Fewer players, fewer homes: concentration and the new dynamics of housing supply

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Overview of presentation

1. Local housing markets have become highly concentrated

2. Theory says this should alter housing cycle dynamics

3. We provide empirical evidence that this is happening

Housing and the economy

Low volume of new housing and pervasive housing shortage

▸ More on housing shortages

Important role for housing in overall business cycle

▸ More on housing and the macroeconomy

Follows broader long-term trend of declining competition

▸ More on concentration

Changes to homebuilding market impact economic vitality

Relevant literature

▶ Competition, investment, and business cycle dynamics

Grenadier (2002), Aguerrevere (2003), Davila and Korinek (2016), He and Kondor (2016)

▶ Models of housing market with explicit construction sector

Poterba (1984), Topel and Rosen (1988), DiPasquale and Wheaton (1994), Grimes and Aitken (2010),

Liu et al. (2016)

▶ Micro-level modelling of housebuilding firms' decisions

Capozza and Helsley (1990) , Grenadier (1996), Somerville (1999), Mayer and Somerville (2000),

Grenadier (2000), Bulan et al. (2009), Epple et al. (2010), Combes et al. (2015), Murphy (2015)

▶ Cross-sectional differences in house price appreciation

Green et al. (2005), Glaeser et al. (2008), Saiz (2010), Paciorek (2013)
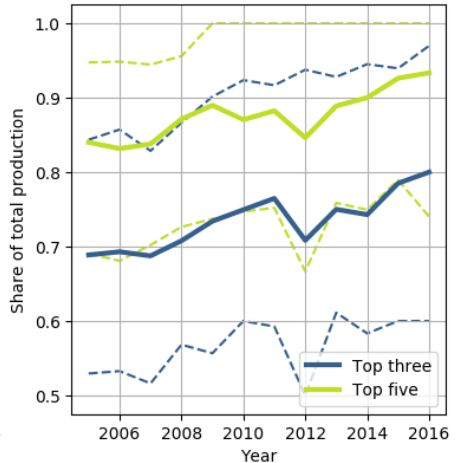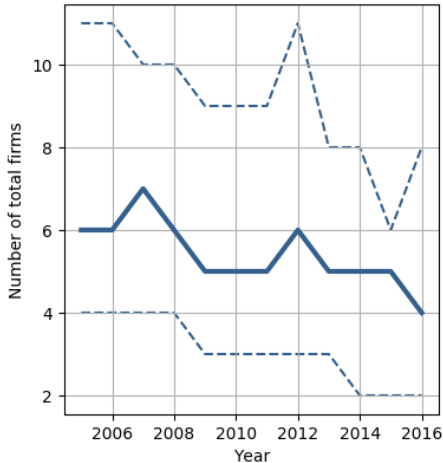
The solid line shows the median market and the dashed lines show the first and third quartiles.

We expect this trend to continue.

Wall Street Journal in May 2017:

MARKETS | HEARD ON THE STREET

Fewer Home Builders Means Happier Home Builders

One reason behind optimism among housing construction companies is there is less competition among them, which has limited supply

Advantages to scale and market power ▶ More on advantages

Why has homebuilding become so concentrated?

Three big macro-level changes

1. Bankruptcy and other exits

▶ Great Recession hard times for homebuilding

▶ Large firms went bankrupt or restructured:
  ▶ Caruso Homes
  ▶ Woodside Homes
  ▶ WCI Communities
  ▶ Gemcraft

▶ Exited market or reduced activity for years

2. Liquidity for large homebuilders in stimulus

Worker, Homeownership, and Business Assistance Act of 2009

- ▶ Headline topics: homebuyer credit, unemployment insurance

- ▶ Additional provision: five years of tax losses for homebuilders
  (increased the ability of homebuilders to use previous years' losses to reduce their tax payments.)

- ▶ Massive liquidity for big homebuilders in early 2010s

- ▶ $2.4 billion for thirteen largest homebuilders

3. National scale mergers

Pulte Homes	+ Centex	(2009)
TriPoint	+ Weyerhauser	(2013)
Standard Pacific	+ Ryland	(2015)
Lennar	+ WCI Communities	(2017)
Lennar	+ CalAtlantic	(2017)
DR Horton	+ Forestar Group	(2017)

3. National scale mergers

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Lennar	+ WCI Communities	(2017)
Lennar	**+ CalAtlantic**	**(2017)**
DR Horton	+ Forestar Group	(2017)

The firm would dominate the housing market in areas where both firms were active.

