# Household debt and spending in the United Kingdom

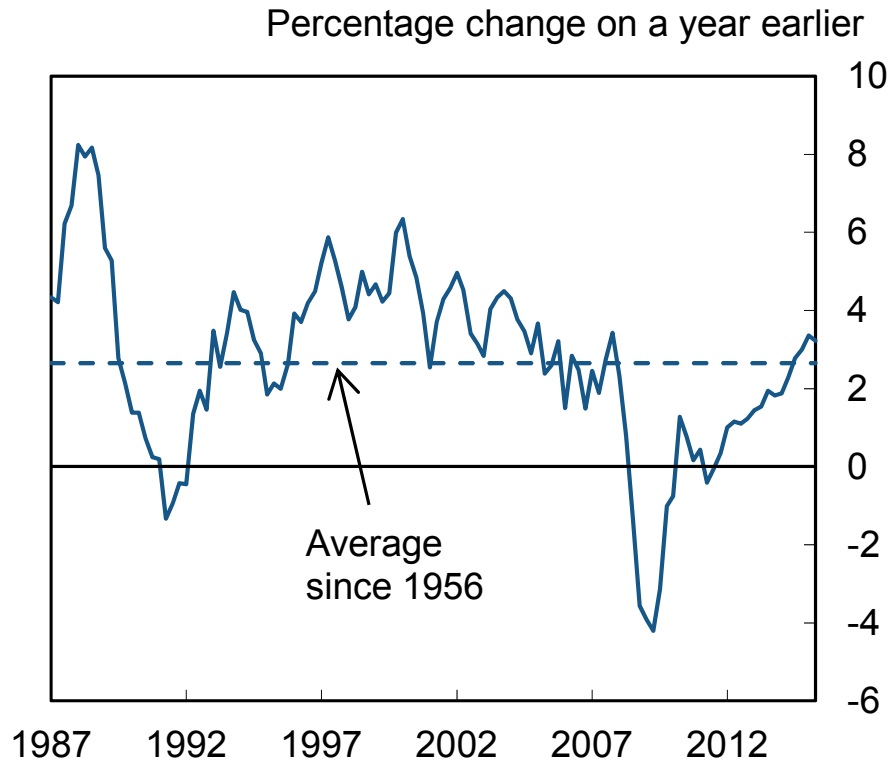Philip Bunn and May Rostom

Bank of England
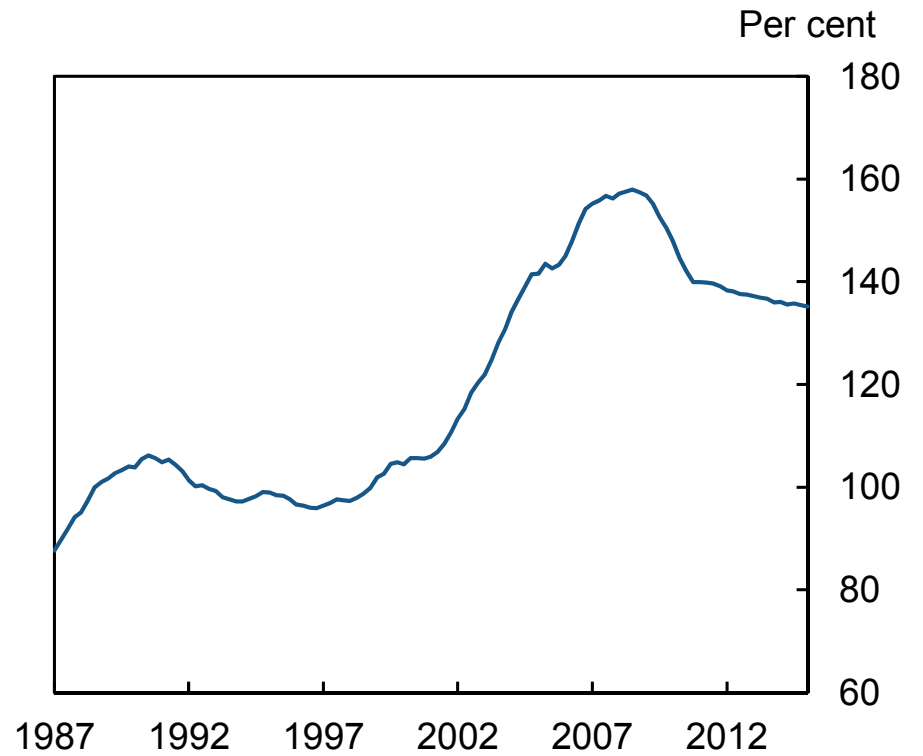
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# Outline

- Motivation

- Literature/theory

- Data/methodology

- Econometric results

- Reasons for different spending responses

- Conclusion/policy implications

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# Consumption growth

# Household debt to income

Percentage change on a year earlier

Per cent



Average since 1956

1987    1992    1997    2002    2007    2012

1987    1992    1997    2002    2007    2012

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# Motivation

- There was a large build up of household debt in the UK before the financial crisis

- Did households who had high levels of pre-crisis debt reduce their consumption by more than others after the crisis?

- And did debt provide any support to spending before 2007?

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# Why this matters for policy

- Want to understand the reasons for weakness in household spending during the financial crisis

- More generally, it is important to understand implications of higher levels of indebtedness

- Greater risk of households suffering financial distress following shocks to income or interest rates may pose direct risks to banking system

- Larger spending cuts could have knock on effects for rest of the economy
  - Financial distress could increase further
  - Affects monetary policy decisions

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# Should debt affect household spending?

- In a simple life-cycle model, households borrow or save to smooth their consumption and debt has no causal effect on spending decisions

- But assumptions of the simple model may not hold
  - Households' ability to borrow may change
  - Households are not certain about their lifetime incomes

- Some models do find a role for debt in affecting spending by allowing changes in income expectations or credit conditions to interact with debt (King (1994), Eggertson and Krugman (2012))

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# Literature

- Mian, Rao & Sufi (2013)
  - Decline in consumption was greater in regions of the US that had higher debt prior to the crisis

- Dynan (2012)
  - Highly leveraged US mortgagors had larger declines in spending between 2007-2009

- Andersen, Duus and Jensen (2014)
  - Negative correlation between pre-crisis LTV and change in consumption during crisis in Denmark

