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

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Abstract

In pursuit of understanding the mechanism that relates the expansion in credit to the increase in real-estate prices during the real-estate bubble, I explore transaction-level data for 1994-2008. I document a strong correlation between borrowing at high leverage (>95% loan to value) and paying the full listing price or above. Homebuyers in these transactions pay prices that are higher than market prices by 3.4% ($5,700 on average) and they are 22.7% more likely to default on their mortgages, relative to other highly leveraged borrowers. The correlation between leverage and paying high prices is stronger beyond what a mechanical relation predicts: there is a discontinuity in the average leverage around the full listing price. The correlation is stronger for financially constrained and unsophisticated homebuyers, and in areas of high past price growth (indicative of buyer optimism). The study highlights the importance of buyer sophistication, financial constraints, and beliefs in determining prices and leverage.

Keywords: lending, mortgages, overpayment, sophistication, financial constraints, optimism

JEL Classification: G11, D14, R21, L85

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1 Introduction

It is widely agreed that the expansion in the credit supply in the early 2000s is associated with the sharp increase in the general level of home prices in the years that followed. Typical tests of this proposition compare aggregate price levels across geographical areas (e.g., zip codes, counties, MSAa) with respect to the financing used by borrowers (Mayer and Pence 2008, Mian and Sufi 2009, 2010, among others). Similarly, on the theoretical level, prices are often modeled as reflecting the opportunity cost for a representative agent (e.g., Glaeser, Gottlieb, and Gyourko 2010, Pavlov and Watcher 2011).

While aggregate portraits of the relation between credit expansion and prices provide a general picture of the economic forces in the real-estate market, they mask the dynamics underlying the price discovery process. When one moves away from the general focus, there is an a priori expectation that the price discovery process would be slow and heterogeneous within geographical areas due to the nature of information flows across the real-estate market (Moskowitz and Garmaise 2003). But that expectation does not consider whether credit and prices are correlated at the individual borrowers and the mechanism that links aggressive financing to prices.

In contrast to more general approaches, this study uses transaction level data to provide new insights about the channels which connect debt to prices. Specifically, I uncover high correlation between prices and leverage at the transaction level. Specifically, highly leveraged homebuyers are significantly more likely to pay the full listing price or above (which reflects a higher price on average) and are substantially more likely to default.[1] The correlation between

[1] See Agarwal, Ambrose, Chomsisengphet, and Sanders (2011) for a discussion of residential defaults during the financial crisis.

leverage and prices is stronger for some subgroups, depending on buyer and location characteristics. Overall, the findings show that the credit expansion has heterogeneous effects across agents, with financial constraints and poor financial literacy appearing to intensify the effects.

From a theoretical standpoint, aggressive financing may relate to prices through multiple channels. Borrowers may overpay for housing and borrow at high leverage if they are optimistic about future home prices (see survey evidence by Case and Shiller 1988, 2003 and models by Scheinkman and Xiong 2003 and Geanakoplos 2009). Also, financially constrained buyers[2] may be willing to pay higher prices when high leverage is available. Adams, Einav, and Levin (2009) find that subprime car buyers exhibit substantially higher demand when the required down payment is low. Allen and Gale (2000) and Barlevy and Fisher (2010) argue that speculators may be bidding up asset prices when aggressive financing is available because their downside is limited in cases of a low payoff state.

The data used in the study contains over 770,000 leveraged transactions from Cook County, Illinois for the years 1994 through 2008. One advantage of this dataset is that, in addition to having transaction details and mortgage information, it contains listing prices and details about intermediaries (real estate agents, mortgage brokers), as well as property-identifying information that allows transactions for the same property to be tracked over time.

The first part of the paper documents the novel stylized of a high correlation between the propensity to borrow at high leverage and the propensity to pay the full listing price. To illustrate, while the fraction of homebuyers who pay the full listing price or above is 13% for

[2] Piskorski, Seru, and Vig (2010) and Agarwal, Chang, and Yavas (2011) show that underwriting standards declined with securitization, allowing financially constrained borrowers to enter the market.

borrowers at loan-to-value (LTV) of 80% or lower, it is 20% for borrowers at 95% LTV and 33% for borrowers at 100% LTV. This correlation is high throughout the sample period, and especially high at the peak of the real-estate boom period (2004-2006). The focus of the paper is, therefore, on transactions that close at the full listing price or above and that are financed at high leverage (≥ 96%); I call these transactions full price-high leverage (FPHL) transactions.

I find that FPHL transactions are materially of low quality. Homebuyers in FPHL transactions overpay, on average, for housing.[3] To test whether this is the case, I use a subsample of nearly 385,000 repeat-sale transactions. I find that indeed, FPHL transactions are closed at prices that are higher by 2.8% to 3.9% than the market-adjusted price for previous transactions involving the same property and that are lower, by a similar magnitude, than market-adjusted prices for the following transaction. These figures translate to $4,800 to $6,700 of the average FPHL transaction price, respectively.

Also, borrowers in FPHL transactions are more likely to default on their mortgages. The economic magnitude of the effect is large: their properties are more likely to be foreclosed within one year by about 1.0 percentage points on average, a 22.7% increase relative to the likelihood of foreclosure for borrowers with similar debt leverage who pay less than the full listing price. Based on a small sample that includes loans' interest rates, there is no evidence that lenders charge FPHL borrowers higher interest rates.

The second part of the paper analyzes several potential mechanisms that could explain why high leverage is associated with paying high prices. Initially, I explore variables that are related to the borrowers' socio-economic situation. In particular, there is a possibility that the

[3] The result, that these homebuyers are overpaying, is not obvious, since paying the full listing price does not necessarily imply overpaying; for example, homebuyers could pay the full listing price for bargain (undervalued) properties and finance them with high leveraged debt.

introduction of low and no down payment mortgages allowed weak and unsophisticated populations to enter the housing market (Mayer and Pence 2008, Mayer, Pence and Sherlund 2009). A related idea suggests that financial constraints are an important factor in transaction characteristics. As mentioned above, Adams, Einav, and Levin (2009) find that the demand for a car from subprime buyers is materially higher when the down payment requirements are minimal.

I test whether these modifiers intensify the correlation between high leverage and paying the full listing price. I find that among the three variables: borrower income, sophistication (proxied by the number of years of education), and financial constraints (proxied by affordability: house price to income ratio), the most important modifier of the correlation is the proxy for investor sophistication.

Next, I explore the mechanism through which unsophisticated homebuyers come to pay higher prices and borrow more. One possibility is that real-estate agents exploit the situation of unsophisticated homebuyers and convince them to pay the full listing price. This may occur because real-estate agents are compensated only when transactions are completed (Levitt and Syverson 2008), and therefore have the incentive to convince buyers to pay the full listing price. Real-estate agents may have an easier task convincing buyers to pay the full listing price if the down payment is low. Prelec and Loewenstein (1998) find that using debt for purchases involves less "pain of paying" and thus increases the willingness to pay. Thus, real-estate agents may help borrowers to find high-leverage financing for the transaction. The data supports this hypothesis: homebuyers who use the services of real-estate agents with a history of many past FPHL transactions are more likely to engage in such transactions themselves. Overall, this explanation

is in line with evidence about the misaligned incentives of intermediaries (e.g., Berndt, Hillifield, and Sandas 2010, and Ben-David 2011).

Another potential explanation for the relation between high leverage and paying the full listing price or above is buyer optimism.[4] Buyers who are optimistic about the prospects of the asset are enthusiastic to buy it (and therefore may be more willing to pay the full listing price), and less concerned about borrowing at high leverage. I find modest supporting evidence for this channel. Specifically, the correlation between high leverage and paying the full listing price or above is higher in zip codes that experienced high past growth, especially during the peak of the bubble (2004 through 2006).

There are two additional explanations which the data do not bear out. First, I find little evidence that the correlation between real-estate prices and leverage is generated mechanically because of a costly search process. This explanation predicts a constant correlation between leverage and prices across the price spectrum. However, I show that the correlation between leverage and prices is significantly higher around the listing price.

Finally, I consider the possibility that the availability of high leverage induced a fundamental demand for housing, which consequently led to a higher likelihood of paying the full listing price or above. I test this hypothesis by examining a non-monetary aspect of the demand for housing: the time between property listing to contract. Contrary to the prediction that

[4] Several theoretical models propose a relation between borrower beliefs and leverage. Geanakoplos (2009) presents a model of homebuyer optimism and leverage. In his model, some homebuyers believe that they are buying undervalued assets and are therefore willing to finance them at high leverage. Scheinkman and Xiong (2003) propose that optimism about the value of the underlying assets could generate an asset bubble given constraints on short selling. A related study by Barlevy and Fisher (2010) proposes that speculative mortgages (e.g., interest-only mortgages) are issued during bubbles since banks cannot distinguish between regular borrowers and speculators. See additional models reviewed in Brunnermeier (2008).

the time on the market should be shorter for FPHL transactions, I find that FPHL transactions occur for assets that have been on the market for 30% longer.

In sum, the results, taken together, imply that high leverage is tightly associated with paying high prices both relative to the listing price and in the absolute sense. Furthermore, buyers who pay the full listing price or above and who borrow at high leverage are significantly more likely to default compared to other borrowers with similarly high leverage mortgages. The study shows that the main factors that drive the relation between leverage and prices are a lack of sophistication, financial constraints, and optimism on behalf of buyers.

The paper is organized as follows. Section 2 describes the data used in the study. In Section 3, I provide evidence for the relation between paying the full listing price and borrowing at high leverage. Section 4 explores several explanations for the relation. Some concluding remarks are offered in Section 5.

2 Data

The study uses several datasets. The first is the Cook County Recorder of Deeds, which is available online. It contains information about all real-estate transactions in Cook County, Illinois from 1990 to the present; it also includes addresses, prices, loan amounts, and registered liens. The second dataset is the Multiple Listings Service (MLS), which includes all property listings listed and transactions mediated by realtors in Cook County from October 1994 until April 2008. The database contains detailed information about home characteristics, sellers' and buyers' agents, listing prices, transaction prices, and time on the market. Also, for most transactions, the dataset contains information about mortgage rates (called APR, Average

Percentage Rate). The databases are merged according to the property identification number (PIN) and closing date.