Empirical strategy

1. Assemble panel of concentration and market outcomes

2. Run IV regressions to measure impact of concentration

3. Scale to national-level counterfactual

Empirical model

$$Y_{mt} = \beta COMP_{mt} + \gamma X_{mt} + \lambda_m + \mu_t + \varepsilon_{mt}$$

1. Measures of total production volume
2. Measures of supply in pipeline
3. Measures of price and production volatility

Empirical model

$$Y_{mt} = \beta COMP_{mt} + \gamma X_{mt} + \lambda_m + \mu_t + \varepsilon_{mt}$$

▶ Number of firms producing 90% of housing
▶ Results robust to alternate measures
▶ More on instrument shortly

Empirical model

$$Y_{mt} = \beta COMP_{mt} + \gamma X_{mt} + \lambda_m + \mu_t + \varepsilon_{mt}$$

1. Construction cost index
2. Jobs within fifty miles in other counties
3. Robustness: more on market structure
4. Robustness: more on market maturity

Empirical model

$$Y_{mt} = \beta COMP_{mt} + \gamma X_{mt} + \lambda_m + \mu_t + \varepsilon_{mt}$$

▶ Market m and year t fixed effects

Instrumenting for competition

Use predicted behaviour of large national firms

▶ National firms' activity changing due to macro-level conditions

▶ No one market driving strategy
  ▶ Pulte Homes: 49 metros in 25 states
  ▶ CalAtlantic: 49 metros in 21 states
  ▶ NVR: 31 metros in 14 states

▶ Use activity in other markets to predict activity in this market

▶ Analogous to shift-share ("Bartik") instrument

▶ Related to instrument for competition in Atalay et al (2017)

▶ (▸ Equation)

Defining markets for housing

Our approach: places as defined by Census

▶ Incorporated municipalities e.g. Camden, NJ or Baltimore, MD

▶ Unincorporated areas e.g. Columbia, MD or Levittown, PA

▶ Corresponds with scale of search in Piazzesi et al (2015)

▶ Much less heterogeneous than counties or MSAs

▶ Prices tend to co-move closely within places

Markets in our study: places with at least 25,000 residents

▶ More on market areas

Data sources

▶ Information on new housing production from Metrostudy
  ▶ Identity of firms building new units
  ▶ Price, size, and other attributes of new units
  ▶ Data for Mid-Atlantic 2005–2016
  ▶ Covers all projects with at least ten units

▶ Nearby jobs from Quarterly Census of Employment and Wages

▶ Construction cost index from RSMeans

◀ Summary statistics
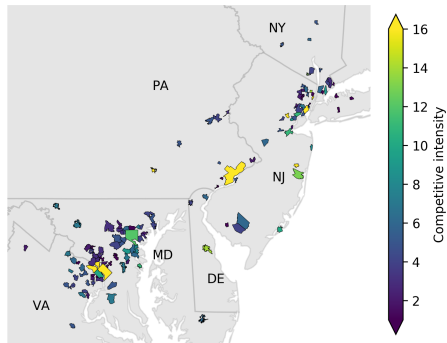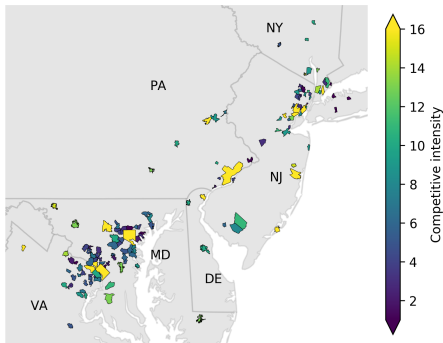
Competitive intensity in 2006 and 2015

	Total value		Square footage		Units	
	OLS	IV	OLS	IV	OLS	IV
Firms producing 90%	0.17***	0.87***	0.17***	0.91***	0.082**	0.62***
	(0.040)	(0.25)	(0.039)	(0.25)	(0.040)	(0.24)
Jobs within 50 miles	-2.97**	2.71	-2.58*	3.38	-1.04	3.33
	(1.41)	(2.58)	(1.37)	(2.55)	(1.43)	(2.46)
Construction cost	-0.44***	-0.43***	-0.33***	-0.32***	-0.32***	-0.32***
	(0.089)	(0.10)	(0.086)	(0.10)	(0.090)	(0.098)
Observations	927	927	925	925	927	927
R^2	0.572		0.497		0.530	
1st Stage F		27.483		27.390		27.483
1st Stage p-value		0.000		0.000		0.000

Standard errors in parentheses.

All specifications include market and year fixed effects.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

	In pipeline		Ready for sale		Active subdivisions	
	OLS	IV	OLS	IV	OLS	IV
Firms producing 90%	0.19***	0.40***	0.49***	2.88***	0.42***	1.51***
	(0.020)	(0.10)	(0.093)	(0.63)	(0.033)	(0.26)
Jobs within 50 miles	-7.24***	-6.33***	-13.5**	-2.32	1.91	6.54**
	(1.15)	(1.32)	(5.44)	(8.23)	(1.96)	(3.31)
Construction cost	4.38***	4.68***	-0.12	3.76	3.54***	5.09***
	(0.31)	(0.36)	(1.46)	(2.30)	(0.51)	(0.89)
Observations	690	690	651	651	688	688
R^2	0.642		0.161		0.376	
1st Stage F		25.725		24.683		25.924
1st Stage p-value		0.000		0.000		0.000

Standard errors in parentheses

All specifications include market and year fixed effects.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

	Price volatility		Production volatility	
	OLS	IV	OLS	IV
Firms producing 90%	-0.23**	-3.24***	0.68***	3.84***
	(0.10)	(0.78)	(0.12)	(0.86)
Jobs within 50 miles	-9.32***	-33.5***	4.37	18.4*
	(3.58)	(7.92)	(6.90)	(10.6)
Construction cost	-0.50**	-0.54*	-14.9***	-9.98***
	(0.23)	(0.32)	(1.86)	(2.98)
Observations	924	924	658	658
R^2	0.093		0.298	
1st Stage F		27.390		22.603
1st Stage p-value		0.000		0.000

Standard errors in parentheses.

