



Financial Integration, Housing and Economic Volatility

by Elena Loutskina and Philip Strahan

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We Care About Housing Market

- Roots of the Current Crisis
 - Existing research emphasizes role of excessively loose credit in driving ‘bubble’
 - Mian and Sufi (2009), Keys et al (2010), Loutskina and Strahan (2011), Rajan, et al (2010)
 - Recovery of housing market and recovery of real economy
 - Mian and Sufi (2011);
 - This paper asks: Did financial integration – by facilitating capital flows – contribute to the boom/bust cycle of real economy?
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Financial Integration

- Financial integration dampens credit supply shocks
 - Morgan, Rime, Strahan (2004); Demyanyk et al (2007); Imbs (2006); Holmstrom and Tirole (1997); Otto, Voss and Willard (2001), ...
- Financial integration amplifies demand side shocks
 - Morgan, Rime, Strahan (2004); Holmstrom and Tirole (1997); Demyanyk et al (2007); Kalemni-Ozcan, Papaioannou, Peydro (2011);
- Capital becomes less informed (more collateral driven)
 - Loutskina and Strahan (2011), Cortez (2011), Purnanandam (2011)

Research Questions

- Has financial integration increased volatility and reduced co-movement of local housing prices?
- Has financial integration strengthened the link from housing (as a proxy for collateral generally) to local economy?

Financial Integration

- Advent of securitization (common across geographies)
 - Prime mortgage finance (starting in 1970s)
 - Credit card, auto (starting in 1980s)
 - Allow public-information-based loans to be financed thru securities markets
 - Deregulation (within variation over time)
 - Within state (1970s ad 1980s)
 - Across states (1990s and 2000s)
 - Allows relationship loans to access external sources of intermediary capital
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This paper

- With rise of financial integration the housing prices become more volatile and less synchronized across geographies
- We establish a causal link from housing prices to real economy
 - 1% increase in housing prices leads to .2 to 0.3% increase in real economy
- Financial integration makes this relationship stronger
- Overall, financial integration amplifies the business cycles
 - Higher volatility of the housing prices
 - Strengthening the housing price impact on output

CBSA- year level panel data

- Measures of financial integration
 - Summary of Deposits (1994-2006)
- Housing Prices (1976-2006)
 - Housing price index compiled by FHFA
- Measures of real economy (1976-2006)
 - Personal Income Growth (BEA)
 - Employment and industry structure (BLS)
 - GDP (Moody's analytics)
- Other control variables
 - Bank capital, size, growth (Call reports)
 - Lag dependent variable
 - Industry shares (BEA)

Measures of Financial Integration

Summary of Deposits based

In CBSA ratio = % of CBSA deposits held by banking institutions with outside branches

Common CBSA ratio = Ratio of deposits held by banks with branches in both CBSAs by to total deposits in both CBSAs

Core Models Part I

1. Estimate links from financial integration to local housing volatility

$$\text{Volatility of Housing Prices}_{i,t} = \alpha_t + \gamma_i + \beta^1 \text{Integration}_{i,t} + \text{Other Controls} + \varepsilon_{i,t}$$

$$\text{Housing Price Interrelatedness}_{i,j,t} = \alpha_t + \gamma_{i,j} + \beta^2 \text{Integration}_{i,j,t} + \text{Other Controls} + \varepsilon_{i,j,t}$$

Measuring Volatility

By CBSA-year

$$\begin{aligned} \ln \text{ Housing Price}_{i,t} - \ln \text{ Housing Price}_{i,t-1} \\ = \alpha_t + \gamma_i + \text{growth-shock}_{i,t} \end{aligned}$$

$$\text{Volatility}_{i,t} = |\text{growth-shock}_{i,t}|$$

By CBSA-year pairs

$$\text{Interrelatedness}_{i,j,t} = - \left| \text{growth-shock}_{i,t} - \text{growth-shock}_{j,t} \right|$$

Core Models Part I

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Instrument for In-CBSA ratio

- Branching restrictions index (0 to 4)
 - Add 1 if minimum age > 3 years
 - De novo branching prohibited
 - State does not permit individual branch purchases
 - Cap on total deposits owned $< 30\%$

