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Borrower Default during the Real-Estate Boom**

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# Financial Constraints, Inflated Home Prices, and Borrower Default during the Real-Estate Boom

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## ABSTRACT

During the housing boom, many subprime home buyers were not able to make a mortgage down payment and therefore were at risk of being rationed from the market. To resolve the issue, some buyers, sellers and intermediaries artificially expanded the scope of transactions by including items that cannot be collateralized. As a result, observed house prices were higher and mortgages larger, ultimately relaxing buyers' financial constraints. I estimate that between 2005 and 2008, up to 16% of highly leveraged ( $> 95\%$  loan-to-value) transactions in Cook County, Illinois were inflated (with prices higher by 6% to 15%). Inflated transactions are more likely in low-income neighborhoods and when intermediaries have a high stake in the transaction. Although borrowers were twice as likely to default, their mortgage rates were not higher.

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## ABSTRACT

During the housing boom, many subprime home buyers were not able to make a mortgage down payment and therefore were at risk of being rationed from the market. To resolve the issue, some buyers, sellers and intermediaries artificially expanded the scope of transactions by including items that cannot be collateralized. As a result, observed house prices were higher and mortgages larger, ultimately relaxing buyers' financial constraints. I estimate that between 2005 and 2008, up to 16% of highly leveraged ( $> 95\%$  loan-to-value) transactions in Cook County, Illinois were inflated (with prices higher by 6% to 15%). Inflated transactions are more likely in low-income neighborhoods and when intermediaries have a high stake in the transaction. Although borrowers were twice as likely to default, their mortgage rates were not higher.

JEL Classification: D12, D18, G21, L85

Key Words: Moral Hazard, Agency Costs, Delegated Monitoring, Fraud, Mortgage, Collateral, Appraisal, Valuation, Financial Intermediation

# I. Introduction

During the housing boom of 2000-2006, the mortgage market opened to a low-income population that had previously been excluded (Mian and Sufi 2009). Yet many potential buyers still could not afford to purchase a house because they were financially constrained, i.e., they were not able to make the required down payment. The consequences of this credit rationing were twofold: borrowers incurred a welfare loss and intermediaries (e.g., real-estate agents and mortgage brokers) lost transaction fees. Buyers and intermediaries often resolved this problem by expanding the scope of transactions, adding items to transactions such as appliances, transaction costs, cars, coupons, and often cash (Hagerty and Simon 2006, Harney 2007, Lahart 2007, Reagor 2007, Hagerty and Corkery 2007). These transactions have higher observed prices and therefore allowed borrowers to draw larger mortgages based on the same collateralized asset. In addition, these inflated transactions allowed intermediaries to receive their fees upon deal completion.

Despite the popularity of inflated transactions among low-income borrowers, research has yet to study how these transactions contributed to the housing bubble and the subprime crisis. This paper examines the practice of inflating transaction prices as a solution to home buyer financial constraints. Potential inflated transactions are identified as transactions in which the seller offers to expand the content of the transaction. For example, sellers may offer to pay for buyers' transaction costs, to pay cash, or to include discounts at the closing event. These transactions have several features which can be explained by having artificially inflated price as a response to buyer credit constraints. First, these transactions are extremely leveraged on average and take place in low-income neighborhoods. Between

2005 and 2008, the fraction of transactions identified as inflated among the 95%+ leverage at the lowest income quintile is estimated as 5.4% to 16.1%. Second, transactions identified as inflated are more likely to have high prices relative to a hedonic model or to a market-adjusted-price repeat sale price. The average prices of inflated transactions which are highly leveraged are higher by 6% to 15%, on average. Third, inflated transactions are more likely to take place when intermediaries have a special stake in the transaction. Fourth, borrowers in these transactions are twice as likely to default, nevertheless, they do not pay higher mortgage rates. Overall, the results indicate that some of the observed prices in the lower end of the market were inflated due to credit constraints and agency problems, contributing to the overall bubble in real-estate prices and their subsequent bust.

The examination of these transactions provided by this paper contributes to our better understanding of the deterioration in the credit quality of borrowers towards the end of the real-estate boom and how that further deepened the subprime crisis. The results imply that low-income borrowers could overleverage themselves beyond lenders guidelines, suggesting that borrowers with the worst credit quality had worse support of collateral values than previously thought. The analysis shows that the biased judgement of appraisers was critical to enabling inflated transactions. Without their approval of excessive transaction prices, buyers would not be able to draw larger mortgages based on inflated prices and the phenomenon would have ceased. Finally, the results explain why the observed increase in house prices of subprime borrowers was temporary (Mayer, Pence, and Sherlund 2009).