I match the data with the Home Mortgage Disclosure Act (HMDA) database in order to obtain the reported income. Then, I supplement the data with decennial Census statistics (e.g., average number of years of education) from the year 2000.

I follow Levitt and Syverson (2008) and Ben-David (2011) and remove transactions with extreme prices (below $30,000 or above $7,000,000), as well as transactions with no matched mortgages or with leverage outside the market's normal lending terms, (loan-to-value below 25% or above 103%),[5] transactions that were closed below 50% or above 200% of the listing price, and properties that had been on the market for more than two years. Those transactions most likely reflect data errors. The final sample contains 768,537 completed transactions with mortgage information between October 1994 and April 2008.

Table 1 presents summary statistics for the main dataset used in the study. The mean transaction price is $248,302 and the median transaction is $194,000. 19.6% of homeowners pay the full listing price or above; 27.5% of homebuyers borrow 96% or more of their home's prices. Figure 1A presents the distribution of leverage. It shows that while leverage above 100% was available to borrowers throughout the sample period, it was only towards the end of the sample that the fraction of borrowers who took highly leveraged loans increased dramatically, from about 5-8% in 1994-2003 to more than 20% in 2004-2008. Figure 1B presents the distribution of the price to listing price. The figure shows that over the sample period, in conjunction with the general price level in the Chicago area, homebuyers paid a higher fraction of the listing price.

[5] During the period studied, lenders offered up to 100% LTV for purchases. In rare cases, lenders offered mortgages that covered transaction costs and therefore a small fraction of loans reach 103% LTV. Loans with more than 103% LTV are likely to reflect data errors rather than economic transactions.

3 The Relation between Leverage and Prices

3.1 Leverage and the Willingness to Pay

I begin the analysis by exploring the nature of the relation between leverage and prices. The first set of regressions examines the hypothesis that the likelihood of paying the full listing price is correlated with the likelihood of taking on a highly leveraged loan. To test this hypothesis, I regress an indicator of whether the full listing price or above was paid on leverage indicators and controls. The controls include logged price, logged number of days plus one from listing to contract, logged number of bedrooms, logged garage size (by number of cars), and interactions between the zip code and quarter indicators.

The results are presented in Table 2. The table shows that the likelihood of paying at or above the full listing price sharply increases with leverage. Column (1) shows that, compared to transactions at 80% leverage or below (the omitted leverage category), transactions financed with 81% to 90% LTV are less than 1% more likely to pay the full listing price or above. The likelihood of paying the full listing price or above is higher when the leverage is 91% to 95%, by about 3%; it reaches its height—about 12-13%—for leverage of 96% and higher.

The table shows that tightening the geographical grid of fixed effects has little effect on the coefficients. In Column (1), the grid of fixed effects is based on 2,362 interactions of zip code and calendar quarter. In Column (2), the grid of fixed effects is based on 19,428 interactions of tax code and calendar quarter. Tax codes are small geographical units that share the same municipal services (e.g., schools, sewer). In the sample, there are 336 zip codes, and 1,664 tax codes.

This relation between high leverage and the likelihood of paying the full listing price or above is statistically significant in all sample sub-periods (Columns (3) through (6)). It is strongest, however, during the peak of the real estate bubble (2004-2006) (Column (5)). During that period, high-leverage borrowers were 16.1% more likely to pay the full listing price than were borrowers with 80% leverage or less.

The relation between leverage and the likelihood of paying at or above the full listing price is also portrayed in Figure 2. This figure presents coefficient estimates from a regression similar to that in Table 2, Column (2); however, instead of using only three leverage categories, as in the table, for the figure I use a leverage dummy for each loan-to-value percentage point bin. The chart shows that, relative to transactions with 80% leverage or less, the likelihood of paying the full listing price or above is indistinguishable from zero, up to 94% LTV. The likelihood then peaks for 98% LTV mortgages (18%), and remains high for 99% LTV mortgages (12%) and for 100% LTV mortgages (13%). For LTVs higher than 100%, which were not common in Cook County (see Figure 1A), the likelihood of paying the full listing price or above is lower (3% to 6%).

The time-series patterns are depicted graphically in Figure 3. The figure shows three time series: the fraction of borrowers with high leverage (≥96%), the fraction of transactions that close at the listing price or above, and the interaction between the two. The chart shows that the fraction of high-leverage loans in Cook County is around 25% until 2004, when it increases to about 40%. Conversely, the fraction of transactions that were closed at the full listing price or above more than doubles (from 10% to circa 25%) in 1999[6] and remains stable until early 2005, when it slides down to the region of 15%-20%. The frequency of highly leveraged transactions

[6] This finding is consistent with Ferreira and Gyourko (2011), who identify 2000 as the beginning of the real-estate boom in Chicago.

and transactions that close at or above the listing price matches the results in Table 2: the frequency of these transactions increases over time, peaking in 2006.

3.2 Real Effects of Full-Price-High-Leverage Transactions

3.2.1 Overpaying for Housing

While the previous test shows that leverage is correlated with paying the full listing price or above, it is not necessarily the case that homebuyers in these transactions are overpaying. An alternative explanation is possible—some homebuyers may simply identify bargains (undervalued assets) and quickly snap them up at the listing price. As the properties are undervalued, both the buyer and the lender are comfortable with financing them at high leverage.

To test whether paying the full listing price or above means overpayment on average, I use a subsample that includes only properties that have records for two transactions or more ("repeat sale transactions").[7] By comparing transaction prices for a single property over time, I can difference out property-specific effects and isolate the overpayment effect of FPHL. A similar technique was used in Ben-David (2011) to evaluate overpayment in another context. In the context of this study, the hypothesis is that the market-adjusted price paid in an FPHL transaction is significantly higher than the market-adjusted price paid for the same house would be, either in the past or in the future, if it were bought by borrowers who were not highly leveraged or who did not pay the full listing price.

[7] An advantage of the dataset used here is that it contains a property identification number, and therefore all deals that transacted for the same property can be examined. Furthermore, the property identification number can be linked to the Cook Country Recorder of Deeds database, so that additional transactions (those not mediated by real-estate agents) can be linked to properties. This database therefore allows me to examine the transaction price evolution across time for each property.

The sample and test are designed as follows. For each property, I find all related transactions and compute the logged price differences for each pair of consecutive transactions. Then I regress the logged price differences on transaction characteristics. In the first set of specifications considered, I am interested in examining the price difference between the previous transaction and the current transaction. Therefore, the transaction characteristics on the right-hand side belong to the current transaction. To adjust for changes in systematic market prices over time, I include two sets of fixed effects: (1) interactions of the tax code dummy with dummies for the calendar quarter of the previous transaction, and (2) interactions of the tax code dummy with dummies for the calendar quarter of the current transaction. The regressions also include interactions between the high leverage indicator and an indicator for sellers' hints.[8] In addition, there are controls for whether borrowers paid the full listing price or above, the logged number of bedrooms, the logged garage size (by number of cars), the logged time on the market (since the initial listing of the property), and the main effect of the seller's hint about price inflation.

Table 3, Columns (1) through (3) present the results. Column (1) shows that buyers with debt leverage ≥96% do not overpay on average. However, when interacted with whether buyers pay the full listing price or above (Columns (2)-(3)), the regressions show an overpayment of between 2.8% to 3.1% relative to the previous transaction in the same property.

I also conduct the reverse experiment. This time, I compare the current transaction to a future transaction for the same property. If the current FPHL transactions have excessive prices, then these properties should have lower selling prices in the future. Indeed, Table 3, Columns (4)

[8] In Ben-David (2011), I find that some homebuyers intentionally inflate transaction prices in order to borrow larger mortgages. To identify these transactions, I scan property listings and identify cases in which sellers invite buyers to participate in these transactions ("Seller's hint"). The indicator for these transactions in introduced in most specifications to account for transactions that are potentially inflated. For more information, see Ben-David (2011).

through (6) show that future transactions on properties that were financed with high leverage and transacted at the full listing price or above are later sold at market-adjusted prices that are lower by 3.7%-3.9%.

In conclusion, the results in Table 3 show that properties in FPHL transactions are overpriced by about 2.8%-3.9%. From where the lender stands, overpaying means that, in practice, many FPHL transactions are financed for more than 100% of their market value.

3.2.2 Higher Likelihood of Default

Another potential outcome of FPHL transactions is a higher default rate. Borrowers in these transactions could default more often because they are financially weaker (e.g., if overpaying is due to lack of sophistication, as shown below). Alternately, default might be more common because these buyers overpay in the first place, and therefore are implicitly overleveraged.

To measure the performance of mortgages, I use foreclosure data provided by the Cook County Recorder of Deeds. In Table 4, I regress a foreclosure dummy on debt leverage indicators interacted with an indicator as to whether borrowers paid the full listing price on the property. The results show that borrowers who are highly leveraged are more likely to default, as previously found by Ambrose and Capone (1998) and Kelly (2008). More importantly for the current analysis, the results show that borrowers who are highly leveraged and who paid the full listing price or above are 1% more likely to be foreclosed on within one year, relative to other highly leveraged borrowers (Columns (1) and (2)). Given that the foreclosure rate of high LTV

borrowers is 4.4% (untabulated), paying the full listing price is associated with a higher foreclosure rate of 22.7%.

One might wonder whether banks are aware of the elevated risk imposed by FPHL borrowers. On the face of it, it seems that lenders could relatively easily identify borrowers who engage in FPHL transactions, as the listing price is public information. To test this idea, I use the Annual Percentage Rate (APR), which lenders report to the Recorder of Deeds. The advantage of APR over the simple interest rate is that it also annualizes the mortgage's initial costs. The results in Table 4, Column (7), show that the APR charged by lenders for FPHL transactions is slightly lower than the APR charged to other, similarly high-leverage transactions that close at prices below the listing price. Hence, it does not appear that lenders price this additional risk into mortgage interest rates.

Overall, the results in this section show that homebuyers who pay the full listing price and borrow at high leverage overpay, on average, for housing, and are more likely to default on their debt. Furthermore, it appears that lenders do not negatively discriminate these borrowers and charge them a higher interest rate.

4 Explaining the Relation between Leverage and Prices

There are several potential non-mutually exclusive explanations for the relation between the propensity to take on high leverage and to pay at or above the full listing price. In this section, I evaluate the validity of several explanations.