All specifications include market and year fixed effects.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Robustness checks

Additional controls:

- ▶ Size of competitor firms
  - ▶ Results

- ▶ Maturity of market
  - ▶ Results

Changes to sample:

- ▶ Drop low population markets
  - ▶ Results

- ▶ Drop low production markets
  - ▶ Results

Robustness of instrument:

- ▶ Drop adjacent markets
  - ▶ Results

- ▶ Control for adjacent zipcodes
  - ▶ Results

Test of instrument power:

- ▶ Placebo test for false positives
  - ▶ Results

Results consistent across specifications

External validity

✓ Sample region contains 9.74 million people

✗ Older established cities may have different land use patterns

✓ Representative mix of large cities, suburbs, smaller centres

✗ Middle of supply elasticity pack in Saiz (2010)

✓ Competitive intensity levels and changes similar to rest of country

✗ Excludes SAND state markets with major bubbles

Counterfactual exercise

▶ How much impact does this have at national scale?

▶ What would 2015 outcomes look like with 2006 concentration?

▶ Calibrate using Zipcode Business Patterns data (▸ More on calibration)

	25th	Median	75th
Number of firms producing 90% in 2006	6.13	6.18	6.39
Number of firms producing 90% in 2015	4.63	4.78	5.47
Δ Value of housing produced (%)	-22	-20	-13
Δ Number of units produced (%)	-16	-15	-9
Δ Price volatility (%)	67	130	146

▶ $106 billion more housing per year at 2006 concentration levels

▶ Equivalent to 3.4% of private fixed investment in US economy

Conclusion

▶ Concentration in housing production matters to dynamics

▶ Possible government interventions for housing shortage

▶ Rise of market concentration matters for macro outcomes

▶ Full draft of paper available online

▶ Thanks to AREUEA-ASSA for the opportunity to present!

Housing shortages

New units still 20% behind 1975–2000 average in 2016

▶ Limits ability to move to employment

  Hsieh and Moretti (2015), Ganong and Shoag (2017), Bunten (2017)

▶ Strains budget of low-income renters

  Albouy et al. (2016)

▶ Creates unequal housing wealth distribution

  Glaeser and Gyourko (2018)

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Housing and the macroeconomy

▶ 16% of total personal consumption expenditures, 11% of GDP

▶ Mortages are two-thirds of all household debt

▶ Leamer at Jackson Hole in 2007: "housing *is* the business cycle"

▶ Mian and Sufi: housing drives consumption drop in recessions

▶ Guerrieri and Uhlig: transmits financial shocks to real economy

Market concentration and the macroeconomy

▶ Competition declining in many industries from 1980s onwards

  Autor et al. (2017), De Loecker and Eeckhout (2017)

▶ Impact on wage growth from firm monopsony power

  Azar et al. (2017), Benmelech et al. (2018)

▶ Investment declining in concentrated industries

  Gutiérrez and Philippon (2017)

▶ This paper: local market concentration and residential investment

What are the advantages of scale?

1. Lower administrative costs and cheaper materials
   Lane (2007), Martín and Whitlow (2012), Khouri (2015), O'Hollaren (2017)

2. Patience and ability to navigate local land use
   Porter (2003), Metcalf (2018)

3. Strategic advantages of dominant market position
   Lahart (2017), Builder Magazine M&A (2017)

Industry analyst prediction: large firms' market power will grow

McGraw Hill Construction (2006), O'Hollaren (2017)

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More on market definitions

Why are places the right size?

- ▶ Liu et al (2016): within-county price dynamics highly hetereogenous
- ▶ Barrow (2002) and many others: school catchments matter (and approx. match our place definition)
- ▶ Zillow zipcode prices: high correlation in place but not MSA
- ▶ Robustness tests

Is it okay that most markets will be suburbs?

- ▶ Nechyba and Walsh (2004): all net growth 1950–2000 in suburbs
- ▶ Couture and Handbury (2017): faster growth in suburbs in 98% of metros
- ▶ Frey (2018): suburbs growing faster than cities

Robustness checks add nearby zipcodes with no change

Summary statistics

	N	Median	Mean	Std. Dev.	Min.	Max.
Number of firms producing 90%	1581	6	8.6	11.7	1	129
Jobs within 50 miles (millions)	1600	3.5	4.3	2.1	0.1	8.5
Construction cost index	1600	18.9	19.1	2.7	12.9	25.2
Total value ($ million)	1580	29.2	76.2	134.2	0.1	1387.0
Total square footage (thousands)	1546	173.3	378.1	598.7	0.8	7863.3
Units sold	1581	67	158.8	266.9	1	2706
In pipeline	1600	737.5	2801.3	4628.9	0	26203
Ready for sale	1600	3	30.7	88.2	0	1405
Active subdivisions	1600	3.5	8.4	12.9	0	132
Price volatility	1392	15.2	30.8	65.4	0.1	1364.9
Production volatility	1455	3	16.9	50.1	0	878
Firms per market-year	1600	10	15.7	22.7	0	225
National firms per market-year	1581	2	2.4	2.6	0	17
Observations	1600					

