High Leverage and Willingness to Pay: Evidence from the Residential Housing Market

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Motivation

- Recent evidence that expansion in the credit supply is correlated/causes with aggregate price increase
  - Empirics: Mayer and Pence (2008), Mian and Sufi (2009, 2010)
  - Theory: Glaeser, Gottlieb, and Gyourko (2010), Pavlov and Watcher (2011)

- How does the price discovery take place in micro-data?
  - Price discovery is slow (Garmaise and Moskowitz 2003)
  - Leverage is associated with high prices at the car market (Adams, Einav, and Levin 2009)

- What's new in this paper?
  - Transaction level data, including asking prices

- Main results
  - Strong correlation between prices and leverage; discontinuity around full listing price
  - Driven by lack of buyer sophistication, real-estate agent behavior, optimism

How Are Leverage and Prices Related?

- Financially constrained buyers finance high prices with debt
  - Mechanical relation
  - Behavioral/Persuasion: Low down payment is interpreted as low price
- Optimism leads buyers to be willing to pay higher prices for housing and borrow more
- Moral hazard: Leveraged buyers do not suffer downside; have incentive to overpay (Allen and Gale, 2000; and Barlevy and Fisher, 2010)
  - Effect should be constant over time

Data

- MLS: All transactions that were mediated by real-estate agents from 1/1994 to 4/2008
  - Approx. 770,000 transactions
  - Includes asking prices, time on the market, information about the real-estate agents
- Recorder of Deeds: All mortgages
  - Includes mortgage size interest rates, foreclosure information
- HMDA: Income (loan level)
- Census: Education (zip code level)

