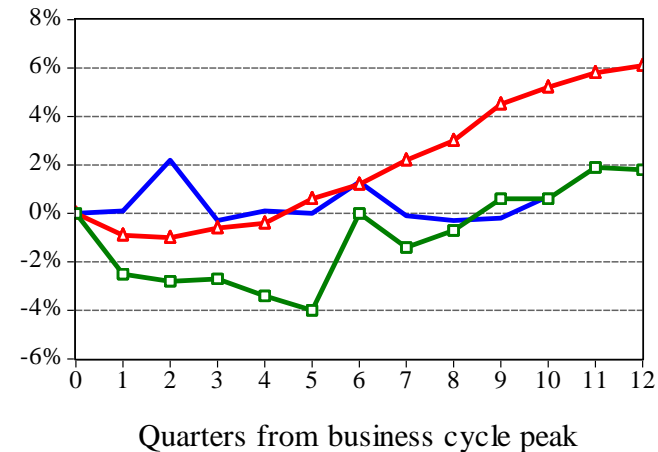
(b) Change in employment (%)



(c) Change in the share of long-term unemployment (%)



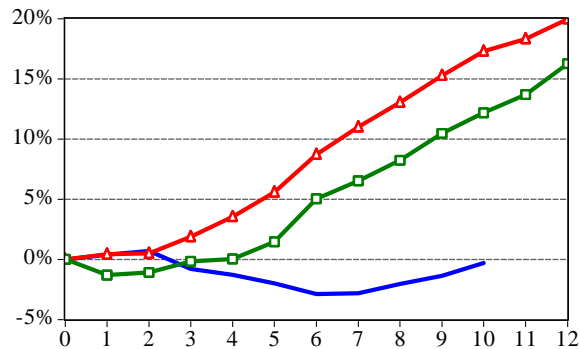
(d) Change in real disposable income per capita



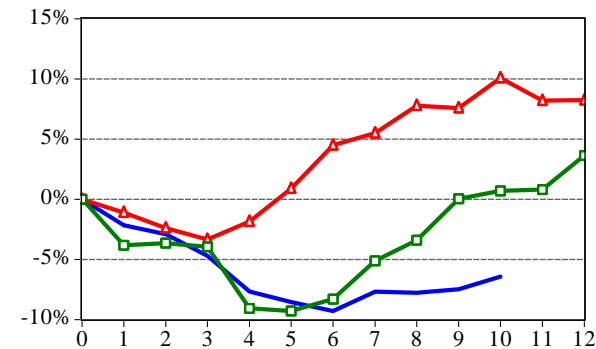
— 2007-2009 recession
 —△— Median change in post-war recessions
 —□— Worst decline in post-war recessions

Which GDP component holds back the recovery?

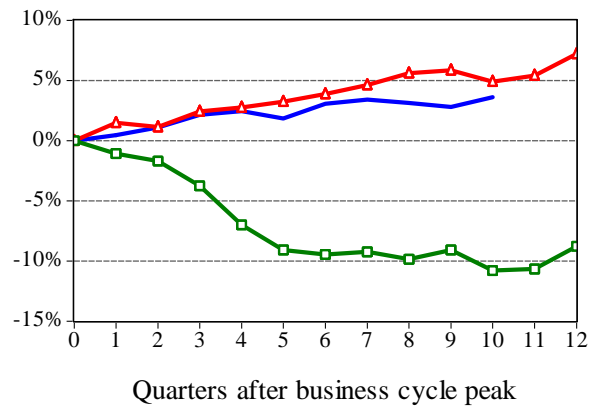
(a) Non-durable consumption and services



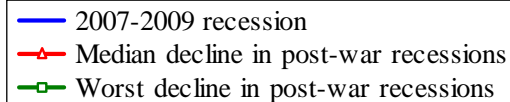
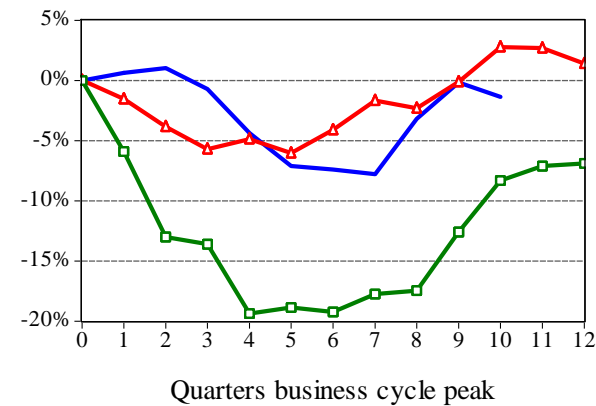
(b) Durable consumption and residential investments