4.1 Homebuyer Sophistication and Financial Constraints

The first explanation suggests that homebuyers who are financially frailer and less sophisticated are more likely to engage in highly leveraged transactions with high prices. Such evidence would parallel the evidence about subprime car buyers who exhibit high demand when the low down payment requirement is low (Adams, Einav, and Levin 2009).[9]

To test this idea, I use several proxies for the economic variables of interest. Specifically, I use logged income (from HMDA) as measure of wealth, the average number of years of education in the zip code (from Census data) as a proxy for sophistication, and the ratio of price to income as a measure of affordability and financial constraints. In the regression, I introduce each variable individually and then conduct a horse race between them.

The results are presented in Table 5. Columns (1) and (2) present the regressions with interactions of logged income. Other controls include interactions of the high leverage indicator with seller's hint and transaction characteristics. The results indeed show that the correlation between the likelihood of paying the full listing price or above and the likelihood of taking high-debt leverage is higher for low-income buyers. Conditional on borrowing at high leverage, a one standard deviation shift in logged income (0.494) is associated with a modest 1.4% increase in the likelihood of paying the full listing price.

In Columns (3) and (4), I examine the importance of the average number of years of education as a modifier. The regressions show that this variable is a major factor in the regression. Conditional on borrowing at high leverage, a one standard deviation in the number of

[9] The relation between prices and financial constraints also arises for sellers. Genesove and Mayer (1997) report that home sellers with high loan-to-value mortgages set higher asking prices, their properties stay on the market for a longer time, and, conditional on selling, they receive a higher price than do home sellers with less debt.

years of education (1.342) is associated with a higher likelihood of paying the full listing price, by about 2.7% (about 7% of the standard deviation in the dependent variable).

Columns (4) and (5) explore the importance of affordability, proxied by the price to income ratio. This variable also modifies the association between taking on high leverage and paying the full listing price, although at a modest economic significance. Conditional on borrowing at high leverage, a one standard deviation in the price to income ratio (1.420) is associated with an increase in the likelihood of paying the full listing price by about 1.0%.

When putting all the variables together in a single regression, the education variable dominates. In Columns (7) and (8), logged income and the price to income ratio lose their economic and statistical significance,[10] while the average number of years of education remains strong. This evidence suggests that sophistication appears to be the primary economic factor that links borrower characteristics to price and leverage.

4.2 Why Homebuyer Sophistication Matters

Several non-mutually exclusive mechanisms can account for the intensified relation between leverage and prices for an unsophisticated population. Such a population may be naïve about negotiating prices, especially when high-leverage financing is offered. Alternatively, unsophisticated homebuyers may not perceive a house's price as high because it is being paid by a third party (the bank), not from their own pocket. Similar evidence was found for consumers'

[10] One concern is that logged income and price to income ratio lose significance due to multicollinearity. In unreported analysis I verify that when these variables are introduced separately to the regression, they still lose power.

being more aware of prices when the medium of payment is vivid than when it is not (e.g., cash versus credit cards) (Prelec and Loewenstein 1998).[11]

Another possibility is that intermediaries convince unsophisticated buyers to pay the full listing price (so they can receive their commission), and to help them finance the purchase at high leverage. This explanation is consistent with evidence that the misaligned incentives of intermediaries affect deal outcomes. Levitt and Syverson (2008) find that real-estate agents achieve better selling terms for their own houses than they do for houses of clients. Ben-David (2011) shows that transactions are more likely to be fraudulent when real-estate agents receive larger-than-usual compensation or when mortgage brokers are involved. Also, Berndt, Hillifield, and Sandas (2010) document that mortgage brokers earn higher fees on loans that turned out to be of worse quality *ex post*.

The data allows testing the latter explanation, that intermediaries convince unsophisticated buyers to engage in FPHL transactions. To test this hypothesis, I rely on the fact that the data includes identification information for real-estate agents. I examine buyer-side and seller-side agents separately. For each buyer-side real-estate agent, I compute (1) the total number of the agent's transactions for his previous four quarters, (2) the number of the agent's transactions in which borrowers had high leverage (≥96% LTV), (3) the number of the agent's transactions in which borrowers paid at or above the full listing price and, (4) the number of the agent's transactions in which borrowers had high leverage *and* paid the full listing price or

[11] Allen and Gale (2000) propose a risk-shifting mechanism that could also be related to sophistication. When high leverage credit is available, buyers have the incentive to overpay for risky assets and to finance it with debt. At high payoff states, buyers enjoy the profits, while at low payoff states, creditors suffer. One would expect that sophisticated borrowers would be more likely to engage in such transactions; however, the empirical evidence shows that *less* sophisticated buyers are actually more likely to exhibit this behavior.

above. Then, I repeat these measurements for the sellers' agents. In addition, I include in the analysis an indicator of whether the mortgage was arranged by a mortgage broker.

The tests in Table 6 regress an indicator of paying the full listing price or above on leverage indicators interacted with information about the real-estate agents who mediated the transaction, as described above. Additionally, there is an interaction of a high-leverage transaction with an indicator for the presence of a mortgage broker in the transaction. As usual, I include the main effects, controls, and fixed effects for tax code dummies interacted with the calendar quarter.

The regressions reveal two interesting findings. First, it appears that buyers' agents have a strong influence over whether the buyer pays the full listing price and borrows at high leverage. The regressions in Columns (2) and (3) show that homebuyers who use the services of a real-estate agent with many past FPHL transactions have a higher likelihood of engaging in an FPHL transaction themselves. Second, homebuyers who arrange their financing through a mortgage broker are more likely to pay the full listing price or above and to borrow at high leverage. Hence, there is evidence that intermediaries persuade buyers to pay the full listing price (to ensure that the transaction closes and the real-estate agent receives his fee) and to borrow at high leverage.

The regressions indicate that the influence of real-estate agents and mortgage brokers is indeed related to homebuyer sophistication. Specifically, compare Column (1) (the base regression) to Column (2): the coefficient on the number of years of education declines by 45% once the intermediaries' characteristics are introduced to the regressions. This suggests that the effect of real-estate agents promoting FPHL transactions is higher in areas where the population has had less education.

An alternative interpretation of the results in Table 6 is that unsophisticated homebuyers hire real-estate brokers who specialize in an unsophisticated population. To account for this possibility, I include in Columns (2) to (7) a control for the average number of years of education associated with real-estate agents' transactions for the previous year. This variable controls for the sophistication level of the population with whom the real-estate agent works. As is evident in the regression, the logged number of the FPHL transactions of the buyer's real-estate agent is still a very strong covariate.

The economic effect of intermediaries' influence is material. Conditional on borrowing at high leverage, a shift of one standard deviation of the logged number of FPHL transactions of the buyer's real-estate agent is associated with an increase in the likelihood of paying the full listing price by 13.1%.[12] The same variable for the seller's real-estate agent has less than half of the economic effect. Homebuyers who use a mortgage broker to arrange their financing (as opposed to a retail lender) are more likely to pay the full listing price by about 3.3%, conditional on borrowing $\geq$ 96%.

4.3 Borrower Optimism

Another possibility is that optimistic homebuyers are likely to pay high prices while simultaneously borrowing at high leverage. The idea is that optimistic homebuyers believe they are buying an undervalued house; hence, they are happy to pay the full listing price, because they

[12] From Table 1, the standard deviation of log(1 + # FPHL of buyer's real-estate agent) is 1.10, the standard deviation of log(1 + # FP of buyer's real-estate agent) is 1.26, and the standard deviation of log(1 + # HL of buyer's real-estate agent) is 1.34. Multiplying the standard deviations by relevant coefficients from Column (3) yields: 1.10*7.02+1.26*2.65+1.34*1.53 = 13.1%.

perceive it as a bargain. Additionally, they are willing to borrow at high leverage, believing that the true leverage is not actually high because the house is being sold below market price.

To test this hypothesis, I rely on Case and Shiller (1988, 2003), who document that homeowners anticipate that the previous 12 months' growth will persist over the following year. For each zip code-month I compute the 12-month price growth of the median transaction (computed as logged difference). Zip code-months must have at least 10 transactions. Following Case and Shiller (1988, 2003), it is predicted that homebuyers in townships that experienced high recent growth will anticipate high future growth and will thus be willing to pay high prices and to borrow at high leverage.

In Table 7, I regress the usual full price payment indicator on the high leverage indicator interacted with the one-year zip code price growth variable. In addition, calendar quarter and tax code fixed effects are included, so that the one-year zip code price growth variable captures variation within calendar quarter and tax code. When the entire sample is used, as it is in Columns (1) and (2), an effect is indeed evident: homebuyers in high past-growth townships are more likely to pay the full listing price or above and to borrow at high leverage. The economic effect of this effect is modest: conditional on borrowing at high leverage, a shift of one standard deviation of price growth (0.119) is associated with a 1.3% higher likelihood of paying the full listing price.

Across period-based subsamples, it appears that the effect of this optimism existed only at the peak of the market, between 2004 and 2006 (Column (5)). In other periods, the effect is economically weak and statistically insignificantly different from zero.

In sum, it appears that homebuyer optimism modestly contributes to the correlation between leverage and prices.

4.4 Mechanical Relation due to Financial Constraints

Another alternative is that the relation between paying the full listing price or above and financing the property at high leverage could be the mechanical result of financial constraints. To see how financial constraints can create this kind of dependence, consider someone who plans to buy a house for $200,000, with a $20,000 down payment. In the course of his housing search, the buyer finds a house he likes for $210,000. Since the search is costly, the buyer might agree to pay the full listing price (as he likes the house) but, because of his financial constraints, he must finance the additional $10,000 with debt. The financial constraints explanation therefore predicts that any unexpected increase in price is financed, dollar for dollar, by debt. The implication of this insight is that leverage should increase with the ratio of price to listing price. If this is the case, then it is possible that the correlation we observe between paying the full listing price or above and high leverage is simply mechanical.

