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**The Impact of Housing Markets on Consumer Debt: Credit
Report Evidence from 1999-2012**

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The Impact of Housing Markets on Consumer Debt: Credit Report Evidence from 1999 to 2012

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Dallas Fed, November 2013

How should a house price increase affect consumption?

Theoretical context

- Sinai & Souleles (2005): Long-lived, immobile, borrowing unconstrained consumer
 - Wealth \nearrow just offset by \nearrow in future imputed rents
 - *No change in consumption*
- Campbell & Cocco (2007): **Older** or mobile consumer
 - Intend sale, wealth effect - *increase consumption*
- Ortalo-Magne & Rady (2006): Credit constrained consumer (**young**, less creditworthy)
 - Increased available collateral - *increase consumption*

How do debt portfolios respond to house price changes?

Empirical questions

- Does debt that funds consumption (mortgages aside) respond to house prices at all? If so, for whom?
- Portfolio reallocation between uncollateralized & collateralized debt / credit card & HELOC?
- Do parent homeowners substitute out of home equity debt into student debt as owner equity evaporates?

- Relatively stable housing market period, 1999-2001
- Historic housing boom, 2002-2006
- Historic housing bust, 2007-2012

Macro house prices and consumption literature

- Aron, Duca, Muellbauer, Murata & Murphy (2012): Housing collateral - consumption relationship not fixed, but shifting with lending standards.
- Mian and Sufi (2011): Existing homeowners extract equity during the boom, no indication that it funds investment.
- Dynan (2012), Cooper & Dynan (2013), Cooper (forthcoming): Leverage effect on consumption post-crisis, wealth v. collateral effects of house price appreciation.

Aside: Consumption v. Consumer debt

Consumer debt is not consumption. Concerns:

(i) Debt may support assets.

Set aside mortgages.

Auto debt supports auto consumption.

Credit card debt's high rates \Rightarrow poor investment funding.

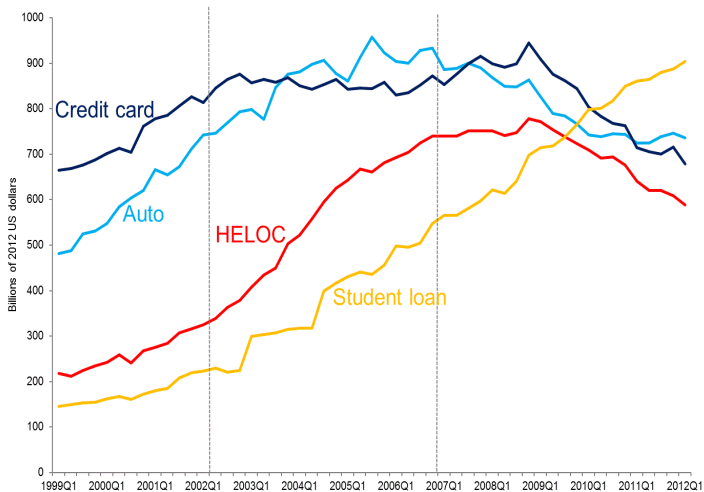
HELOC supports consumption or home remodeling.

(ii) Debt measures only a subset of consumption.

Misses consumption changes funded by income changes or positive savings changes.

Weigh these shortcomings against the small sample sizes or narrow consumption bundles of explicit consumption data.

Leading non-mortgage debt categories



Source: FRBNY Consumer Credit Panel/Equifax

Empirical approach

Challenges and solutions

- Home values unknown - missing from credit report data, measured with error elsewhere.
→ Match CoreLogic zip code-level house price data to CCP.
- Identification of homeowners is imperfect in credit report data.
→ Use history of home-secured debt, following Mian and Sufi (2011).
- Homeowner sample evolves endogenously.
→ Define homeowners & assign zip codes based on housing debt observed *before* the estimation period.

Empirical approach

Challenges and solutions

- Unobservable borrower characteristics may be correlated with both house prices and debt use.
→ Difference.
- Potential endogeneity of house price growth - local economic conditions.
→ Instrument house price growth using Saiz (2010) MSA-level land topology-based supply elasticity measure.