Controlling for size of competitor firms

	Total Value				Total Sq Feet				Units Sold			
	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Firms producing 90%	0.17***	1.07***	0.21***	0.89***	0.16***	1.11***	0.20***	0.93***	0.087**	0.80***	0.17***	0.66***
	(0.043)	(0.34)	(0.041)	(0.25)	(0.042)	(0.34)	(0.039)	(0.25)	(0.043)	(0.32)	(0.040)	(0.23)
Jobs within 50 miles	-3.02**	2.15	-2.34*	3.45	-2.54*	2.87	-2.06	4.08	-1.09	2.96	0.28	4.39*
	(1.42)	(2.60)	(1.40)	(2.63)	(1.37)	(2.58)	(1.36)	(2.61)	(1.44)	(2.45)	(1.37)	(2.42)
Share national firms	0.22	0.22			0.14	0.14			0.037	0.042		
	(0.27)	(0.33)			(0.26)	(0.32)			(0.27)	(0.31)		
Share regional firms	0.20	0.37			-0.093	0.077			-0.077	0.061		
	(0.30)	(0.37)			(0.30)	(0.38)			(0.31)	(0.35)		
Share micro firms	0.16	-0.90*			0.11	-1.00**			-0.046	-0.88*		
	(0.24)	(0.49)			(0.23)	(0.49)			(0.24)	(0.47)		
Share of single family			-0.47***	-0.90***			-0.39***	-0.85***			-0.98***	-1.28***
			(0.11)	(0.20)			(0.10)	(0.20)			(0.11)	(0.18)
Construction cost	-0.43***	-0.47***	-0.46***	-0.48***	-0.32***	-0.36***	-0.35***	-0.37***	-0.32***	-0.35***	-0.37***	-0.38***
	(0.089)	(0.11)	(0.088)	(0.10)	(0.087)	(0.11)	(0.085)	(0.100)	(0.091)	(0.10)	(0.086)	(0.093)
Observations	927	927	927	927	925	925	925	925	927	927	927	927
R^2	0.572		0.581		0.498		0.504		0.530		0.570	
1st Stage F		18.694		28.213		18.666		28.114		18.694		28.213
1st Stage p-value		0.000		0.000		0.000		0.000		0.000		0.000

Standard errors in parentheses.
All specifications include market and year fixed effects.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Controlling for size of competitor firms

	In pipeline				Ready for sale				Active subdivisions			
	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Firms producing 90%	0.17***	0.39***	0.20***	0.40***	0.47***	3.17***	0.58***	2.77***	0.44***	1.69***	0.45***	1.49***
	(0.020)	(0.11)	(0.020)	(0.099)	(0.098)	(0.75)	(0.091)	(0.58)	(0.035)	(0.31)	(0.033)	(0.24)
Jobs within 50 miles	-6.87***	-6.79***	-7.07***	-6.16***	-13.4**	-10.9	-12.0**	-1.22	0.99	1.45	2.35	7.16**
	(1.16)	(1.26)	(1.15)	(1.31)	(5.55)	(8.21)	(5.28)	(7.75)	(1.99)	(3.37)	(1.93)	(3.20)
Share national firms	0.35***	0.33***			0.96*	0.38			0.37**	0.24		
	(0.11)	(0.12)			(0.53)	(0.80)			(0.18)	(0.31)		
Share regional firms	0.33***	0.29**			1.10*	0.32			0.41*	0.17		
	(0.13)	(0.14)			(0.62)	(0.93)			(0.22)	(0.37)		
Share micro firms	0.40***	0.18			0.91*	-2.00*			0.10	-1.14***		
	(0.098)	(0.15)			(0.49)	(1.07)			(0.17)	(0.42)		
Share of single family			-0.12***	-0.20***			-1.47***	-2.26***			-0.34***	-0.74***
			(0.047)	(0.062)			(0.22)	(0.37)			(0.079)	(0.15)
Construction cost	4.28***	4.72***	4.37***	4.64***	-0.32	5.68**	-0.25	3.16	3.67***	6.13***	3.51***	4.92***
	(0.31)	(0.41)	(0.31)	(0.35)	(1.49)	(2.74)	(1.41)	(2.13)	(0.52)	(1.06)	(0.50)	(0.84)
Observations	690	690	690	690	651	651	651	651	688	688	688	688
R^2	0.651		0.646		0.166		0.214		0.383		0.393	
1st Stage F		21.488		27.262		20.279		26.174		21.454		27.472
1st Stage p-value		0.000		0.000		0.000		0.000		0.000		0.000

Standard errors in parentheses.
All specifications include market and year fixed effects.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Controlling for size of competitor firms