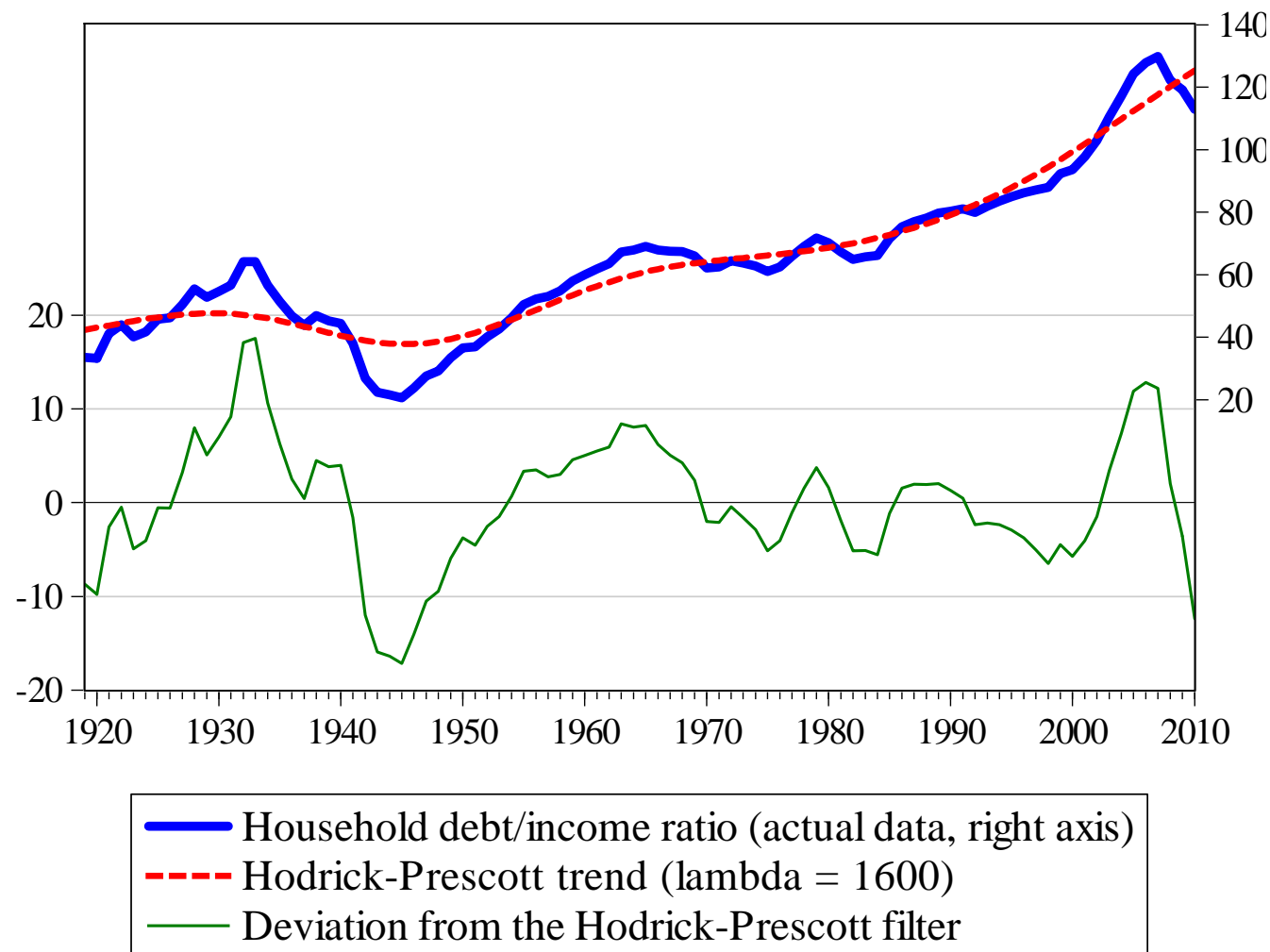
(c) Government expenditures



(d) Other components of GDP



Household debt/income ratio in the United States, 1919-2010



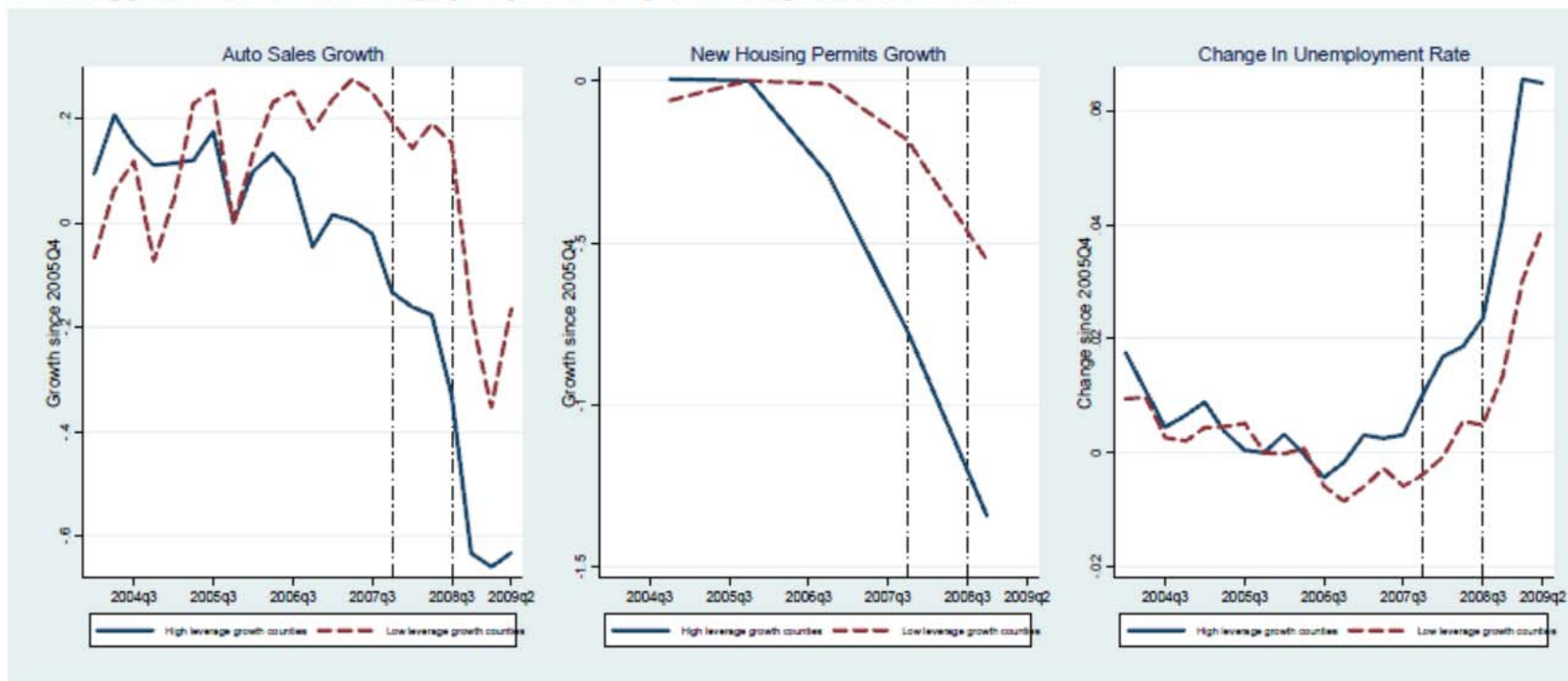
Note: the latest data are for 3rd quarter of 2010.

Household debt and recession severity: micro evidence for U.S. counties

Figure 6A

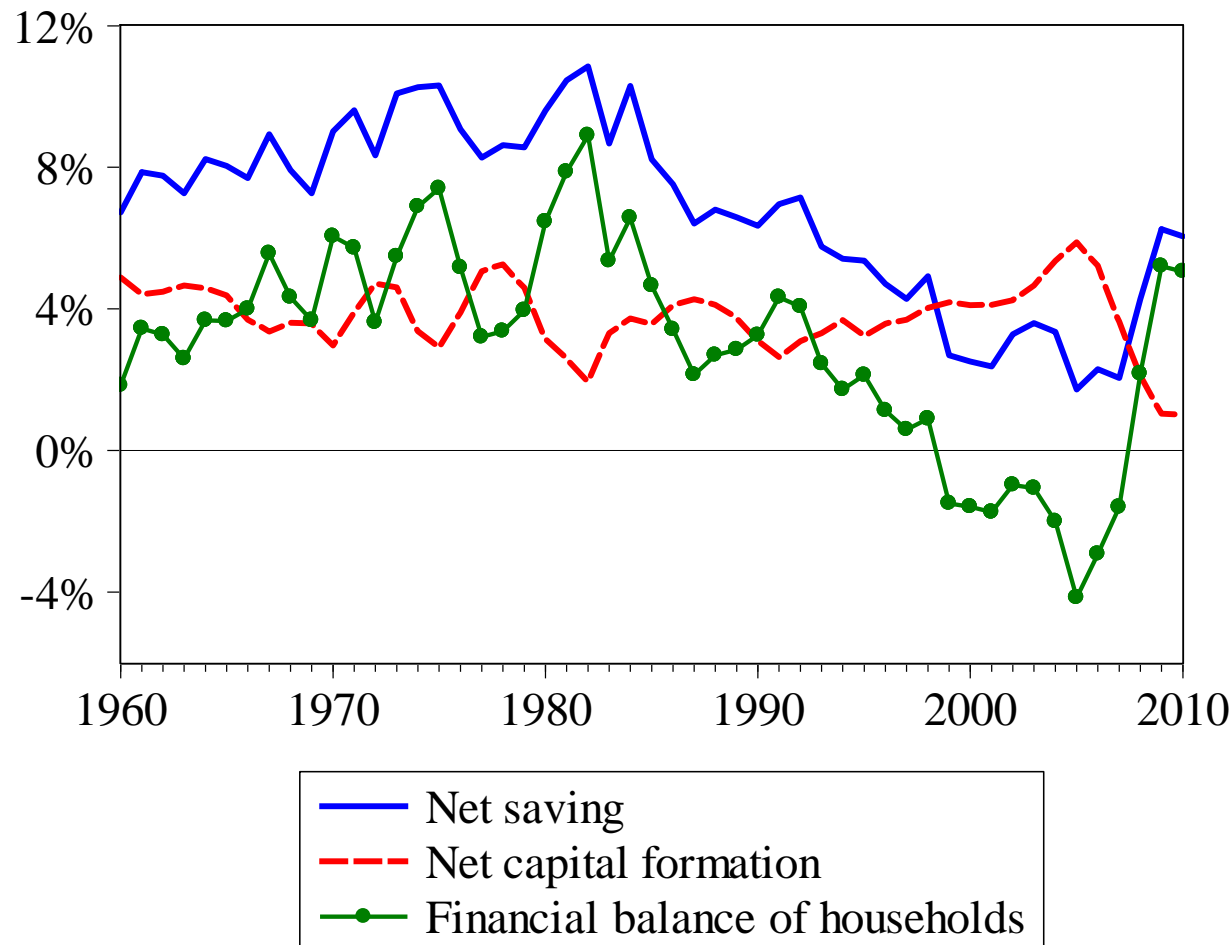
Auto Sales, New Home Building, and Unemployment Rates in High and Low Leverage Growth Counties

High leverage growth counties are defined to be the top 10% of counties by the increase in the debt to income ratio from 2002Q4 to 2006Q4. Low leverage growth counties are in the bottom 10% based on the same measure. The left panel plots the growth in auto sales since 2005, the middle panel plots the growth in new housing permits since 2005, and the right panel plots the change in the unemployment rate since 2005.