The sample used in the study contains about 768,000 residential transactions that took place in Cook County, Illinois, between 1995 and 2008. Following a series of interviews with

real-estate agents, loan officers, and appraisers, I manually construct a set of phrases that identify inflated transactions as transactions in which sellers announce in property listings that they would include non-collateralized items in the selling price. For example, some sellers advertise “Let’s talk about cash back at closing!!!,” “\$10,000 back with full price,” “Free car with full price,” “Buy this home with no money down!,” and “Seller will provide allowance for remodeling.” Figure 1 shows photos of advertisements expressing similar offers. Between 2006 and 2008, the fraction of seller hints peaks to about 5% of the highly leveraged transactions, and the fraction of inflated transactions is estimated to account to up to 12% of all highly leveraged transactions.<sup>1</sup> The frequency of seller hints grows significantly over time (from 2.6% in 1995 to 5.5% in 2007 of all highly leveraged transactions) and the hints are most prevalent in low-income neighborhoods, where financial constraints are tighter (see Figure 2).

Inflated transactions are more likely to happen when intermediaries have a special stake in the transaction. The likelihood of the seller hinting about inflating the price is higher when the real-estate agent is the seller himself, when a single real-estate represents both the buyer and the seller, or when a mortgage broker arranges the financing. This result is consistent with intermediaries pushing for such transactions in order to capture transaction fees (which are only paid with the completion of the transactions (Bureau of Labor Statistics 2006, Levitt and Syverson 2008, Committee on Financial Services 2004, Roberts 2006, Agarwal

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<sup>1</sup>Since seller hints capture only seller-driven transactions, I treat it as a low estimate for inflated transactions activity. Most inflated transactions are likely to be initiated by buyers. As a high estimate for price inflating activity, I use the fraction of highly leveraged transactions that are closed at the listing price or above it for reasons that cannot be explained by known determinants (e.g., time since listing, calendar month). Paying the full listing price is an almost necessary condition for transactions with substantial price inflation.

and Wang 2008)). Furthermore, this result is consistent with recent evidence that financial intermediaries shirk on screening borrowers (Keys, Makherjee, Seru, and Vig 2009).

Transactions that are suspected of being inflated do indeed have higher prices relative to benchmarks. Observed property prices are higher in transactions in which inflation is suspected by 6% to 8% relative to a hedonic model as well as relative to prices paid for the same property both in the past and in the future (repeat sales). The results are robust to adjusting prices to changes in market conditions. The magnitude of the price inflation is an estimate of the additional leverage that borrowers took on themselves.

Borrowers who engage in inflated transactions are more likely to default on their mortgage. Specifically, the foreclosure rate of highly leveraged borrowers who engage in inflated transactions is higher during the first year by 0.7% to 3.9%, relative to other highly leveraged borrowers (unconditional foreclosure rate is 2.2%). This evidence is consistent with the observation that their actual leverage is much higher than observed, and that their credit quality is marginal.

Despite their elevated credit risk, borrowers who engage in inflated transactions *do not* pay higher mortgage rates. Rather, they are pooled by lenders with other borrowers who borrow at the same observed leverage. These results indicate that borrowers who engage in inflated transactions are effectively subsidized by less constrained borrowers.

The paper proceeds as follows. Section II reviews the market practices of inflating transaction prices and derives empirical predictions. In Section III the data sets used in the study

are described. Section IV analyzes the evidence linking inflated transactions to financial constraints, agency considerations, and mortgage performance. Section V concludes.

## II. Background and Hypotheses

### A. Financial Constraints and Inflated Transactions

Some home buyers who technically qualify for subprime mortgages may not be able to complete the transaction because they do not have sufficient funds for the down payment and for the costs associated with buying a new house (such as moving expenses, transaction fees, furnishing costs, etc.). By artificially inflating the transaction price, credit-constrained home buyers could borrow beyond the amount that lenders would normally allow (since mortgage amounts for new houses are determined as a fraction of the transaction price), and thus resolve their financial constraints.<sup>2</sup> To learn about the practices of inflating prices, I conducted a series of interviews with real-estate professionals: real-estate agents, loan officers, appraisers, and real-estate lawyers. These interviews revealed the techniques used to inflate transaction prices. In inflated transactions, the buyer and the seller agree to expand the scope of the transaction and sign a contract for an amount greater than the true economic value of the underlying property. Inflated transactions often include cars, coupons, transaction fees, home appliances (e.g., plasma screen TVs) or cash. The buyer then uses the inflated sales contract in his application for a mortgage. The lender sends his appraiser

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<sup>2</sup>This scheme is well-known to practitioners in the real-estate business, and has been mentioned many times in the media: Gendler (1998), Goodman (2002), Simpson (2004), Conrad (2005), Jackson (2005), Aaron (2006), Coombes (2006), Goodman (2006), Olinger (2006), Lloyd (2006), Roberts (2006), Tong (2006), Carr (2007), Creswell (2007), Lahart (2007), Reagor (2007), Hagerty and Corkery (2007), and Jackson (2008).

to verify that the price is reasonable. If the mortgage is approved, it is typically larger than it would otherwise be because mortgage amounts are determined as a fraction of the selling price (e.g., 90% of the selling price). In inflated transactions, the borrower essentially borrows against assets that cannot be foreclosed upon by the lender (such as transaction costs). Figure 1 shows photos taken in Chicago in 2006 in which sellers offer to add cash or cars to the transaction as incentives to buyers.