	Price volatility				Production volatility			
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Firms producing 90%	-0.27**	-4.17***	-0.26**	-3.30***	0.74***	4.43***	0.79***	3.70***
	(0.11)	(1.10)	(0.10)	(0.78)	(0.12)	(1.03)	(0.12)	(0.79)
Jobs within 50 miles	-8.78**	-31.0***	-9.69***	-35.4***	1.35	4.50	6.66	20.8**
	(3.57)	(8.33)	(3.60)	(8.17)	(6.99)	(10.8)	(6.75)	(10.1)
Share national firms	-0.48	-0.48			0.37	-0.36		
	(0.68)	(1.05)			(0.65)	(1.02)		
Share regional firms	1.83**	1.13			1.68**	0.67		
	(0.77)	(1.22)			(0.77)	(1.22)		
Share micro firms	0.75	5.35***			-0.14	-3.95***		
	(0.61)	(1.60)			(0.59)	(1.39)		
Share of single familiy			0.28	2.20***			-1.61***	-2.69***
			(0.28)	(0.62)			(0.28)	(0.49)
Construction cost	-0.59***	-0.43	-0.49**	-0.43	-15.0***	-7.18*	-15.1***	-10.8***
	(0.23)	(0.35)	(0.23)	(0.31)	(1.89)	(3.61)	(1.81)	(2.77)
Observations	924	924	924	924	658	658	658	658
R^2	0.110		0.094		0.309		0.332	
1st Stage F		18.666		28.114		18.773		24.132
1st Stage p-value		0.000		0.000		0.000		0.000

Standard errors in parentheses.
All specifications include market and year fixed effects.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Controlling for market maturity

	Total Value				Total Sq Feet				Units Sold			
	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Firms producing 90%	0.19***	0.99***	0.18***	0.90***	0.20***	1.04***	0.18***	0.94***	0.12***	0.75***	0.095**	0.63***
	(0.039)	(0.27)	(0.041)	(0.26)	(0.037)	(0.26)	(0.039)	(0.26)	(0.038)	(0.24)	(0.041)	(0.25)
Jobs within 50 miles	-5.91***	0.51	-2.70*	3.40	-5.72***	1.03	-2.37*	4.06	-4.84***	0.22	-0.76	3.84
	(1.40)	(2.69)	(1.43)	(2.75)	(1.34)	(2.66)	(1.39)	(2.72)	(1.36)	(2.47)	(1.45)	(2.62)
Established Market	-0.41***	-0.44***			-0.43***	-0.47***			-0.54***	-0.57***		
	(0.042)	(0.052)			(0.040)	(0.052)			(0.041)	(0.048)		
Share of resales			0.054	0.087*			0.049	0.084*			0.018	0.043
			(0.037)	(0.044)			(0.036)	(0.044)			(0.038)	(0.042)
Construction cost	-0.31***	-0.31***	-0.41***	-0.41***	-0.19***	-0.19*	-0.31***	-0.30***	-0.16*	-0.16	-0.32***	-0.31***
	(0.086)	(0.10)	(0.091)	(0.11)	(0.082)	(0.10)	(0.088)	(0.10)	(0.083)	(0.095)	(0.092)	(0.10)
Observations	916	916	916	916	914	914	914	914	916	916	916	916
R^2	0.612		0.573		0.551		0.497		0.606		0.531	
1st Stage F		25.233		26.154		25.108		26.057		25.233		26.154
1st Stage p-value		0.000		0.000		0.000		0.000		0.000		0.000

Standard errors in parentheses.
All specifications include market and year fixed effects.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

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Controlling for market maturity

	In pipeline				Ready for sale				Active subdivisions			
	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Firms producing 90%	0.18*** (0.019)	0.39*** (0.10)	0.19*** (0.020)	0.41*** (0.10)	0.44*** (0.090)	2.77*** (0.62)	0.50*** (0.092)	2.86*** (0.63)	0.41*** (0.032)	1.49*** (0.26)	0.41*** (0.032)	1.51*** (0.26)
Jobs within 50 miles	-7.13*** (1.14)	-6.28*** (1.30)	-7.37*** (1.16)	-6.45*** (1.33)	-11.9** (5.24)	-1.51 (7.95)	-10.2* (5.43)	1.05 (8.23)	2.32 (1.90)	6.73** (3.25)		7.04** (3.32)
Established Market	-0.090*** (0.023)	-0.072*** (0.027)			-0.83*** (0.11)	-0.61*** (0.17)			-0.26*** (0.039)	-0.16** (0.067)	-0.25*** (0.039)	
Share of resales			0.018 (0.026)	0.022 (0.028)			-0.61*** (0.14)	-0.65*** (0.14)			-0.10** (0.043)	-0.12* (0.071)
Construction cost	4.36*** (0.31)	4.66*** (0.36)	4.44*** (0.31)	4.73*** (0.36)	-1.06 (1.42)	2.85 (2.27)	0.69 (1.47)	4.51* (2.30)	3.29*** (0.50)	4.89*** (0.89)	3.50*** (0.50)	5.21*** (0.89)
Observations	686	686	686	686	647	647	647	647	684	684	684	684
R^2	0.652		0.645		0.229		0.185		0.413		0.417	
1st Stage F		24.699		25.351		23.643		24.408		24.887		25.557
1st Stage p-value		0.000		0.000		0.000		0.000		0.000		0.000