Source: Mian, A. and Sufi, A. (2010) Household Leverage and the Recession of 2007 to 2009, *IMF Economic Review*, 58, 74–117.

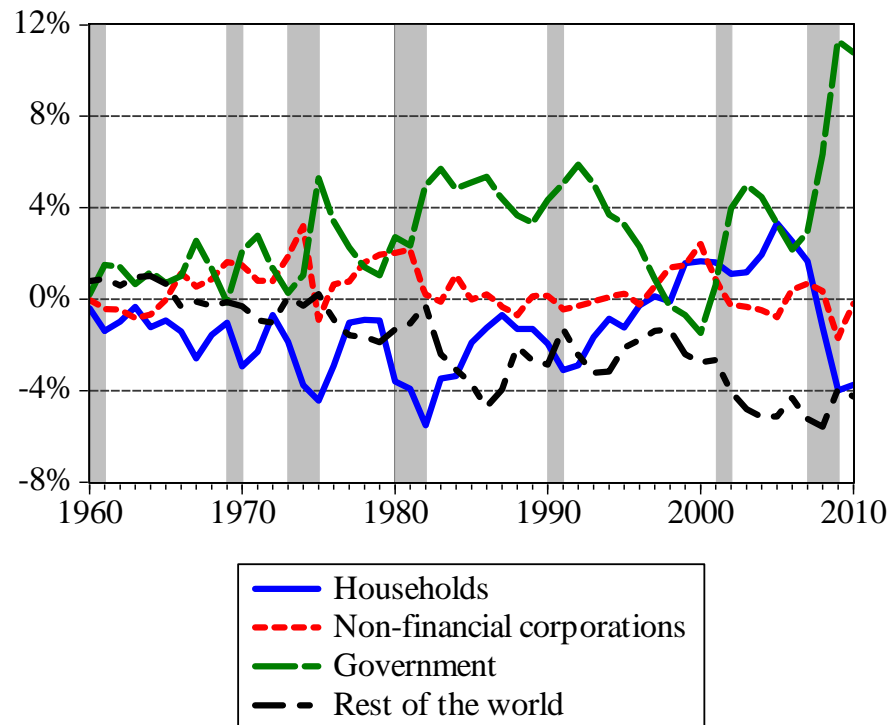
Saving-Investment balance of U.S. households (% of GDP)



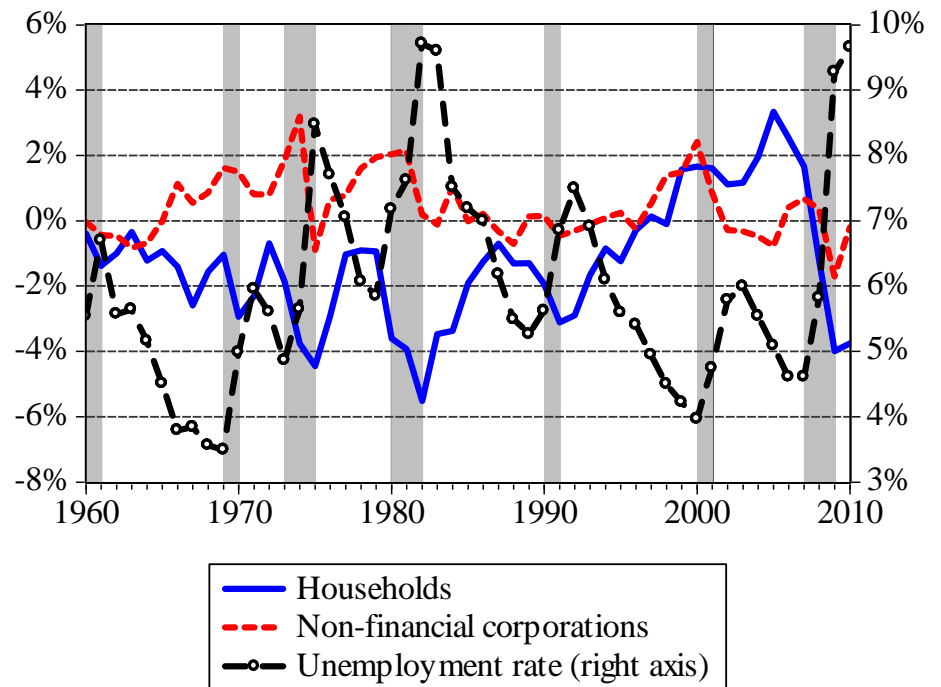
Source: Integrated Macroeconomic Accounts of the United States. This is not the official national income and product accounts (NIPA).

Investment-Saving balances of major U.S. sectors (% of GDP)