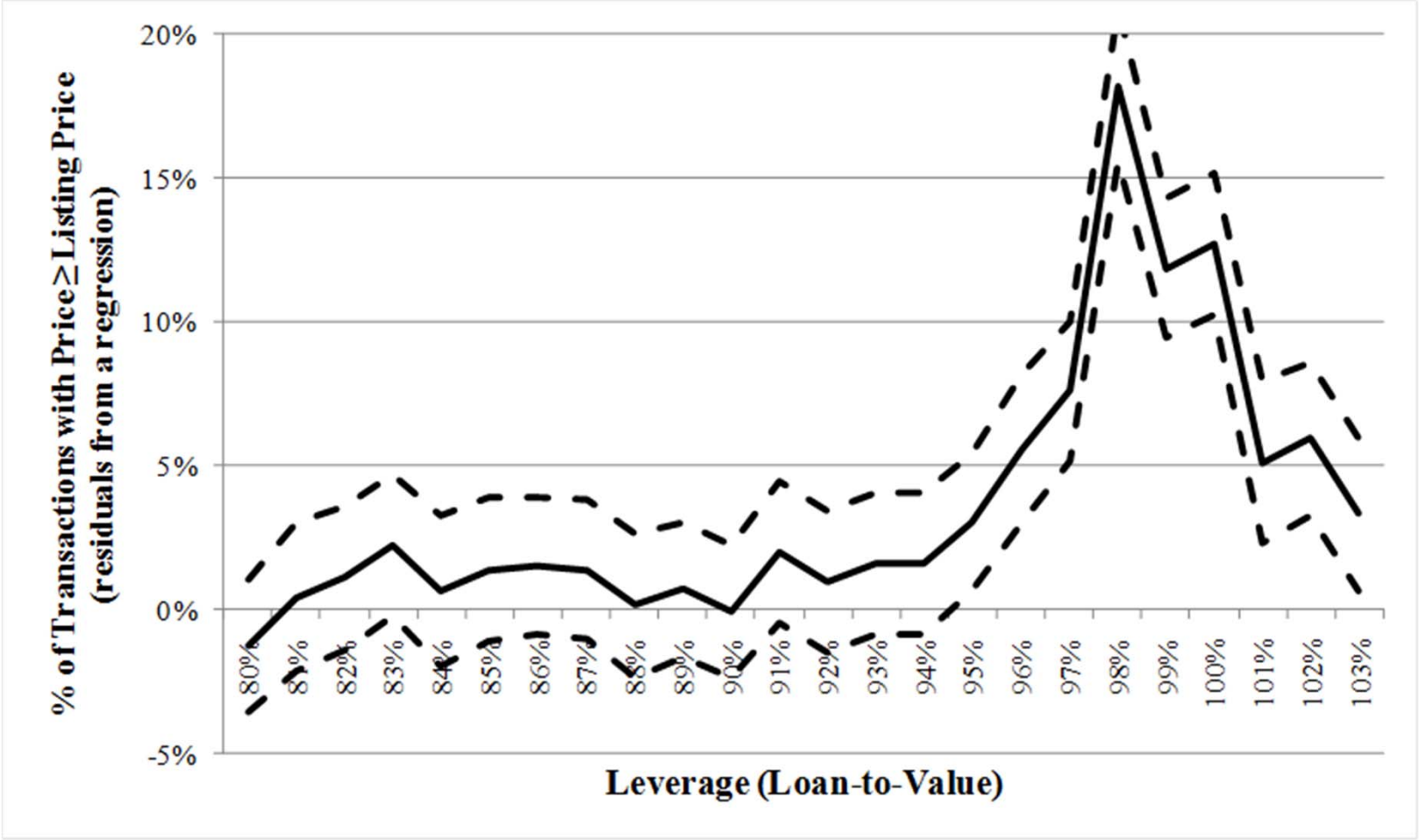
Stylized Facts

Leverage and Price/Listing

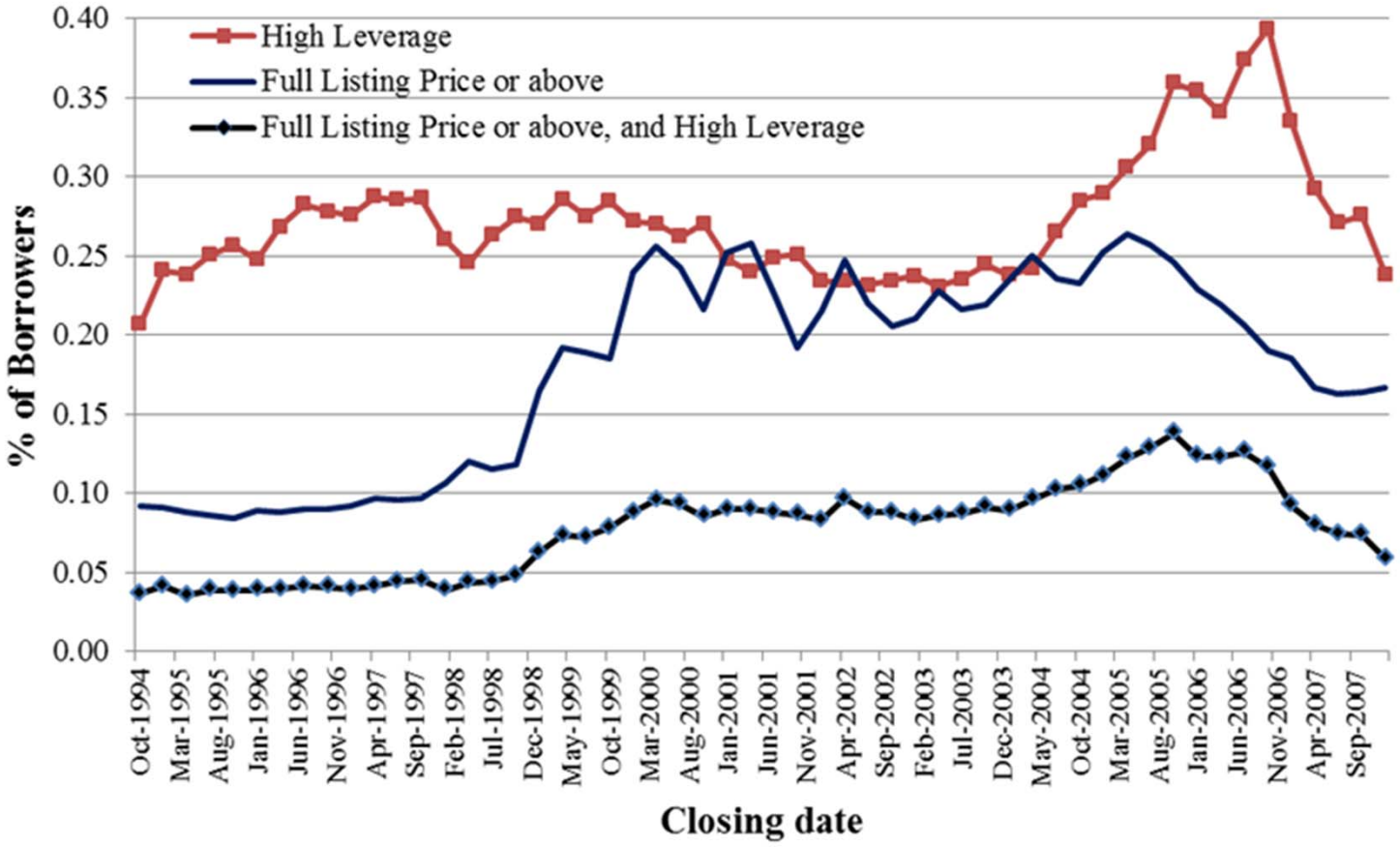
	Dependent variable: I(Price ≥ Listing price) × 100					
Sample:	All	All	1994-1999	2000-2003	2004-2006	2007-2008
	(1)	(2)	(3)	(4)	(5)	(6)
96% ≤ LTV	13.18**	12.66**	6.53**	13.61**	16.08**	12.67**
	(32.42)	(29.92)	(16.82)	(25.23)	(27.32)	(23.34)
91% ≤ LTV ≤ 95%	2.98**	3.28**	0.92**	3.37**	4.55**	5.20**
	(10.78)	(11.79)	(3.71)	(10.09)	(9.95)	(10.67)
81% ≤ LTV ≤ 90%	0.76**	0.98**	0.61**	0.85**	1.10**	2.15**
	(4.91)	(6.60)	(3.14)	(3.58)	(4.35)	(5.62)
Transaction controls	Yes	Yes	Yes	Yes	Yes	Yes
Zip code × Quarter FE	Yes	No	No	No	No	No
Tax code × Quarter FE	No	Yes	Yes	Yes	Yes	Yes
Observations	770,237	770,934	214,424	251,376	244,498	60,636
Adj. R^2	0.099	0.105	0.070	0.089	0.111	0.097