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# Consumption growth

# Consumption relative to income
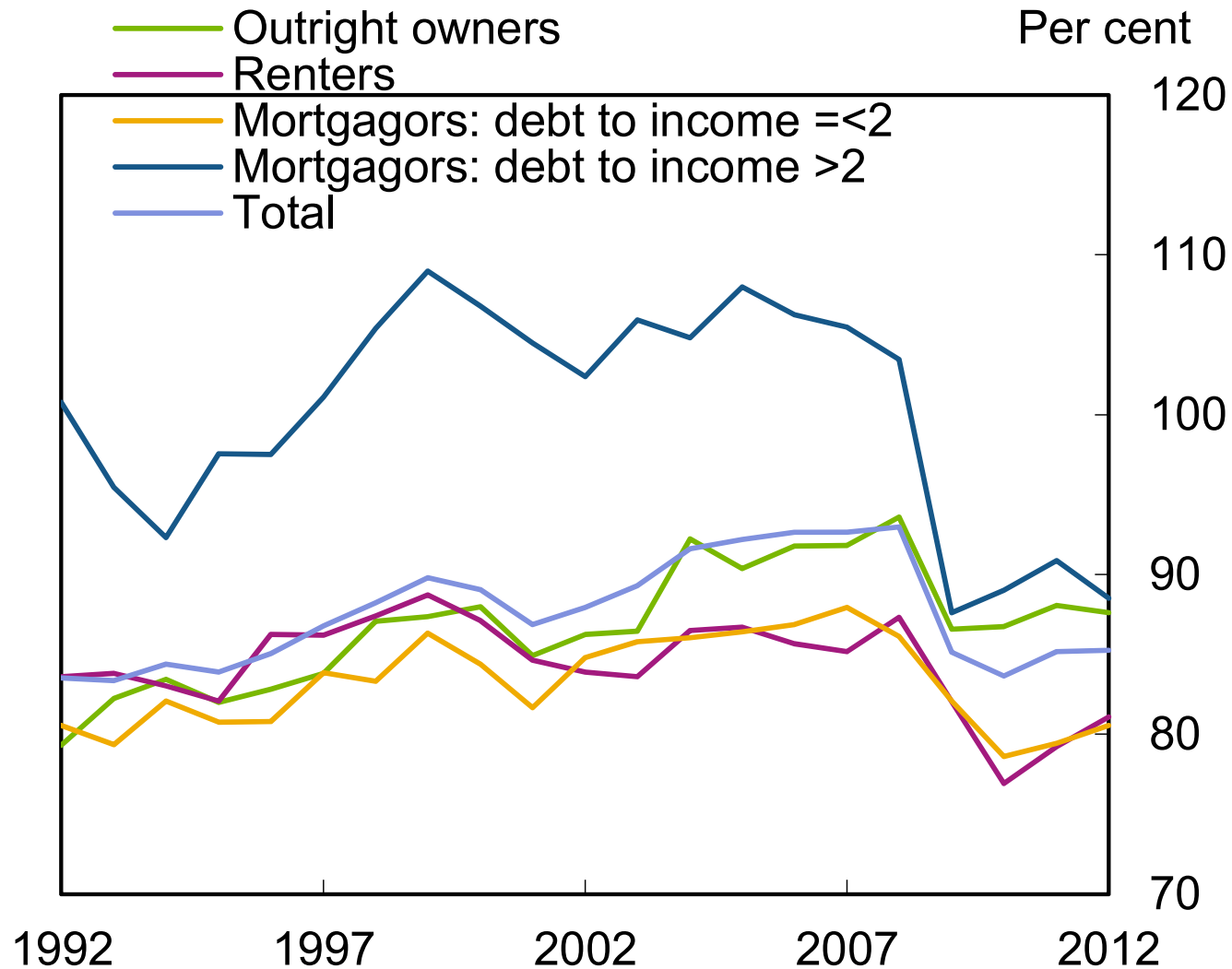
# Research design

- Ideally would use household panel data to look at changes in consumption over the crisis period by debt level

- But there is no panel in the UK with good consumption and balance sheet data, only repeated cross-section

- Follow 2 different approaches:
  1. Create a pseudo panel (Deaton (1985)) to look at changes in consumption for cohorts
  2. Look at how level of consumption varies by debt level in cross-sectional data and how that changes over time

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# Data

- Living Costs and Food Survey (1992-2012)

  – Main source of UK consumption microdata

  – Repeated cross section of UK households (5300 a year)

  – Focus only on households where head is aged 21-69

  – Use non-housing consumption

  – Secured debt data: level of outstanding mortgage debt

- Wealth and assets survey (3 waves, 2006-12)

  – Merge in with LCFS at cohort level

  – Data on housing wealth, financial wealth and unsecured debt

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# Pseudo panel research design

- We estimate the following equation:

$$\Delta C_{it} = \beta_1 (D_{it-1} / Y_{it-1}) + \beta_2 \Delta Y_{it} + \beta_3' \Delta W_{it} + \beta_4' \Delta HH_{it} + e_{it}$$

- Assess sensitivity to different cohort definitions:
  — Single birth years
  — Single birth years by mortgagor/non-mortgagor status
  — 5 birth years by mortgagor/non-mortgagor status
  — 10 birth years by region

- Pool 2006/07 and pre-crisis period and 2009/10 as post-crisis

- Minimum cell size of 50 (averages of 198, 110, 475 and 159)

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# Pseudo panel regression results 1

Dependent variable: Δln(non-housing consumption 06/07 to 09/10)

| Cohort definition | Single birth year | | Single birth year, mortgagor/non-mortgagor | | 5 birth year, mortgagor/non-mortgagor | | 10 birth year, region | |
|---|---|---|---|---|---|---|---|---|
| | [1] | [2] | [3] | [4] | [5] | [6] | [7] | [8] |
| **06/07 mortgage debt to income ratio** | -0.030** (0.014) | | -0.028*** (0.007) | | -0.026** (0.009) | | -0.024 (0.014) | |
| **06/07 mortgage loan-to-value ratio** | | -0.128* (0.064) | | -0.153*** (0.038) | | -0.160** (0.054) | | -0.129** (0.050) |
| Observations | 45 | 45 | 76 | 76 | 19 | 19 | 53 | 53 |

All equations are estimated by OLS.  Robust standard errors in parentheses, *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

All equations also include change in income, change in housing wealth, change in financial wealth, change in number of adults, change in number of children and a constant.

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# Pseudo panel regression results 2

Changes 2006/07 to 2009/10.  Single birth year, mortgagor/non-mortgagor cohorts.

| Dependent variable | Δln(Non-housing consumption) | Δln(Non-housing consumption) | Δln(Durables) | Δln(Non-durables) |
|---|---|---|---|---|
| | [1] | [2] | [3] | [4] |
| Δln(Income net of mortgage interest) | | 0.602*** (0.117) | 0.934*** (0.195) | 0.447*** (0.147) |
| Δln(Income before mortgage interest) | 0.612*** (0.120) | | | |
| **Predicted 06/07 mortgage debt to income ratio** | | | | |
| **Actual 06/07 mortgage debt to income ratio** | **-0.017** (0.008)** | **-0.027*** (0.007)** | **-0.051*** (0.013)** | **-0.010 (0.012)** |
| 06/07 unsecured debt to income ratio | | -0.020 (0.122) | | |
| Observations | 76 | 76 | 76 | 76 |

All equations are estimated by OLS.  Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. All equations also include change in housing wealth, change in financial wealth, change in number of adults, change in number of children and a constant.

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# Pseudo panel regression results 3

Dependent variable: $\Delta\ln$(non-housing consumption)

Single birth year, mortgagor/non-mortgagor cohorts

| Time period | 06/07 to 09/10 | 06/07 to 11/12 | 00/01 to 03/04 | 03/04 to 06/07 |
|---|---|---|---|---|
| | [1] | [2] | [3] | [4] |
| **Mortgage debt to income ratio at start of period** | **-0.028*** <br> (0.007) | **-0.031*** <br> (0.007) | **0.009** <br> (0.009) | **0.006** <br> (0.008) |
| Observations | 76 | 73 | 78 | 78 |

All equations are estimated by OLS.  Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

All equations include change in income, change in number of adults, change in number of children and a constant.