Table 2: Housing Price Volatility

<i>Dependent Variable:</i>	In-CBSA Ratio	Absolute Value of Residual House-Price Growth	
	<i>First-Stage</i>	<i>OLS</i>	<i>IV</i>
	(1)	(2)	(3)
Branch Restriction Index	-0.0133***	-	-
	(3.02)	-	-
In-CBSA Ratio	-	0.00832**	0.0307**
		(2.48)	(2.18)
	-		
Year fixed effects	yes	yes	yes
CBSA fixed effects	no	no	no
Industry Structure Controls	yes	yes	yes
Observations	4,397	4,397	4,397
R-squared	10.0%	14.7%	27.2%

Core Models Part I

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Table 3: Synchronization of Housing Markets

<i>Dependent Variable:</i>	Interrelatedness	Interrelatedness Indicator	- Absolute Value of Differential Growth Shock			
	First-Stage	First-Stage	OLS	OLS	IV	IV
Branch Restriction Index	-0.00432*** (10.41)	-0.0195*** (10.65)	- -	- -	- -	- -
Interrelatedness	-	-	-0.0245*** (8.17)	-	-0.200*** (4.92)	-
Interrelatedness Indicator	-	-	-	-0.00260*** (4.07)	-	-0.0442*** (4.61)
Distance between Employment Shares	-0.00635 (0.54)	-0.0295 (0.57)	-0.0144** (2.10)	-0.0143** (2.08)	-0.0147** (2.17)	-0.0147** (2.15)
Time Effects	yes	yes	yes	yes	yes	yes
CBSA-Pair Fixed Effects	yes	yes	yes	yes	yes	yes
Number of Observations	707,256	707,256	707,256	707,256	707,256	707,256
R ²	18.2%	20.2%	23.0%	23.0%	16.0%	14.0%

First Set of Results

- Volatility increases with integration
- Synchronization of markets decreases with integration