(a) I-S balances of major sectors

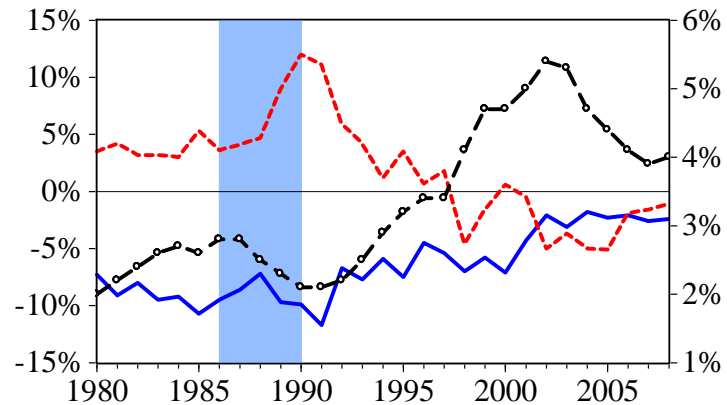


(b) I-S balance of the private sector and unemployment rate

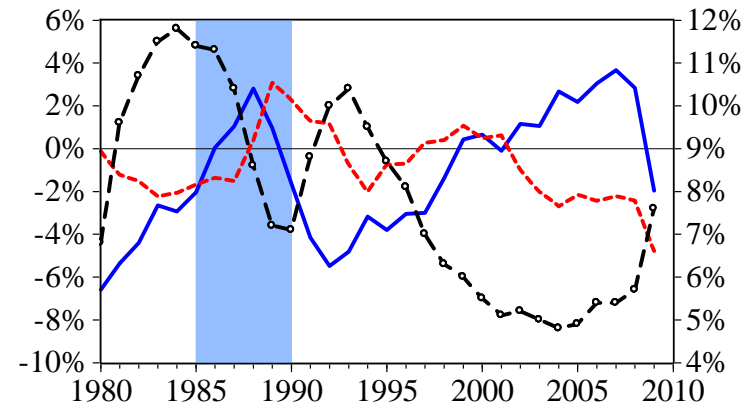


I-S balance and unemployment rate in other representative credit booms and busts

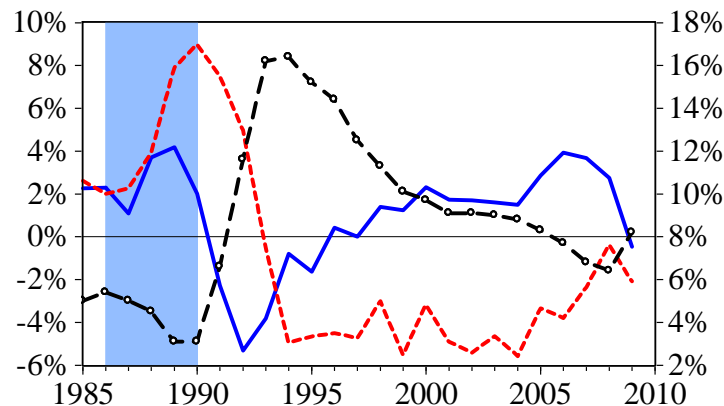
(a) Japan



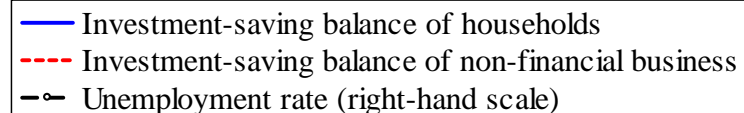
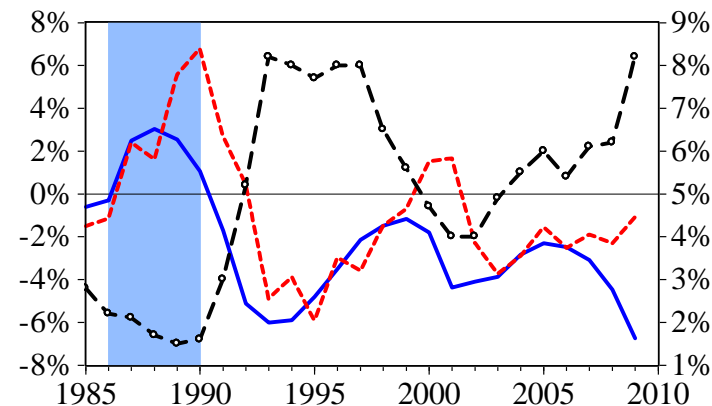
(b) United Kingdom



(c) Finland

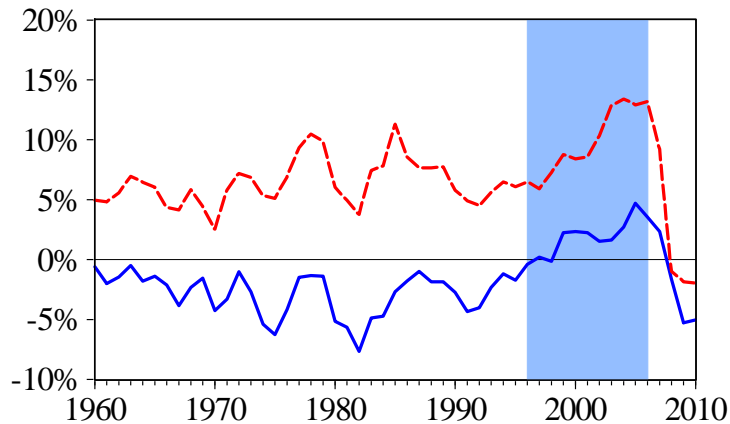


(d) Sweden

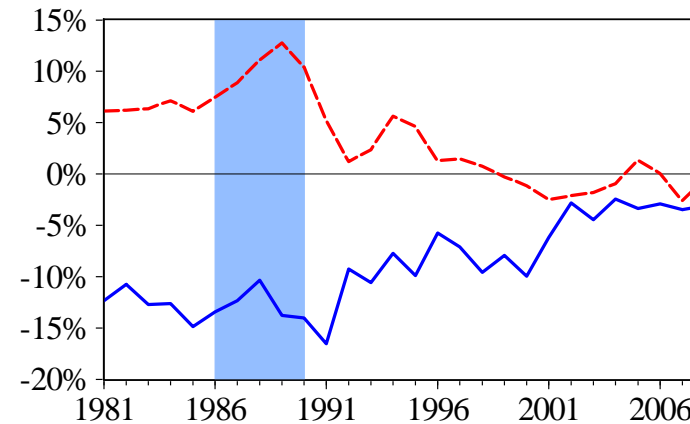


Net borrowing and I-S balances of households (% of disposable income)

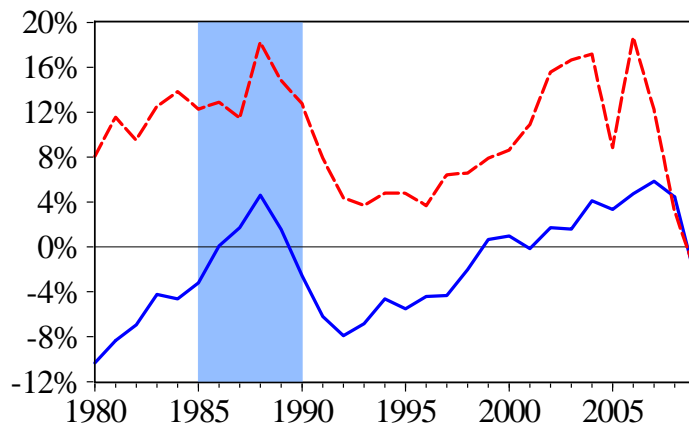
(a) United States



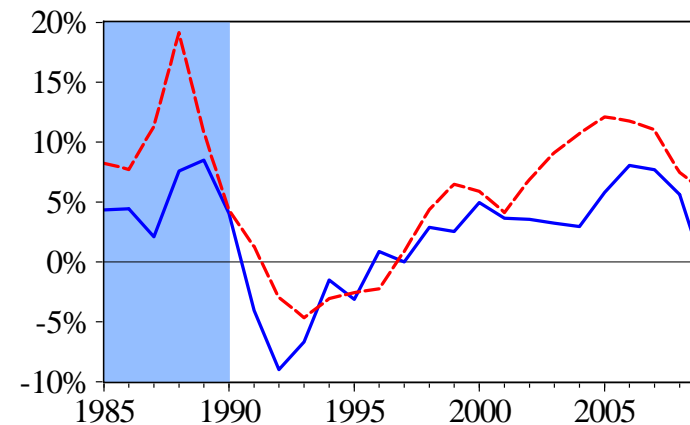
(b) Japan



(c) United Kingdom



(d) Finland



— Net saving of households / disposable income
- - - Net borrowing of households / disposable income

Models of household consumption

- I begin with a standard life-cycle model of household consumption (Fernández-Villaverde and Krueger, 2007; Attanasio et al., 2009).
- The model identifies age, cohort, and year effects, and is applied to different birth cohorts of households
- Three major effects are estimated by sets of dummy variables for the age of household head, for the year of birth of household head (to identify birth cohorts), and for the current year (to capture effects of macro shocks).

Models of household consumption (cont.)

- Denote the sets of dummy variables by D_a , D_c , and D_t . Let $Y_{c,t}$ be the real consumption of households from birth cohort c at time t . Then $Y_{c,t}$ is defined by

$$\log(Y_{c,t}) = \alpha_a D_a + \alpha_c D_c + \alpha_t D_t + \beta' z_{c,t} + \varepsilon_{c,t} \quad (1)$$

where $z_{c,t}$ denotes other control variables with effect on $Y_{c,t}$.

- If major three effects on consumption are specified as linear, there is perfect collinearity among D_a , D_c , and D_t (i.e., calendar time t is simply equal to year of birth (cohort) c plus age a).

Solutions to the collinearity problem

- Solution 1: just drop one effect, but the omitted variable bias may be serious.
- Solution 2: model age or cohort effect with small-order polynomials. Attanasio *et al.* (2009) used fifth order polynomials in age.
- Solution 3: specify age or cohort effect as a nonparametric term in a semiparametric model. For example, in Fernández-Villaverde and Krueger (2007), the age effect is a nonlinear smooth function of age a .
- In this paper, the cohort effect is a nonlinear smooth function of birth year c

$$\log(Y_{c,t}) = \alpha_a D_a + f(c) + \alpha_t D_t + \beta' z_{c,t} + \varepsilon_{c,t} \quad (2)$$

Solutions to the collinearity problem (cont.)

- Equation (2) is specified for pseudo-panel data that use cohort averages (but not raw household data)
- Attanasio *et al.* (2009) modified (2) with an extra term $u_{i \rightarrow c,t}$ for the deviation of household i from the cohort average $Y_{c,t}$. If the number of households in cohort c is large enough, $u_{i \rightarrow c,t}$ averages out to zero, and specification (2) can be estimated with individual data

$$\log(Y_{i \rightarrow c,t}) = \alpha_a D_a + f(c) + \alpha_t D_t + \beta' z_{i \rightarrow c,t} + u_{i \rightarrow c,t} + \varepsilon_{c,t} \quad (3)$$

- Similarly, if birth cohorts c are observed over sufficiently long period of time t , $\varepsilon_{c,t}$ averages out to zero.