Equations [1] and [2] also include change in housing wealth and change in financial wealth.

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# Cross-sectional analysis research design

- We estimate the following equation:

$$C_{it} = \beta_1 (D_{it}/Y_{it}) + \beta_2' (D_{it}/Y_{it}) * year_t + \beta_3' \, year_t + \beta_4' \, cohort_i + \beta_5' \, X_{it} + e_{it}$$

vector

- Allow coefficient on debt to income to vary by year, relative to 2007

- Estimate from 1992-2012

- Include controls for income, birth cohort, age, household composition, education, employment status, region and house prices

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# Cross sectional regression results

| Dependent variable: ln(non-housing consumption) | (1) |
|---|---|
| Mortgage debt to income ratio year interactions (reference year 2007): | |
| 2008 | -0.008 (0.007) |
| 2009 | -0.024*** (0.007) |
| 2010 | -0.017** (0.007) |
| 2011 | -0.022*** (0.007) |
| 2012 | -0.029*** (0.007) |

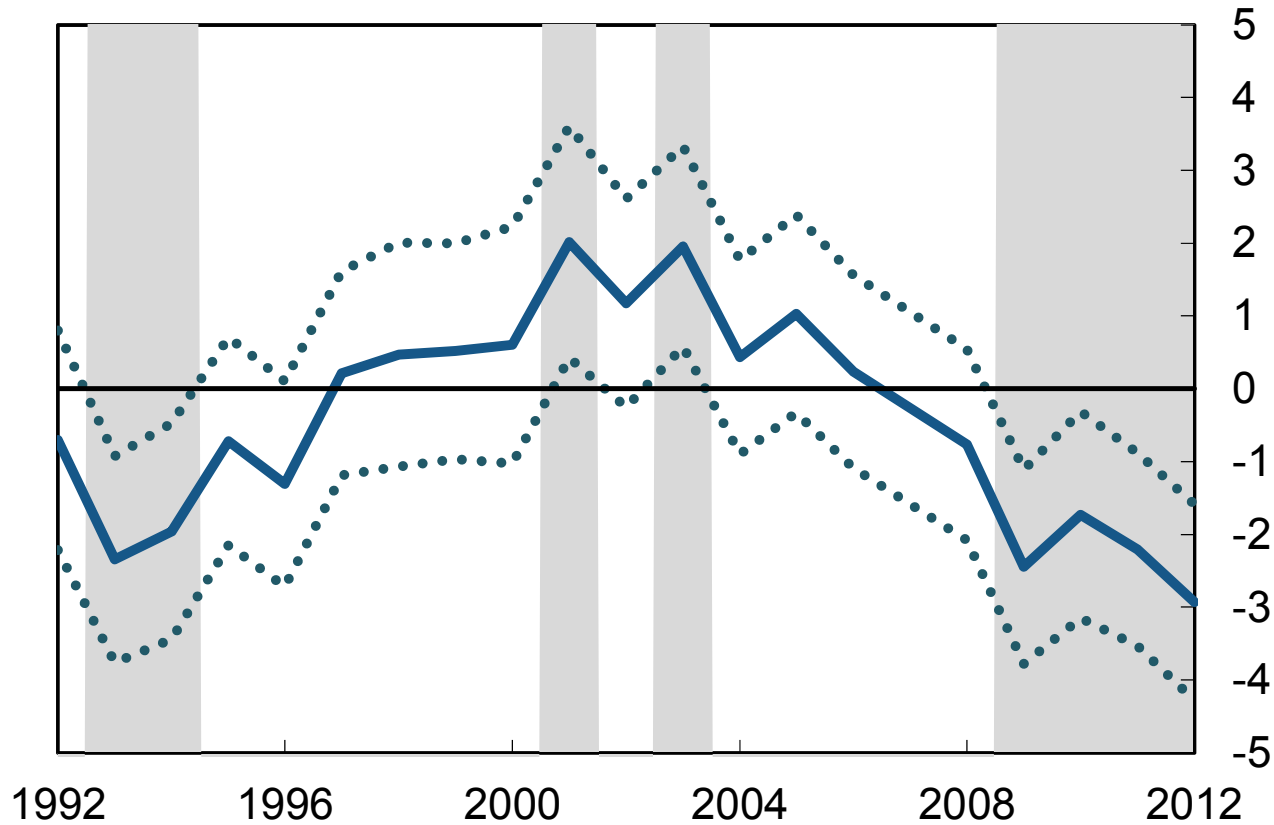Robust t-statistics in parentheses, *** $p<0.01$, ** $p<0.05$, * $p<0.1$

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# Cross sectional regression results

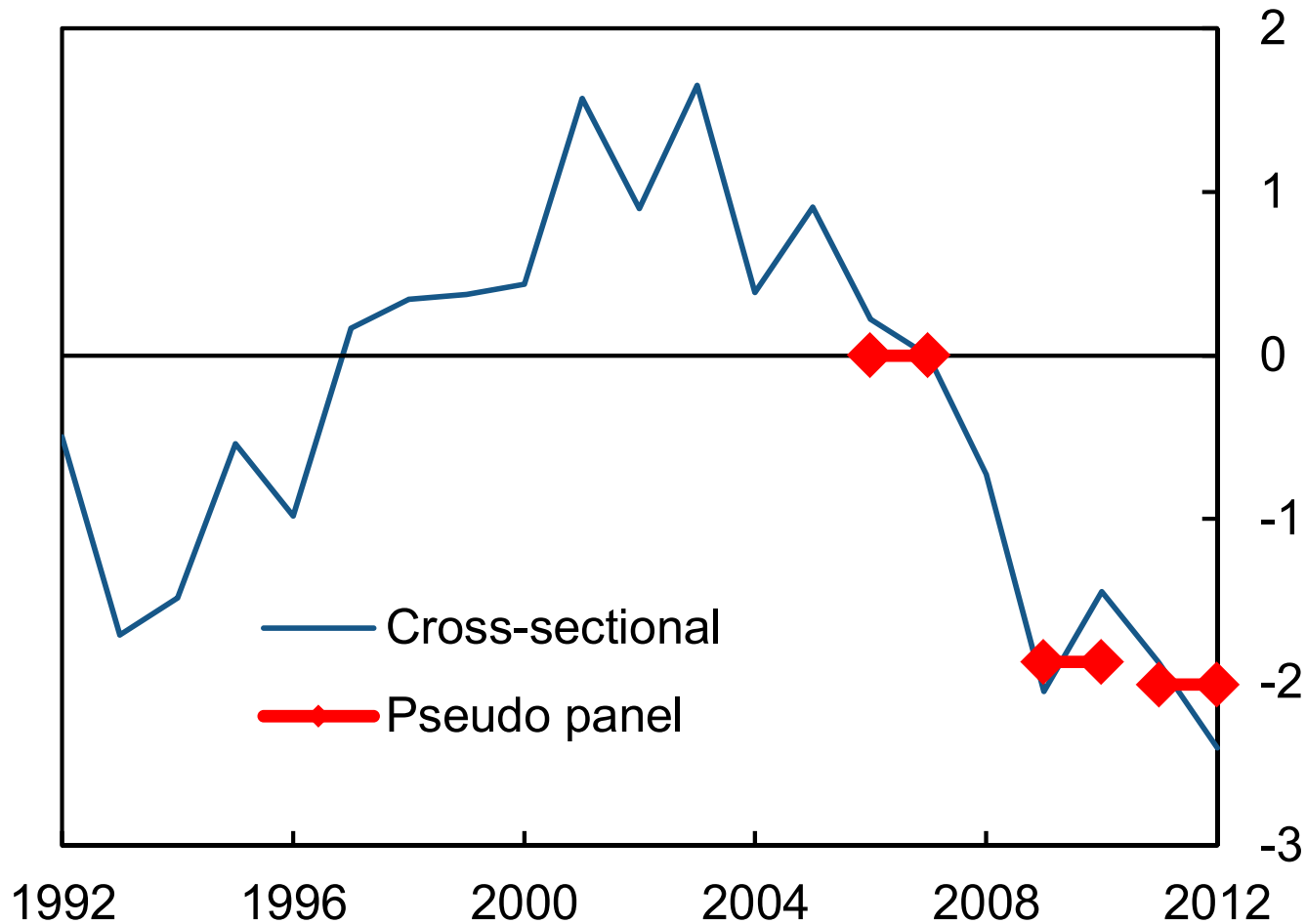Impact of a 1 unit increase in debt to income ratio on
consumption, relative to 2007

