Economics 210c/236a
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LECTURE 12
Deleveraging and Balance Sheet Effects

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I. INTRODUCTION

What Do We Mean By "Balance Sheet Effects"?

- Not just an impact of wealth on behavior.
- Why might assets and liabilities, rather than just their difference, matter?
  - Heterogeneity in wealth.
  - Bankruptcies (an extreme form of heterogeneous wealth?).
  - Channels through which assets and liabilities on the balance sheets of a single agent might not net out in determining behavior.

II. Richard Koo, "Japan's Recession"

Koo's Hypotheses

- Japan's poor macro performance is the result of balance sheet effects.
- In his view, why wasn't it just the difference between assets and liabilities that mattered?
  - In places, he seems to imply that the entire economy had negative net worth. But that can't be right.
  - His story appears to be one of heterogeneity: "many … firms had a negative net worth."

Koo's Hypotheses (cont.)

Balance sheet effects:

- Operate through AD, not AS.
- Operate through credit demand, not credit supply.
- Not only reduce demand, but make it less responsive to the interest rate.

What Evidence Does Koo Look at to Distinguish the Potential Output and AD Views?

- Direct evidence about $\overline{Y}$ (e.g., quality of products, frequency of strikes).
- Inflation.
- The exchange rate and net exports.
- Interest rates.

Exhibit 1-1. Structural problems cannot explain Japan's economic malaise

	Japan's Great Recession	U.S. during Reagan era
Short-term interest rates	0%	~22%
Long-term interest rates	~1.5%	~14%
Home mortgage rates	~3–4%	~17%
Labor issues	None	Frequent strikes
Prices	Deflation	Double-digit inflation
Balance of trade	World's largest surplus	Deficit
Exchange rate	Massive intervention to stem yen's rise	Falling sharply
Basic economic conditions	**Adequate supply but not enough demand**	**Adequate demand but not enough supply**

Note: Home mortgage rates are for 30-year fixed mortgages.

Source: NRI.

What Evidence Does Koo Look at to Distinguish the Credit Supply and Credit Demand Views?

- Did firms that were able to issue debt?
- Did foreign banks enter?
- Were interest rates (real and nominal) high?

Exhibit 1-2. Financial indicators are not consistent with the credit crunch argument

Source: Bank of Japan, *Average Contracted Interest Rates on Loans and Discounts* and *Principal Assets and Liabilities of Foreign Banks in Japan*; Japan Securities Dealers Association, *Issuing, Redemption and Outstanding Amounts of Bonds*.

Possible Weaknesses in Koo's Analysis

- He presents little evidence that these effects were quantitatively important.
- He present almost no evidence that demand became less responsive to interest rates.
- He doesn't address the issue of whether these effects can explain 15 years of poor macro performance.

III. Gauti B. Eggertsson and Paul Krugman, "Debt, Deleveraging, and the Liquidity Trap: A Fisher-Minsky-Koo Approach"

Key Ingredients

- Two types of consumers – credit-constrained and unconstrained.
  - As a result, the distribution of wealth, and not just its overall level, matters.
- Debt is denominated in nominal terms.
  - Gives rise to endogenous redistributions.
- Central bank's rule involves the inflation rate, not the price level.
  - As a result, there's no nominal anchor.

Case 1: Prices Are Flexible, Debt Is Denominated in Real Terms, and Monetary Policy Is Targeting the Price Level

- Endowment economy.
- Half of households are impatient, borrow, and are constrained. Half of households are patient, save, and are unconstrained.

The Constrained Households

- As a matter of accounting:

$$C_t^{BORROWERS} = Y_t^{BORROWERS} - (1 + r_{t-1})D_{t-1} + D_t.$$

- There's a potentially time-varying constraint on borrowing. The limit is not on D_t, but on $(1 + r_t)D_t$:

$$(1 + r_t)D_t \leq \bar{Z}_t, \text{where the } \bar{Z}'\text{s are exogenous.}$$

- They focus on cases where the constraint is always binding. (And they assume each group's income is Y/2.) Thus:

$$C_t^{BORROWERS} = \frac{Y}{2} - \bar{Z}_{t-1} + \frac{\bar{Z}_t}{1+r_t}.$$

- Note that if Z and r are constant, $C_t^{BORROWERS} = \frac{Y}{2} - \frac{r\bar{Z}}{1+r}$.

The Unconstrained Households

- Utility: $\sum_t \beta^t \ln C_t^{SAVERS}$.
- Euler equation: $\frac{1}{C_t} = \frac{\beta(1+r_t)}{C_{t+1}}$.

Equilibrium

- r_t adjusts so that $C_t^{BORROWERS} + C_t^{SAVERS} = Y$.

Their Focal Example

- Starting in some period, which we'll call period 1, Z is permanently at some level below its previous value. Call the old value Z_0 and the new value Z_1.
- One can show that there is a steady state starting in period 2. The key feature of that steady state is that the consumption of the savers is constant and equal to $C^{SAVERS} = \frac{Y}{2} + \frac{r^{SS}}{1+r^{SS}}\bar{Z}_1$, where $1 + r^{SS} = \frac{1}{\beta}$.
- In period 1: $C_1^{BORROWERS} = \frac{Y}{2} - \bar{Z}_0 + \frac{\bar{Z}_1}{1+r_1}$.

Their Focal Example (cont.)

- Market clearing: $C_1^{SAVERS} = Y - C_1^{BORROWERS}$.
- Savers' Euler equation:

$$1 + r_1 = \frac{C_2^{SAVERS}}{\beta C_1^{SAVERS}}.$$

- Putting all this together

$$1 + r_1 = \frac{\frac{Y}{2} + (1-\beta)\bar{Z}_1}{\beta(\frac{Y}{2} - \frac{\bar{Z}_1}{1+r_1} + \bar{Z}_0)}.$$

- Algebra yields:

$$1 + r_1 = \frac{\frac{Y}{2} + \bar{Z}_1}{\beta(\frac{Y}{2} + \bar{Z}_0)}.$$

Case 1 – Messages

- Deleveraging as a source of AD shocks.
- Government purchases still stimulate an economy affected by deleveraging.
- Tax cuts can stimulate an economy affected by deleveraging.

Question: Is there a tension between Eggertsson & Krugman's MPC of 1 and Koo's view that highly indebted agents will use additional resources only to pay down debt?