Empirical approach

Specification

$$D_{izt_2} - D_{izt_1} = (X_{izt_2} - X_{izt_1}) \beta^D + \delta^D \left(\frac{\widehat{H_{izt_2} - H_{izt_1}}}{H_{izt_1}} \right) + \gamma^D (t_2 - t_1) + v_{izt_2t_1}$$

$$\frac{H_{izt_2} - H_{izt_1}}{H_{izt_1}} = (X_{izt_2} - X_{izt_1}) \beta^H + \rho LZ + \zeta_{iz,t_2,t_1}$$

D_{izt} = debt balance of $izt \in \{\text{auto, card, student, home equity, total non-housing}\}$

X_{izt} = risk score polynomial, zip code-level IRS income polynomial, county-level BLS unemployment

H_{izt} = CoreLogic house price index for zip code z at time t

$v_{iz,t_2,t_1}, \zeta_{iz,t_2,t_1}$ = uncorrelated, idiosyncratic errors

5% random sample of all Equifax credit reports, + household

Sample on SS#: No panel attrition problems, automatic refreshing – Lee & van der Klaauw (2010)

- Balances, payments, limits, delinquency, & default on all standard consumer debts
- Foreclosure, bankruptcy, liens, collections, court actions
- Geographic location to the Census block
- Age, FICO-equivalent risk score
- Missing: gender, race/ethnicity, ...

Aggregates consistent with Flow of Funds, G.19, ACS, SCF (except credit card balances)

Data

CoreLogic house price index, IRS income, BLS unemployment

Corelogic HPI:

- Tracks changes in home prices using repeat transaction sales
- 6739 zip codes, 80% coverage in our sample

IRS Individual Income Tax Statistics zip code data:

- 1998, 2001, 2002, 2004-2008
- Interpolation of other years, total coverage 39,708 zip codes

BLS Local Area Unemployment Statistics (LAUS):

- County-level, monthly unemployment data
- 3218 counties containing 32,038 zip codes

From baseline ~2.5 million, our final $N = 314,202$ for 1999-2001, 449,627 for 2002-2006, 565,768 for 2007-2012.

Instrument

Saiz (2010) land topology-based measure of housing supply elasticity

Saiz (2010) generates a housing supply elasticity measure using land gradient and presence of bodies of water.

153 unique MSAs \rightarrow 10,923 (relatively populous) zip codes using GIS

Other applications of Saiz instrument:

- Mian and Sufi (2009, 2011, 2012)
- Mian, Rao, and Sufi (2012)
- Chetty and Szeidl (2010)
- Halket (2012)
- Adelino, Schoar, Severino (2013)

Mian and Sufi (2011) vet the instrument in Equifax data.

First stage

Regression of % change in HPI on land supply elasticity index

Dependent variable	Period		
	1999-2001	2002-2006	2007-2012
Land supply elasticity index	-6.833*** (0.027)	-19.832*** (0.067)	6.823*** (0.026)
Mean house price % chg	22.62	54.02	-22.94

*significant at the 10 percent, ** at the five percent, and *** at the one percent level.

Source: FRBNY Consumer Credit Panel/Equifax

Results

Baseline estimates

Dependent variable	Period		
	1999-2001	2002-2006	2007-2012
Non-Housing Debt	-57.16*** [-\$1292.96]	25.53*** [\$1379.13]	8.30 [-\$190.40]
HELOCs	67.84*** [\$1534.54]	96.25*** [\$5199.43]	103.83*** [-\$2,381.86]

•significant at the 10 percent, ** at the five percent, and *** at the one percent level.

Source: FRBNY Consumer Credit Panel/Equifax

Results

Findings in the full sample

- Sensible portfolio reallocation 1999-2001: \$1-for-\$1 non-housing (mainly credit card) to HELOC substitution, minimal net consumption effect
- +\$6579 average non-mortgage debt response to the housing boom - wealth or collateral?
- -\$2572 average response to the bust (paydown/inaccess/default)
- Mian & Sufi (2011) result for 2002-6 represents a stable pattern over time: 1% HPI gain \Rightarrow \$68-104 HELOC gain.

Results

Heterogeneity - Equifax risk score

	1999-2001	2002-2006	2007-2012
		Risk score 700+	
Non-housing Debt	-70.90***	15.50***	-32.52***
HELOCs	61.27***	103.61***	44.09***
<hr/>			
		Risk score < 620	
Non-housing Debt	-12.84	22.55***	121.21***
HELOCs	53.16***	23.64***	161.17***
<hr/>			

Source: FRBNY Consumer Credit Panel/Equifax

Results

Largest magnitude debt cycles

	1999-2001	2002-2006	2007-2012
		Risk score 620-699	
Non-housing Debt	-64.03**	30.22***	72.51***
HELOCs	77.07***	105.73***	281.23***
<hr/>			
		Age < 50	
Non-housing Debt	-49.54***	27.56***	38.32***
HELOCs	80.14***	120.98***	149.89***
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Source: FRBNY Consumer Credit Panel/Equifax

Results

Student loan-HELOC substitution

Hypothesized substitution between HELOC & student loan hard to test.