- Higher likelihood of paying the full listing price for the population that has leverage ≥ 96%

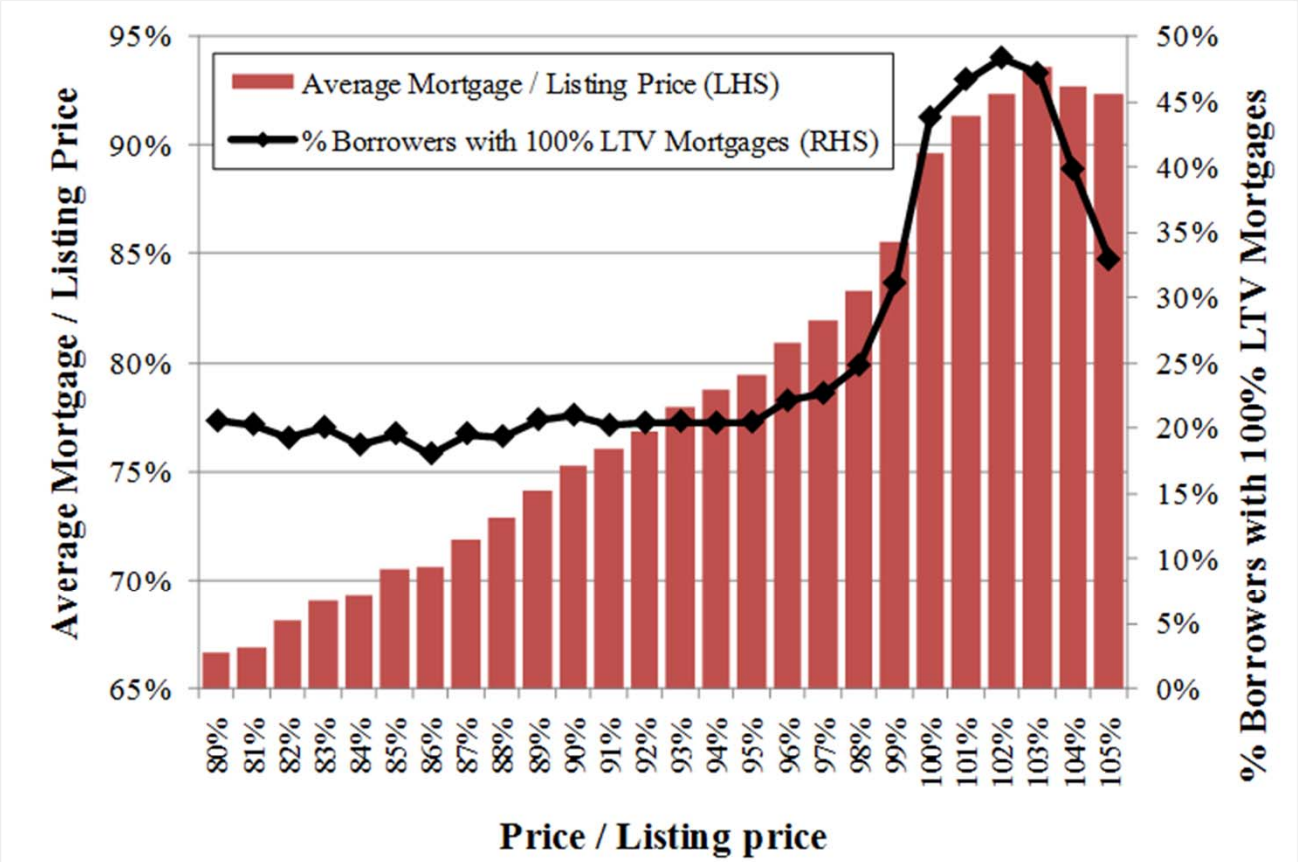
Leverage and Price/Listing



Time-Series of Leverage and Full Listing Price

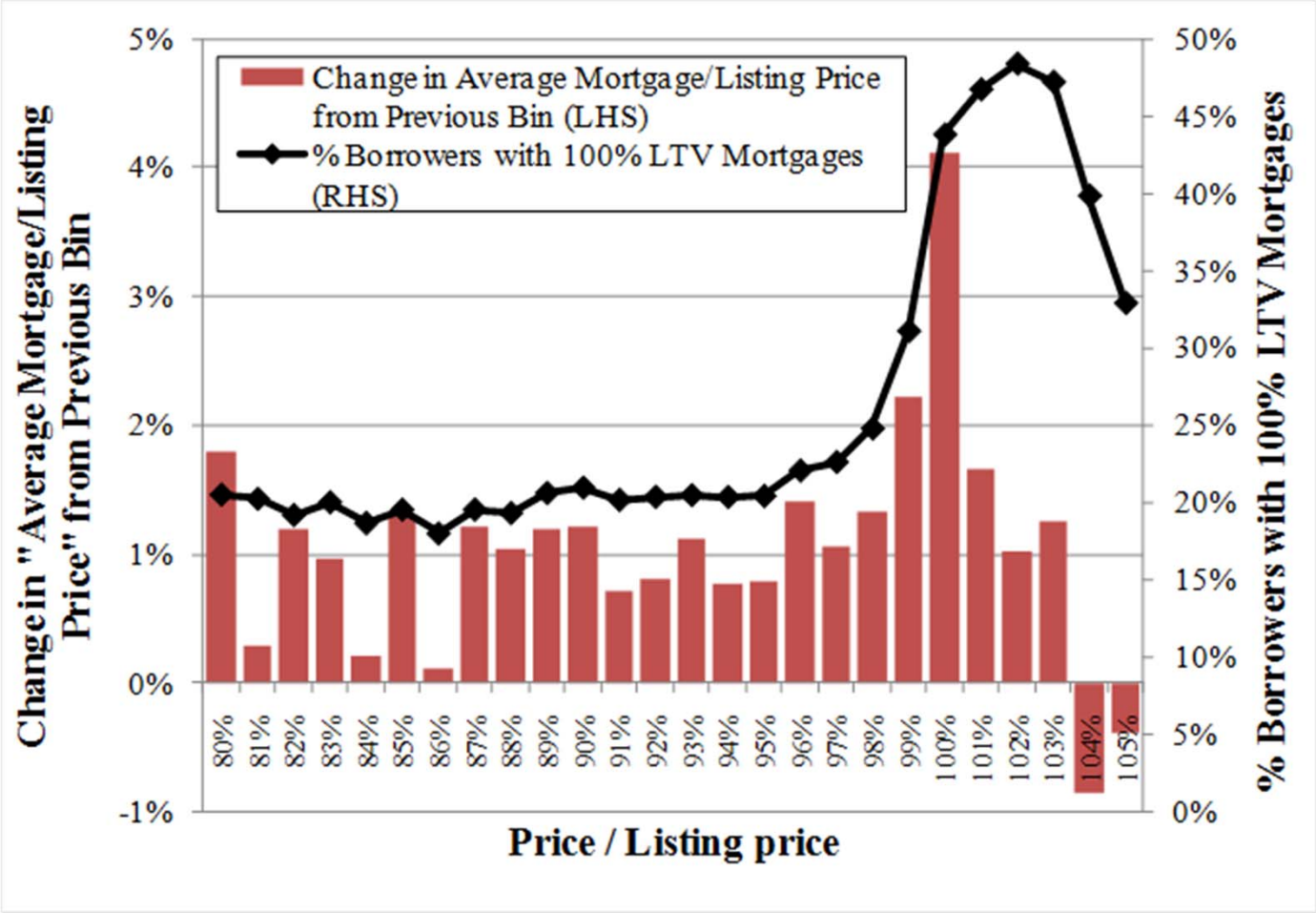


Discontinuity around the Full Listing Price



- Holds for sub-periods and with location x time controls

Discontinuity around the Full Listing Price



Overpayment?

- Does paying the full listing price mean overpaying?
- Alternative story: Buyers find bargains (undervalued assets), pay the full listing price for them, and finance them with high leverage
- Test:
  - Use repeat-sale sample to test whether buyers overpay

Overpayment

Dependent variable:	$\log(P_{Current}(\$)) - \log(P_{Past}(\$))$			$\log(P_{Future}(\$)) - \log(P_{Current}(\$))$		
	(1)	(2)	(3)	(4)	(5)	(6)
96% ≤ LTV	0.001	0.005	-0.012*	0.056**	0.043**	0.067**
	(0.006)	(1.29)	(-2.08)	(7.32)	(8.36)	(9.17)
× I(Price ≥ Listing price)		0.028**	0.031**		-0.037**	-0.039**
		(5.42)	(5.85)		(-5.35)	(-5.36)
× I(Seller hint)		0.032**	0.039**		-0.032**	-0.027*
		(3.26)	(3.86)		(-2.91)	(-2.40)
Transaction controls	Yes	Yes	Ye	Yes	Yes	Yes
Transactions fixed effects:						
Zip code × Quarter FE	No	Yes	No	No	Yes	No
Tax code × Quarter FE	Yes	No	Yes	Yes	No	Yes