Significant at 5% level
95% confidence interval
Debt/year interaction coefficients

Percentage
difference from
2007



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# Impact of debt on aggregate consumption

Percentage difference from 2007

# Possible explanations for why indebted households made larger spending cuts

Larger spending cuts could reflect more indebted households:

1) Being disproportionately affected by tighter credit conditions

2) Becoming more concerned about their ability to make future loan repayments:

— Lower permanent income

— Increased uncertainty

3) Making larger adjustments to income expectations (perhaps because their previous expectations were too optimistic)

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# Evidence on why indebted household might have made larger cuts in spending

- Hard to prove causality from observing empirical correlations, even after controlling for other factors

- Three approaches to investigating this further:
  - Including proxies for the different channels in regressions
  - Using survey data on attitudes to spending
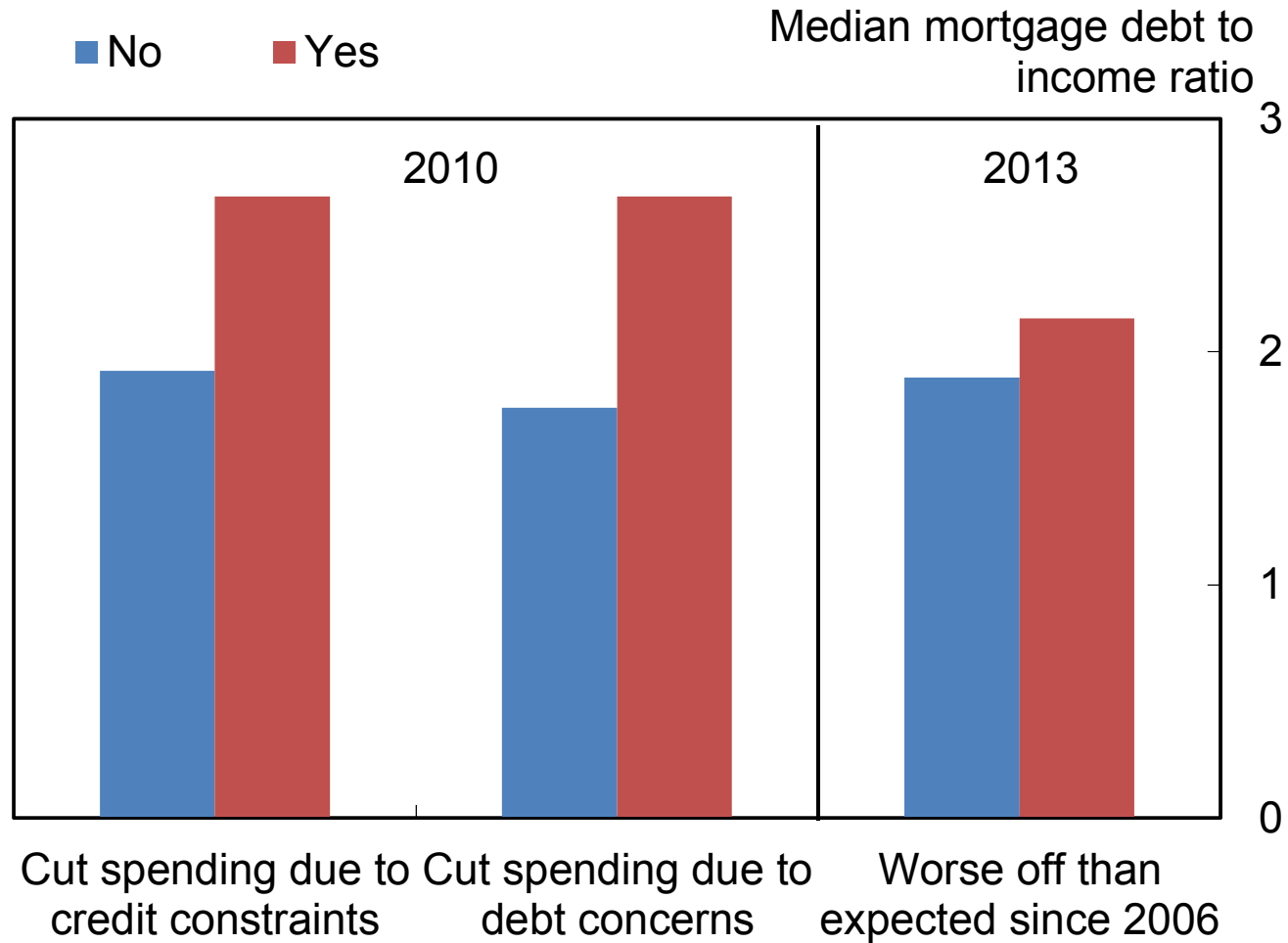  - Developing a structural life-cycle model

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# Pseudo panel regression results 4

Dependent variable: Δln(non-housing consumption 06/07 to 09/10)

| Cohort definition | Single birth year, mortgagor/ non-mortgagor [1] | 5 birth year, mortgagor/ non-mortgagor [2] | 10 birth year, region [3] | 5 birth year, mortgagor/ non-mortgagor [4] |
|---|---|---|---|---|
| **06/07 mortgage debt to income ratio** | **-0.022***** **(0.008)** | **-0.014** **(0.014)** | **0.004** **(0.015)** | **-0.002** **(0.027)** |
| ΔCohort unemployment | -0.280 (0.261) | -0.466 (0.456) | 0.079 (0.478) | -0.451 (0.727) |
| ΔCohort unemployment x 06/07 mortgage debt to income ratio | -0.429 (0.384) | -0.563 (0.677) | -0.961** (0.453) | -1.517 (1.457) |
| % Credit constrained | | | | -0.192 (0.354) |
| Observations | 76 | 19 | 53 | 17 |

All equations are estimated by OLS.  Robust standard errors in parentheses, *** $p<0.01$, ** $p<0.05$
All equations also include change in income, change in housing wealth, change in financial wealth, change in number of adults, change in number of children and a constant.