To test whether leverage increases with the ratio of price/listing price, I compute leverage as mortgage/listing price and estimate the following regression. To ease the interpretation of the results, the sample is restricted to observations that have a price/listing price between 90% and 105%. I define a series of dummy variables for price/listing price bins, based on the rounded value in percentage: $I\left(round\left(\frac{price}{listing\ price_i}\right) = j\right)$. The regression is:

$$\frac{mortgage}{listing\ price_i} = \sum_{j=91\%}^{105\%} \beta_j I\left(round\left(\frac{price}{listing\ price_i}\right) = j\right) + controls_i + fixed\ effects_i + \varepsilon_i$$

The coefficients β_j in this regression measure the average ratio of the mortgage to the listing price for each price/listing price bin (adjusted for controls as well as for time and location fixed effects). The financial constraints explanation predicts that $\beta_{j+1} \leq \beta_j + 1\%$, i.e., as we

move from one price/listing price bin to the next, the average mortgage/listing price increases by up to 1%.

The results are presented in Table 8. Column (1) presents a base regression with no controls or fixed effects. The results show that as the ratio of price to listing price increases, the average of mortgage/listing price increases as well. The increments for the first eight betas are about 1% (the omitted level is *I(Price/Listing price = 90%)*). However, as we move towards the full listing price (*I(Price/Listing price = 100%)*), the increments increase: the increment from 98% price/listing price to 99% is 2.2%, and the increment from 99% price/listing price to 100% is 4.15%.

Figure 4 presents related information. Figure 4A shows the coefficients from Table 8, Column (1), in addition to the fraction of borrowers who borrow at 100% LTV. The figure highlights the fact that, for price to listing price ratios lower than 99%, the fraction of borrowers who take on 100% LTV mortgages is more or less constant at about 20%. This fraction increases dramatically for 99% and 100% price to listing price, to 31% and 43%, respectively. Figure 4B presents the difference between each price to listing price bin. When the ratio of price to listing price is low, the average increment is about 1%. At 99% and 100% price/listing price, the increments are substantive and coincide with the increase in the fraction of borrowers who take on 100% LTV financing.

Returning to Table 8, as controls and fixed effects are added to the regressions in Columns (2) to (4), the difference in the betas between the ratios of price to listing price of 98% and 99%, and 99% and 100%, declines, but it still remains above 1%, at 1.8% and 2.4%, respectively (see Column (3)). The breakdown by sub-period in Columns (5) to (8) shows that the largest jump between 99% and 100% price/listing price occurs during the peak of the real-

estate bubble, the years 2004 to 2006. At that time, the jump between the ratios of price to listing price of 98% and 99% was 1.8%; for the ratios of price to listing price of 99% to 100%, it was 3.2%.

To summarize, these results show that while the financial constraints story does a good job of explaining the variation of leverage ratios for the low ratios of price to listing price, it fails to explain the jump in leverage when approaching the full listing price.

4.5 Credit Expansion Fuels Fundamental Demand for Housing

Finally, I evaluate an explanation for the correlation between high prices and high leverage that suggests that the abundance of credit available to borrowers expanded the demand for housing, which in turn caused borrowers to pay higher prices. Put differently, the credit expansion in the early 2000s allowed many people to borrow cheaply, and therefore boosted the demand for housing for those who could borrow at high leverage and low cost. As a result of the heightened demand, more homebuyers could end up paying the full listing price.

To explore this explanation, I test whether fundamental demand is higher in FPHL transactions. Typically, higher demand would be measured by price, but in the case of this study, high prices are an integral part of FPHL transactions. I therefore turn to another measure of demand: time on the market, i.e., the number of days that a property is on the market, from its listing until it is sold. High demand for housing is reflected in a shorter listing period, i.e., shorter time on the market.

In Table 9, I regress logged time-on-the-market on interactions of a high leverage indicator with an indicator for paying the full listing price or above, in addition to controls. The

regressions show that, in fact, the time on the market for properties that are sold at high leverage and at full listing price or above is actually longer, by about 30% on average. This result contradicts the idea that high leverage generated a higher fundamental demand for housing in the market, which consequently led to higher prices.

5 Conclusion

This study reveals some of the mechanisms that speak to how the credit supply expansion increased home prices in the 2000s. Specifically, I use transaction level data to show that homebuyers exhibit a high correlation between paying the full listing price or above and borrowing at a high leverage. I find that borrowers who put less than 5% down and who pay the full listing price overpay for housing by 2.8%-3.9% on average; they are also 22.7% more likely to default on their mortgages.

In seeking the economic mechanism that drives this relation, I find evidence that supports several possibilities. First, homebuyers' lack of sophistication and financial constraints can modify this correlation between leverage and prices. Second, some intermediaries (real-estate agents and mortgage brokers) appear to induce buyers to pay the full listing price and to borrow at high leverage. Intermediaries are interested in the price paid by buyers since their compensation is contingent on the transaction being completed and completion is more likely if the buyer agrees to pay the full listing price. To help buyers disgorge the high price, intermediaries may suggest to buyers that they finance the property using high leverage. This finding joins the accumulating evidence about the role of intermediaries in propagating the

housing bubble and subsequent meltdown. Finally, I find some evidence that the relation between leverage and prices is the consequence of buyer optimism.

Overall, the study presents novel evidence that higher leverage is associated with higher willingness to pay and higher prices. The relation is especially strong for unsophisticated, financially constrained and optimistic homebuyers.

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Appendix A

Variable definitions

I(Price ≥ Listing price)	An indicator of whether the transaction price is equal to or higher than the last listing price on the property.
xx% ≤ LTV ≤ yy%	An indicator of whether the leverage is between xx% and yy%.
log(Price)	Logged transaction price.
log(# bedrooms)	Logged number of bedrooms.
log(# car garages)	Logged garage size (by number of cars).
I(Seller hint)	An indicator variable as to whether the seller hinted about a side payment to the buyer that could potentially increase the price. This variable is borrowed from Ben-David (2011).
log (1 + time-on-the-market)	The logged time on the market in days plus one.
$log(P_{Current}(\$)) - log(P_{Past}(\$))$	The log difference in prices between the current transaction price and the previous transaction price on the same property
$log(P_{Future}(\$)) - log(P_{Current}(\$))$	The log difference in prices between the next transaction price on the property and the current transaction price on the property.
I(Foreclosed within one year)	An indicator of whether a property was foreclosed within one year of the transaction.
APR (%)	Annual Percentage Rate: the annualized interest rate paid by the borrower.
Zip code 1-year price growth (log)	Logged difference between current and 12-month past zip code median prices.
Mortgage broker indicator	An indicator for whether the loan was originated by a mortgage broker or directly by a lender.
log(1 + # FPHL of buyer's(seller's) real-estate agent)	The logged number of FPHL transactions that the buyer's (seller's) real-estate agent has engaged in during the previous year plus one. FPHL transactions are transactions in which the transaction price is equal to or higher than the listing price and the leverage is higher than 95%.
log(1 + # HL of buyer's(seller's) real-estate agent)	The logged number of highly leveraged (HL; ≥96% leverage) transactions that the buyer's (seller's) real-estate agent has engaged in during the previous year plus one.

log(1 + # FP of buyer's(seller's) real-estate agent)	The logged number of transactions at the full listing price or above that the buyer's (seller's) real-estate agent has engaged in during the previous year plus one.
log(1 + # transactions of buyer's(seller's) real-estate agent)	The logged total number of transactions that the buyer's (seller's) real-estate agent has engaged in during the previous year plus one.
Avg # years of education of clients of buyer's (seller's) agent	For each transaction, I recorded the average number of years of education per zip code (from Census data). Then, for each buyer's (seller's) agent, I calculate the average of the number of education years across all the transactions in the past year.
log(Income)	The log of income as reported in HMDA.
Price / income	Ratio of house price to income as reported in HMDA.
Avg # years of education	The zip-code-level average number of years of education as reported by the Census.
I(Mortgage broker)	Indicator variable as to whether a lender is a "lender" and likely to hold the mortgages it originates (= 0), or a "mortgage broker" and likely to sell the mortgages it originates (= 1).

Table 1. Summary Statistics

The table presents summary statistics for the data used in the study. The dataset is based on the Multiple Listing Service data for Cook County for October 1994 to April 2008. It includes the residential properties that were sold through real-estate agents. This dataset is merged to the Cook County Recorder of Deeds dataset. Variable definitions are in the Appendix.

	N	Mean	Std dev	Min	p10	p50	p90	Max
I(Price ≥ Listing price) × 100	770,967	19.608	39.703	0.00	0.00	0.00	100.00	100.00
96% ≤ LTV	770,967	0.275	0.447	0.00	0.00	0.00	1.00	1.00
91% ≤ LTV ≤ 95%	770,967	0.164	0.370	0.00	0.00	0.00	1.00	1.00
81% ≤ LTV ≤ 90%	770,967	0.198	0.398	0.00	0.00	0.00	1.00	1.00
Price	770,967	248302	211786	30200	97000	194000	432000	6800000
log(Price)	770,967	12.218	0.605	10.32	11.48	12.18	12.98	15.73
log(# bedrooms)	770,967	1.325	0.379	0.00	1.10	1.39	1.61	2.30
log(1 + # car garages)	770,967	0.920	0.344	0.00	0.69	1.10	1.10	2.30
log(1 + time-on-the-market)	770,967	3.242	1.245	0.00	1.61	3.37	4.78	6.59
Seller hint (0/1)	770,967	0.029	0.168	0.00	0.00	0.00	0.00	1.00
$\log(P_{Current}(\$)) - \log(P_{Past}(\$))$	385,145	0.392	0.482	-1.32	0.00	0.29	0.92	3.73
$\log(P_{Future}(\$)) - \log(P_{Current}(\$))$	219,338	0.247	0.396	-1.90	-0.09	0.24	0.69	1.67
Mortgage / listing price × 100	770,967	83.168	15.402	15.02	62.86	87.15	98.55	198.60
Price / listing price × 100	770,967	97.125	4.038	50.00	93.33	97.37	100.00	200.00
I(Foreclosed within one year) × 100	710,331	2.202	14.676	0.00	0.00	0.00	0.00	100.00
Zip code 1-year price growth (log)	754496	0.057	0.119	-2.20	-0.06	0.06	0.17	1.93
log(income)	745,727	10.816	0.494	9.36	10.25	10.74	11.45	13.63
Avg # years of education	740,271	14.033	1.342	9.00	12.39	13.84	16.01	18.46
Price / income	472,484	3.076	1.420	0.01	1.50	2.86	4.90	9.50
I(96% ≤ LTV) × I(Price ≥ Listing price)	770,967	0.085	0.279	0.00	0.00	0.00	0.00	1.00
Mortgage broker indicator	728,209	0.593	0.491	0.00	0.00	1.00	1.00	1.00
log(1 + # FPHL of buyer's real-estate agent)	655,267	0.479	1.096	0.00	0.00	0.00	1.39	5.82
log(1 + # transactions of buyer's real-estate agent)	655,267	1.926	1.368	0.69	0.69	1.61	2.77	8.17
log(1 + # FP of buyer's real-estate agent)	655,267	0.793	1.260	0.00	0.00	0.69	1.79	6.74
log(1 + # HL of buyer's real-estate agent)	655,267	0.938	1.339	0.00	0.00	0.69	2.08	6.84
Avg # years of education for clients of buyer's agent	650,711	14.015	1.079	9.00	12.68	13.92	15.51	17.70
log(1 + # FPHL of seller's real-estate agent)	677,087	0.488	0.870	0.00	0.00	0.00	1.39	5.02
log(1 + # transactions of seller's real-estate agent)	677,087	2.090	1.194	0.69	0.69	1.95	3.37	7.49
log(1 + # FP of seller's real-estate agent)	677,087	0.864	1.085	0.00	0.00	0.69	2.08	6.34
log(1 + # HL of seller's real-estate agent)	677,087	1.028	1.121	0.00	0.00	0.69	2.30	5.98
Avg # years of education for clients of seller's agent	673,297	14.030	1.085	9.00	12.72	13.95	15.55	17.70