A potential obstacle to inflating transactions is the appraiser's judgement. According to common appraisal rules, appraisers should value homes as if they were purchased for cash, without any financial or other incentives to the buyer (Fannie Mae 2005, Fannie Mae 2007). However, appraisers' incentives could actually encourage them to approve high transaction prices. During the sample time period appraisers used to be appointed by the mortgage originators (e.g., mortgage brokers)<sup>3</sup> and as such had the incentive to approve transaction prices in order to satisfy the originator and obtain future valuation assignments. As long as the deviations of the price from the real economic value were small, it was easy for appraisers to justify their estimation.<sup>4</sup>

Some lenders allow a limited amount of "seller concessions." These concessions are discounts or payments that sellers pay to buyers or on behalf of buyers. For example, a seller

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<sup>3</sup>In response to the subprime crisis, this practice is changing. Recently, Fannie Mae has announced that appraisers would be appointed through a central pool of appraisers and not by mortgage brokers.

<sup>4</sup>Congressman Gary G. Miller of California reported on his experience at the U.S. Department of Housing and Urban Development in a session of the Committee on Financial Services on the effects of mortgage fraud on the lending industry Committee on Financial Services (2004): "...we refer to the MAI<sup>5</sup> appraisals as Made As Instructed. And it is very, very simple for an individual to buy a \$210,000 home, have a connection with a broker or an appraiser, and an [sic] appraiser will come back with an appraisal for \$235,000 that might be inflated \$25,000. But that inflation on your part is very, very, very hard to prove. Because an aggressive appraiser can justify most anything they want within 10 percent. If they are really creative, I have seen it to exceed 10 percent very easily; and for you to come back and say they committed fraud is very difficult."

may pay a buyer's closing costs. Of course, if a seller offers such a concession, then the observed price will be higher than the economic value of the property, since the price reflects the sum of the value of the property and the value of the concession. Typically, lenders limit the magnitude of seller concessions. For example, in some of its loan programs, Fannie Mae allows sellers to pay some of the buyer's transaction costs, depending on the buyer's leverage. Sellers can pay for buyers' transaction costs of a magnitude of up to 6% (3%, 2%) of the price as long as the buyer puts at least 10% (5%, 3%) of his own equity in down payment.

Appraisal guidelines dictate that concessions should not be part of the appraised value, and therefore, concessions should have an effect on a mortgage only under very special circumstances. Specifically, lenders typically compute the loan-to-value (LTV) ratio based on the *minimum* between the appraisal and the transaction price. According to the common valuation guidelines, appraisers should ignore any concessions by sellers or special financing when estimating the value of a house (Fannie Mae 2005). Hence, if appraisers reported the true economic value of homes, there is no point of inflating prices (because inflated prices would be above the appraised value and will not affect the LTV calculation), *unless* a house is sold below its market value. Only then would a seller concession increase the price in a legal way that would allow higher 'value' component in the LTV calculation. The empirical evidence in Section IV.B actually shows that properties for which inflation is suspected have prices higher than their benchmarks, ruling out this possibility.

The motivation of credit-constrained borrowers to engage in illegal inflated transactions was high because there have been virtually no legal ramifications to inflating prices for either the buyer or the seller. In practice, lenders have only limited ability to track down transfers

between sellers to buyers. Furthermore, enforcement authorities are concerned only with systematic mortgage fraud (“fraud for profit”),<sup>6</sup> rather than one-time falsifications done by homeowners (“fraud for property/housing”).<sup>7</sup>

With great benefits to inflating prices and with no apparent penalty, why don't all borrowers engage in inflated transactions? There are several reasons for the limited spread of these transactions. First, many borrowers (and intermediaries) are not sufficiently constrained to search for creative solutions. Second, inflating the transaction price may sound suspicious to many buyers and sellers and therefore will attempt to avoid transactions that they do not understand completely. Third, even if there is no direct penalty of this practice, people may be averse to engaging in a transaction that does not seem straightforward.