Addition of balance sheet effects

- I estimated the effect of changes in net assets A and net liabilities L by extending equation (3) with normalized balance sheet effects

$$\begin{aligned} \log(Y_{i \rightarrow c,t}) = & \alpha_a D_a + f(c) + \alpha_t D_t + \beta' z_{i \rightarrow c,t} \\ & + f(\Delta A_{i,t}/YD_{i,t}) + f(\Delta L_{i,t}/YD_{i,t}) + u_{i \rightarrow c,t} + \varepsilon_{c,t} \end{aligned} \quad (4)$$

where $YD_{i,t}$ is disposable income.

- Note that balance sheet effects may be nonlinear. The only restriction is that $f(\Delta A_{i,t}/YD_{i,t})$ and $f(\Delta L_{i,t}/YD_{i,t})$ are smooth functions.

Balance sheet effects on consumption

	ΔA	ΔL	ΔNW	Example
Case 1	+	0	+	Assets increase from saved income
Case 2	-	0	-	Consumption is financed by running down financial assets (liabilities fixed)
Case 3	0	+	-	Consumption is financed by new debt (assets fixed)
Case 4	0	-	+	Decrease of debt, financed from saved income (<i>i.e.</i> , deleveraging)
Case 5	+	+	0	Purchase of non-financial asset, financed by installment credit
Case 6	-	-	0	Reduction of debt, financed by selling non-financial asset

Data

- I used household data from the Consumption Expenditure Survey (CEX), provided by the NBER.
- Sample period: 1982-2003.
- Major exclusion criteria: (1) incomplete income records; (2) extreme changes in $\Delta L/YD$ and $\Delta A/YD$; (3) inconsistency between sources and uses of funds.
- For criteria (2), I dropped households below 5% and above 95% in the distribution of $\Delta L/YD$. This left households with $-0.23 \leq \Delta L/YD \leq 0.46$, covering debt changes in all major credit booms and busts.
- For criteria (3), I omitted households if their uses and sources of funds differed by more than 33.3%.
- Final sample size: 26,463 households.

Estimation method

- Models (3) and (4) are estimated by generalized additive model (GAM) of Hastie and Tibshirani (1990), which is a partially-linear regression model.
- The GAM requires specifying the degree of smoothness of its nonparametric terms. I used the modified cross-validation (MGCV) algorithm of Wood (2004) that endogenously selects the degree of smoothness.
- The degree of smoothness is given by ν , which is the number of degrees of freedom used in approximating nonparametric components of the GAM.
- For linear effects, $\nu = 1$. Larger ν indicate increased nonlinearity.

Estimation results

Table 2.
Model estimates for household consumption of durables.

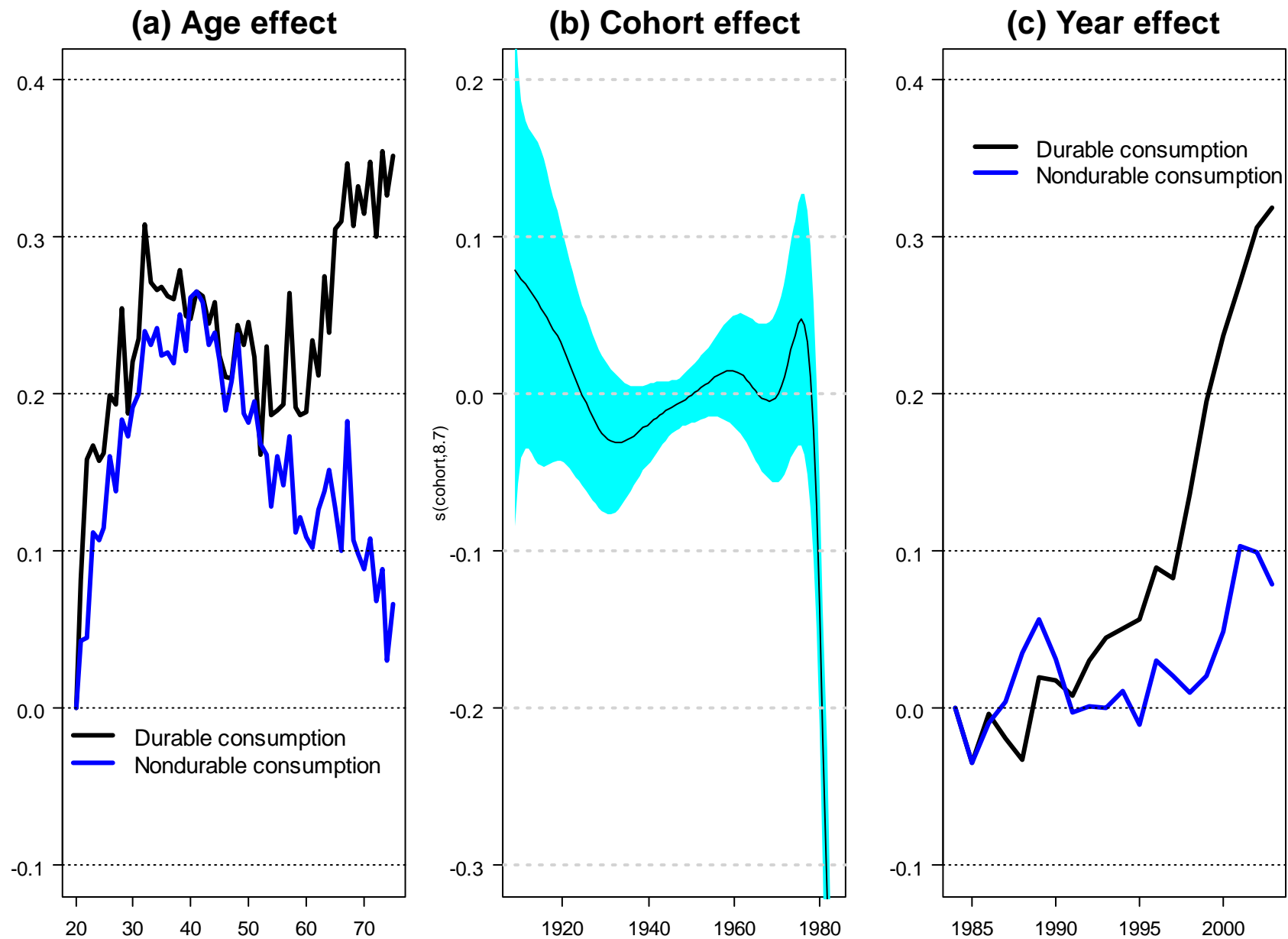
<i>Dependent variable: log of durable consumption expenditures</i>				
	<i>Basic model</i>		<i>Model with balance sheet effects</i>	
	Coef.	p-value	Coef.	p-value
Intercept	9.223	< 0.001 ***	9.238	< 0.001 ***
High school	-0.086	< 0.001 ***	-0.079	< 0.001 ***
College	0.150	< 0.001 ***	0.136	< 0.001 ***
Graduate	0.302	< 0.001 ***	0.297	< 0.001 ***
Full time/Full year	0.452	< 0.001 ***	0.413	< 0.001 ***
Part time/Full year	0.276	< 0.001 ***	0.254	< 0.001 ***
Full time/Part of year	0.309	< 0.001 ***	0.272	< 0.001 ***
Part time/Part of year	0.180	< 0.001 ***	0.158	< 0.001 ***