Case 2: Debt Is Denominated in Nominal Terms (Prices Are Flexible, and Monetary Policy Is Targeting the Price Level)

- Same experiment as before, except debt is in nominal terms (and the fall in Z is unexpected).
- The price level before the shock is P^{ss} (which is still the central bank's long-run target).
- As a result, in period 1 borrowers have to repay Z_0P^{ss}/P_1.
- Thus, $$C_1^{BORROWERS} = \frac{Y}{2} - \frac{\bar{Z}_0 P^{ss}}{P_1} + \frac{\bar{Z}_1}{1 + r_1}.$$

Case 2 (continued)

- Reasoning like that for case 1 yields

(*)
$$1 + r_1 = \frac{\frac{Y}{2} - (1-\beta)\bar{Z}_1}{\beta\left(\frac{Y}{2} - \frac{\bar{Z}_1}{1+r_1} + \frac{\bar{Z}_0 P^{ss}}{P_1}\right)}.$$

- At the zero lower bound, $1 + r_1 = \frac{P_1}{P^{ss}}$.

- Algebra gives
$$1 + r_1 = \frac{P_1}{P^{ss}} = \frac{\frac{Y}{2} + \bar{Z}_1 - \bar{Z}_0}{\beta\frac{Y}{2}}.$$

Case 2 – Messages

- Having debt denominated in nominal terms magnifies the effects of deleveraging shocks.
- Expected inflation through a fall in the current price level and through a rise in the expected future price level are no longer equivalent.

What Happens When Monetary Policy Is Targeting the Inflation Rate?

- For a shock large enough to push the economy to the zero lower bound, if prices are flexible no equilibrium exists.
- If prices are sticky, equilibrium exists.
- With sticky prices:
  - If debt is indexed, price flexibility has no effect on the real equilibrium.
  - If debt is nominal, greater price flexibility increase the fall in output.

Table 1: Household debt as % of disposable personal income

	2000	2008
US	96	128
UK	105	160
Spain	69	130

Source: McKinsey Global Institute (2010)

IV. Martha Olney, "Avoiding Default: The Role of Credit in the Consumption Collapse of 1930"

Key Features of Installment Debt in the 1920s

- It grew rapidly, and was substantial by the end of the decade.
- Down payments were high and contract durations were short.
- The penalty for default was that the seller could repossess the good, with no compensation for the excess of its value over what the buyer still owed.

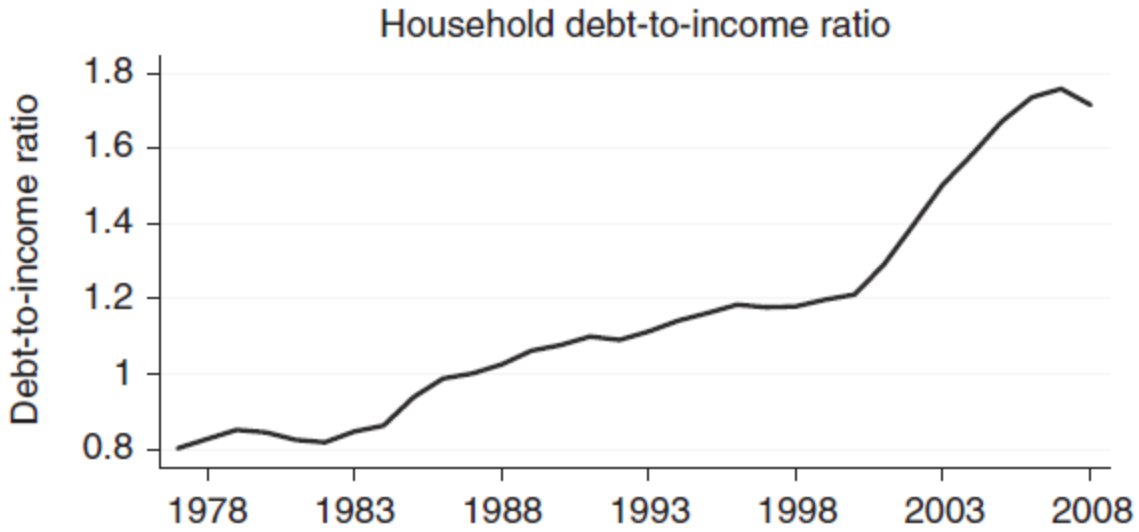
TABLE III

DEFAULTS ON AUTOMOBILE CONTRACTS, 1925–1939

	Percentage of cars repossessed (national average)			Commercial Credit Company	
	New cars	Used cars	All cars	Percentage of notes 60 days or more past due	Percentage of notes extended or refinanced
1925	2.1	3.6	—	0.48%	n.a.
1926	2.4	4.7	—	0.45	n.a.
1927	2.9	5.3	—	0.20	n.a.
1928	2.9	5.6	4.1	0.11	n.a.
1929	3.0	5.6	4.2	0.15	n.a.
1930	3.7	6.9	5.4	0.18	n.a.
1931	4.5	11.4	8.5	0.43	1.43%
1932	5.7	13.1	10.4	0.10	3.29
1933	2.8	7.8	5.7	0.03	0.89
1934	2.9	7.2	5.3	0.03	0.82
1935	2.7	10.7	7.3	0.04	0.86
1936	2.2	7.5	5.1	0.04	0.82
1937	4.1	13.2	9.4	0.04	0.90
1938	6.3	19.2	15.1	0.05	1.92
1939	2.7	10.1	7.5	0.04	2.90

Sources. National averages are from National Association of Sales Finance Companies [1939]. CCC data are from *Annual Reports,* Commercial Credit Company, 1925–1940.

V. Mian and Sufi, "Household Leverage and the Recession of 2007-09"



Source: Mian and Sufi, "Household Leverage and the Recession of 2007-09

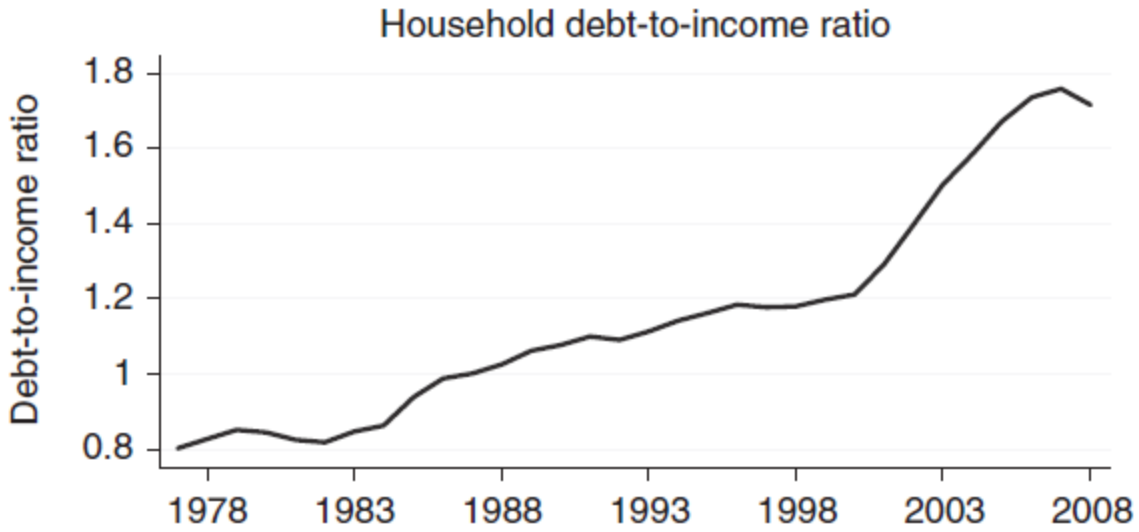


Table 1. Summary Statistics for U.S. Counties

	N	Mean	Median	SD	10th	90th
Equifax credit bureau/IRS income						
Debt to income increase, 2002:Q4–2006:Q4	450	0.775	0.668	0.530	0.256	1.460
Debt to income, 2001:Q4	450	2.211	2.084	0.533	1.615	2.995