- Move across credit reports within the same household.
- Even in household data (CCP, SCF, ...), need to observe child *at* parents' address.
- Parent student loans, eg PLUS, increasing in prevalence (D of Ed) - older homeowner -5.29**.

Try aggregating: Zip code-level 18-22 year olds' student debt on HPI or HELOC aggregates.

Results

Student loan-HELOC substitution

Independent variable	Period		
	1999-2001	2002-2006	2007-2012
House price index	-0.44* (0.23)	0.77*** (0.24)	0.85 (1.03)
HELOC dollars	-0.02* (0.01)	0.01*** (0.00)	0.01 (0.02)

N = 4770, *significant at the 10 percent, ** at the five percent, and *** at the one percent level.

Source: FRBNY Consumer Credit Panel/Equifax

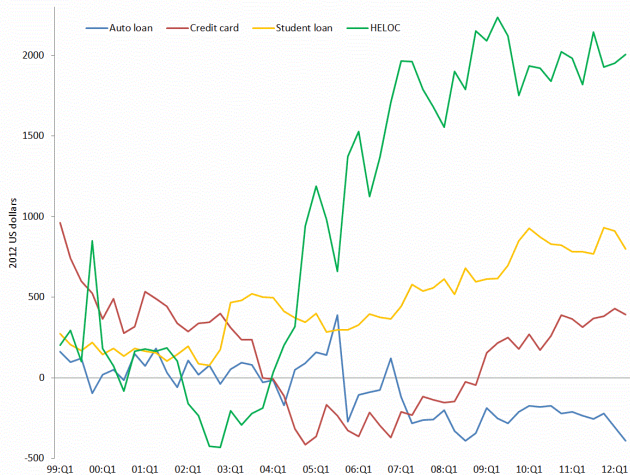
Results

Student loan-HELOC substitution

- None of the estimates provide any indication of substitution out of student debt into HELOCs during the boom.
- Zip code aggregates show substitution *only* for 1999-2001
- & no new evidence of substitution during the bust.

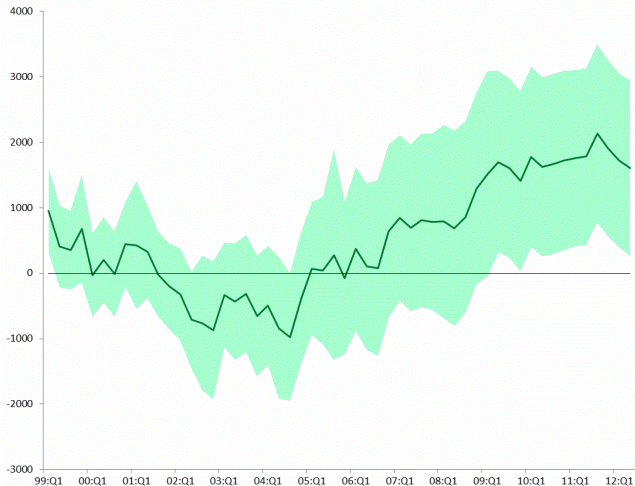
Controlled difference-in-differences estimates

Figure 6: Controlled difference in differences estimates of the effect of house price appreciation quartile on consumer debts



Controlled difference-in-differences estimates

Figure 7: Difference in differences estimates of the effect of home price appreciation on total non-mortgage debt



Conclusions

- Young & less creditworthy borrowers' non-housing debts follow house prices, suggesting large and persistent collateral effects of house prices on debt-funded consumption.
- In stable and deteriorating housing markets, older & prime homeowners performed sensible reallocation of debt, but left net balances largely unchanged. → limited role for wealth effects.
- However, all homeowners increased total debt substantially during the housing boom, suggesting simultaneous wealth and collateral effects of unprecedented house price growth.
- Little or no evidence of student debt – HELOC substitution, hence little indication that housing recovery will curb student debt growth.
- \$2700 average non-mortgage debt overhang for high boom era appreciation homeowners, despite loss of most boom-era equity gains.