Household debt and spending in the United Kingdom

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Bank of England

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Outline

• Motivation
• Literature/theory
• Data/methodology
• Econometric results
• Reasons for different spending responses
• Conclusion/policy implications
Consumption growth

Household debt to income

Percentage change on a year earlier

Average since 1956

Per cent
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?
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
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))
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
Consumption growth
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
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
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)
## Pseudo panel regression results 1

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

<table>
<thead>
<tr>
<th>Cohort definition</th>
<th>Single birth year</th>
<th>Single birth year, mortgagor/non-mortgagor</th>
<th>5 birth year, mortgagor/non-mortgagor</th>
<th>10 birth year, region</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[1]</td>
<td>[2]</td>
<td>[3]</td>
<td>[4]</td>
</tr>
<tr>
<td>06/07 mortgage debt to income ratio</td>
<td>-0.030**</td>
<td>-0.028***</td>
<td>-0.026**</td>
<td>-0.024</td>
</tr>
<tr>
<td></td>
<td>(0.014)</td>
<td>(0.007)</td>
<td>(0.009)</td>
<td>(0.014)</td>
</tr>
<tr>
<td>06/07 mortgage loan-to-value ratio</td>
<td>-0.128*</td>
<td>-0.153***</td>
<td>-0.160**</td>
<td>-0.129**</td>
</tr>
<tr>
<td></td>
<td>(0.064)</td>
<td>(0.038)</td>
<td>(0.054)</td>
<td>(0.050)</td>
</tr>
<tr>
<td>Observations</td>
<td>45</td>
<td>45</td>
<td>76</td>
<td>76</td>
</tr>
</tbody>
</table>

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.
Pseudo panel regression results 2


<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Δln(Non-housing consumption)</th>
<th>Δln(Non-housing consumption)</th>
<th>Δln(Durables)</th>
<th>Δln(Non-durables)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[1]</td>
<td>[2]</td>
<td>[3]</td>
<td>[4]</td>
</tr>
<tr>
<td>Δln(Income net of mortgage interest)</td>
<td>0.602***</td>
<td>0.934***</td>
<td>0.447***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.117)</td>
<td>(0.195)</td>
<td>(0.147)</td>
<td></td>
</tr>
<tr>
<td>Δln(Income before mortgage interest)</td>
<td>0.612***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.120)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Predicted 06/07 mortgage debt to income ratio

| Actual 06/07 mortgage debt to income ratio | -0.017** | -0.027*** | -0.051*** | -0.010 |
|                                          | (0.008)  | (0.007)   | (0.013)   | (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.
### Pseudo panel regression results 3

Dependent variable: $\Delta \ln($non-housing consumption$)$
Single birth year, mortgagor/non-mortgagor cohorts

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

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.
Cross-sectional analysis research design

- We estimate the following equation:

\[ C_{it} = \beta_1 (D_{it} / Y_{it}) + \beta_2 (D_{it} / Y_{it}) \times year_t + \beta_3 year_t + \beta_4 cohort_i + \beta_5 X_{it} + e_{it} \]

- 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
Cross sectional regression results

<table>
<thead>
<tr>
<th>Year</th>
<th>Coefficient</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>-0.008</td>
<td>0.007</td>
</tr>
<tr>
<td>2009</td>
<td>-0.024***</td>
<td>0.007</td>
</tr>
<tr>
<td>2010</td>
<td>-0.017**</td>
<td>0.007</td>
</tr>
<tr>
<td>2011</td>
<td>-0.022***</td>
<td>0.007</td>
</tr>
<tr>
<td>2012</td>
<td>-0.029***</td>
<td>0.007</td>
</tr>
</tbody>
</table>

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

Dependent variable: ln(non-housing consumption)
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

- Cross-sectional
- Pseudo panel


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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)
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
### Pseudo panel regression results 4