Source: Mian and Sufi, "Household Leverage and the Recession of 2007-09

County-Level Data Set

- Equifax data by zip code
    - Default rates
    - Debt
    - Credit score
    - Credit card utilization

County-Level Data Set

- Income by zip code (IRS)
- House prices (FHFA, MSA level)
- Auto sales (Polk, registrations by county)
- New housing building permits (Census Bureau)
- Unemployment (QCEW, BLS)
- County employment and industrial composition (County Business Patterns, Census Bureau)

Key Explanatory Variable

- Growth in leverage from 2002Q4 to 2006Q4
- Is the growth in leverage the right variable?
- Do Mian and Sufi have a hypothesis for why leverage growth reduced consumer spending later on?

Why did mortgage defaults begin to rise and house prices begin to fall in the middle of 2006? This question is beyond the scope of our analysis, but we offer three potential reasons. First, rising interest rates likely played a role in reducing house prices by lowering the relative advantage of homeownership (Mayer and Hubbard, 2008). Second, lending standards on mortgages deteriorated to such a degree that mortgages originated in 2006 experienced shockingly high default rates almost immediately after origination (Demyanyk and Van Hemert, forthcoming). Third, even small increases in default rates may have shut down securitization markets, leading to an amplification effect on default rates as households were unable to refinance.

Source: Mian and Sufi, "Household Leverage and the Recession of 2007-09

Outcome Variables

- House prices
- Default rate
- Auto sales
- Building permits
- Unemployment

Methodology

- Graphs of outcomes in high- and low-leverage counties.
- Scatter plots of outcome growth after 2006 and leverage growth before.
- First-difference regressions

First-Difference Regression Framework

$$EconomicOutcome06q4_{09q2_i} = \beta * LeverageGrowth02q4_{06q4_i} + \Gamma * ControlVariables_i + \varepsilon_i \quad (1)$$

- Economic Outcome: Change from 2006Q4 to 2009Q2
- Leverage Growth: Change from 2002Q4 to 2006Q4
- Control Variables: Set of cyclicality, demographic, and industrial composition measures

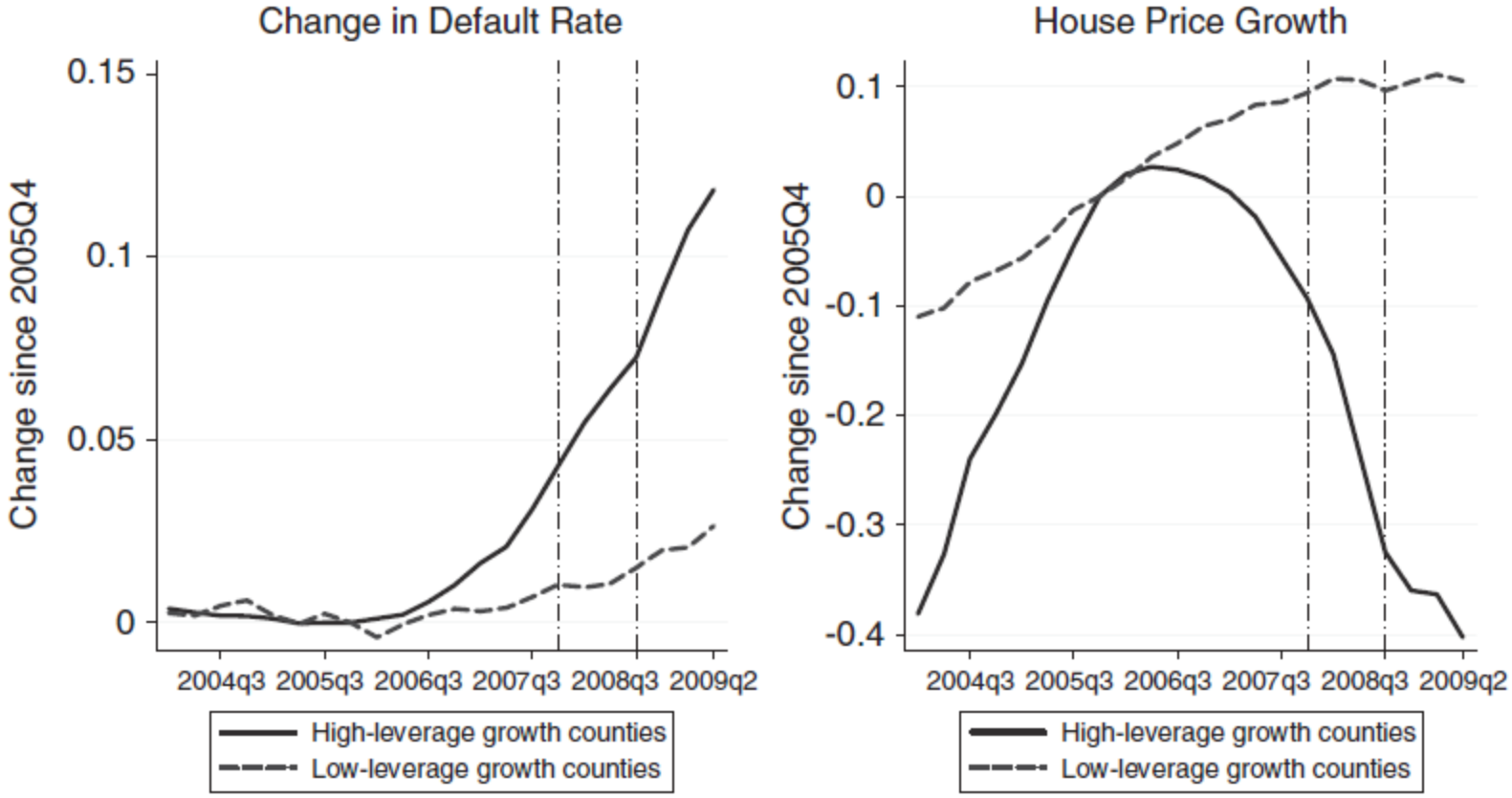
IV Regression Framework

$$EconomicOutcome06q4_{09q2_i} = \beta * \widehat{LeverageGrowth}02q4_{06q4_i} + \Gamma * ControlVariables_i + \varepsilon_i \quad (2)$$

$$LeverageGrowth02q4_{06q4_i} = \gamma * HousingSupplyInelasticity_i + \Theta * ControlVariables_i + u_i \quad (3)$$