Standard errors in parentheses.
All specifications include market and year fixed effects.
$^*\ p < 0.10$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$

Controlling for market maturity

	Price volatility				Production volatility			
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Firms producing 90%	-0.24**	-3.47***	-0.24**	-3.38***	0.65***	3.75***	0.69***	3.82***
	(0.10)	(0.84)	(0.10)	(0.81)	(0.12)	(0.85)	(0.12)	(0.85)
Jobs within 50 miles	-8.53**	-34.3***	-9.40***	-36.0***	5.67	19.1*	5.60	19.9*
	(3.72)	(8.51)	(3.64)	(8.55)	(6.80)	(10.4)	(6.97)	(10.7)
Established Market	0.072	0.23			-0.68***	-0.44**		
	(0.11)	(0.17)			(0.14)	(0.21)		
Share of resales			-0.098	-0.24*			-0.22	-0.28
			(0.094)	(0.14)			(0.18)	(0.26)
Construction cost	-0.53**	-0.53	-0.56**	-0.58*	-15.6***	-10.7***	-14.6***	-9.79***
	(0.23)	(0.33)	(0.23)	(0.33)	(1.85)	(2.97)	(1.89)	(3.00)
Observations	913	913	913	913	655	655	655	655
R^2	0.097		0.097		0.321		0.298	
1st Stage F		25.108		26.057		22.001		22.572
1st Stage p-value		0.000		0.000		0.000		0.000

Standard errors in parentheses.
All specifications include market and year fixed effects.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

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Dropping markets with fewer than 40k residents

	Total Value		Total Sq Feet		Units Sold	
	OLS	IV	OLS	IV	OLS	IV
Firms producing 90%	0.15***	0.75***	0.15***	0.82***	0.065	0.59**
	(0.050)	(0.28)	(0.047)	(0.28)	(0.050)	(0.28)
Jobs within 50 miles	-5.01***	0.58	-4.32***	1.87	-2.41	2.45
	(1.70)	(3.22)	(1.62)	(3.20)	(1.70)	(3.14)
Construction cost	-0.48***	-0.44***	-0.36***	-0.32***	-0.33***	-0.29**
	(0.10)	(0.12)	(0.099)	(0.12)	(0.10)	(0.12)
Observations	927	927	925	925	927	927
R^2	0.634		0.567		0.612	
1st Stage F		17.646		17.593		17.646
1st Stage p-value		0.000		0.000		0.000

Standard errors in parentheses.

All specifications include market and year fixed effects.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Dropping markets with fewer than 40k residents

| | In pipeline | | Ready for sale | | Active subdivisions | |
	OLS	IV	OLS	IV	OLS	IV
Firms producing 90%	0.22***	0.44***	0.52***	2.76***	0.50***	1.54***
	(0.024)	(0.11)	(0.13)	(0.71)	(0.047)	(0.30)
Jobs within 50 miles	-8.38***	-7.38***	-16.8**	-5.98	2.02	6.76
	(1.36)	(1.59)	(7.21)	(10.4)	(2.66)	(4.29)
Construction cost	4.21***	4.63***	-0.96	3.36	3.82***	5.79***
	(0.36)	(0.44)	(1.87)	(2.88)	(0.67)	(1.16)
Observations	690	690	651	651	688	688
R^2	0.748		0.206		0.433	
1st Stage F		18.005		18.388		17.977
1st Stage p-value		0.000		0.000		0.000

Standard errors in parentheses.

All specifications include market and year fixed effects.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Dropping markets with fewer than 40k residents

	Price volatility		Production volatility	
	OLS	IV	OLS	IV
Firms producing 90%	-0.30**	-3.87***	0.84***	4.12***
	(0.14)	(1.06)	(0.16)	(1.03)
Jobs within 50 miles	-10.4**	-43.4***	3.93	19.0
	(4.73)	(12.0)	(9.28)	(14.3)
Construction cost	-0.76***	-1.00**	-17.2***	-10.9***
	(0.29)	(0.45)	(2.42)	(4.01)
Observations	924	924	658	658
R^2	0.139		0.374	
1st Stage F		17.593		16.620
1st Stage p-value		0.000		0.000

Standard errors in parentheses

All specifications include market and year fixed effects.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Dropping markets in lowest production decile

	Total Value		Total Sq Feet		Units Sold	
	OLS	IV	OLS	IV	OLS	IV
Firms producing 90%	0.17***	0.90***	0.17***	0.95***	0.076*	0.62**
	(0.039)	(0.26)	(0.038)	(0.26)	(0.039)	(0.25)
Jobs within 50 miles	-3.41**	2.86	-3.04**	3.65	-1.39	3.32
	(1.38)	(2.74)	(1.33)	(2.72)	(1.38)	(2.57)
Construction cost	-0.42***	-0.44***	-0.31***	-0.33***	-0.31***	-0.32***
	(0.085)	(0.10)	(0.083)	(0.10)	(0.085)	(0.094)
Observations	927	927	925	925	927	927
R^2	0.599		0.526		0.565	
1st Stage F		25.027		24.936		25.027
1st Stage p-value		0.000		0.000		0.000

Standard errors in parentheses.