Core Models Part II

2. Estimate link from housing to output, and add the effect of financial integration:

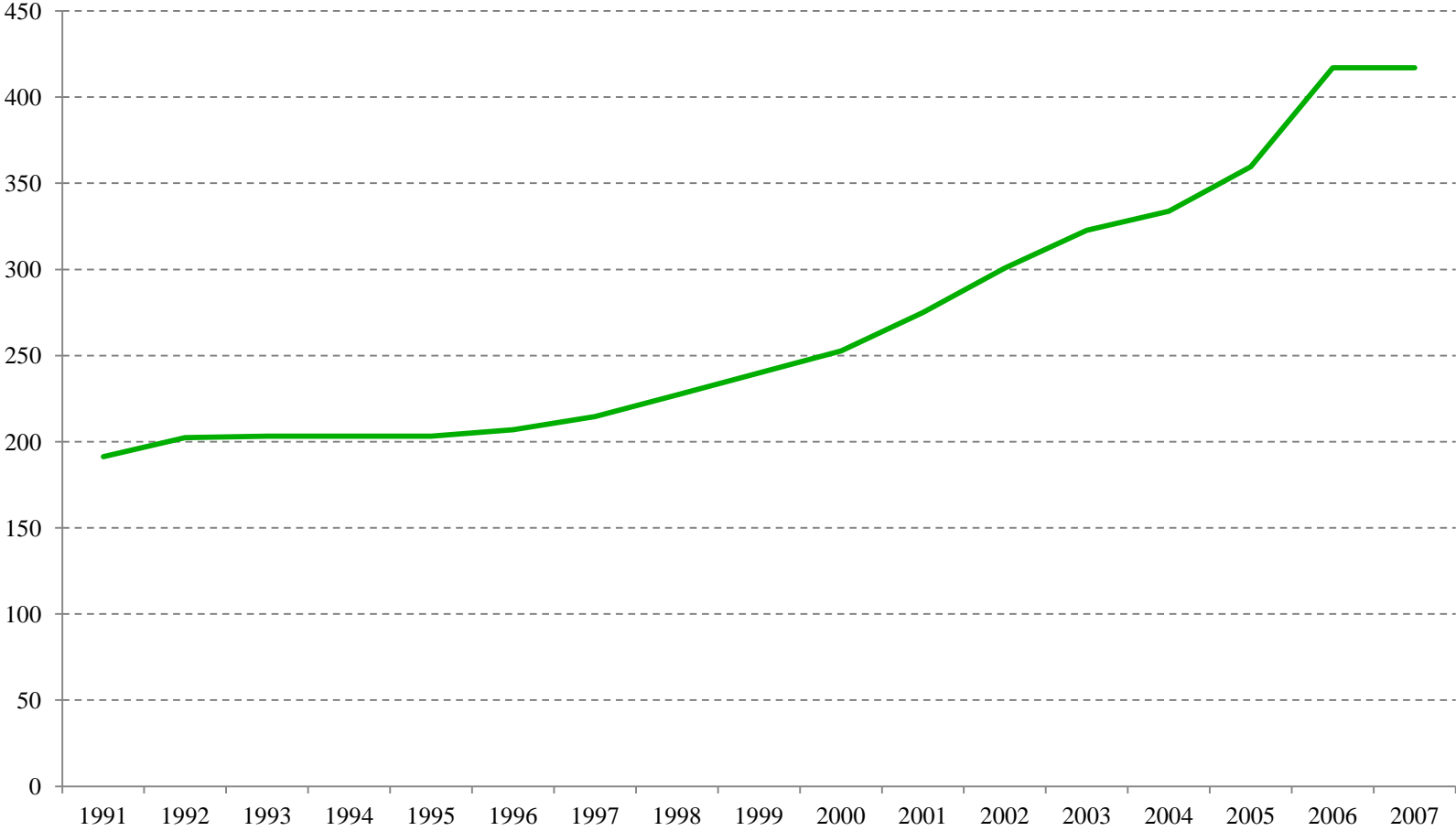
$$Y_{i,t} = \alpha^y_t + \gamma^y_i + \beta^y_1 \text{House-Price Growth}_{i,t} + \text{Other Control Variables} + \varepsilon_{i,t}$$

$$Y_{i,t} = \alpha^y_t + \gamma^y_i + \beta^y_1 \text{House-Price Growth}_{i,t} + \beta^y_2 \text{Financial Integration}_{i,t} +$$

$$\beta^y_3 \text{Financial Integration}_{i,t} * \text{House-Price Growth}_{i,t} +$$

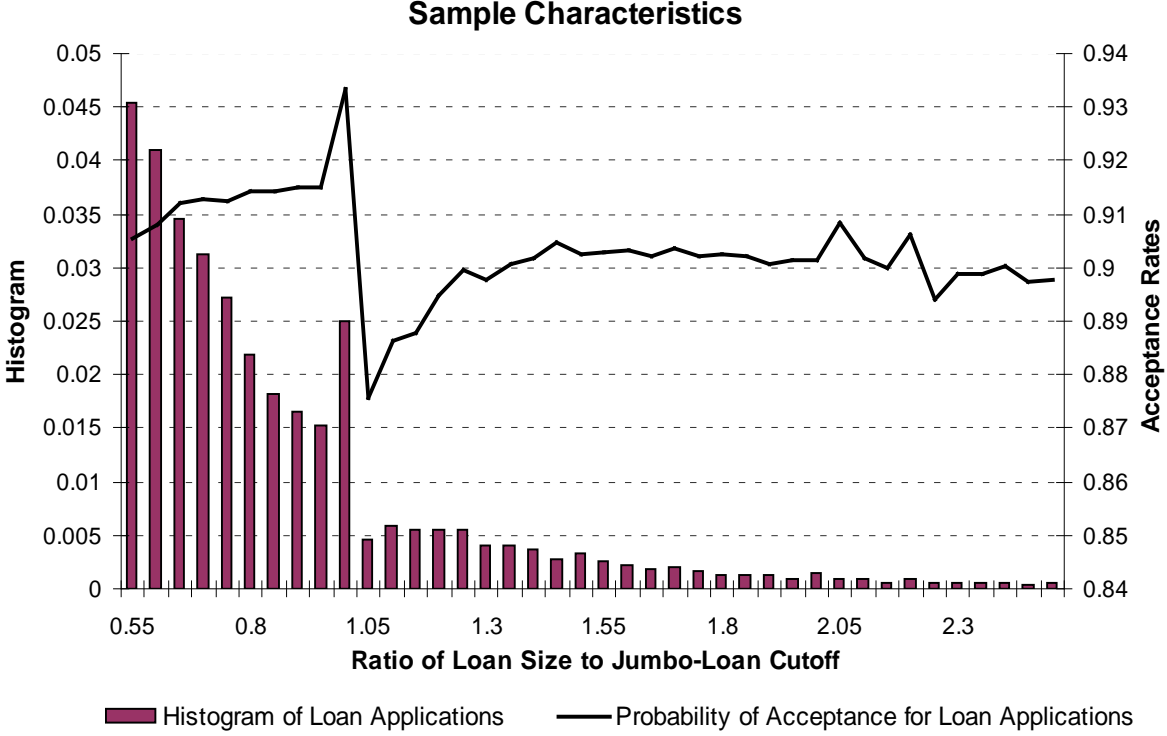
$$+ \text{Other Control Variables} + \varepsilon_{i,t}$$