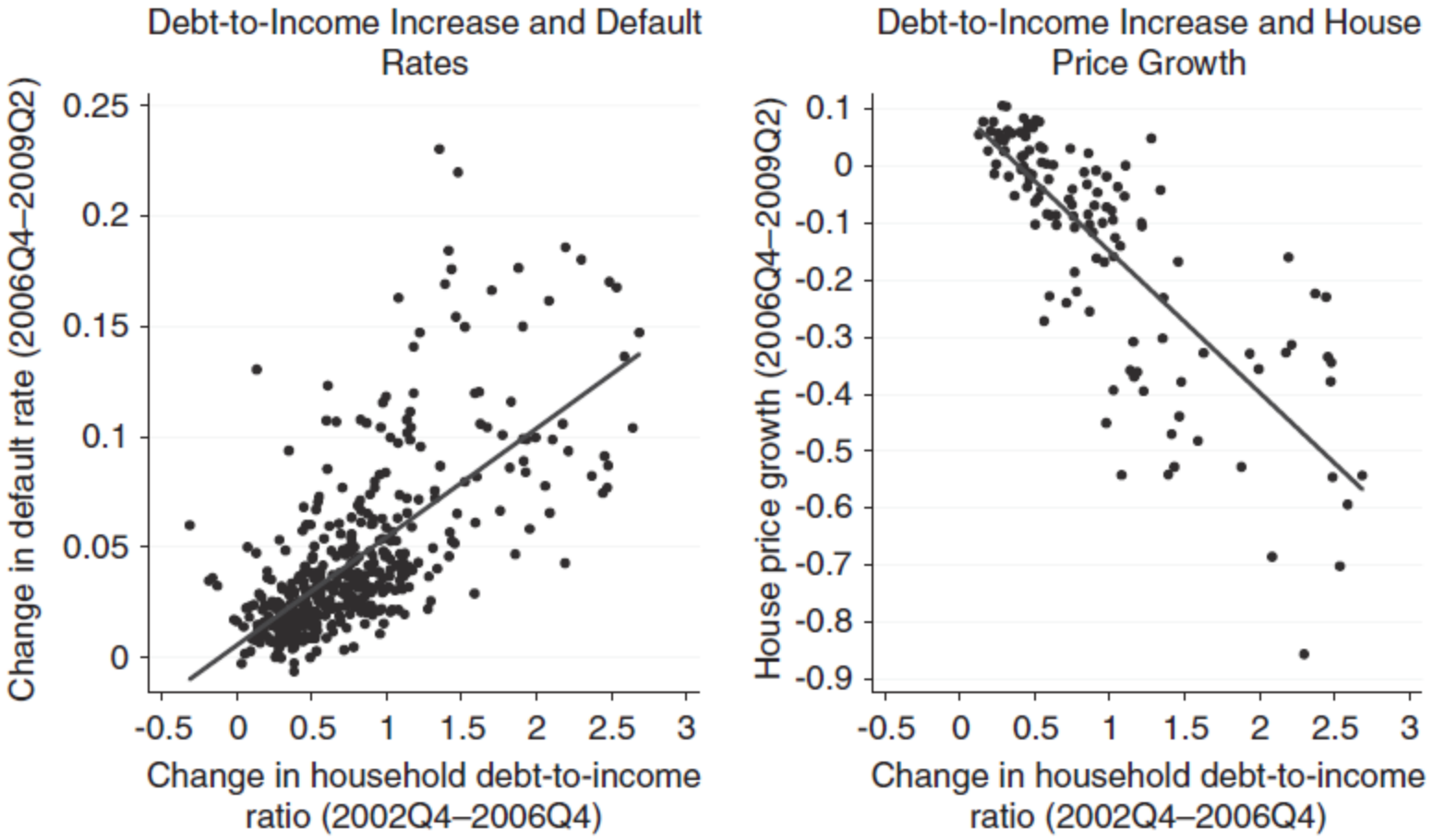
- Housing supply inelasticity is a measure of how easy it was to increase housing in a county
- What omitted variable are they worried about?

Figure 5. Default Rates and House Price Growth in High- and Low-Leverage Growth Counties



Source: Mian and Sufi, "Household Leverage and the Recession of 2007-09

Figure 6. Correlation across Counties of Default Rates and House Prices during Recession with Leverage Growth from 2002 to 2006



Source: Mian and Sufi, "Household Leverage and the Recession of 2007-09

Table 2. Household Leverage Increase from 2002:Q4 to 2006:Q4 and Default Rates from 2006:Q4 to 2009:Q2

	Dependent variable: Change in default rates, 2006:Q4–2009:Q2				
	(1) Unweighted	(2) Weighted	(3) Weighted	(4) Weighted	(5) Weighted IV
Change in debt to income, 2002–06	0.049***	0.058***	0.056***	0.055***	0.093***
	(0.008)	(0.009)	(0.009)	(0.009)	(0.025)
Debt to income, 2001			0.020***	0.015**	0.010
			(0.006)	(0.006)	(0.010)
Unemployment rate, 2006			−0.782	−0.520	−0.986**
			(0.474)	(0.429)	(0.429)
Unemployment rate, 2001			0.850***	0.767**	1.134***
			(0.313)	(0.301)	(0.349)
Default rate, 2006			−0.171	−0.228	−0.486
			(0.246)	(0.259)	(0.323)
Default rate, 2001			1.280***	1.232***	1.642***
			(0.342)	(0.360)	(0.388)
Fraction with credit score under 660, 2001			0.245***	0.239***	0.093
			(0.075)	(0.082)	(0.131)
Credit card utilization rate, 2006			−0.628***	−0.610***	−0.232
			(0.130)	(0.138)	(0.325)
Fraction black, 2000			−0.066***	−0.063**	−0.049*
			(0.025)	(0.025)	(0.027)
Fraction homeowner, 2000			−0.074**	−0.049	−0.088
			(0.031)	(0.036)	(0.054)
Fraction with high school or less, 2000			0.116**	0.131**	0.241***
			(0.053)	(0.050)	(0.065)
Ln (Median household income, 2000)			0.081***	0.072***	0.104***
			(0.022)	(0.022)	(0.033)
Ln (Median home value, 2000)			−0.021*	−0.018	−0.052**
			(0.012)	(0.012)	(0.021)