All specifications include market and year fixed effects.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Dropping markets in lowest production decile

	In pipeline		Ready for sale		Active subdivisions	
	OLS	IV	OLS	IV	OLS	IV
Firms producing 90%	0.18***	0.38***	0.48***	2.88***	0.43***	1.54***
	(0.019)	(0.10)	(0.094)	(0.65)	(0.034)	(0.26)
Jobs within 50 miles	-7.57***	-6.60***	-14.4***	-2.47	2.01	7.34**
	(1.13)	(1.31)	(5.47)	(8.39)	(1.97)	(3.41)
Construction cost	4.51***	4.78***	-0.030	3.74	3.58***	5.09***
	(0.30)	(0.35)	(1.47)	(2.32)	(0.51)	(0.90)
Observations	690	690	651	651	688	688
R^2	0.657		0.167		0.382	
1st Stage F		24.839		23.473		25.032
1st Stage p-value		0.000		0.000		0.000

Standard errors in parentheses.

All specifications include market and year fixed effects.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Dropping markets in lowest production decile

	Price volatility		Production volatility	
	OLS	IV	OLS	IV
Firms producing 90%	-0.23**	-3.50***	0.70***	3.83***
	(0.10)	(0.85)	(0.12)	(0.85)
Jobs within 50 miles	-8.54**	-36.5***	4.84	20.1*
	(3.66)	(8.92)	(6.98)	(10.8)
Construction cost	-0.53**	-0.45	-14.9***	-10.2***
	(0.23)	(0.33)	(1.88)	(2.97)
Observations	924	924	658	658
R^2	0.097		0.300	
1st Stage F		24.936		22.863
1st Stage p-value		0.000		0.000

Standard errors in parentheses.

All specifications include market and year fixed effects.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

IV dropping adjacent markets

	Total Value		Total Sq Feet		Units Sold	
	OLS	IV	OLS	IV	OLS	IV
Firms producing 90%	0.18***	0.84***	0.17***	0.89***	0.091**	0.59**
	(0.041)	(0.24)	(0.040)	(0.24)	(0.041)	(0.23)
Jobs within 50 miles	-2.88**	2.67	-2.54*	3.37	-0.81	3.32
	(1.43)	(2.57)	(1.38)	(2.54)	(1.44)	(2.46)
Construction cost	-0.45***	-0.45***	-0.34***	-0.34***	-0.33***	-0.34***
	(0.089)	(0.10)	(0.086)	(0.10)	(0.090)	(0.097)
Observations	913	913	911	911	913	913
R^2	0.570		0.494		0.530	
1st Stage F		29.656		29.534		29.656
1st Stage p-value		0.000		0.000		0.000

Standard errors in parentheses.

All specifications include market and year fixed effects.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

IV dropping adjacent markets

	In pipeline		Ready for sale		Active subdivisions	
	OLS	IV	OLS	IV	OLS	IV
Firms producing 90%	0.19***	0.35***	0.52***	2.24***	0.44***	1.46***
	(0.020)	(0.099)	(0.095)	(0.55)	(0.034)	(0.25)
Jobs within 50 miles	-7.24***	-6.55***	-13.1**	-4.60	2.07	6.64**
	(1.15)	(1.28)	(5.47)	(7.23)	(1.96)	(3.19)
Construction cost	4.49***	4.72***	-0.019	2.91	3.65***	5.16***
	(0.31)	(0.35)	(1.48)	(2.04)	(0.51)	(0.86)
Observations	683	683	644	644	681	681
R^2	0.646		0.164		0.382	
1st Stage F		25.580		24.916		25.693
1st Stage p-value		0.000		0.000		0.000

Standard errors in parentheses.

All specifications include market and year fixed effects.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

IV dropping adjacent markets

	Price volatility		Production volatility	
	OLS	IV	OLS	IV
Firms producing 90%	-0.23**	-2.37***	0.68***	3.28***
	(0.10)	(0.66)	(0.12)	(0.79)
Jobs within 50 miles	-9.06**	-26.9***	4.37	16.6*
	(3.63)	(6.94)	(6.93)	(9.79)
Construction cost	-0.50**	-0.49*	-15.0***	-10.8***
	(0.23)	(0.27)	(1.88)	(2.76)
Observations	910	910	652	652
R^2	0.097		0.296	
1st Stage F		29.534		22.570
1st Stage p-value		0.000		0.000

Standard errors in parentheses.