## **B. Empirical Predictions**

The primary objective of inflated transactions is to alleviate liquidity constraints of borrowers in order to allow them to purchase a house and originate a mortgage. Therefore, I expect that inflated transactions were most popular among credit-constrained borrowers, i.e., highly leveraged borrowers who purchase properties in low-income neighborhoods:

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<sup>6</sup>Such fraud often involves borrowing based on falsified documentation. Fraudsters usually borrow large amounts based on greatly overappraised properties, then default immediately and intentionally (Committee on Financial Services 2004).

<sup>7</sup>Chris Swecker, Assistant Director for Criminal Investigations in the Federal Bureau of Investigation, testifies that “. . . I mentioned the two types of frauds, fraud for housing, fraud for profit. Most of our efforts are focused on the fraud-for-profit type of violation. We are looking for something that is more systemic than just an unwitting individual borrower who has been caught up in a situation. Maybe they went along with it because they were unsophisticated, but that is not our focus at all. We don't have the resources to engage in that type of single transaction investigation. Our focus is clearly on the insiders and the schemes.” (Committee on Financial Services 2004). Similar arguments were raised by Chicago Police Department officers in a mortgage fraud meeting held in the City of Chicago in July 2008.

**Prediction 1 (Credit Constraints)** *Inflated transactions are more common in highly leveraged transactions and credit-constrained populations.*

The classification of inflated transactions is performed based on an ex ante measure. It is crucial, therefore, to test whether transactions that are identified as inflated are truly inflated, i.e., their prices are higher relative to benchmarks.

**Prediction 2 (Inflated Price)** *Transactions that are identified as inflated have higher prices than otherwise.*

Intermediaries are usually compensated based on deal completion and therefore are interested in relaxing home buyers' financial constraints. For example, the compensation of real-estate agents and mortgage brokers is based on commission only, with no salary component (Bureau of Labor Statistics 2006), and therefore, their goal is to complete transactions (Levitt and Syverson 2008).<sup>8</sup> Given their compensation structure, intermediaries are more likely to promote inflated transactions when their stake in the transaction is larger:<sup>9</sup>

**Prediction 3 (Intermediaries)** *Transactions in which intermediaries have a large stake are more likely to be inflated.*

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<sup>8</sup>Further support for this argument is in LaCour-Little and Chun (1999) who find that mortgages originated by third-party originators are more likely to be prepaid, and in Gan and Mayer (2006) Keys, Makherjee, Seru, and Vig (2009), who find that loans are more likely to default when the originator sells them on to investors.

<sup>9</sup>William Matthews, Vice President and General Manager of Mortgage Asset Research Institute, Inc. testifies that "...One [type of mortgage fraud] is commission fraud. This is where one or more industry professionals misrepresent information in a loan transaction in order to receive a commission. Commission fraud is a more common practice in the industry and is a concern to mortgage lenders. It can result in harm not only to consumers but to lenders as well." (Committee on Financial Services 2004).

Borrowers who engage in inflated transactions are expected to default more often. In effect, inflated transactions effectively allow borrowers to increase their leverage beyond the limits set by lenders, thus enhancing their riskiness even more.

**Prediction 4 (Foreclosure Rate)** *Borrowers who engage in inflated transactions are more likely to default on their mortgages and their properties are more likely to be foreclosed.*

The optimal response of lenders to inflating prices is ambiguous. On one hand, lenders may seek to charge higher mortgage rates when poor-quality borrowers overborrow. On the other hand, identifying poor-quality borrowers may be difficult based on the hard information which is available to lenders. Furthermore, it may be plausible that lenders are not interested to use price discrimination as a tool to make themselves whole for reputational and political reasons. Also, it is possible that the tight competition between lenders (DellAriccia, Igan, and Laeven 2008) or beliefs about continuing rising house prices (Nadauld and Sherlund 2009) led lenders to approve mortgages on inflated transactions rather than to reject them.

Another possibility for lenders is to subsidize mortgages of inflated transactions by charging higher rates to all borrowers. It remains an empirical question, therefore, of whether lenders charge higher interest to borrowers who engage in inflated transactions, or not.

**Prediction 5 (Mortgage Rates)** *Borrowers who engage in inflated transactions pay the same mortgage rate as borrowers in similar risk groups, based on observable characteristics.*

## III. Data

### A. Data Sources

The tests for inflated transactions use several data sets. The first data set is the Cook County Recorder of Deeds, which is available online. The data set contains information about real-estate transactions, loan sizes, registered lenders, foreclosure information. The second data set is the Multiple Listings Service (MLS), which includes all property listings and transactions that were recorded by realtors in Cook County. The database contains detailed information about home characteristics, sellers' and buyers' agents, listing prices, transaction prices, and time on the market. For some transactions that were completed after 2003, the data set contains information about mortgage rates. The databases are merged according to property identification number (PIN), closing date, and sale price. The data is supplemented by IRS zip code-level average income data from 1998, 2001, and 2004.