Observations	384,904	384,904	384,904	219,084	219,084	219,084
Adj. R^2	0.111	0.077	0.111	0.073	0.042	0.063

- Overpayment by 2.8%-3.9% ($4,800-$6,700)

Higher Foreclosure Rate

Dependent variable:	I(Foreclosed within one year) × 100						APR (%)
	All	All	All	1994-1999	2000-2003	2004-2006	All
96% ≤ LTV	2.00**	1.69**	1.55**	2.06**	0.84**	1.68**	-0.17**
	(20.15)	(16.24)	(16.86)	(11.60)	(7.32)	(13.14)	(-17.79)
× I(Price ≥ Listing price)		1.08**	0.97**	2.91**	0.61**	0.78**	-0.02*
		(5.89)	(5.37)	(6.94)	(2.72)	(3.71)	(-2.50)
× I(Seller hint)		0.45	0.38	1.13	0.30	0.08	0.01
		(1.42)	(1.21)	(1.78)	(0.58)	(0.18)	(0.30)
91% ≤ LTV ≤ 95%	0.35**	0.31**	0.32**	0.06	0.30**	0.50**	-0.11**
	(5.99)	(5.55)	(5.76)	(0.53)	(3.44)	(6.47)	(-13.90)
80% < LTV ≤ 90%	0.16**	0.17**	0.16**	0.00	0.18**	0.20**	-0.08**
	(3.93)	(3.85)	(3.91)	(0.05)	(2.64)	(3.70)	(-11.90)
Transaction controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Zip code × Quarter FE	No	Yes	No	No	No	No	No
Tax code × Quarter FE	Yes	No	Yes	Yes	Yes	Yes	No
Tax code × Quarter FE × ARM	No	No	No	No	No	No	Yes
Observations	710,331	710,331	710,331	212,025	251,377	244,499	429,541
Adj. R^2	0.021	0.025	0.023	0.016	0.030	0.023	0.475

- Foreclosure rate is higher by about 1.0% (22.7% in relative terms)

Potential Explanations

Income, Education, Financial Constraints?