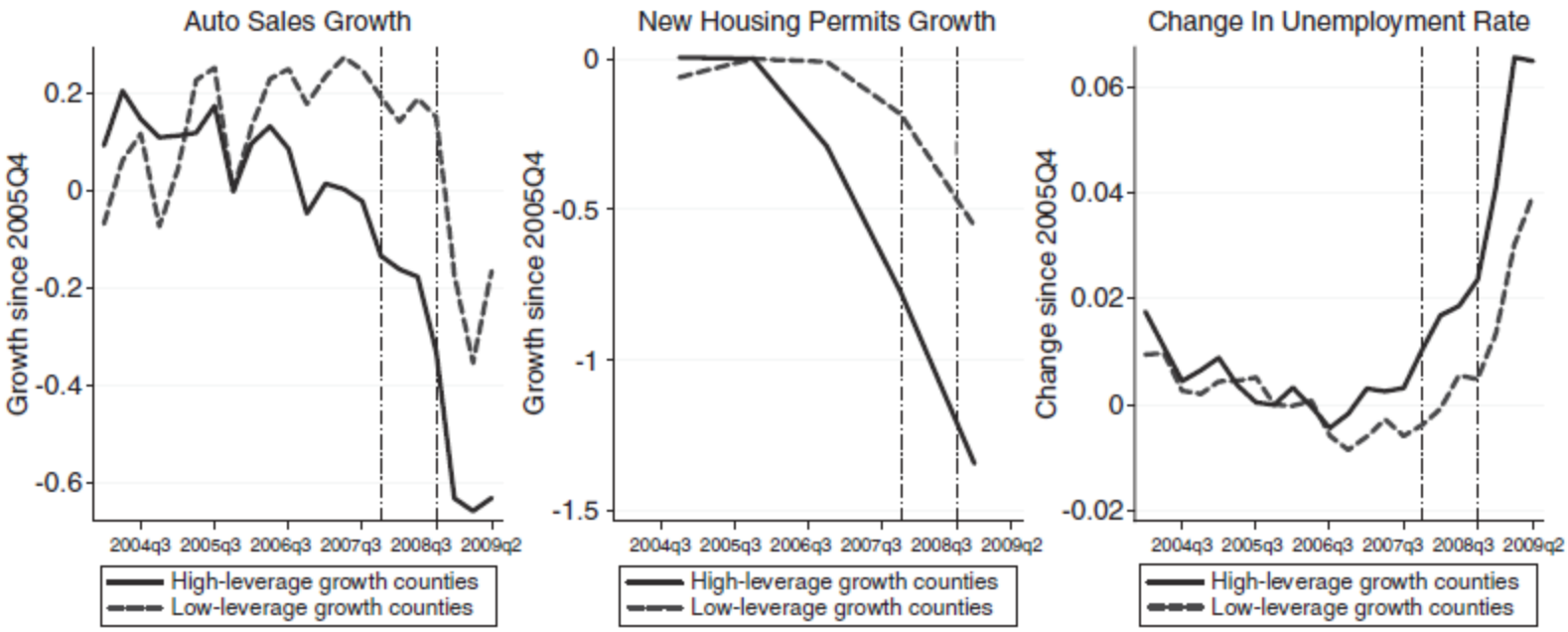
Source: Mian and Sufi, "Household Leverage and the Recession of 2007-09

Table 3. Household Leverage Increase from 2002:Q4 to 2006:Q4 and House Price Growth from 2006:Q4 to 2009:Q2

	Dependent variable: House price growth, 2006:Q4–2009:Q2				
	(1) Unweighted	(2) Weighted	(3) Weighted	(4) Weighted	(5) Weighted IV
Change in debt to income, 2002–06	−0.247***	−0.235***	−0.221***	−0.221***	−0.553
	(0.024)	(0.032)	(0.036)	(0.035)	(0.574)
Debt to income, 2001			−0.117**	−0.079*	0.076
			(0.050)	(0.044)	(0.385)
Unemployment rate, 2006			−0.985	−0.760	−0.144
			(1.798)	(2.106)	(2.938)
Unemployment rate, 2001			−1.523	−2.007	−4.407
			(1.365)	(1.359)	(3.122)
Default rate, 2006			−2.661	−2.877	3.918
			(2.061)	(2.223)	(14.229)
Default rate, 2001			−0.341	−0.809	−3.204
			(1.891)	(2.080)	(6.192)
Fraction with credit score under 660, 2001			−1.523**	−1.263**	−0.384
			(0.597)	(0.593)	(1.675)
Credit card utilization rate, 2006			4.261***	4.017***	0.602
			(0.793)	(0.762)	(7.349)
Fraction black, 2000			0.262	0.220	0.303
			(0.226)	(0.220)	(0.490)
Fraction homeowner, 2000			0.466*	0.394	0.267
			(0.230)	(0.249)	(0.816)
Fraction with high school or less, 2000			−0.417	−0.345	−0.939
			(0.309)	(0.291)	(1.065)
Ln (Median household income, 2000)			−0.575***	−0.460***	−0.929**
			(0.149)	(0.141)	(0.409)
Ln (Median home value, 2000)			0.251**	0.199***	0.615
			(0.062)	(0.072)	(0.468)