I follow Levitt and Syverson (2008) 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 above the market's normal lending terms (below 25% or above 103% loan-to-value), transactions that were closed below 50% or above 200% of the listing price, and properties that have been on the market for more than two years. The final sample contains 768,534 completed transactions with mortgage data.

Table I presents summary statistics for the main data set used in the study. The mean transaction price is \$248,612 and the median transaction is \$194,000 (Panel A). Figure 3b

presents the cumulative distribution of transactions as a function of the leverage. From the chart, the most popular leverage ratios are 80%, 90%, 95%, 97%, 98%, 99%, and 100%. Panel B presents some time-series statistics. Over the sample period, the average leverage has risen from 84.5% to 87.4% (in 2006).

## **B. Identifying Inflated Transactions Through Sellers' Hints**

In a fraction of property listing records, sellers explicitly hint that they are willing to expand the scope of the transaction. For example, one seller writes: "...\$8,000 cash back to buyer at closing with full price offer." In this case, a cash transfer is likely to have taken place, because the property was sold for its full asking price, \$80,000, and was financed with an \$80,000 mortgage. The market value of the property is likely to be \$72,000, hence the actual mortgage leverage is 111%.

In another case, a seller offers "...no money down...\$10,000 under-appraised..." Also in this case, some sort of transfer is likely to have taken place. The seller asks for \$159,000 but the sale price is \$170,000. The buyer borrowed \$161,500 (95% of the sale price). If the true economic price were \$159,000, the mortgage amount is sufficient to cover the full price and most of the transaction costs, i.e., almost no money down is required from the buyer, as promised.

In many other cases, the offer is less specific, but still reveals sellers' intentions, for instance: "seller will give credit at closing."<sup>10</sup> In general, these transfers can be direct (e.g., cash, coupons), or indirect (e.g., the seller pays the buyer's transaction costs).

To investigate this evidence in a systematic manner, I compose a list of about 50 common word combinations that are likely to be associated with transfers from sellers to buyers but are less common in other contexts (Appendix B presents a list of the top 25 words and phrases). A transaction that includes any of the keywords is flagged with the dummy variable *Seller Hint*. Overall, 2.9% of the sample transactions and 3.4% (4.3%) of all mortgages above 80% (95%) leverage are flagged.

## IV. Empirical Analysis

### A. Financial Constraints and Inflated Transactions

The leverage of buyers dictates whether manipulation of the collateral valuation is worthwhile or not: only highly leveraged borrowers (above 80% loan-to-value) can benefit from manipulating the collateral value. The reason for this is that mortgage rates (Average Percentage Rate, APR) in the U.S. are only sensitive to the value of the collateral when the ratio of loan-to-value exceeds 80%. This pattern is illustrated in a real mortgage annual per-

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<sup>10</sup>As further evidence that these transfers are illegal, in a small number of announcements sellers deliberately clarify that they will not transfer cash to buyers, or pay closing costs beyond the allowed amount.

centage rate quote, presented in Figure 3a. Below 80%, loan-to-value rates are practically flat,<sup>11</sup> but beyond 80% loan-to-value, rates increase steeply with leverage.<sup>12</sup>

Figure 4a plots the percentage of transactions with a seller hint with respect to the buyer's leverage. Below 80% leverage, only in 2.0% of the transactions do sellers advertise a hint. Above 80% leverage, the fraction of transactions with seller hints steadily increases and at 95% leverage, the fraction of transactions with seller hints increases to 3.2%, and it peaks at 100% leverage with 4.9%.

A similar association appears in the regression framework, in Table II, columns (1) and (2).<sup>13</sup> The association between seller hints and buyer leverage increases with buyer leverage (column (1)), although it declines as controls and fixed effects are added (column (2)).<sup>14</sup>

Table II also explores whether the association between seller hints and leverage is stronger in zip codes where credit constraints are tighter. The regression in column (3) interacts logged average zip code income with seller hint indicator. The results show that seller hints are more common in areas in which income is lower. Overall, the evidence in Table II is consistent with Prediction (1) that inflated transactions are a response to borrower credit constraints.

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<sup>11</sup>At very low leverage, APRs slope downwards due to the amortization of set-up costs.

<sup>12</sup>This pattern emerges since the Government-Sponsored Entities (GSEs), who are large buyers of mortgages in the secondary market, require borrowers to pay private mortgage insurance (PMI) on mortgages above 80% leverage. Background interviews with loan officers indicate that the upward sloping rate structure is similar for piggyback mortgages, i.e., when high-leverage mortgages are split into first and second mortgages so that borrowers do not need to pay the PMI.