Part of the table is omitted

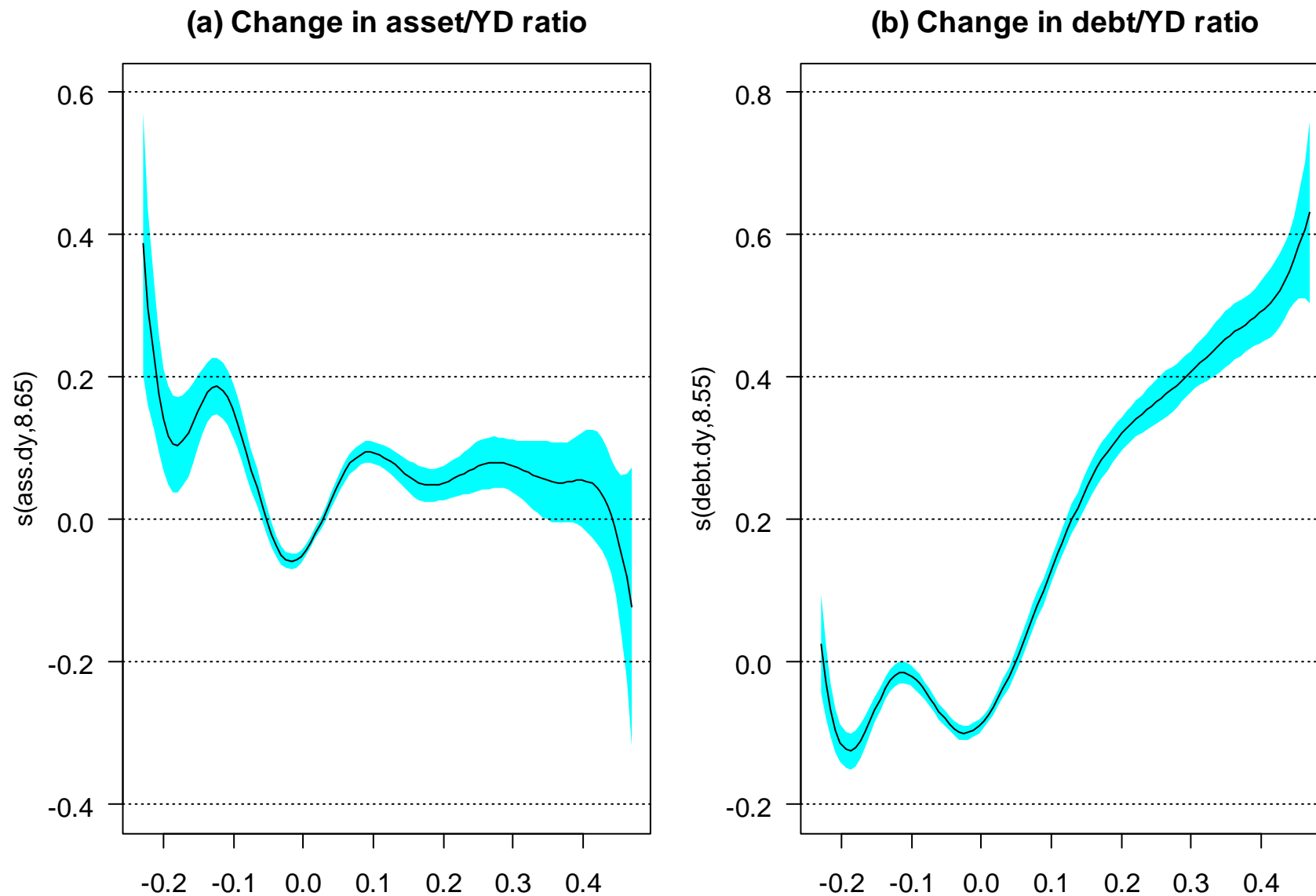
<i>Estimated smooth functions</i>				
	E.d.f.	p-value	E.d.f.	p-value
<i>f(cohort)</i>	8.710	< 0.001 ***	8.700	< 0.001 ***
<i>f(debt/disposable income)</i>			8.550	< 0.001 ***
<i>f(assets/disposable income)</i>			8.650	< 0.001 ***
Deviance explained	0.583		0.628	
GCV score	32,145		28,732	
Number of households	26,463		26,463	

Note: basis functions for nonparametric terms are P-splines.

Estimation results (cont.)