The Jumbo Loan Cut-Off



Instrumental Variable Inspiration

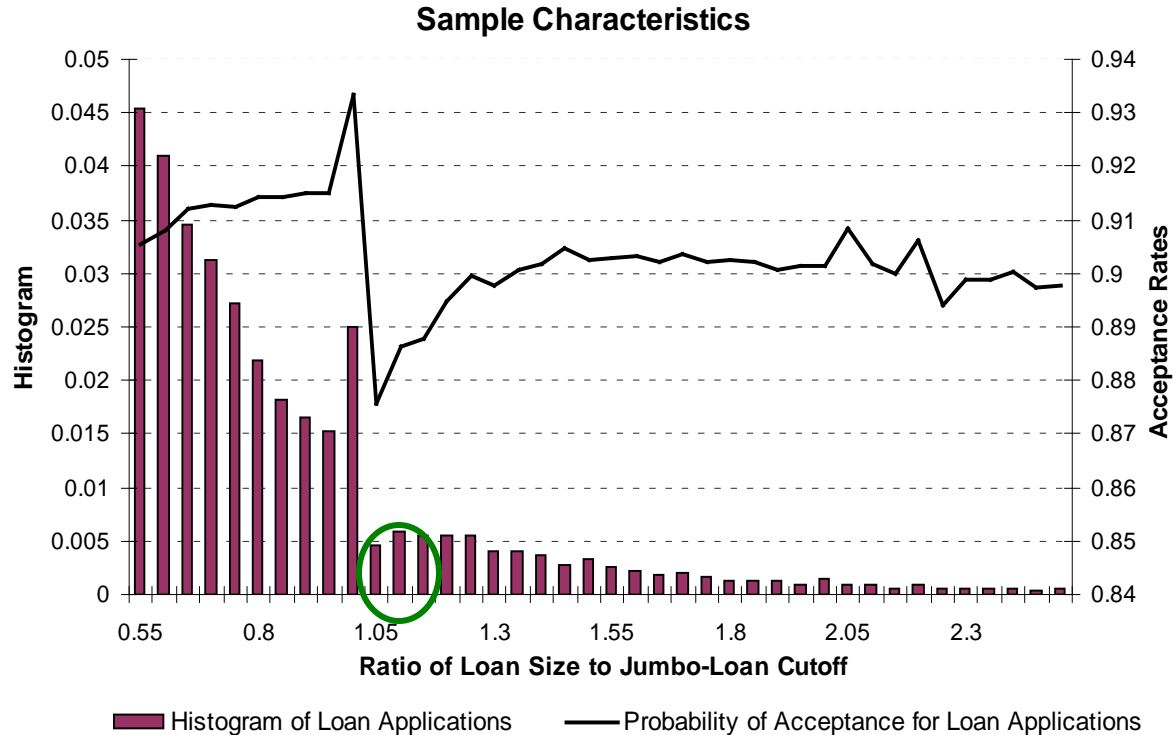
Loutskina and Strahan (2009)