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# Mortgage debt to income and NMG survey responses



Median mortgage debt to income ratio

Legend: No (blue), Yes (red)

2010 panel: Cut spending due to credit constraints; Cut spending due to debt concerns

2013 panel: Worse off than expected since 2006

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# Structural life-cycle model (joint with Agnes Kovacs)

- Heterogeneous agents model where households live for T periods
- Can take out a mortgage to buy a house or withdraw equity
- Maximum LTV limit on borrowing, depends on credit conditions and house prices
- Two sources of uncertainty: idiosyncratic income and house prices
- Mortgage repayments part of intertemporal budget constraint

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# Simulated permanent income shock
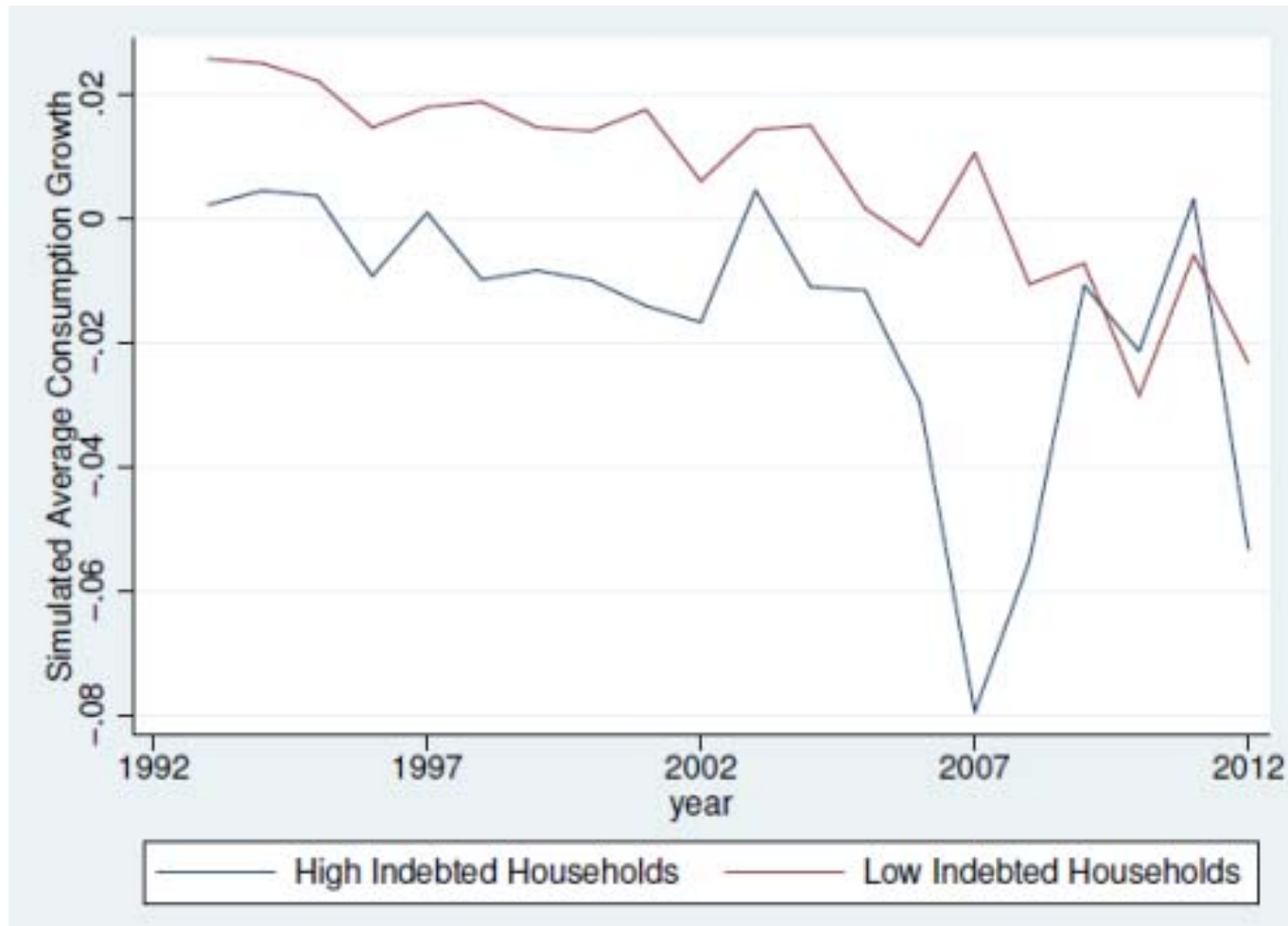
# Preliminary results from structural life-cycle model

- A reduction in permanent income a key driver of the results

- Increased variance of income shocks also seems to have an effect

- Credit channels and house price falls less important

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# Conclusion

- Indebted UK households made larger cuts in spending following the financial crisis, after controlling for other factors

- Those effects have persisted, at least up until 2012

- Two different econometric approaches give broadly similar results – worth about 2% off aggregate consumption

- Empirical work does not prove a causal link

- Very provisional results from structural life-cycle model suggest that permanent income shock/increased uncertainty may have been important in explaining larger spending cuts by indebted households

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# Policy implications

- June 2014 Bank of England Financial Policy Committee recommendations:
  - Lenders should apply stress test to assess affordability if Bank Rate rose by 3 percentage points in first 5 years of loan
  - Lenders should limit proportion of mortgages at loan to income ratios of 4.5 or above to 15% of new mortgage lending

- FPC wanted to insure against further a significant increase in number of highly indebted households

- Evidence on indebted households making larger cuts in spending during financial crisis in UK and elsewhere was an important reason for this

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# Pseudo panel vs cross section analysis

- Pseudo panel:
  - Shows how consumption changed for different groups
  - Small number of observations
  - Trade off between number of cohorts and reliability of consumption estimate for each cohort
  - Less variation in debt
  - Allows cohort level data from other sources to be merged in