<sup>13</sup>The regression framework used in this table and throughout the paper is OLS. Although the dependent variables in most regressions are binary indicators (multiplied by 100), a linear regression framework can accommodate interactions on the righthand side, where non-linear frameworks (such as probit and logit) may produce inconsistent coefficients (Ai and Norton 2003).

<sup>14</sup>Property controls include: logged number of bedrooms, logged number of garages, and logged number of bathrooms. Time fixed effects are calendar quarterly indicators. Location fixed effects are at the zip-code level. Many regressions use zip-code-quarter interactions fixed effects (noted in the tables).

I also examine how the frequency of seller hints changed over time. Table I, Panel B, shows that seller hints increased over time, especially for the highly leveraged population. Figure 2 plots the time-series chart for the fraction of seller hints in transactions with buyers who are highly leveraged (above 80%). The time-series is presented for the low and high income quintiles (determined by zip code average income, as reported by the IRS). While the level of seller hints for the top quintile of income zip codes hovers around 2%, the frequency of seller hints for highly leveraged home buyers from the low quintile of income zip codes steadily increases over time, especially after 2003, due to the opening of mortgage market to subprime borrowers (Mian and Sufi 2009). This evidence is also consistent with the FBI's claim that manipulation has intensified over time in recent years (Federal Bureau of Investigation 2005, Federal Bureau of Investigations 2007, Creswell 2007).

The seller hint variable is useful in estimating the lower bound of the economic magnitude and the frequency of inflated transactions; however, it underestimates the magnitude of the inflated transactions phenomenon, since credit-constrained buyers, rather than sellers, are likely to be the drivers for these transactions. To estimate an upper bound for the occurrence of inflated transactions, I measure the fraction of transactions in which home buyers pay the full listing price, or above it, which cannot be explained by transaction characteristics.<sup>15</sup> Inflated transactions should have higher prices, and the listing price is a focal point for negotiations around which inflated transactions may concentrate. If the transacting parties are interested in inflating the price, then they are likely to inflate up to the listing price

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<sup>15</sup>To reduce the possibility that high prices were paid due to bidding wars, I exclude for this analysis all transactions that were closed within 14 days of listing.

because in this price range the transaction is not attracting outsiders' attention. Some transacting parties may exceed the listing price at the risk of attracting more attention.

Using the coefficients in columns (1) and (4)<sup>16</sup> and the fraction of transactions in each leverage bracket, the fraction of transactions that are likely to be distorted across the sample can be computed. In order to do so, I multiply the coefficients of the regressions (for column (1), the intercept is added) by the fraction of the sample with matching leverage (from Table I), and add the results. Appendix C presents the details of the calculation. The calculation yields that manipulated transactions occur between 2.2% to 4.5% for all transactions, between 3.4% to 7.0% for all transactions with leverage higher than 80%, and between 4.3% to 13.8% for all transactions with leverage higher than 95%. When this analysis is repeated for the years 2005 to 2008, the estimate increases to 2.9% to 6.1% of all transactions, 4.4% to 9.2% of transactions with leverage higher than 80%, and 5.4% to 16.1% of all transactions with leverage higher than 95%.

Calculating the loss in dollar terms due to price inflation requires further assumptions. In inflated transactions, lenders in practice overlend to poor-quality borrowers on a non-secured basis. Suppose that the difference between a high-leverage secured mortgage and an unsecured loan is 8%.<sup>17</sup> Additionally suppose that, on average, prices are inflated by 5%. With these parameters, the lower bound of the annual interest loss is \$5.2m, and the upper bound is \$26.1m. This calculation assumes that seller hints are not priced in APRs (this assumption is tested in the next section). Hence, the potential damage due to manipulation

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<sup>16</sup>The samples used for the regressions in columns (4) and (5) only include transactions that were signed 14 days or more following the listing. This helps to remove transactions in which buyers paid the full listing price because the property was listed at a bargain price.

<sup>17</sup>This estimation is based on the difference between credit cards' average rate of 15.5% and a hypothetical cost of 7% of a 95% LTV mortgage.

is in the ballpark of \$10m-\$20m a year in this sample. If this sample is representative of the U.S., then the *expected* annual national loss in recent years is about 15 to 20 times greater, i.e., \$150m-\$400m per year. Section IV.D presents evidence that the loss due to interest rate was actually shared by highly leveraged borrowers who are less financially constrained.

## **B. Are the Prices of Inflated Transactions Higher?**

Next, I test Prediction (2) that transactions identified as inflated indeed have higher prices. Table III uses several methods to test this prediction. Column (1) presents a regression of logged transaction price on interactions of leverage and seller hint indicator. The regression shows that prices of small properties and high-leverage transactions are more likely to include a seller hint. Nevertheless, transactions in which both seller hint and high leverage occur together have higher prices by up to 8%, relative to those with only seller hint or only high leverage.