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

<table>
<thead>
<tr>
<th>Cohort definition</th>
<th>Single birth year, mortgagor/ non-mortgagor</th>
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<th>10 birth year, region</th>
<th>5 birth year, mortgagor/ non-mortgagor</th>
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<tr>
<td></td>
<td>[1]</td>
<td>[2]</td>
<td>[3]</td>
<td>[4]</td>
</tr>
<tr>
<td>$06/07 \text{ mortgage debt to income ratio}$</td>
<td><strong>-0.022</strong>*</td>
<td>-0.014</td>
<td>0.004</td>
<td><strong>-0.002</strong></td>
</tr>
<tr>
<td></td>
<td>(0.008)</td>
<td>(0.014)</td>
<td>(0.015)</td>
<td>(0.027)</td>
</tr>
<tr>
<td>$\Delta \text{Cohort unemployment}$</td>
<td>-0.280</td>
<td>-0.466</td>
<td>0.079</td>
<td>-0.451</td>
</tr>
<tr>
<td></td>
<td>(0.261)</td>
<td>(0.456)</td>
<td>(0.478)</td>
<td>(0.727)</td>
</tr>
<tr>
<td>$\Delta \text{Cohort unemployment x}$</td>
<td>-0.429</td>
<td>-0.563</td>
<td>-0.961**</td>
<td>-1.517</td>
</tr>
<tr>
<td>$06/07 \text{ mortgage debt to income ratio}$</td>
<td>(0.384)</td>
<td>(0.677)</td>
<td>(0.453)</td>
<td>(1.457)</td>
</tr>
<tr>
<td>% Credit constrained</td>
<td></td>
<td></td>
<td></td>
<td><strong>-0.192</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.354)</td>
</tr>
<tr>
<td>Observations</td>
<td>76</td>
<td>19</td>
<td>53</td>
<td>17</td>
</tr>
</tbody>
</table>

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.
Mortgage debt to income and NMG survey responses

- Cut spending due to credit constraints
- Cut spending due to debt concerns
- Worse off than expected since 2006

Median mortgage debt to income ratio

<table>
<thead>
<tr>
<th>Year</th>
<th>Cut Spending Due to Credit Constraints</th>
<th>Cut Spending Due to Debt Concerns</th>
<th>Worse Off Than Expected Since 2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>2013</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>
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
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
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
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
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
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)
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

Mortgage debt to income ratio:

- 0-1
- 1-2
- 2-3
- 3-4
- 4+

Per cent

## Full pseudo panel regression results

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

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<tr>
<td></td>
<td>[1]</td>
<td>[2]</td>
<td>[3]</td>
<td>[4]</td>
</tr>
<tr>
<td>$\Delta \ln(\text{Income net of mortgage interest})$</td>
<td>0.675*** (0.122)</td>
<td>0.743*** (0.124)</td>
<td>0.599*** (0.118)</td>
<td>0.607*** (0.117)</td>
</tr>
<tr>
<td>$\Delta \text{Number of adults}$</td>
<td>0.267** (0.118)</td>
<td>0.232* (0.121)</td>
<td>0.212** (0.098)</td>
<td>0.205** (0.097)</td>
</tr>
<tr>
<td>$\Delta \text{Number of children}$</td>
<td>0.036 (0.036)</td>
<td>0.048 (0.037)</td>
<td>0.010 (0.031)</td>
<td>0.018 (0.031)</td>
</tr>
<tr>
<td>$06/07 \text{ mortgage debt to income ratio}$</td>
<td>$-0.030** (0.014)$</td>
<td>$-0.028*** (0.007)$</td>
<td>$-0.026** (0.009)$</td>
<td>$-0.024 (0.014)$</td>
</tr>
<tr>
<td>$06/07 \text{ mortgage loan-to-value ratio}$</td>
<td>$-0.128* (0.064)$</td>
<td>$-0.153*** (0.038)$</td>
<td>$-0.160** (0.054)$</td>
<td>$-0.129** (0.050)$</td>
</tr>
<tr>
<td>$\Delta \ln(\text{Housing wealth})$</td>
<td>0.035 (0.070)</td>
<td>0.123 (0.096)</td>
<td>0.060 (0.036)</td>
<td>0.060 (0.036)</td>
</tr>
<tr>
<td>$\Delta \ln(\text{Financial Wealth})$</td>
<td>-0.000 (0.020)</td>
<td>0.004 (0.020)</td>
<td>0.006 (0.023)</td>
<td>0.007 (0.023)</td>
</tr>
<tr>
<td>Constant</td>
<td>$-0.018 (0.023)$</td>
<td>$-0.011 (0.029)$</td>
<td>$-0.027** (0.012)$</td>
<td>$-0.026** (0.012)$</td>
</tr>
<tr>
<td>Observations</td>
<td>45</td>
<td>45</td>
<td>76</td>
<td>76</td>
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</tbody>
</table>

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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

**Non-durables**

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

Percentage difference from 2007
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?’
## Characteristics of mortgagors cutting spending due to debt concerns

<table>
<thead>
<tr>
<th>Reduced spending in response to debt concerns (2013 data)</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median mortgage debt to income ratio</td>
<td>2.4</td>
<td>1.7</td>
</tr>
<tr>
<td>Proportion who are worse off than they expected in 2006</td>
<td>73%</td>
<td>39%</td>
</tr>
<tr>
<td>Proportion who are think that a sharp fall in income is quite likely over the next year</td>
<td>33%</td>
<td>19%</td>
</tr>
</tbody>
</table>
Simulated uncertainty shock
House price shock

House price and credit shock