- Cross section:
  - Can only compare difference in level of consumption for households with similar characteristics at different points, not how it changed for an individual household
  - Larger sample size
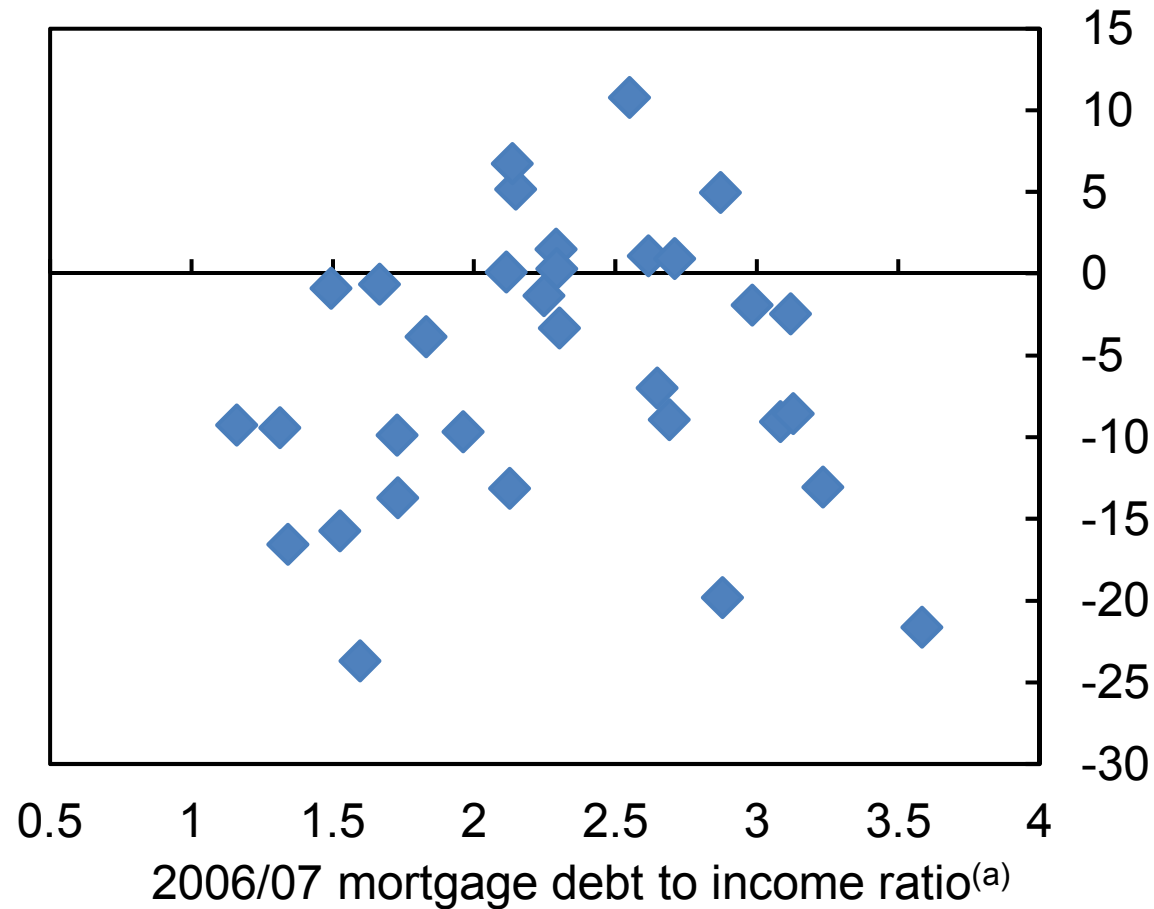  - More variation in debt

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# Change in consumption relative to income (single birth year mortgagor cohorts)

Percentage point change in non-housing consumption/income 2006/07 to 2009/10[a]



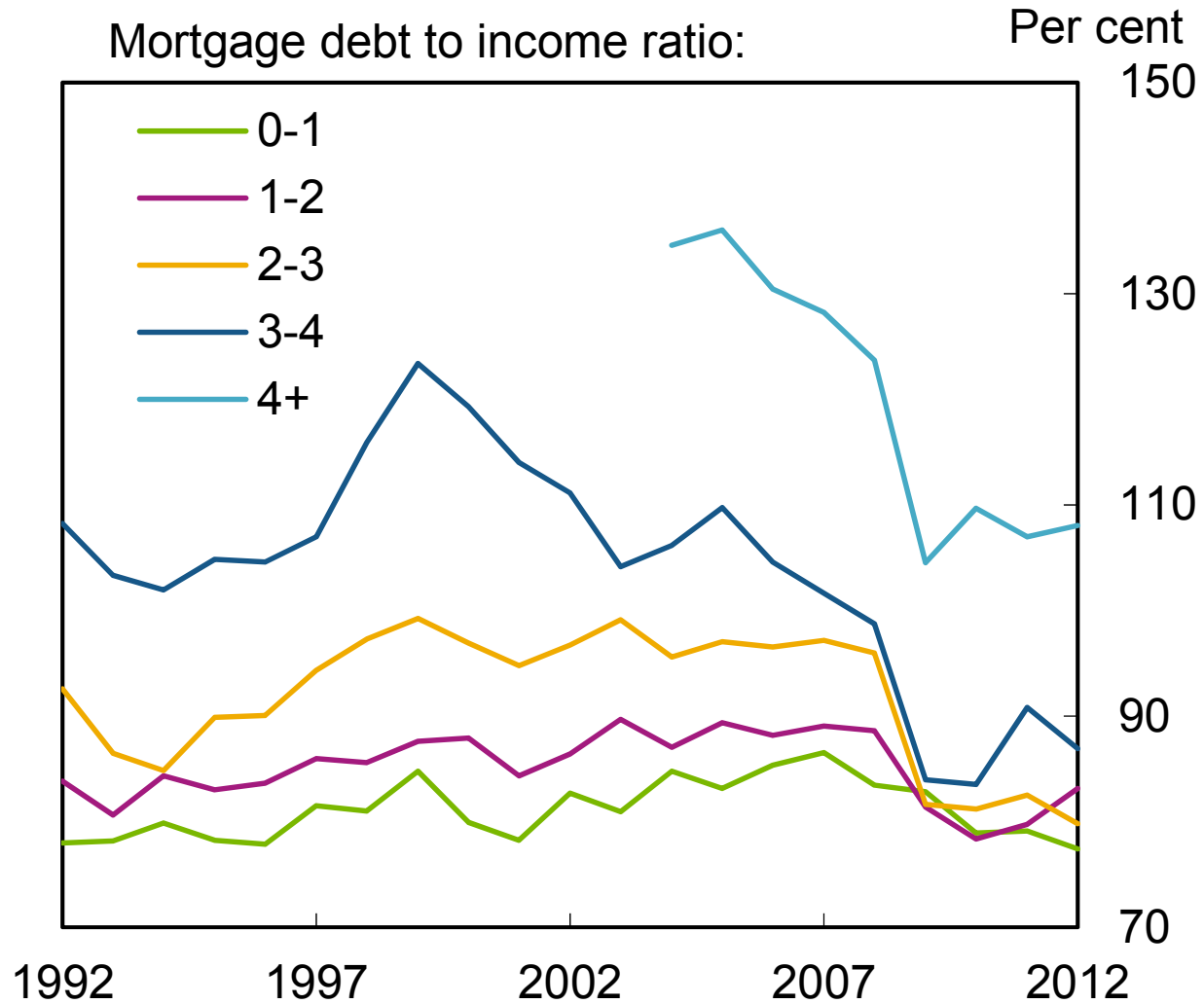2006/07 mortgage debt to income ratio[b]
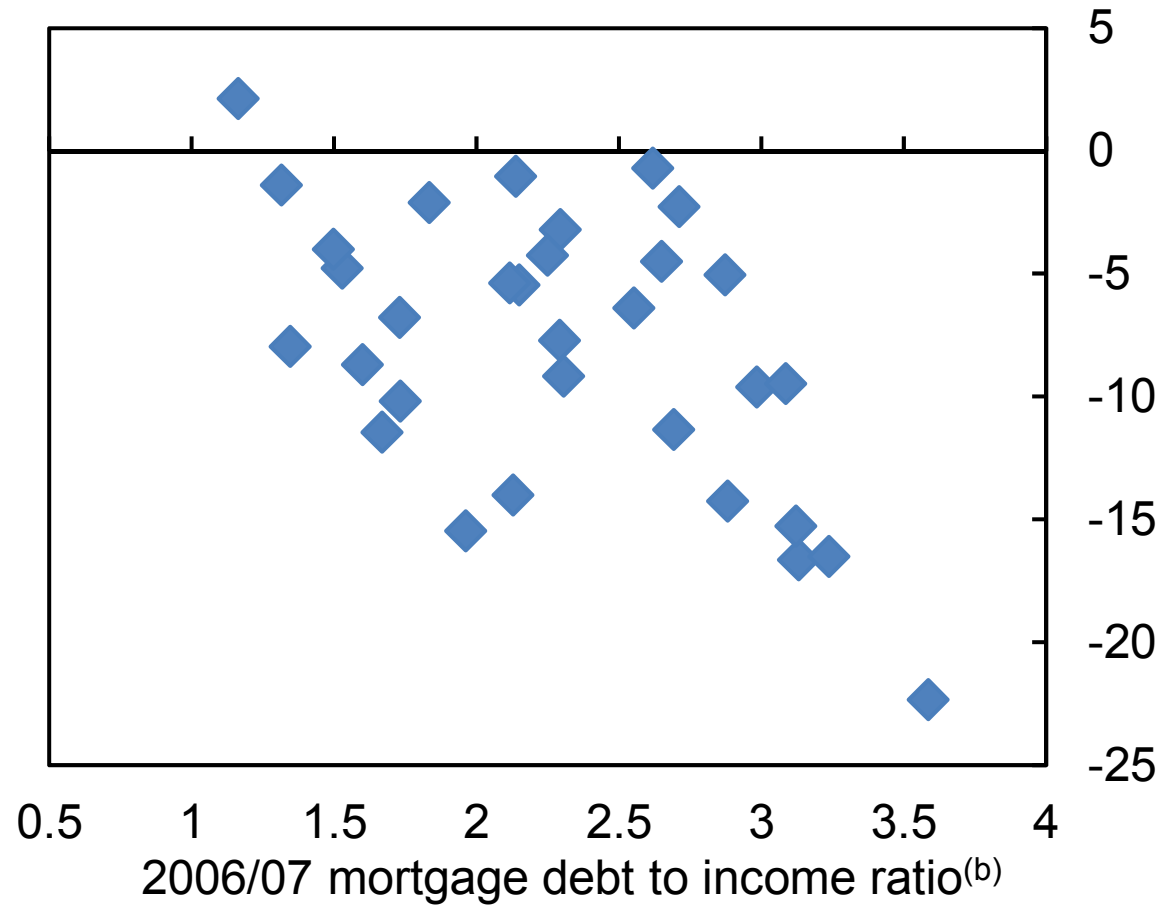
# Change in consumption
# (single birth year mortgagor cohorts)