Then, I test whether the actual prices of transactions for which inflation is suspected are actually much higher than the listing prices of these properties. In column (2), I regress the ratio of transaction price to the most updated listing price (in percentage). The regression indicates that transaction prices are higher by about 0.2% when highly leveraged borrowers engage in inflated transactions. The result is similar if the original listing price is used (untabulated). The fact that the premium above the listing price is minuscule suggests that sellers who hint about inflating the price begin by initially posting high listing prices that already include the concessions, as was reflected in the anecdotes in Section III.B.

Another way to estimate the extent to which the prices of transactions are inflated is to measure the difference in prices of a current transaction, relative to the prices of the same property in the past or in the future. In columns (3) to (6), I examine raw and market-adjusted changes in properties that appear on the market multiple times during the sample period (repeat sales).

Column (3) regresses the log difference of current transaction price and the previous transaction price (as recorded with the Recorder of Deeds) of properties with repeat sales. The table shows that transactions with high leverage and a seller hint sell at a price higher by up to 6% to 7% than the price of the previous transaction. This regression adjusts for the change in market-wide prices by controlling for zip code fixed effects interacted with quarter fixed effects.

Next, I test whether the prices of properties with seller hints are positioned higher in the distribution of prices within the month of closing. For each transaction, I compute its percentile within the distribution of transaction prices that took place during the same month. The dependent variable of the regression is the difference between the current price percentile with the current month, and the price percentile of the previous transaction. The regression in column (4) shows that properties with a seller hint and high leverage are sold at prices higher by about 2 percentiles than otherwise. In the sample period a percentile equals to about 1.8% of dollar prices.

The next two columns analyze the price difference between the current transaction and the next transaction in the data. Column (5) shows that the price of highly leveraged transactions and seller hint decline in the next transaction by 6% to 15%. Similar results are

in Column (6). Prices of properties for which inflation is currently suspected are expected to decline by 2 to 4 percentiles (4% to 7.2%).

Overall, these results support Prediction (2) that transactions in which inflation was identified do indeed have high prices.<sup>18</sup>

### C. The Role of Intermediaries

Intermediaries are in an excellent position to facilitate inflated transactions for their own benefit. Intermediaries such as real-estate agents and mortgage brokers typically earn commissions on a success basis (Levitt and Syverson 2008, Bureau of Labor Statistics 2006). They therefore have an incentive to help potential buyers find creative solutions for their credit constraints, of which the inflating the price is one. Furthermore, intermediaries are familiar with the techniques of and possibilities for exploiting creative funding opportunities.

Table IV tests whether transactions in which real-estate agents and mortgage brokers have a stake are more likely to include a seller hint. I use several proxies for the intermediaries' stake. First, real-estate agents that represent both parties are more inclined to close the deal since the commission is nearly doubled. Also in those cases, the complexity of negotiating an inflated transaction is significantly lower with one intermediary. Second, sellers who are agents themselves have better information about the mechanics of inflated transactions and therefore should be more likely to offer such transactions. Third, transactions that are

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<sup>18</sup>These results also corroborate with United States Government Accountability Office (2005) which finds that transactions in which the down payment was financed by non-profit organizations were sold at higher prices.

financed through mortgage brokers should be more likely to include seller hints, consistent with lax screening (Keys, Makherjee, Seru, and Vig 2009).

Table IV, column (1), shows that all these agency proxies increase the likelihood of a seller hint with an economic magnitude ranging from 0.3% to 1.5% (the unconditional mean of seller hint is 2.9%). Column (2) shows that the results become stronger when I tighten the definition of a seller hint and require that the buyer pays the full listing price (being an amplified signal of inflated transaction). Overall, these results are consistent with Prediction (3), that intermediaries play a key role in the promotion of inflated transactions.

#### **D. Borrower Default and Interest Rates**

The results in Section IV.B show that inflated transactions have higher prices, and hence that borrowers in these transactions effectively borrow at higher leverage than is perceived by outside parties. Next, I examine whether these borrowers are more likely to default on their debt, and whether this risk is correctly priced by lenders.

Table V presents results about mortgage performance and pricing. The dependent variables in columns (1) to (3) are indicator variables of whether properties were foreclosed within the first, third, or fifth year of occupancy, respectively.<sup>19</sup> The table shows the known result that highly leveraged borrowers, and especially borrowers with 100% leverage or higher are more likely to default on their debt (consistent with Kelly 2009). This evidence is also

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<sup>19</sup>Foreclosures are identified in the data according to whether they were assigned by the court to a third party at a later date.

consistent with the report of Base Point Analytics (2007) suggesting that the high default rate of subprime borrowers is linked to fraud at the mortgage origination.