Table 2. Correlation between Paying the Full Listing Price and Taking on High Leverage

The table presents the correlations between the propensity to pay the full listing price or above on a property and to also take out a high-leverage mortgage. Variable definitions are in the Appendix. All regressions are OLS regressions. *t*-statistics are reported in parentheses. Standard errors are clustered by zip code. ** and * denote statistical significance at the 5% and 10% levels, respectively.

	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)
log(# bedrooms)	3.93**	2.40**	-0.49	4.68**	5.93**	1.70
	(9.73)	(5.81)	(-1.82)	(8.39)	(7.19)	(1.12)
log(1 + # car garages)	-0.79*	-1.99**	-1.18**	-3.11**	-2.29**	-3.96**
	(-2.45)	(-6.72)	(-3.85)	(-7.55)	(-4.82)	(-5.58)
log(1 + time-on-the-market)	-4.06**	-4.23**	-3.39**	-5.25**	-4.16**	-3.10**
	(-37.27)	(-39.07)	(-20.14)	(-34.42)	(-34.81)	(-17.55)
log(Price)	-4.83**	-3.07**	-0.07	-4.86**	-4.97**	-2.21**
	(-10.14)	(-7.60)	(-0.19)	(-9.98)	(-8.99)	(-2.70)
I(Seller hint)	3.96**	3.27**	3.44**	2.34**	3.02**	4.55**
	(10.70)	(9.56)	(5.86)	(4.04)	(5.44)	(5.17)
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

Table 3. Do Highly Leveraged Buyers Who Pay the Full Listing Price Overpay?

The table explores whether paying the full listing price or above on a property and taking out a high-leverage mortgage is indicative of overpaying. The sample is composed of pairs of transactions: the sample used in Columns (1)-(3) compares the current price paid on a property to the price in the most recent transaction for the same property, and the sample used in Columns (4)-(6) compares the current price paid on a property to the price for the same property in the following transaction. Columns (2) and (5) include the fixed effects of zip code indicators interacted with calendar quarter dummies for both the current and benchmark quarters. Columns (1), (3), (4), and (6) include the fixed effects of tax code indicators interacted with calendar quarter dummies for both the current and benchmark quarters. Variable definitions are in the Appendix. All regressions are OLS regressions. *t*-statistics are reported in parentheses. Standard errors are clustered by zip code. ** and * denote statistical significance at the 5% and 10% levels, respectively.

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)
91% ≤ LTV ≤ 95%	-0.024**	-0.015**	-0.024**	0.055**	0.044**	0.055**
	(0.004)	(-4.44)	(-5.85)	(10.97)	(10.23)	(11.04)
81% ≤ LTV ≤ 90%	-0.014**	-0.011**	-0.014**	0.045**	0.039**	0.044**
	(0.003)	(-3.84)	(-4.69)	(12.36)	(12.24)	(12.41)
I(Price ≥ Listing price)		0.014**	0.014**		-0.022**	-0.005
		(3.04)	(3.24)		(-6.12)	(-1.05)
log(# bedrooms)	0.010**	0.011**	0.010**	-0.005**	-0.008**	-0.006**
	(0.001)	(10.80)	(9.31)	(-5.23)	(-7.97)	(-5.92)
log(1 + # car garages)	0.138**	0.119**	0.137**	-0.062**	-0.049**	-0.061**
	(0.009)	(14.52)	(16.02)	(-8.34)	(-6.51)	(-8.18)
log(1 + time-on-the-market)	0.054**	0.074**	0.055**	-0.047**	-0.044**	-0.047**
	(0.007)	(12.97)	(7.95)	(-6.24)	(-5.93)	(-6.29)
I(Seller hint)	0.030**	0.018*	0.013	-0.010	-0.007	0.000
	(0.007)	(1.97)	(1.50)	(-1.43)	(-0.81)	(0.02)
Current transaction:						
Zip code × Quarter FE	No	Yes	No	No	Yes	No
Tax code × Quarter FE	Yes	No	Yes	Yes	No	Yes
Benchmark transaction:						
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

Table 4. Borrower Foreclosure Rates

The table explores whether borrowers who pay the full listing price or above on a property and who take out a high-leverage mortgage are more likely to be foreclosed within one year, and whether they pay a higher adjustable percentage rate (APR). Column (8) includes two sets of tax code × quarter fixed effects: one for adjustable rate mortgages and one for fixed rate mortgages. Variable definitions are in the Appendix. All regressions are OLS regressions. *t*-statistics are reported in parentheses. Standard errors are clustered by zip code. ** and * denote statistical significance at the 5% and 10% levels, respectively.

Dependent variable:	I(Foreclosed within one year) × 100						APR (%)
	All	All	All	1994-1999	2000-2003	2004-2006	All
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
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)
I(Price ≥ Listing price)		1.38**	1.26**	0.88**	1.33**	1.15**	0.03**
		(9.86)	(9.70)	(4.74)	(8.67)	(8.96)	(4.71)
log(# bedrooms)	0.54**	0.80**	0.49**	-0.36**	1.18**	1.48**	0.05**
	(4.70)	(6.27)	(4.46)	(-2.80)	(8.08)	(11.26)	(4.11)
log(1 + # car garages)	-0.67**	-0.55**	-0.64**	-1.00**	-0.79**	-0.51**	0.02**
	(-6.53)	(-5.39)	(-6.39)	(-5.41)	(-5.96)	(-4.15)	(2.71)
log(1 + time-on-the-market)	0.08**	0.20**	0.15**	0.16**	0.17**	0.12**	0.00
	(5.25)	(9.51)	(8.29)	(4.38)	(6.28)	(4.85)	(1.19)
log(Price)	-0.66**	-1.03**	-0.60**	0.22	-1.24**	-0.95**	-0.56**
	(-4.99)	(-6.74)	(-4.81)	(1.32)	(-8.50)	(-7.91)	(-31.95)
I(Seller hint)	0.51**	0.43**	0.31	0.82**	-0.09	0.23	-0.01
	(3.24)	(2.69)	(1.82)	(2.62)	(-0.31)	(0.98)	(-0.32)
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

Table 5. Borrower Sophistication and High-Price-High-Leverage Transactions

The table explores whether borrower wealth and sophistication moderate paying at or above the full listing price and taking on a high-leverage mortgage. Variable definitions are in the Appendix. All regressions are OLS regressions. *t*-statistics are reported in parentheses. Standard errors are clustered by zip code. ** and * denote statistical significance at the 5% and 10% levels, respectively.

	Dependent variable: I(Price ≥ Listing price) × 100							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
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)
× I(Seller hint)	2.21**	1.92*	2.21**	1.79*	2.53**	2.21**	2.11*	1.81*
	(2.62)	(2.40)	(2.61)	(2.26)	(2.92)	(2.72)	(2.56)	(2.29)
91% ≤ LTV ≤ 95%	2.98**	3.25**	3.07**	3.38**	2.81**	3.04**	3.06**	3.28**
	(7.58)	(8.62)	(7.67)	(8.77)	(7.28)	(8.31)	(8.37)	(9.22)
80% < LTV ≤ 90%	0.69**	0.85**	0.76**	0.93**	0.62**	0.74**	0.73**	0.84**
	(3.14)	(4.04)	(3.51)	(4.43)	(2.84)	(3.56)	(3.42)	(4.11)
log(Price)	-5.75**	-3.40**	-5.58**	-3.23**	-5.76**	-3.00**	-5.80**	-3.02**
	(-8.04)	(-6.33)	(-7.67)	(-6.10)	(-7.99)	(-4.70)	(-7.89)	(-4.85)
log(# bedrooms)	4.00**	2.29**	3.77**	2.05**	4.06**	2.29**	3.79**	2.04**
	(7.70)	(4.80)	(7.23)	(4.35)	(7.75)	(4.78)	(7.26)	(4.30)
log(1 + # car garages)	-0.37	-0.59	-0.56	-0.73*	-0.37	-0.59	-0.55	-0.73*
	(-0.90)	(-1.80)	(-1.43)	(-2.25)	(-0.89)	(-1.79)	(-1.39)	(-2.24)
log(1 + time-on-the-market)	-4.37**	-4.50**	-4.36**	-4.50**	-4.36**	-4.49**	-4.37**	-4.50**
	(-28.80)	(-29.24)	(-28.81)	(-29.44)	(-28.66)	(-29.06)	(-28.69)	(-29.22)
log(Income)	0.70**	0.48*	0.22	0.05	0.13	-0.35	0.72	-0.03
	(2.89)	(2.38)	(1.23)	(0.28)	(0.36)	(-0.91)	(1.77)	(-0.08)
I(Seller hint)	3.38**	2.59**	3.35**	2.58**	3.26**	2.47**	3.38**	2.57**
	(6.60)	(5.04)	(6.56)	(5.05)	(6.34)	(4.78)	(6.61)	(5.07)
Price / Income					-0.14	-0.26*	-0.02	-0.18
					(-1.14)	(-2.04)	(-0.13)	(-1.37)
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

Table 6. The Role of Intermediaries

The table explores whether engaging in FPHL transactions is related to intermediaries' characteristics. Variable definitions are in the Appendix. All regressions are OLS regressions. *t*-statistics are reported in parentheses. Standard errors are clustered by zip code. ** and * denote statistical significance at the 5% and 10% levels, respectively.