Instrumental variable motivation

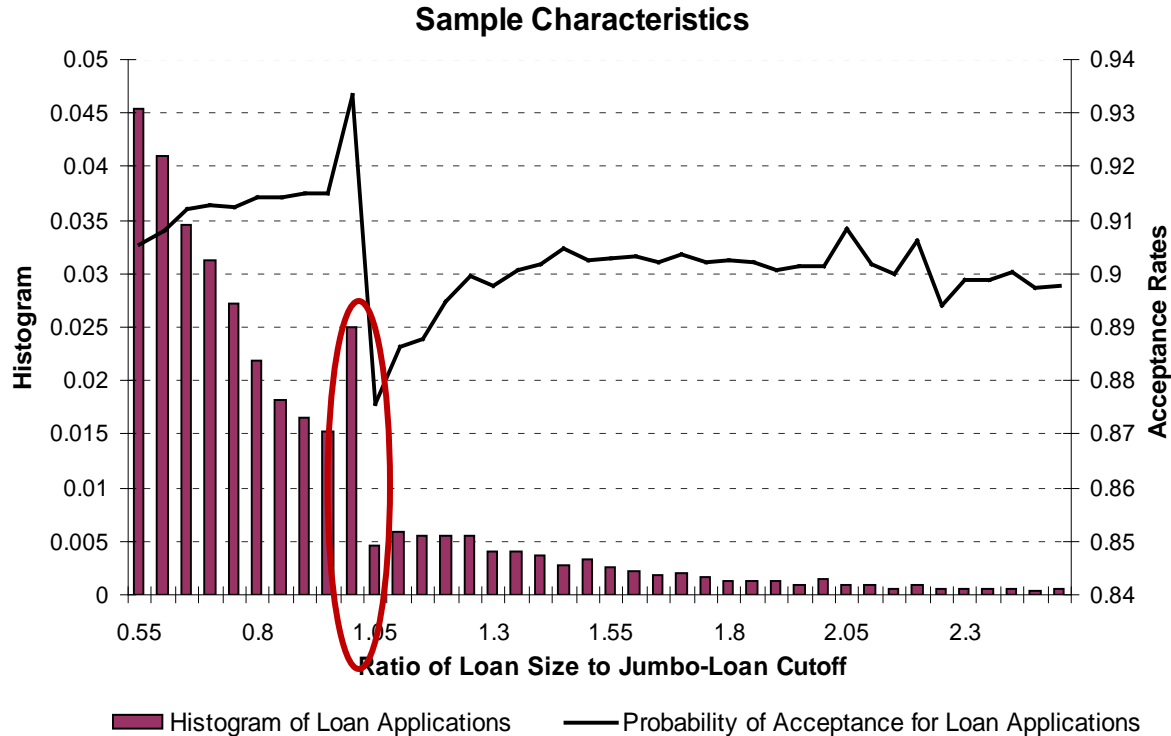
- Exploit exogenous shocks to the conventional loan cut-off (jumbo cut-off)
 - Importance of GSEs in housing finance
 - Uniform across all markets and exogenous to individual geo areas economies
 - Loutskina and Strahan (2009)
 - Jumbo loan cut-offs are binding
 - Loan supply is dramatically higher below the cutoff
 - Adelino, Schoar and Severino (2011)
 - Eligibility for GSE financing increases house value by 1.1\$/sq.f.
- Exploit elasticity of housing supply
 - Galeser, Gyourko, and Saiz (2008), Saiz (2008)