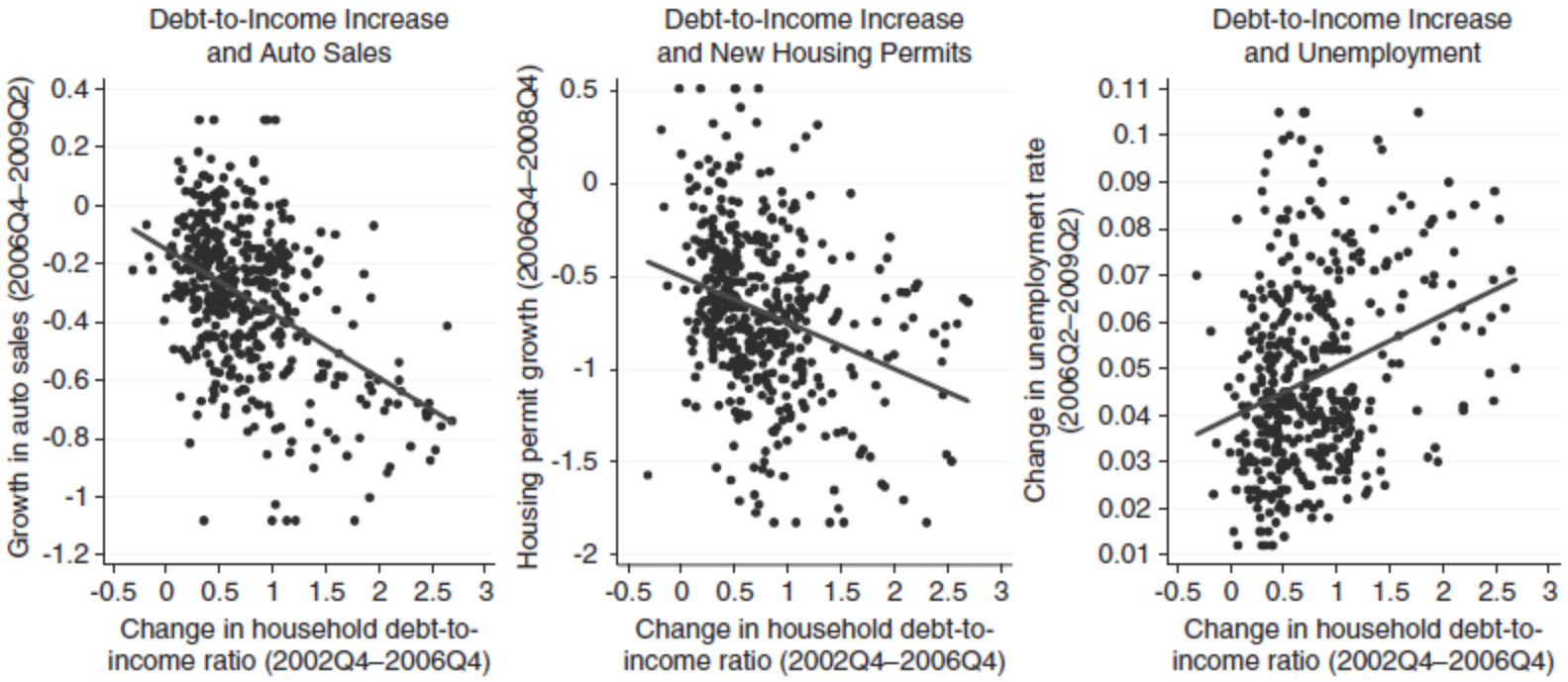
Source: Mian and Sufi, "Household Leverage and the Recession of 2007-09

Figure 7. Auto Sales, New Home Building, and Unemployment Rates in High- and Low-Leverage Growth Counties



Source: Mian and Sufi, "Household Leverage and the Recession of 2007-09

Figure 8. Correlation across Counties of Auto Sales, New Housing Permits, and Unemployment during Recession with Leverage Growth from 2002 to 2006



Source: Mian and Sufi, "Household Leverage and the Recession of 2007-09

Table 4. Household Leverage Increase from 2002:Q4 to 2006:Q4 and Auto Sales Growth from 2006:Q4 to 2009:Q2

	Dependent variable: Auto sales growth, 2006:Q4–2009:Q2				
	(1) Unweighted	(2) Weighted	(3) Weighted	(4) Weighted	(5) Weighted I
Change in debt to income, 2002–06	−0.222***	−0.236***	−0.116**	−0.122**	−0.528
	(0.035)	(0.037)	(0.048)	(0.051)	(0.326)
Debt to income, 2001			−0.250***	−0.238***	−0.106
			(0.049)	(0.053)	(0.120)
Unemployment rate, 2006			−0.406	−1.469	2.589
			(2.364)	(2.292)	(3.029)
Unemployment rate, 2001			−2.089	−2.009	−3.748
			(1.389)	(1.373)	(2.880)
Default rate, 2006			−0.672	0.078	0.869
			(2.399)	(2.336)	(3.031)
Default rate, 2001			0.430	0.877	−0.906
			(2.199)	(2.194)	(5.112)
Fraction with credit score under 660, 2001			−1.699***	−1.808***	−0.303
			(0.556)	(0.557)	(1.614)
Credit card utilization rate, 2006			1.960**	1.806**	−1.995
			(0.809)	(0.750)	(3.906)
Fraction black, 2000			0.126	0.119	−0.174
			(0.259)	(0.259)	(0.378)
Fraction homeowner, 2000			−0.211	−0.422**	−0.257
			(0.204)	(0.207)	(0.468)
Fraction with high school or less, 2000			0.419	0.230	−0.170
			(0.424)	(0.443)	(0.834)
Ln (Median household income, 2000)			−0.283*	−0.217	−0.435
			(0.160)	(0.164)	(0.319)
Ln (Median home value, 2000)			0.178*	0.165*	0.485*
			(0.091)	(0.093)	(0.274)

Source: Mian and Sufi, "Household Leverage and the Recession of 2007-09

Table 5. Household Leverage Increase from 2002:Q4 to 2006:Q4 and New Housing Permit Growth

	Dependent variable: New Housing Permit Growth					
	2006–08					2002–06
	(1) Unweighted	(2) Weighted	(3) Weighted	(4) Weighted	(5) Weighted IV	(6)
Change in D2I, 2002–06	−0.262***	−0.263***	−0.225**	−0.231***	−0.632	−0.094***
	(0.074)	(0.078)	(0.099)	(0.085)	(0.386)	(0.048)
Debt to income, 2001			−0.357***	−0.328***	−0.157	
			(0.062)	(0.062)	(0.185)	
Unemployment rate, 2006			−5.146	−7.139	−5.906	
			(6.351)	(5.734)	(6.003)	
Unemployment rate, 2001			−1.343	−0.771	−2.853	
			(4.294)	(4.065)	(5.055)	
Default rate, 2006			−3.517	−2.675	−0.448	
			(3.994)	(4.124)	(6.066)	
Default rate, 2001			−5.039	−4.818	−5.414	
			(5.023)	(5.054)	(6.584)	
Fraction with CS under 660, 2001			0.233	0.139	0.670	
			(0.995)	(1.076)	(1.961)	
Credit card utilization rate, 2006			0.597	0.541	−1.816	
			(2.320)	(2.445)	(5.762)	
Fraction black, 2000			0.436	0.467	0.291	
			(0.401)	(0.383)	(0.392)	
Fraction homeowner, 2000			0.123	−0.339	−0.273	
			(0.394)	(0.335)	(0.475)	
Fraction with high school or less, 2000			−0.091	−0.335	−1.121	
			(0.484)	(0.544)	(0.948)	
Ln (Median household income, 2000)			−1.055***	−0.945***	−1.265***	
			(0.217)	(0.235)	(0.419)	

Source: Mian and Sufi, "Household Leverage and the Recession of 2007-09

Table 6. Household Leverage Increase from 2002:Q4 to 2006:Q4 and Change in Unemployment Rate from 2006:Q4 to 2009:Q2