	Dependent variable: I(Price ≥ Listing price) × 100						
	All	All	All	1994-1999	2000-2003	2004-2006	2007-2008
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
96% ≤ LTV	46.63**	36.39**	44.75**	25.01**	50.10**	64.77**	38.70**
	(12.31)	(12.07)	(12.47)	(4.68)	(8.51)	(11.70)	(4.25)
× I(Mortgage broker)		3.37**	3.31**	2.14**	3.13**	4.07**	4.61**
		(10.78)	(10.59)	(3.74)	(5.31)	(7.47)	(4.76)
× log(1 + # FPHL of buyer's real-estate agent)		6.64**	7.02**	5.31**	6.82**	4.66**	7.72**
		(13.52)	(14.58)	(5.07)	(7.34)	(5.22)	(4.06)
× log(1 + # transactions of buyer's real-estate agent)		-9.21**	-7.81**	-7.50**	-8.12**	-8.03**	-5.10**
		(-26.33)	(-21.71)	(-11.93)	(-10.92)	(-12.50)	(-4.95)
× log(1 + # FP of buyer's real-estate agent)		3.23**	2.65**	1.71*	2.09**	2.68**	0.39
		(8.33)	(6.77)	(2.08)	(2.61)	(3.77)	(0.24)
× log(1 + # HL of buyer's real-estate agent)		2.67**	1.53**	3.50**	2.65**	3.38**	0.96
		(7.30)	(4.39)	(5.68)	(3.55)	(4.89)	(0.87)
× Avg # years of education for clients of buyer's agent			-1.40**	-0.65	-1.50**	-1.93**	-1.70**
			(-6.87)	(-1.73)	(-4.12)	(-5.91)	(-3.01)
× log(1 + # FPHL of seller's real-estate agent)			3.38**	3.74**	0.65	1.70	2.17
			(6.54)	(3.66)	(0.77)	(1.79)	(1.24)
× log(1 + # transactions of seller's agent)			-1.42**	-2.47**	-0.99	-0.50	-2.49*
			(-3.98)	(-4.80)	(-1.40)	(-0.84)	(-2.10)
× log(1 + # FP of seller's real-estate agent)			-1.05*	-1.57*	-1.35	-2.46**	-1.79
			(-2.52)	(-2.20)	(-1.69)	(-3.20)	(-1.24)
× log(1 + # HL of seller's real-estate agent)			0.11	1.56**	1.48*	1.99**	2.60
			(0.30)	(3.10)	(2.26)	(2.77)	(1.86)
× Avg # years of education for clients of seller's agent			0.20	0.06	0.23	-0.34	0.33
			(0.99)	(0.17)	(0.62)	(-0.93)	(0.52)
× Avg years of education	-2.50**	-1.39**	-0.75**	-0.18	-1.03**	-1.12**	-0.30
	(-9.17)	(-6.23)	(-3.36)	(-0.66)	(-3.44)	(-3.36)	(-0.64)
× I(Seller hint)	1.58*	0.05	-0.18	1.73	1.64	-2.37	-4.24*
	(1.97)	(0.06)	(-0.22)	(1.13)	(1.06)	(-1.59)	(-2.10)
91% ≤ LTV ≤ 95%	3.48**	3.39**	3.43**	1.02**	3.62**	4.76**	5.14**
	(11.10)	(11.43)	(11.63)	(3.18)	(10.14)	(9.23)	(8.45)
81% ≤ LTV ≤ 90%	1.14**	1.09**	1.08**	0.72**	1.20**	1.33**	1.62**
	(6.62)	(6.63)	(6.67)	(2.67)	(4.21)	(4.40)	(3.87)
I(Mortgage broker)		1.17**	1.19**	0.28	0.65**	2.61**	0.06
		(7.85)	(7.90)	(1.34)	(2.73)	(9.81)	(0.14)
log(1 + # FPHL of buyer's real-estate agent)		-2.15**	-2.30**	-2.20**	-1.70**	-1.27**	-3.52**
		(-9.50)	(-10.37)	(-4.22)	(-4.63)	(-3.28)	(-4.66)
log(1 + # transactions of buyer's real-estate agent)		-4.05**	-3.67**	-1.75**	-4.02**	-4.20**	-3.55**
		(-14.78)	(-14.73)	(-6.46)	(-11.54)	(-11.66)	(-7.86)
log(1 + # FP of buyer's real-estate agent)		6.41**	5.63**	4.32**	5.29**	5.58**	5.90**
		(21.62)	(22.40)	(9.81)	(15.06)	(14.67)	(8.68)
log(1 + # HL of buyer's real-estate agent)		0.91**	0.61**	0.20	0.36	0.54	1.11*
		(4.77)	(3.61)	(0.69)	(1.20)	(1.89)	(2.21)
Avg years of education of clients of buyer's agent			-0.90**	0.10	-1.12**	-1.22**	-0.57*
			(-7.25)	(0.71)	(-6.85)	(-6.30)	(-2.12)

(continued below)

Table 6. The Role of Intermediaries (Cont.)

(continued from previous page)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
log(1 + # FPHL of seller's real-estate agent)			-1.50**	-2.23**	1.17**	-1.70**	-3.28**
			(-5.43)	(-4.72)	(2.61)	(-3.80)	(-4.14)
log(1 + # transactions of seller's real-estate agent)			-3.22**	-1.88**	-2.95**	-4.24**	-2.90**
			(-15.06)	(-6.98)	(-9.22)	(-11.99)	(-5.54)
log(1 + # FP of seller's real-estate agent)			6.91**	4.48**	6.25**	7.73**	8.73**
			(20.09)	(11.21)	(14.83)	(14.54)	(12.62)
log(1 + # HL of seller's real-estate agent)			-0.55**	-0.12	-1.19**	-0.78*	-1.00
			(-3.42)	(-0.45)	(-3.46)	(-2.40)	(-1.94)
Avg years of education of clients of seller's agent			0.17	-0.07	0.32	0.63*	0.39
			(1.11)	(-0.46)	(1.56)	(2.55)	(1.45)
log(# bedrooms)	2.16**	1.47**	1.04**	-0.69*	2.64**	2.55**	-0.20
	(4.73)	(3.59)	(2.81)	(-2.20)	(5.33)	(3.22)	(-0.14)
log(1 + # car garages)	-2.12**	-2.01**	-1.81**	-1.15**	-2.46**	-1.88**	-3.44**
	(-6.30)	(-6.60)	(-6.25)	(-2.79)	(-5.73)	(-3.80)	(-4.10)
log(1 + time-on-the-market)	-4.29**	-4.38**	-4.36**	-3.79**	-5.30**	-4.34**	-2.99**
	(-33.96)	(-35.33)	(-35.39)	(-18.94)	(-30.70)	(-31.23)	(-14.46)
log(Price)	-2.99**	-2.32**	-1.62**	0.46	-2.66**	-2.67**	-1.09
	(-6.37)	(-5.63)	(-4.88)	(1.06)	(-6.63)	(-5.23)	(-1.31)
I(Seller hint)	2.37**	2.48**	2.50**	1.64*	1.10	3.37**	5.26**
	(4.88)	(4.99)	(5.13)	(2.01)	(1.41)	(3.89)	(3.85)
	64.96**	60.25**	64.52**	22.27**	80.84**	77.03**	47.34**
Tax code × Quarter FE	(12.64)	(12.93)	(12.48)	(4.00)	(14.25)	(10.15)	(4.47)
Observations	561,199	530,235	524,877	122,068	175,702	165,651	39,581
Adj. R^2	0.105	0.121	0.128	0.086	0.110	0.138	0.116

Table 7. Borrower Optimism

The table explores whether homebuyer optimism generates the correlation between paying the listing price or above and taking on a high-leverage mortgage. Variable definitions are in the Appendix. All regressions are OLS regressions. *t*-statistics are reported in parentheses. Standard errors are clustered by zip code. ** and * denote statistical significance at the 5% and 10% levels, respectively.

	Dependent variable: I(Price ≥ Listing price) (0/1) × 100					
	All	All	1994-1999	2000-2003	2004-2006	2007-2008
	(1)	(2)	(3)	(4)	(5)	(6)
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)
× I(Seller hint)	2.10**	2.17**	2.69*	1.96	-0.90	-1.39
	(3.05)	(3.22)	(2.35)	(1.46)	(-0.75)	(-0.78)
91% ≤ LTV ≤ 95%	2.71**	3.01**	1.08**	3.39**	4.79**	5.59**
	(11.75)	(12.03)	(4.28)	(10.70)	(11.12)	(12.23)
81% ≤ LTV ≤ 90%	0.68**	0.83**	0.63**	0.88**	1.12**	2.42**
	(5.07)	(5.94)	(3.26)	(3.71)	(4.48)	(6.44)
log(# bedrooms)	1.68**	2.68**	-0.16	4.13**	5.85**	2.43
	(4.70)	(6.11)	(-0.53)	(7.04)	(7.06)	(1.81)
log(1 + # car garages)	-1.18**	-2.07**	-1.21**	-2.97**	-2.21**	-3.96**
	(-4.76)	(-6.86)	(-3.91)	(-7.11)	(-4.44)	(-5.77)
log(1 + time-on-the-market)	-4.48**	-4.45**	-3.51**	-5.51**	-4.22**	-3.12**
	(-37.74)	(-36.80)	(-19.12)	(-34.29)	(-32.60)	(-16.61)
log(Price)	-1.06**	-2.69**	0.54	-4.00**	-4.59**	-1.99*
	(-3.35)	(-6.37)	(1.42)	(-7.40)	(-7.57)	(-2.35)
I(Seller hint)	1.92**	2.62**	2.43**	1.11	2.76**	4.49**
	(4.85)	(7.13)	(4.00)	(1.76)	(4.11)	(4.31)
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

Table 8. Mortgage/Listing Price around the Full Listing Price

The table explores the sensitivity of debt leverage to the price/listing ratio, and in particular around the full listing price. *Transaction controls* include the logged number of bedrooms, the logged garage size (by number of cars), the logged time on the market, the logged average income, the logged number of years of education, the logged contract price, and the seller's hint indicator. Variable definitions are in the Appendix. All regressions are OLS regressions. *t*-statistics are reported in parentheses. Standard errors are clustered by zip code. ** and * denote statistical significance at the 5% and 10% levels, respectively.