Percentage change in real non-housing
consumption 2006/07 to 2009/10



2006/07 mortgage debt to income ratio[a]

# Consumption relative to income

# Full pseudo panel regression results

Dependent variable: $\Delta\ln$(non-housing consumption 06/07 to 09/10)

| Cohort definition | Single birth year | | Single birth year, mortgagor/non-mortgagor | | 5 birth year, mortgagor/non-mortgagor | | 10 birth year, region | |
|---|---|---|---|---|---|---|---|---|
| | [1] | [2] | [3] | [4] | [5] | [6] | [7] | [8] |
| $\Delta\ln$(Income net of mortgage interest) | 0.675*** | 0.743*** | 0.599*** | 0.607*** | 0.766*** | 0.857*** | 0.450*** | 0.520*** |
| | (0.122) | (0.124) | (0.118) | (0.117) | (0.123) | (0.130) | (0.148) | (0.155) |
| $\Delta$Number of adults | 0.267** | 0.232* | 0.212** | 0.205** | 0.115 | 0.081 | 0.342*** | 0.283** |
| | (0.118) | (0.121) | (0.098) | (0.097) | (0.103) | (0.100) | (0.121) | (0.119) |
| $\Delta$Number of children | 0.036 | 0.048 | 0.010 | 0.018 | 0.016 | 0.046 | 0.075 | 0.088* |
| | (0.036) | (0.037) | (0.031) | (0.031) | (0.060) | (0.057) | (0.048) | (0.046) |
| **06/07 mortgage debt to income ratio** | **-0.030**\** | | **-0.028**\*** | | **-0.026**\** | | **-0.024** | |
| | **(0.014)** | | **(0.007)** | | **(0.009)** | | **(0.014)** | |
| **06/07 mortgage loan-to-value ratio** | | **-0.128*** | | **-0.153**\*** | | **-0.160**\** | | **-0.129**\** |
| | | **(0.064)** | | **(0.038)** | | **(0.054)** | | **(0.050)** |
| $\Delta\ln$(Housing wealth) | 0.035 | 0.123 | 0.060 | 0.060 | 0.049 | 0.018 | 0.008 | 0.096 |
| | (0.070) | (0.096) | (0.036) | (0.036) | (0.059) | (0.061) | (0.101) | (0.104) |
| $\Delta\ln$(Financial Wealth) | -0.000 | 0.004 | 0.006 | 0.007 | 0.064*** | 0.072*** | 0.002 | -0.004 |
| | (0.020) | (0.020) | (0.023) | (0.023) | (0.021) | (0.021) | (0.032) | (0.032) |
| Constant | -0.018 | -0.011 | -0.027** | -0.026** | -0.036** | -0.034** | -0.026 | -0.010 |
| | (0.023) | (0.029) | (0.012) | (0.012) | (0.013) | (0.013) | (0.020) | (0.020) |
| Observations | 45 | 45 | 76 | 76 | 19 | 19 | 53 | 53 |