All specifications include market and year fixed effects.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Controlling for adjacent zipcodes

	Total Value		Total Sq Feet		Units Sold	
	OLS	IV	OLS	IV	OLS	IV
Firms producing 90%	0.17^{***}	0.89^{***}	0.16^{***}	0.93^{***}	0.060	0.65^{**}
	(0.042)	(0.32)	(0.041)	(0.32)	(0.043)	(0.31)
Firms producing 90% in ring	0.098^{*}	0.45	0.12^{**}	0.51	0.17^{***}	0.59
	(0.051)	(1.30)	(0.049)	(1.29)	(0.052)	(1.26)
Jobs within 50 miles	-2.61^{*}	5.39	-1.90	6.61	-0.028	7.35
	(1.48)	(7.28)	(1.42)	(7.22)	(1.49)	(7.08)
Construction cost	-0.48^{***}	-0.49^{***}	-0.36^{***}	-0.38^{***}	-0.35^{***}	-0.36^{***}
	(0.092)	(0.12)	(0.088)	(0.12)	(0.093)	(0.12)
Observations	927	927	925	925	927	927
R^2	0.580	0.381	0.509	0.223	0.541	0.371
1st Stage F		14.554		14.498		14.554
1st Stage p-value		0.000		0.000		0.000

Standard errors in parentheses.

All specifications include market and year fixed effects.

$*$ $p < 0.10$, $**$ $p < 0.05$, $***$ $p < 0.01$

Controlling for adjacent zipcodes

	In pipeline		Ready for sale		Active subdivisions	
	OLS	IV	OLS	IV	OLS	IV
Firms producing 90%	0.19***	0.50***	0.48***	3.15***	0.43***	1.66***
	(0.018)	(0.14)	(0.096)	(0.86)	(0.034)	(0.33)
Firms producing 90% in ring	0.040*	-0.54	0.17	-3.38	0.012	-1.26
	(0.023)	(0.67)	(0.12)	(5.10)	(0.044)	(1.69)
Jobs within 50 miles	-7.94***	-10.8**	-13.5**	-27.2	1.66	-2.18
	(1.06)	(4.97)	(5.59)	(37.6)	(2.02)	(12.5)
Construction cost	3.87***	3.93***	-0.53	1.09	3.59***	4.60***
	(0.29)	(0.63)	(1.52)	(4.75)	(0.53)	(1.52)
Observations	690	690	651	651	688	688
R^2	0.688	0.310	0.167	-1.649	0.383	-1.300
1st Stage F		12.442		12.098		12.519
1st Stage p-value		0.000		0.000		0.000

Standard errors in parentheses

All specifications include market and year fixed effects.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Controlling for adjacent zipcodes

	Price volatility		Production volatility	
	OLS	IV	OLS	IV
Firms producing 90%	-0.23**	-3.85***	0.72***	4.50***
	(0.11)	(1.07)	(0.12)	(1.26)
Firms producing 90% in ring	-0.0060	2.76	-0.21	-5.48
	(0.13)	(4.31)	(0.15)	(6.20)
Jobs within 50 miles	-9.46**	-20.5	1.14	-20.4
	(3.81)	(24.2)	(7.01)	(45.3)
Construction cost	-0.49**	-0.55	-16.9***	-15.0**
	(0.24)	(0.40)	(1.92)	(6.01)
Observations	924	924	658	658
R^2	0.093	-1.242	0.320	-1.651
1st Stage F		14.498		11.062
1st Stage p-value		0.000		0.000

Standard errors in parentheses.

All specifications include market and year fixed effects.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Placebo test for instrument power

After 1000 random reassignments of instrument values across observations:

Dependent variable	% iterations $p < 0.05$
Total value	3.0%
Square footage	2.3%
Units	1.6%
In pipeline	5.0%
Ready for sale	3.8%
Active subdivisions	9.8%
Price volatility	3.5%
Production volatility	7.3%

Details of calibration

1. Metrostudy data unavailable but Zipcode Business Patterns firm size data available

2. Estimate flexible polynomial mapping between ZBP firm size distribution and Metrostudy competitive intensity

3. Assume change in competitive intensity in out-of-sample markets same as change in in-sample markets

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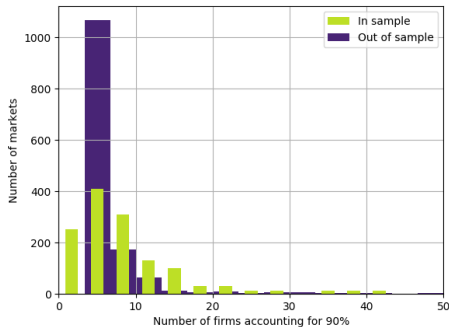
Instrument

- Let C_{mtj} be firm activity; Let J_{mt}^N be the set of national firms active
- Define $\hat{C}_{mtj}$ as the predicted activity by firm j using activities in other markets:

$$\hat{C}_{mtj} = \frac{\sum_{m' \neq m} C_{m'tj}}{\sum_{m' \neq m} C_{m',t-1,j}} C_{m,t-1,j}$$

- For each market, define the market-weighted average over all national firms:

$$\bar{C}_{mt} = \frac{\sum_{j \in J_{mt}^N} C_{mt,j-1} \hat{C}_{mtj}}{\sum_{j \in J_{mt}^N} C_{mt,j-1}}$$

Finally, normalize by the previous year's total construction by all national firms:

$$Z_{mt} = \frac{\bar{C}_{mt}}{\sum_{j \in J_{mt}^N} C_{mt,j-1}}$$