	Dependent variable: Mortgage / Listing price × 100							
	All	All	All	All	1994-1999	2000-2003	2004-2006	2007-2008
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
I(Price / Listing price = 91%)	0.73**	0.76**	0.86**	0.84**	1.23**	0.69	0.44	0.78
	(3.42)	(3.80)	(4.27)	(4.12)	(4.34)	(1.72)	(1.10)	(1.41)
I(Price / Listing price = 92%)	1.53**	1.56**	1.72**	1.72**	2.07**	1.51**	1.46**	1.53**
	(6.76)	(7.32)	(8.24)	(8.19)	(6.47)	(4.21)	(3.47)	(2.79)
I(Price / Listing price = 93%)	2.66**	2.76**	2.91**	2.87**	3.41**	2.91**	2.10**	2.75**
	(12.53)	(14.21)	(14.82)	(14.87)	(11.74)	(8.90)	(5.90)	(5.36)
I(Price / Listing price = 94%)	3.41**	3.59**	3.84**	3.77**	4.36**	3.73**	2.97**	3.91**
	(14.29)	(17.56)	(18.72)	(19.26)	(15.11)	(11.61)	(8.70)	(7.94)
I(Price / Listing price = 95%)	4.20**	4.47**	4.77**	4.72**	5.31**	4.73**	3.90**	4.78**
	(17.13)	(22.23)	(22.76)	(23.85)	(17.81)	(15.30)	(11.40)	(10.22)
I(Price / Listing price = 96%)	5.59**	5.82**	6.08**	5.98**	6.65**	5.85**	5.28**	6.07**
	(21.32)	(28.42)	(27.64)	(28.48)	(21.06)	(19.15)	(15.33)	(13.57)
I(Price / Listing price = 97%)	6.65**	7.01**	7.19**	7.08**	7.68**	7.07**	6.27**	7.42**
	(24.13)	(34.36)	(31.15)	(32.58)	(23.11)	(22.45)	(18.08)	(16.63)
I(Price / Listing price = 98%)	7.98**	8.55**	8.50**	8.36**	9.10**	8.23**	7.52**	9.07**
	(27.09)	(40.04)	(36.20)	(37.53)	(26.80)	(25.82)	(21.21)	(19.70)
I(Price / Listing price = 99%)	10.20**	10.69**	10.30**	10.12**	10.78**	9.85**	9.32**	11.72**
	(34.45)	(47.01)	(39.87)	(41.34)	(29.79)	(29.13)	(25.13)	(24.08)
I(Price / Listing price = 100%)	14.31**	13.87**	12.64**	12.50**	12.07**	11.91**	12.53**	13.58**
	(48.46)	(55.34)	(47.86)	(48.73)	(33.38)	(33.89)	(34.47)	(27.45)
I(Price / Listing price = 101%)	15.97**	16.01**	14.70**	14.53**	13.05**	13.94**	14.86**	14.90**
	(44.97)	(52.25)	(48.06)	(49.02)	(25.57)	(36.88)	(36.94)	(23.35)
I(Price / Listing price = 102%)	16.99**	16.98**	15.37**	15.26**	14.27**	14.79**	15.31**	15.29**
	(44.88)	(49.98)	(46.96)	(49.20)	(27.00)	(36.45)	(35.30)	(24.24)
I(Price / Listing price = 103%)	18.24**	17.88**	16.08**	16.04**	15.30**	16.00**	15.61**	15.91**
	(47.59)	(57.12)	(51.30)	(51.77)	(28.15)	(41.64)	(33.69)	(20.72)
I(Price / Listing price = 104%)	17.40**	17.21**	15.51**	15.49**	13.74**	15.90**	15.02**	15.55**
	(36.70)	(45.95)	(41.06)	(42.23)	(15.20)	(36.31)	(28.76)	(20.81)
I(Price / Listing price = 105%)	17.01**	17.12**	15.24**	15.42**	15.58**	14.76**	15.31**	15.95**
	(31.90)	(41.34)	(37.22)	(37.76)	(19.21)	(25.55)	(27.15)	(13.62)
Transaction controls	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Zip code × Quarter FE	No	No	Yes	No	No	No	No	No
Tax code × Quarter FE	No	No	No	Yes	Yes	Yes	Yes	Yes
Observations	739,549	739,549	738,891	739,549	205,082	241,483	235,341	57,643
Adj. R^2	0.077	0.153	0.198	0.203	0.207	0.202	0.191	0.238

Table 9. Does High Credit Availability Induce High Demand and High Prices?

The table explores whether homebuyer optimism generates the correlation between paying the listing price or above and taking out a high-leverage mortgage. Variable definitions are in the Appendix. All regressions are OLS regressions. *t*-statistics are reported in parentheses. Standard errors are clustered by zip code. ** and * denote statistical significance at the 5% and 10% levels, respectively.

	Dependent variable: log(1 + time-on-the-market)					
	All	All	1994-1999	2000-2003	2004-2006	2007-2008
	(1)	(2)	(3)	(4)	(5)	(6)
96% ≤ LTV	0.08**	0.06**	0.09**	0.05**	0.06**	0.04**
	(10.63)	(8.17)	(7.19)	(4.26)	(7.33)	(2.60)
× I(Price ≥ Listing price)	0.31**	0.29**	0.32**	0.30**	0.28**	0.29**
	(19.45)	(19.74)	(12.94)	(17.22)	(15.34)	(7.97)
× I(Seller hint)	-0.02	-0.02	0.01	0.06*	-0.10**	-0.08
	(-1.04)	(-1.38)	(0.40)	(2.03)	(-3.87)	(-1.83)
91% ≤ LTV ≤ 95%	0.04**	0.04**	0.04**	0.04**	0.05**	0.02
	(7.04)	(7.80)	(5.00)	(4.51)	(6.31)	(1.49)
80% < LTV ≤ 90%	0.01**	0.01**	0.00	0.03**	0.01	0.03
	(2.80)	(3.06)	(0.08)	(3.74)	(0.88)	(1.78)
I(Price ≥ Listing price)	-0.52**	-0.53**	-0.60**	-0.54**	-0.49**	-0.50**
	(-29.97)	(-30.62)	(-28.16)	(-31.59)	(-24.45)	(-14.52)
log(# bedrooms)	-0.01	-0.03*	-0.01	-0.02	-0.08**	0.02
	(-0.58)	(-2.55)	(-0.52)	(-0.99)	(-4.67)	(0.53)
log(1 + # car garages)	0.01	0.01	-0.04**	0.01	0.04*	0.14**
	(0.58)	(0.70)	(-2.86)	(0.78)	(2.30)	(5.82)
log(Price)	0.07**	0.10**	0.06**	0.14**	0.13**	-0.03
	(4.12)	(7.21)	(3.28)	(7.64)	(7.15)	(-1.34)
I(Seller hint)	0.29**	0.28**	0.22**	0.24**	0.36**	0.27**
	(14.40)	(15.52)	(9.03)	(9.12)	(16.00)	(7.74)
Zip code × Quarter FE	Yes	No	Yes	Yes	Yes	Yes
Tax code × Quarter FE	No	Yes	No	No	No	No
Observations	770,237	770,967	214,455	251,377	244,499	60,636
Adj. R^2	0.089	0.104	0.073	0.094	0.062	0.035

Figure 1. Distribution of Leverage and the Ratio of Price to Listing Price, by Time Period

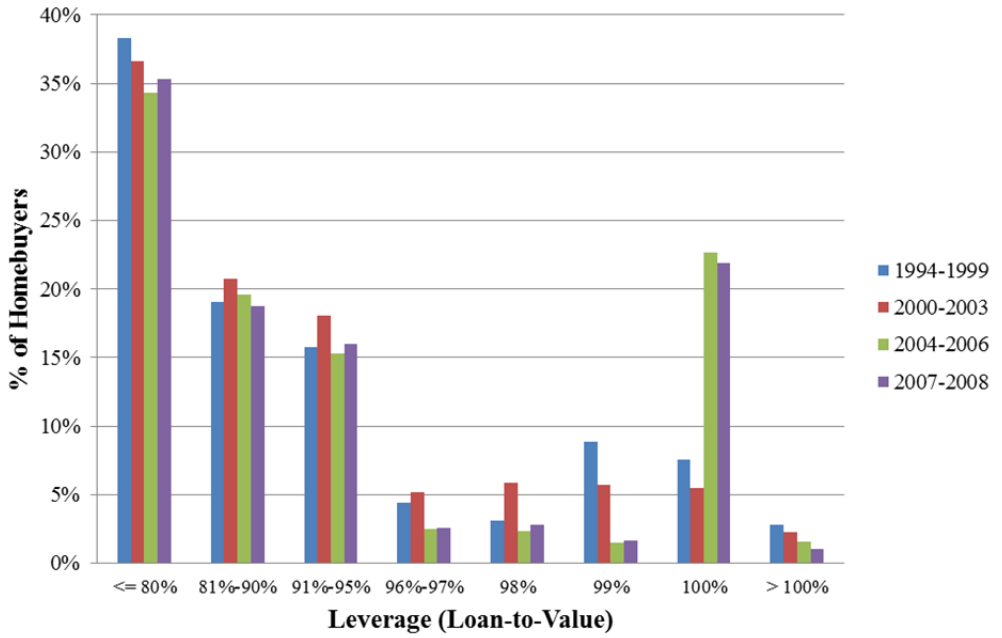


Figure 1A. Distribution of leverage, by time period.