Instrumental variable motivation



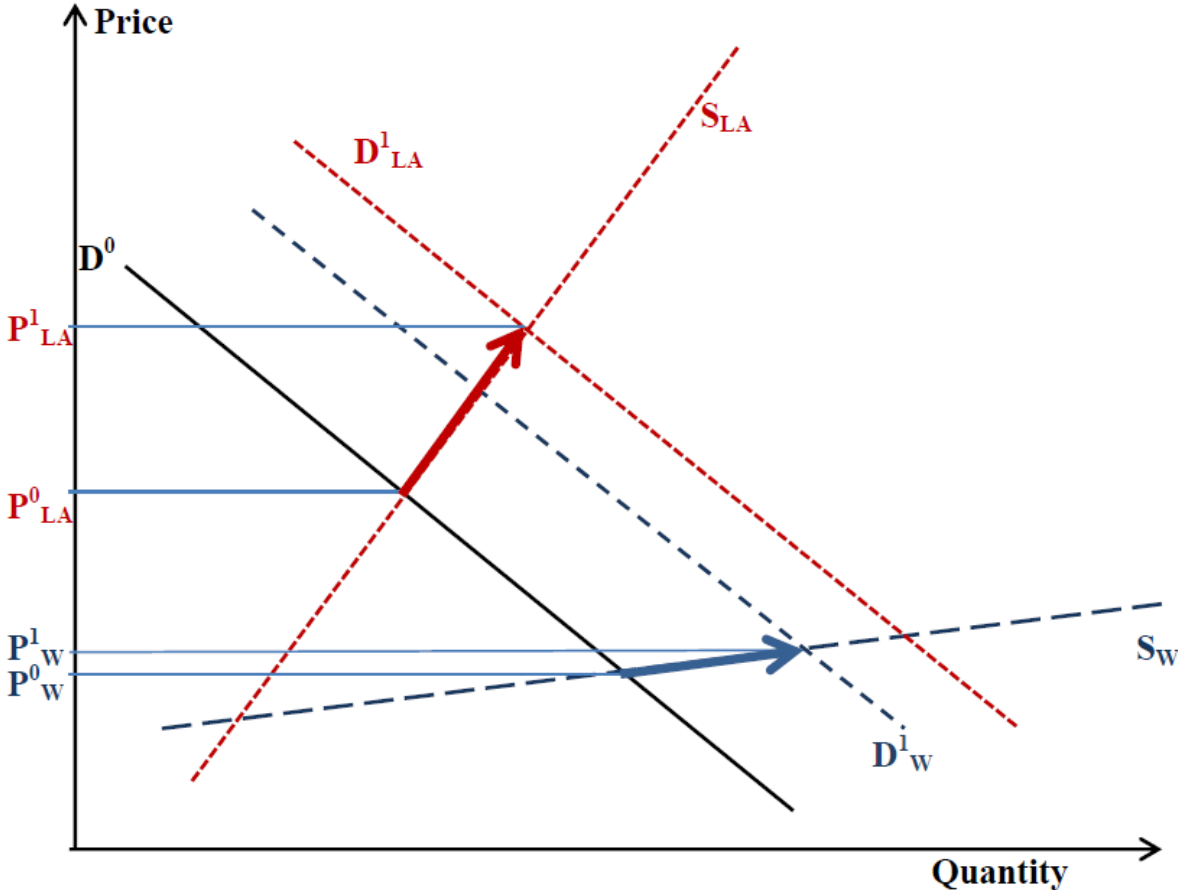
IV1 = Percentage of loan applications at time $t-1$ that were jumbo at that time but would have become non-jumbos at time t .

Instrumental variable motivation



IV2 = Percentage of loan applications within 5% of the jumbo loan cut-off (95% to 105% of the cutoff) * the percentage change in the cutoff

Motivation for Instruments



Instrumental variables examples

<i>Area</i>	<i>Housing Supply Elasticity</i>	<i>% of new non-jumbo loans</i>	<i>% of loans around cut-off</i>
Los Angeles-Long Beach-Santa Ana, CA	0.626	2.66	5.39
Wichita, KS	5.453	0.19	0.47

- Sample 1996-2006
- Exploit sensitivity of the geo areas to increase in supply of conventional loan credit
- Exploit the differences in housing supply elasticity and hence housing price sensitivity to increased demand for housing