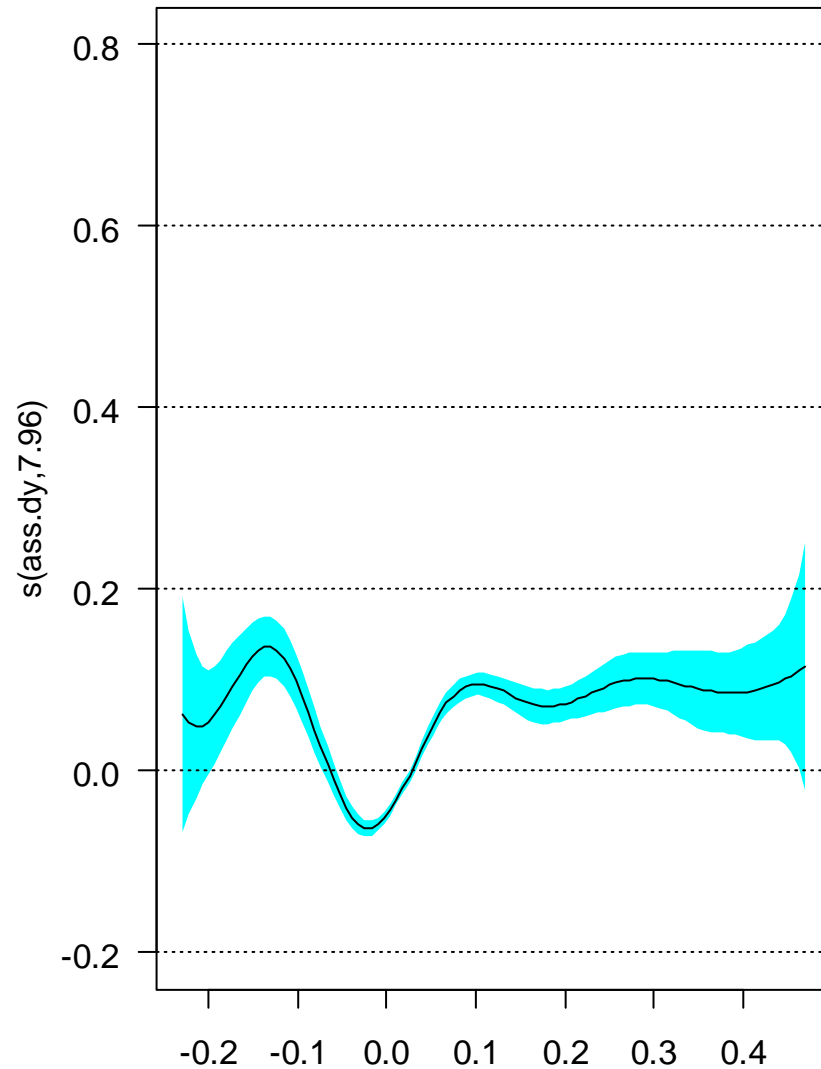


Balance sheet effects on durables

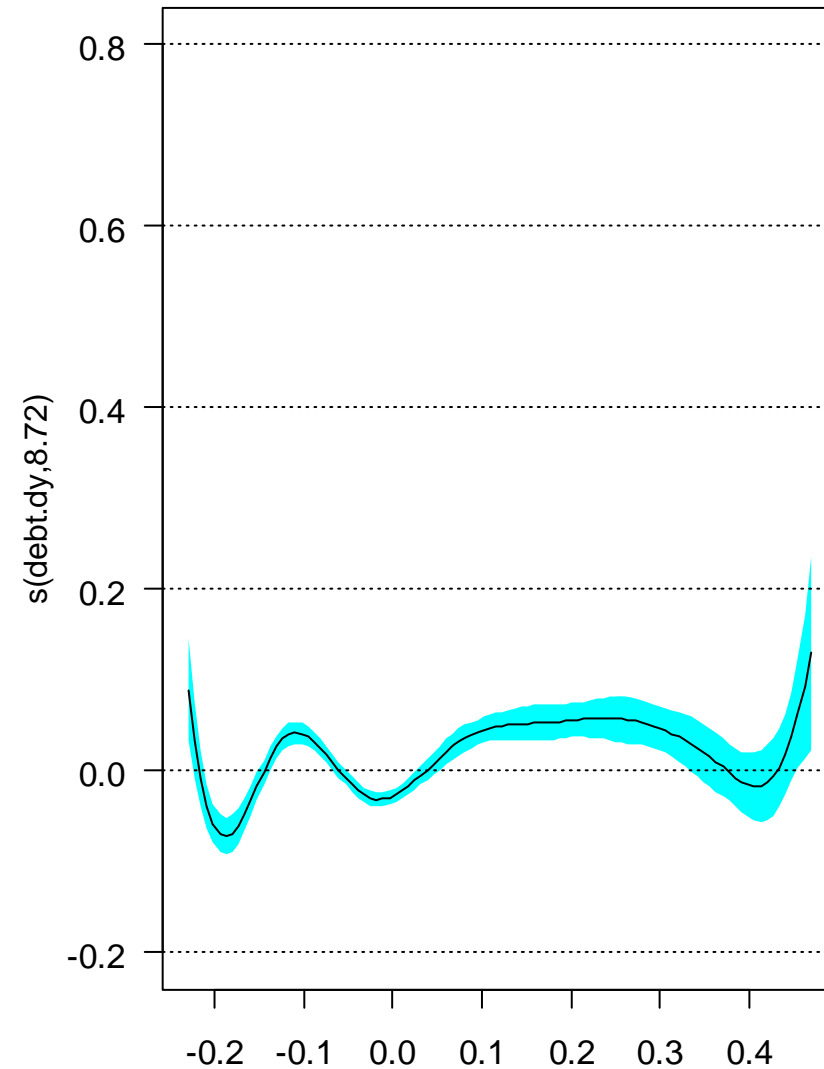


Balance sheet effects on nondurables

(a) Change in asset/YD ratio

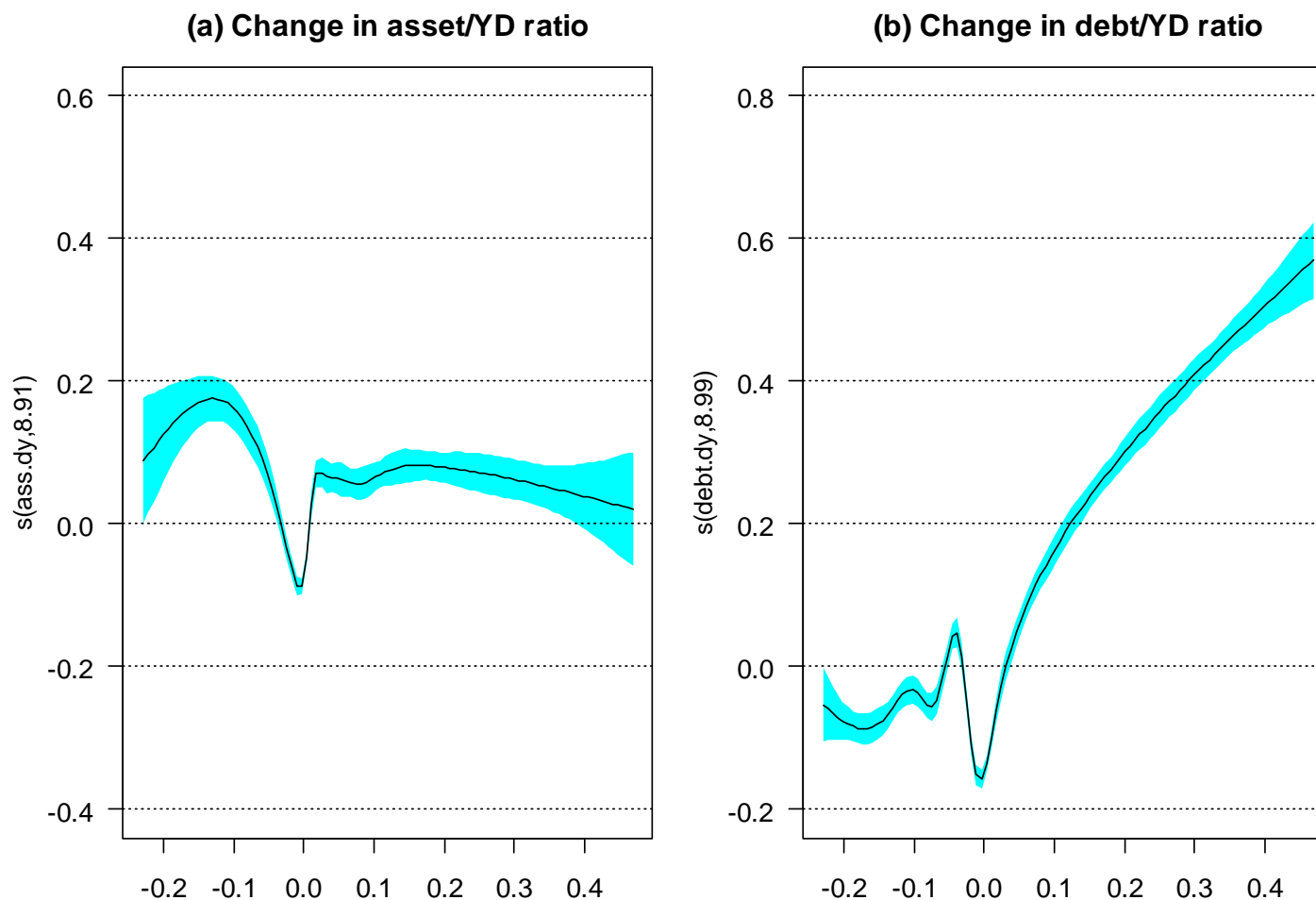


(b) Change in debt/YD ratio



Robustness check

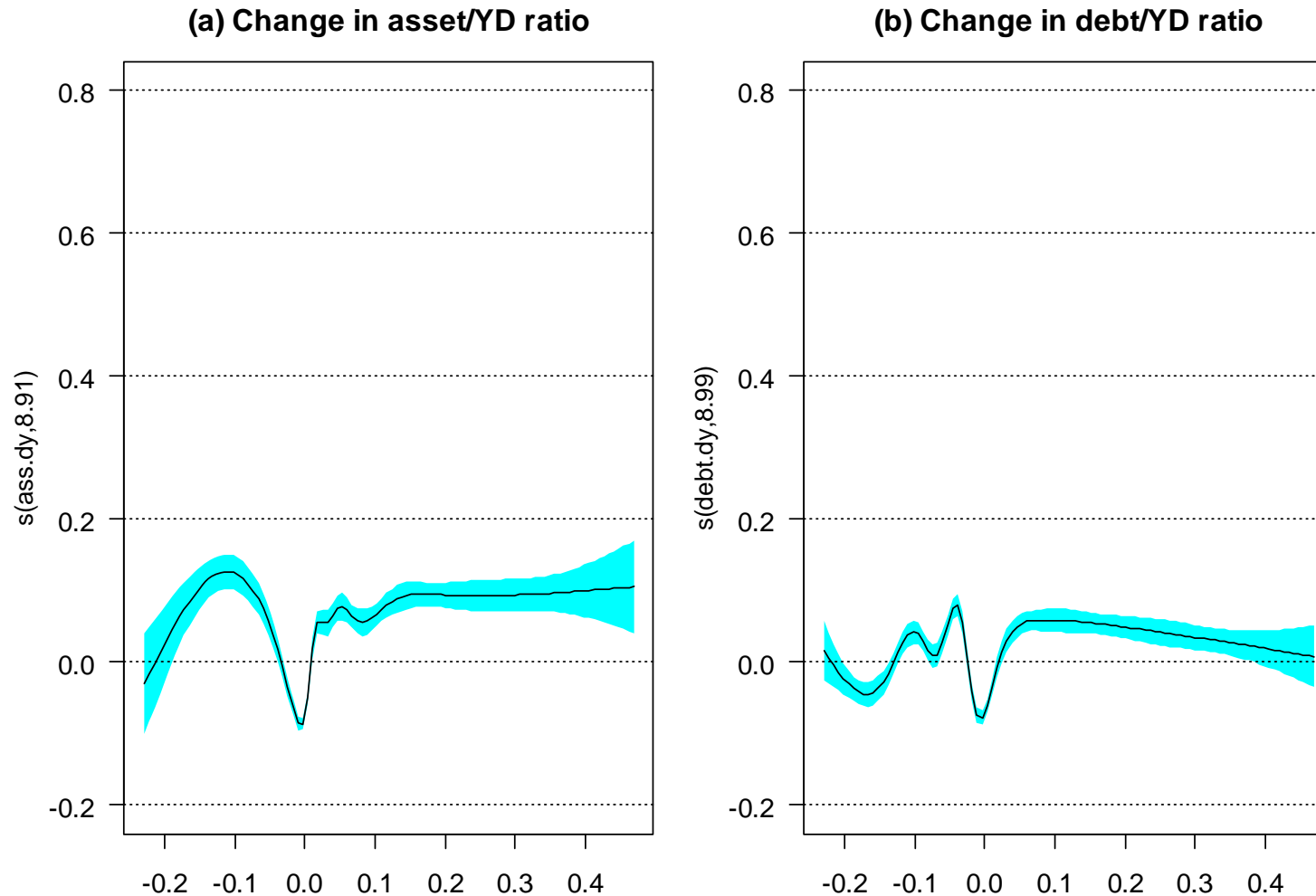
Balance sheet effects on durables



Note: basis functions for nonparametric terms are cubic regression splines

Robustness check

Balance sheet effects on nondurables



Note: basis functions for nonparametric terms are cubic regression splines

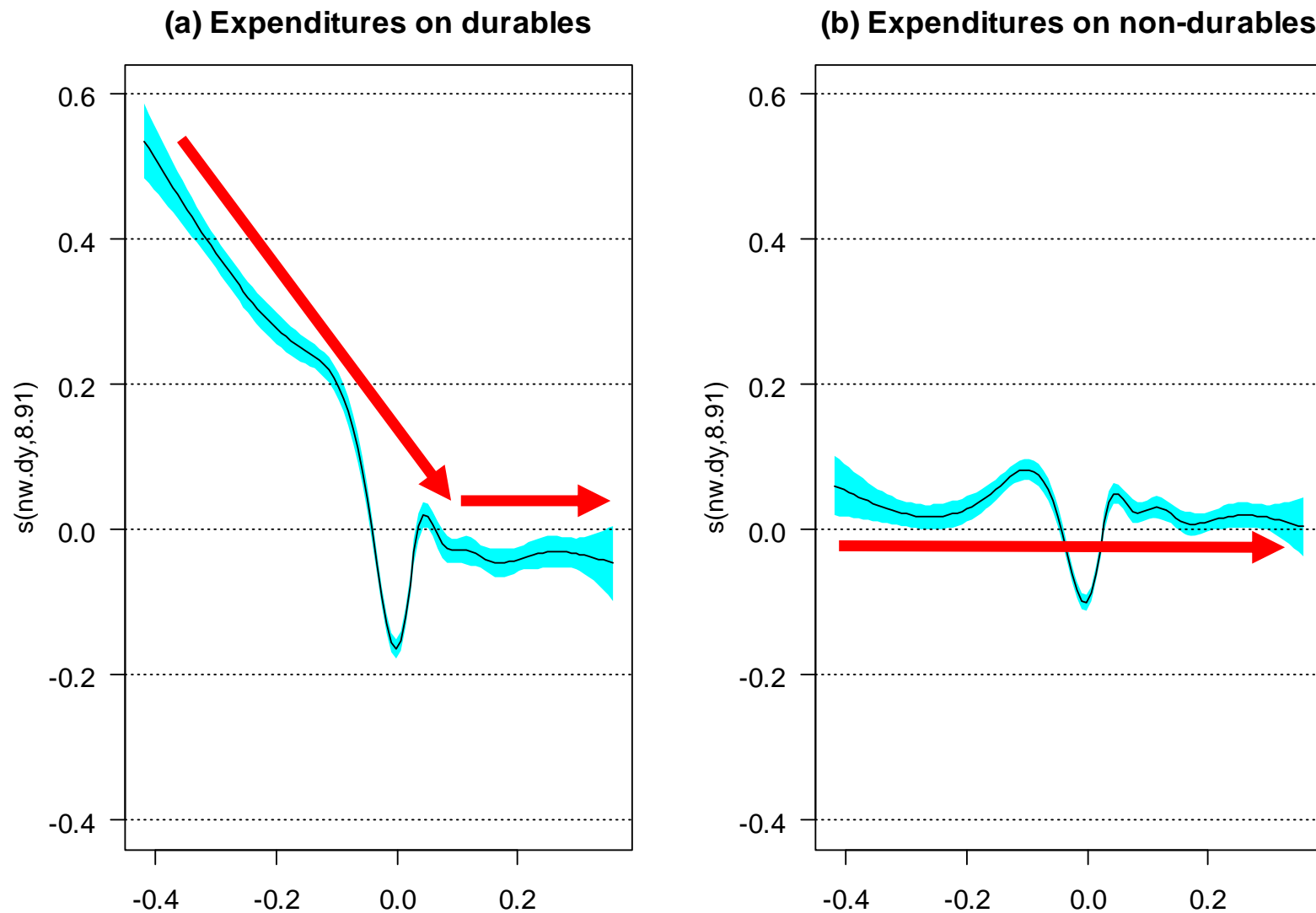
Balance sheet effects in the context of the latest U.S. credit bubble and bust

- In mid-1990s, households increased their net debt by about 6% of disposable income. This was still close to the historical norm for U.S. households
- At the top of the credit bubble, net debt flow rose to 13-14% of disposable income
- Using debt-consumption profile in Figure 9, panel (b), the extra debt flow increased durable consumption by about 20 percentage points
- When the net debt flow slumped to -2% of income in 2008-2010, the deleveraging of households reduced their consumption of durables by about 30 percentage points.

A comparison with past studies

- Conventional studies of the wealth effect on consumption do not separate assets and liabilities, but (1) merge them in the net worth, or (2) use aggregate indices of stock market/housing wealth
- A consensus estimate is that the marginal propensity of consumption is about 3-5 cents for 1\$ increase in stock market/housing wealth.
- Would results be the same with the micro data?
- To answer this question, I created a new sample that omitted households with extreme 5% changes in negative and positive net worth. The final sample had 27,168 households with $-0.42 \leq \Delta NW/YD \leq 0.36$.

Changes in net worth and consumption