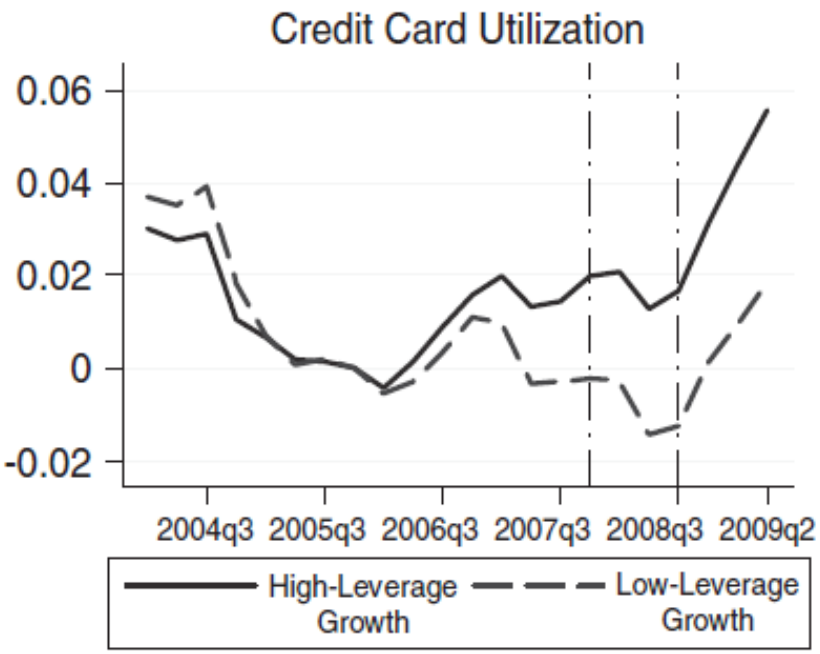
	Dependent variable: Change in unemployment rate, 2006:Q4–2009:Q2				
	(1) Unweighted	(2) Weighted	(3) Weighted	(4) Weighted	(5) Weighted IV
Change in debt to income, 2002–06	0.007**	0.011***	0.008**	0.011***	0.018**
	(0.003)	(0.003)	(0.004)	(0.003)	(0.008)
Debt to income, 2001			0.012***	0.013***	0.005
			(0.003)	(0.003)	(0.005)
Unemployment rate, 2006			0.205	0.157	−0.257
			(0.386)	(0.377)	(0.164)
Unemployment rate, 2001			0.321	0.347*	0.093
			(0.220)	(0.200)	(0.090)
Default rate, 2006			0.205	0.178	0.214
			(0.206)	(0.218)	(0.185)
Default rate, 2001			0.116	0.124	0.015
			(0.179)	(0.178)	(0.194)
Fraction with credit score under 660, 2001			−0.000	0.018	0.035
			(0.046)	(0.042)	(0.050)
Credit card utilization rate, 2006			−0.090	−0.102	−0.112
			(0.106)	(0.110)	(0.123)
Fraction black, 2000			0.023	0.017	0.000
			(0.018)	(0.018)	(0.014)
Fraction homeowner, 2000			−0.005	0.021	−0.007
			(0.025)	(0.026)	(0.018)
Fraction with high school or less, 2000			0.064***	0.073***	0.028
			(0.021)	(0.021)	(0.020)
Ln (Median household income, 2000)			0.020	0.014	0.004
			(0.014)	(0.013)	(0.011)
Ln (Median home value, 2000)			−0.003	−0.003	−0.007
			(0.011)	(0.009)	(0.008)

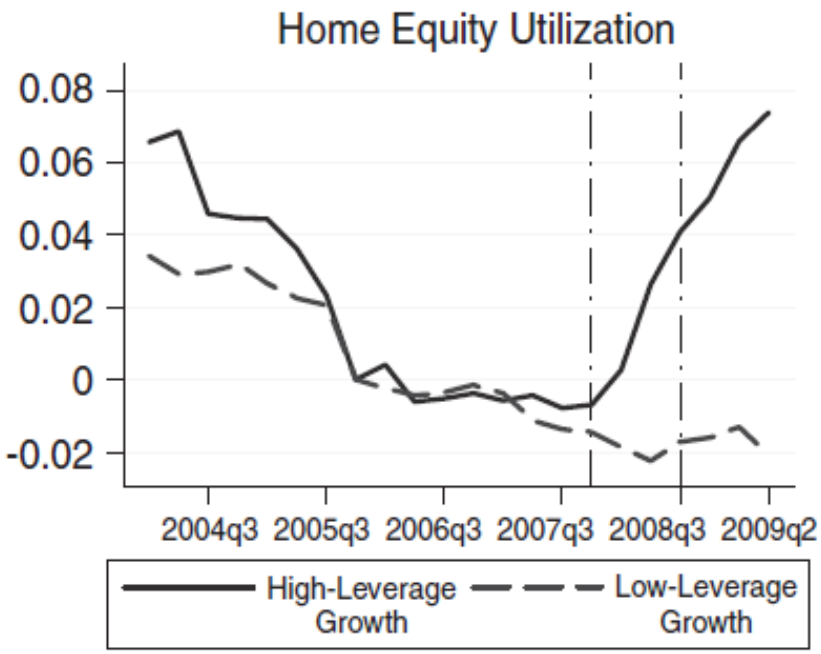
Source: Mian and Sufi, "Household Leverage and the Recession of 2007-09

Why do outcomes plummet in high- and low-leverage counties after 2008Q3?

- Mian and Sufi hypothesize credit-card utilization is another explanatory variable.

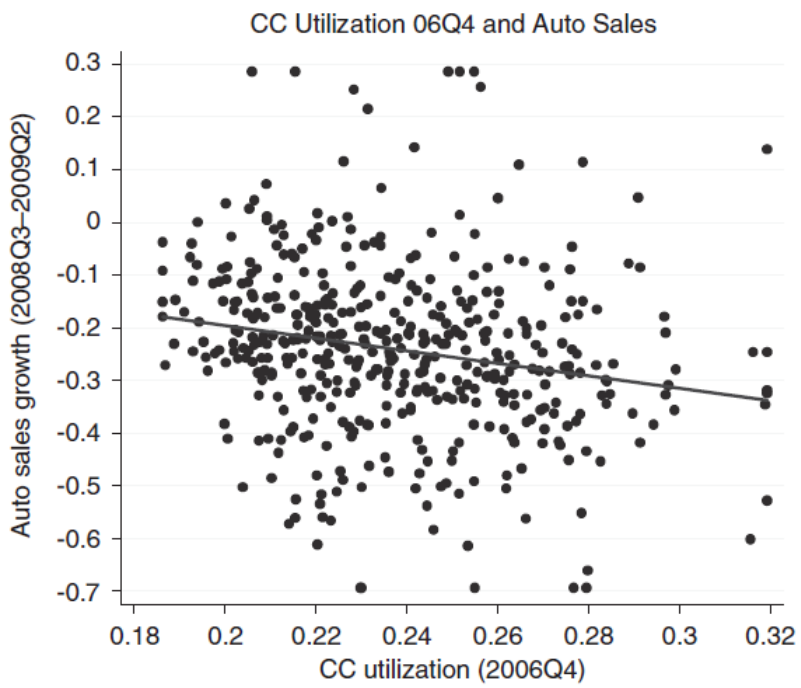
- Perhaps counties with higher credit-card utilization were more affected by the credit shock in the fall of 2008.