Table 5: First Stage Results

Dependent Variable:	Housing Price Growth					
	(1)	(2)	(3)	(4)	(5)	(6)
Share of New Non-Jumbo borrowers	0.25		-3.374***	0.168**		-2.003***
	(1.11)		(6.31)	(2.08)		(4.30)
Share of New Non-Jumbo borrowers	-0.209**		0.845**	-0.243***		0.401
* Saiz Elasticity of housing supply	(2.02)		(2.55)	(2.77)		(1.22)
Share Near the Jumbo Cutoff * Change in Cutoff		4.687***	22.91***		1.835**	5.376**
		-3.967	(7.48)		(1.97)	(2.62)
Share Near the Jumbo Cutoff * Change in Cutoff		-2.013**	-6.594***		-1.032***	-3.907*
* Saiz Elasticity of housing supply		(2.05)	(3.46)		(2.73)	(1.84)
Saiz Elasticity of housing supply	-0.00447***	-0.00342***	-0.00225***			
	(4.09)	(3.47)	(2.64)			
Time fixed effects	yes	yes	yes	yes	yes	yes
Industry structure	yes	yes	yes	yes	yes	yes
Banking Sector Controls	yes	yes	yes	yes	yes	yes
CBSA dummies	no	no	no	yes	yes	yes
Observations	2,783	2,783	2,783	2,783	2,783	2,783
R-squared	0.316	0.322	0.347	0.524	0.516	0.525

Table 6: IV Regressions

	<i>Personal Income Growth</i>		<i>Total Employment Growth</i>		<i>Employment Growth w/o Construction or Finance</i>		<i>GDP Growth</i>	
House-Price Growth	0.186***	0.137***	0.222***	0.209***	0.168***	0.152***	0.259***	0.245***
	(4.25)	(3.52)	(5.83)	(5.76)	(5.12)	(4.77)	(4.66)	(4.39)
Lagged Dependent variable	-	(0.00)	-	-0.121**	-	-0.159***	-	0.0784*
	-	(0.05)	-	(2.53)	-	(2.92)	-	(1.90)
Time fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
Industry structure	yes	yes	yes	yes	yes	yes	yes	yes
Banking Sector Controls	yes	yes	yes	yes	yes	yes	yes	yes
CBSA dummies	yes	yes	yes	yes	yes	yes	yes	yes
Observations	2,783	2,783	2,783	2,783	2,783	2,783	2,783	2,783
R-squared	0.547	0.553	0.426	0.44	0.45	0.467	0.335	0.342

Table 7: Does Financial Integration Affect the Relationship?

	<i>Personal Income Growth</i>	<i>Total Employment Growth</i>	<i>Employment growth w/o Construction or Finance</i>	<i>GDP Growth</i>
House-Price Growth	-0.74 (0.59)	-1.10 (0.44)	-0.82 (0.65)	-0.70 (0.35)
House-Price Growth *In CBSA Ratio	1.014* (1.75)	1.426** (2.12)	1.055* (1.77)	1.044* (1.69)
In CBSA Ratio	0.06 (0.99)	0.13 (1.53)	0.157* (1.75)	0.212* (1.76)
Time fixed effects	yes	yes	yes	yes
Industry structure	yes	yes	yes	yes
Banking Sector Controls	yes	yes	yes	yes
CBSA dummies	yes	yes	yes	yes
Ch ² -test for joint significance of three endogenous variables	19.69	22.86	12.28	18.25
Observations	2,783	2,783	2,783	2,783
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Conclusion

- With rise of financial integration the housing prices become more volatile and less synchronized across geographies
- We establish a causal link from housing prices to real economy
 - 1% increase in housing prices leads to .2 to 0.3% increase in real economy
- Financial integration makes this relationship stronger
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Contribution to the literature

- Explaining the housing boom
 - Mian and Sufi (2009), Keys et al (2010), Demyanyk and Van Hemert (2010), Loutskina and Strahan (2011)
- The housing market roots of the crisis
 - Mian and Sufi (2009 and 2011)
- Financial integration
 - Morgan, Rime and Strahan (2004), Demyanyk, Ostergaard and Sorenson (2007); Kalemni, Papaionnou and Peydro (2010), Peek and Rosengren (2000).

THANK YOU