	Dependent variable: I(Price ≥ Listing price) × 100							
96% ≤ LTV	43.99**	38.70**	38.67**	41.85**	10.50**	9.54**	54.48**	46.17**
	(7.75)	(8.18)	(7.67)	(10.87)	(13.86)	(14.35)	(5.68)	(6.38)
× log(income)	-2.88**	-2.45**					-1.73	-0.66
	(-5.47)	(-5.57)					(-1.84)	(-0.97)
× Avg # years of education			-1.98**	-2.25**			-1.76**	-2.13**
			(-5.19)	(-7.91)			(-4.27)	(-6.95)
× Price / Income					0.57*	0.70**	0.11	0.41
					(2.48)	(3.66)	(0.32)	(1.57)
Transaction controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Zip code × Quarter FE	Yes	No	Yes	No	Yes	No	Yes	No
Tax code × Quarter FE	No	Yes	No	Yes	No	Yes	No	Yes
Observations	476,920	477,294	476,916	477,290	472,108	472,480	472,108	472,480
Adj. R^2	0.108	0.120	0.108	0.120	0.108	0.120	0.109	0.120

- Average years of education explains well the relation between leverage and full listing prices

Role of Real-Estate Agents and Mortgage Brokers

	Dependent variable: I(Price ≥ Listing price) × 100					
	All	All	1994-1999	2000-2003	2004-2006	2007-2008
96% ≤ LTV	46.63**	44.75**	25.01**	50.10**	64.77**	38.70**
	(12.31)	(12.47)	(4.68)	(8.51)	(11.70)	(4.25)
× I(Mortgage broker)		3.31**	2.14**	3.13**	4.07**	4.61**
		(10.59)	(3.74)	(5.31)	(7.47)	(4.76)
× log(1 + # FPHL of buyer's real-estate agent)		7.02**	5.31**	6.82**	4.66**	7.72**
		(14.58)	(5.07)	(7.34)	(5.22)	(4.06)
× log(1 + # transactions of buyer's real-estate agent)		-7.81**	-7.50**	-8.12**	-8.03**	-5.10**
		(-21.71)	(-11.93)	(-10.92)	(-12.50)	(-4.95)
× log(1 + # FP of buyer's real-estate agent)		2.65**	1.71*	2.09**	2.68**	0.39
		(6.77)	(2.08)	(2.61)	(3.77)	(0.24)
× log(1 + # HL of buyer's real-estate agent)		1.53**	3.50**	2.65**	3.38**	0.96
		(4.39)	(5.68)	(3.55)	(4.89)	(0.87)
× Avg years of education	-2.50**	-0.75**	-0.18	-1.03**	-1.12**	-0.30
	(-9.17)	(-3.36)	(-0.66)	(-3.44)	(-3.36)	(-0.64)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Tax code × Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	561,199	524,877	122,068	175,702	165,651	39,581
Adj. R^2	0.105	0.128	0.086	0.110	0.138	0.116

- Real-estate agents with "history" of full price-high leverage transactions more likely to do it again
- Effect of mortgage brokers

Optimism

	Dependent variable: I(Price ≥ Listing price) (0/1) × 100					
	All	All	1994-1999	2000-2003	2004-2006	2007-2008
96% ≤ LTV	10.90	14.34	65.71**	75.92**	96.68**	97.79**
	(1.44)	(1.85)	(8.50)	(9.36)	(11.37)	(8.67)
× Zipcode 1-year price growth (log)	9.04**	11.13**	2.27	3.99	6.81**	2.00
	(5.09)	(6.14)	(1.42)	(1.86)	(3.07)	(0.59)
Transaction controls	Yes	Yes	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Zip code FE	Yes	No	No	No	No	No
Tax code FE	No	Yes	Yes	Yes	Yes	Yes
Observations	754,496	754,496	206,760	247,097	241,435	59,204
Adj. R^2	0.114	0.107	0.078	0.092	0.120	0.104

- Evidence for optimism: relation between high prices and leverage is stronger in areas of high past price growth

Conclusion

- At the transaction level: Strong correlation between the propensity to pay the full listing price and high leverage
- Discontinuity in average leverage around the full listing price
- Potential explanations
  - Real-estate agents push for paying the full listing price and assist with high-leverage financing
  - Buyers lack sophistication
  - Optimism
  - Financial constraints

Thank you!

Main Results

- Strong correlation between leverage and price paid
  - Discontinuity around the Full Listing Price
- Stronger correlation for:
  - Low income and liquidity constrained borrowers
  - Areas with low education
  - Real-estate agents with a “history” of high leverage and high prices
  - When mortgage brokers are involved
  - Optimism: in areas of strong past price growth
- Real-estate agents push buyers to pay the full listing price (in order to close the transaction) and help them finance the transaction at high leverage