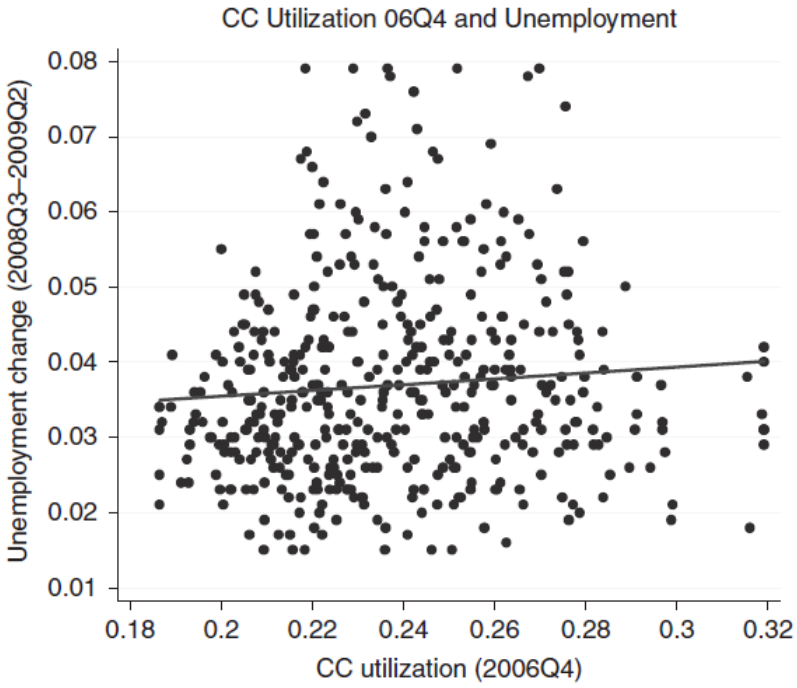




Source: Mian and Sufi, "Household Leverage and the Recession of 2007-09

Figure 10. Consumer Credit Constraints and the Severe Contraction from 2008:Q3 to 2009:Q2





Source: Mian and Sufi, "Household Leverage and the Recession of 2007-09

Table 7. Consumer Credit Constraints and the Deepening of the Recession from 2008:Q3 to 2009:Q2

Dependent variable	Auto sales growth, 2006:Q4–2008:Q3	Auto sales growth, 2006:Q4–2009:Q2		Housing permit growth, 2006–08	Unemployment rate change, 2006:Q4–2008:Q3	Unemployment rate change, 2006:Q4–2009:Q2
	(1)	(2)	(3)	(4)	(5)	(6)
Change in debt to income, 2002–06	−0.194***	−0.281***	−0.264***	−0.287***	0.010***	0.012***
	(0.023)	(0.030)	(0.056)	(0.080)	(0.001)	(0.002)
CC utilization rate, 2006:Q4	−1.066	−3.051***	−1.664*	−1.580	0.034	0.085
	(0.712)	(0.688)	(0.866)	(1.158)	(0.042)	(0.083)
Constant	0.309*	0.616***	−2.282*	−0.065	0.002	0.025
	(0.181)	(0.180)	(1.280)	(0.313)	(0.010)	(0.018)
Control variables?	No	No	Yes	No	No	No
Number of counties	450	450	449	449	450	450
R^2	0.30	0.26	0.37	0.11	0.20	0.11

Note: This table presents coefficient estimates of the effect of credit card utilization rates on auto sales and unemployment. Column 3 (4) restricts the sample to firms in the bottom (top) decile counties of the change in debt to income from 2002 to 2006 distribution. The specification reported in column 3 includes the following control variables: the unemployment rate as of 2001:Q4–2006:Q4, the fraction of population that is black, the fraction of homeowners, the fraction with a high school education or less, and the fraction of employment in construction, real estate, finance, retail and export industries. All regressions are weighted by the number of households and standard errors are clustered by state. ***, **, *Coefficient estimates statistically distinct from 0 at the 1, 5, and 10 percent levels, respectively.

Source: Mian and Sufi, "Household Leverage and the Recession of 2007-09

Could it be local banking conditions?

- Perhaps defaults caused local banks to have trouble.
- This trouble led to a decline in lending to county businesses.

Table 8. Can the Effect of Household Leverage on Recession Severity be because of Local Banking Effects?

	Only counties where banks have <10% local deposits			Include controls for performance of banks in county		
Dependent variable:	(1) Auto sales growth, 2006: Q4–2009:Q2	(2) New Housing Permit Growth, 2006–08	(3) Increase in unemployment rate, 2006:Q4–2009:Q2	(4) Auto sales growth, 2006: Q4–2009:Q2	(5) New Housing Permit Growth, 2006–08	(6) Increase in unemployment rate, 2006:Q4–2009:Q2
Change in debt to income, 2002–06	−0.219***	−0.170***	0.007**	−0.236***	−0.255***	0.010***
	(0.035)	(0.039)	(0.003)	(0.036)	(0.064)	(0.002)
Change in charge-offs for banks in county, 2005–08				−2.334	2.255	−0.061
				(2.464)	(3.998)	(0.132)
Change in net income for banks in county, 2005–08				14.537**	25.300***	−1.133***
				(5.609)	(8.999)	(0.343)
Constant	−0.172**	−0.558***	0.053***	−0.014	−0.307***	0.039***
	(0.066)	(0.073)	(0.005)	(0.062)	(0.089)	(0.004)
Number of counties	52	51	52	450	449	450
R^2	0.30	0.08	0.10	0.25	0.16	0.18

Note: The coefficient estimates reported in columns 1 through 3 are from specifications that isolate the sample to counties where the banks have less than 10 percent of their deposits within the same county. Columns 4 through 6 report coefficient estimates from specifications that include measures of bank performance within the county. All specifications are weighted by the number of households in the county as of 2000. Standard errors are clustered by state. ***, **, *Coefficient estimates statistically distinct from 0 at the 1, 5, and 10 percent levels, respectively.

Source: Mian and Sufi, "Household Leverage and the Recession of 2007-09