All equations are estimated by OLS. Robust standard errors in parentheses, *** $p<0.01$, ** $p<0.05$, * $p<0.1$.
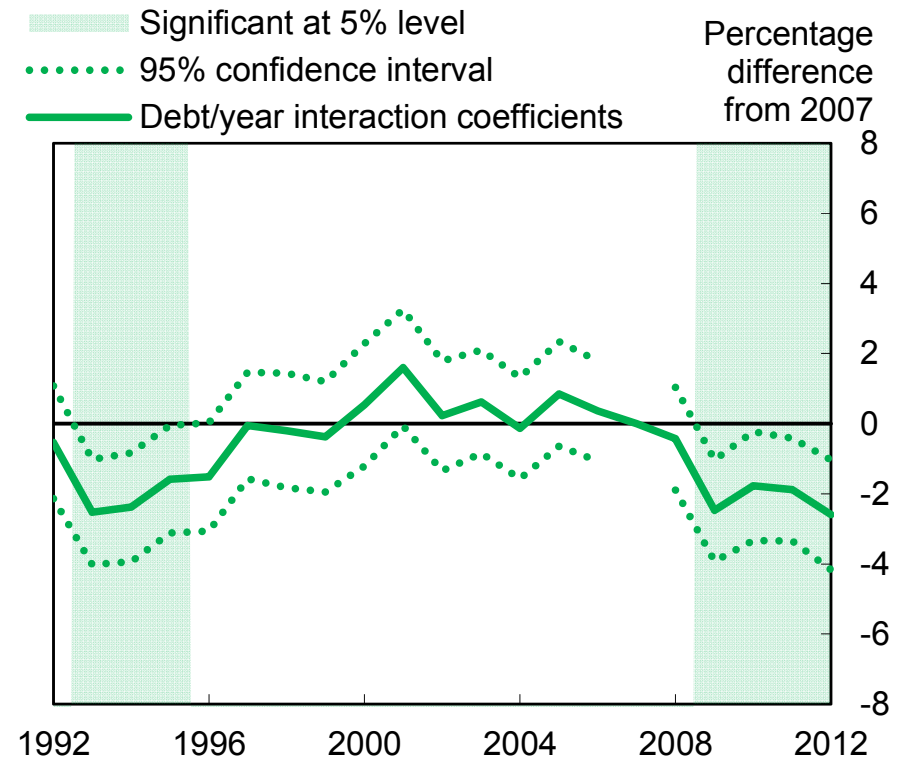
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# Cross sectional regression results

Impact of a 1 unit increase in debt to income ratio on consumption, relative to 2007



**Durables**

Significant at 5% level
95% confidence interval
Debt/year interaction coefficients

Percentage difference from 2007

**Non-durables**

Significant at 5% level
95% confidence interval
Debt/year interaction coefficients

Percentage difference from 2007

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34
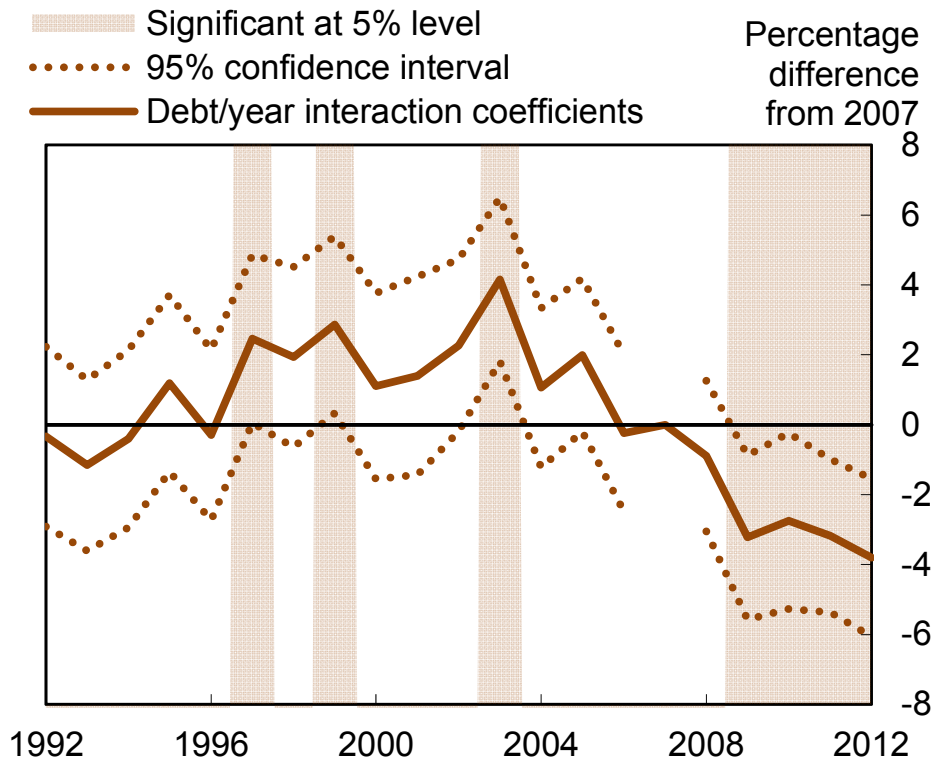
# Explanations why indebted household might have made larger cuts in spending

- Highly indebted households were disproportionately affected by tighter credit conditions
    - 'Have you been put off spending because you are concerned you will not be able to get access to further credit when you need it?'

- Highly indebted households become more concerned about their ability to make future repayments
    - 'How concerned are you about your current level of debt?', and 'What actions are you taking to deal with your concerns?'

- Highly indebted households made larger adjustments to future income expectations
    - 'Would you say you are better or worse off financially now than you would have expected at the end of 2006, before the start of the financial crisis?'

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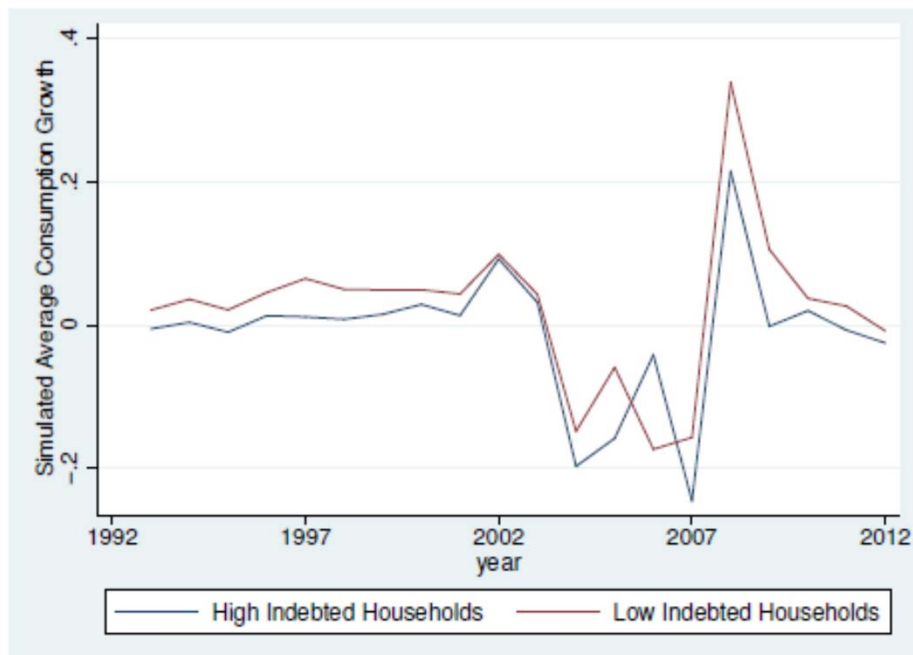# Characteristics of mortgagors cutting spending due to debt concerns

| | Reduced spending in response to debt concerns (2013 data) | |
| --- | --- | --- |
| | Yes | No |
| Median mortgage debt to income ratio | 2.4 | 1.7 |
| Proportion who are worse off than they expected in 2006 | 73% | 39% |
| Proportion who are think that a sharp fall in income is quite likely over the next year | 33% | 19% |

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# Simulated uncertainty shock

# House price shock

# House price and credit shock