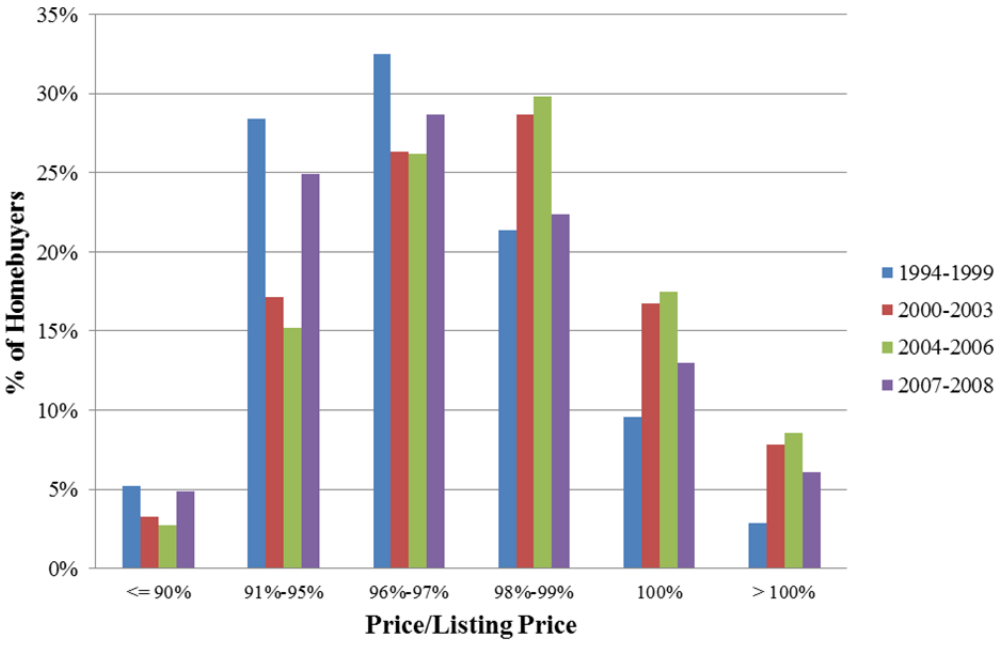
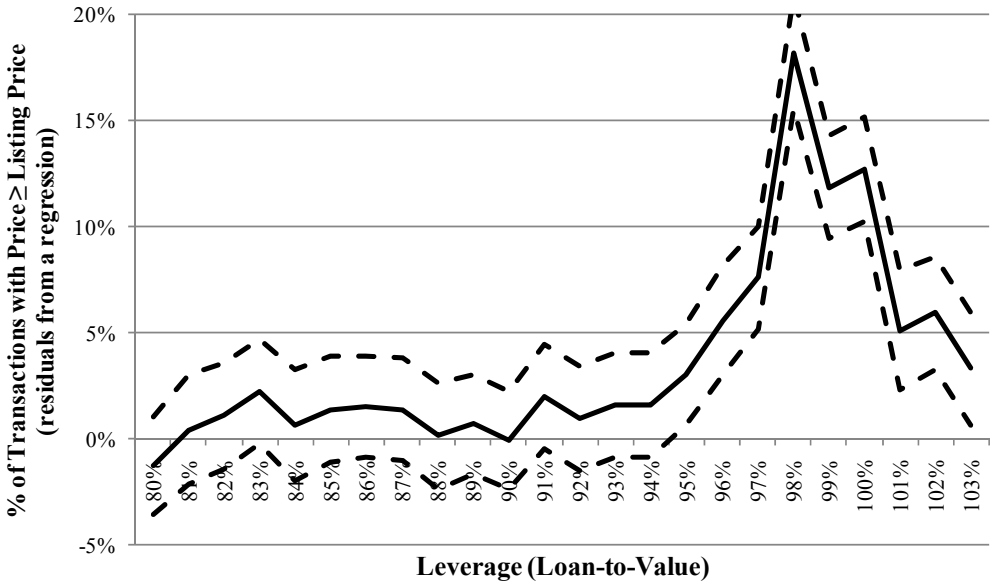


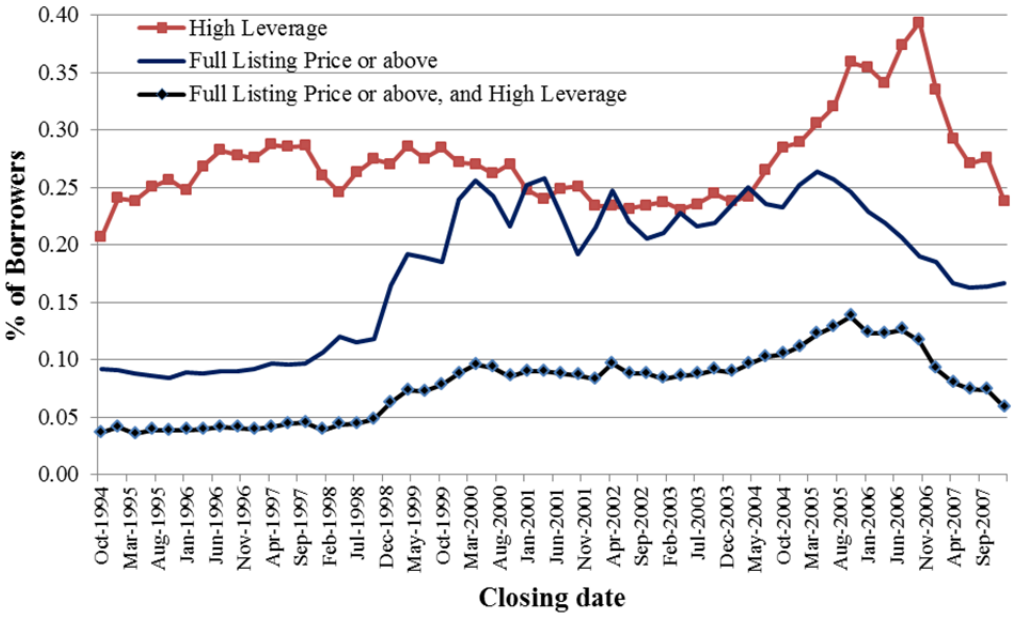
Figure 1B. Distribution of price/listing price ratio, by time period.

Figure 2. The Relation between Paying the Full Listing Price and Leverage



The chart shows coefficients from the regression of an indicator of paying the full listing price and leverage indicators. The solid line presents the point estimates, and the dashed lines reflect 2 standard errors around the point estimate.

Figure 3. Time-Series of the Relation between Leverage and Prices



Time series of the likelihood of borrowing at high leverage (≥96% LTV), of paying the full listing price or above, and of taking both actions.

Figure 4. Average Mortgage/Listing Price as a Function of Price/Listing Price

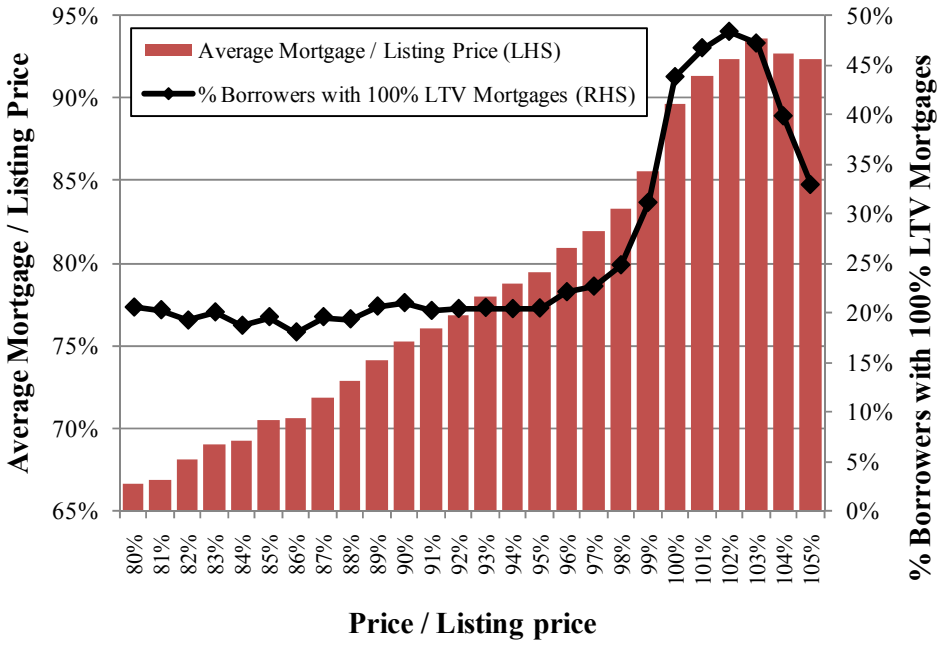


Figure 4A. The figure shows the average mortgage/listing price per price/listing price ratio (left-hand-side scale), in addition to the fraction of borrowers who take on a 100% LTV mortgage (right-hand-side scale).

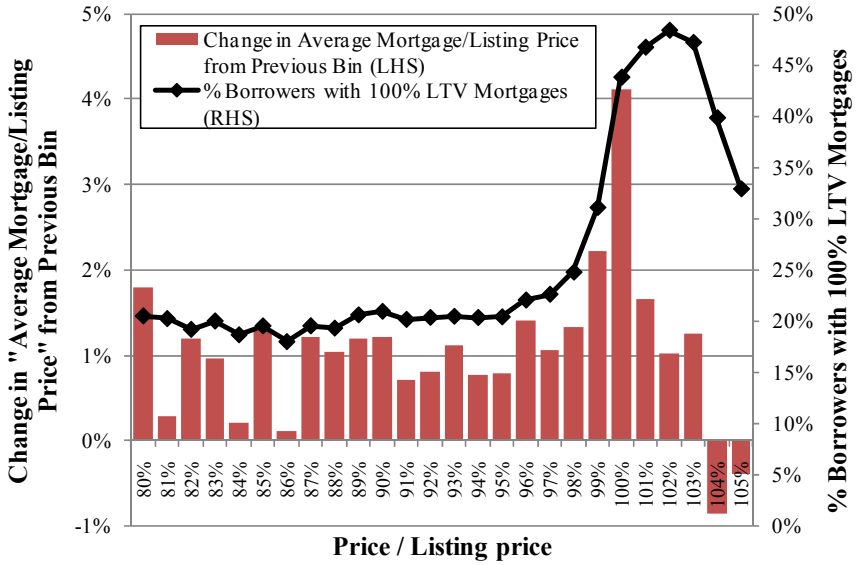


Figure 4B. The figure shows the difference in the average mortgage/listing price between each pair of price/listing price ratio bins (left-hand-side scale), in addition to the fraction of borrowers who take out a 100% LTV mortgage (right-hand-side scale).