Note: basis functions for nonparametric terms are cubic regression splines

Tentative reconciliation of the puzzling result

- Suppose that asset markets are booming
- With increased asset prices, banks lower their borrowing standards
- Households borrow more, and reduce their net worth
- New debt increases durable consumption, while increased assets ($\Delta A/YD > 0$) have no effects on consumption
- With increased durables, the total consumption rises as well, and the aggregate data shows a positive correlation between the total consumption and indices of stock market/housing wealth
- But at the micro level, there is negative correlation between increased consumption and reduced net worth of households

Concluding remarks ...

- Sectoral I - S financial balances deserve more attention. In this framework, households not only consume, but also invest (in housing), and the business sector not only invests, but saves (from retained earnings)
- While $I=S$ holds for the whole economy, the identity does not hold for individual sectors. In particular, during credit bubbles, I of households often exceed their S , and the shortfall of funds is financed by new debts
- This paper showed that this increased credit flow to households has large real effects on durable consumption
- As for the relative importance of balance sheet effects, it is increased debts, but not increased assets, that matter for household consumption

... and an unpleasant policy implication

- “This approach [QE2] eased financial conditions in the past and, so far, looks to be effective again ... Higher stock prices will boost consumer wealth and help increase confidence, which can also spur spending”

Ben Bernanke on expected effects from the QE2,
Washington Post, November 4, 2010.

- If estimates in this paper of net asset effects on consumption are correct, the QE2 will not work as intended