The table shows that highly leveraged buyers who respond to seller hints are more likely to default. For example, while the likelihood of foreclosure within one year for borrowers with leverage of 95% to 100% (above 100%) is 0.7% (3.9%) higher than a similar highly leveraged borrower (unconditional likelihood of default in the sample is 1.6%). The economic importance of seller hints increases with the foreclosure horizon and with the leverage. Consistent with my findings, Corkery (2007) reports that fraud is a main driver of the recent foreclosure wave.

Column (4) tests whether seller hints are priced in mortgage rates. The sample used consists of 57,495 mortgages in which lenders voluntarily report annualized percentage rates (APRs) post 2003. The regression shows that APRs primarily increase with leverage and are broadly insensitive to whether borrowers respond to seller hints.

A further analysis of the magnitude of the regression coefficients and recovery rates suggests that lenders remain unharmed by inflated collateral values. Column (4) shows that highly leveraged borrowers pay on average between 63 to 105 basis points more than low leveraged borrowers (about 55 basis points on weighted basis). Their likelihood of foreclosure (weighted by the number of mortgages) is higher by 0.61% (within one year) to 0.62% (within five years). Therefore, in order for a lender to break even on average, recovery rates must be very low, perhaps lower than 20%. Hence under reasonable assumptions of recovery rate, lenders seem to pool borrowers together rather than use discriminating pricing based on the likelihood of engaging in inflated transactions. This analysis implicitly assumes that lenders

did not anticipate the large wave of foreclosures that occurred following the bust in the real-estate market.

In short, consistent with Predictions (4) and (5), Table V shows that lenders do not discriminate between borrowers who inflate prices and borrowers who don't, and that they charge sufficiently high APRs so as to remain unharmed by this activity. Hence, borrowers who do not engage in this activity are likely to subsidize those who inflate prices. Based on the loss estimation in Section A, and based on the fraction of the highly leveraged population in the sample, it can be estimated that the average annual burden to all highly leveraged borrowers is in the magnitude of \$50 to \$150.<sup>20</sup>

## V. Conclusion

The paper explores a method for resolving borrowers' financial constraints that emerged in the residential mortgage market. The practice shifts wealth from risky borrowers who can make the down payment to those who cannot, and it is incentive-compatible for intermediaries. In essence, financially constrained borrowers collude with sellers and intermediaries to inflate the value of transactions, so that the lender would lend a larger nominal amount based on the same collateral. Inflated transfers account for 3% to 7% (4% to 14%) of the transactions with leverage higher than 80% (95%), meaning that the borrower base has been expanded by up to this amount. Prices on these transactions are significantly higher, by 6% to 8%, on average.

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<sup>20</sup>These conclusions come with a caveat, however, because foreclosures should be treated as *Peso* problem, in the sense that they occur with very low probability, and therefore estimates about profitability of investors could depend to a great extent on the sample period investigated.

The paper also highlights the role of intermediaries in inflated transactions. Specifically, in transactions in which intermediaries can score larger gains, the transaction price is more likely to be inflated. Consistent with the evidence linking lax lending to the securitization process (Keys, Makherjee, Seru, and Vig 2009), I find that prices are more likely to be inflated when a mortgage broker is involved. Furthermore, the empirical results show that while borrowers who engage inflated prices pose a higher risk of default, they do not pay high mortgage rates in return. Instead, they pay the same rates as borrowers with the same observable risk profile.

Overall, the evidence in the paper contributes to our understanding of the real-estate bubble of 2000-2006 and its subsequent bust. Credit-constrained borrowers could participate in the market due to lax screening and ad-hoc arrangements that relaxed their credit constraints. The arrangements discussed in this paper resulted in higher observed transaction prices and in higher default rates for the low-income borrower population.

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## Appendix A: Variable Definitions

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<i>Seller Hint</i>	Indicates whether the seller advertised a hint about inflated transaction.
<i>Foreclosed within X years</i>	Indicator variable as to whether the property was foreclosed in the first $X$ years following the transaction.
<i>Mortgage Broker</i>	Indicator variable as to whether a lender is a “lender” and likely to hold the mortgages it originates ( $= 0$ ), or is a “mortgage broker” and likely to sell the mortgages it originates ( $= 1$ ).
$X\% < \text{Leverage} \leq Y\%$	Indicator variables as to whether loan-to-price is higher than $X$ and lower than or equal to $Y$ .
$\log(\text{Average Income})$	Logged average income at zip code level according to the IRS.
$\log(\text{Price})$	Logged transaction price.
$\log(1 + \text{Time on the Market})$	Log of one plus the time on the market (time between listing and contract), in days.
<i>Property Controls</i>	Controls variables for: logged number of bathrooms, logged number of half-bathrooms, logged number of bedrooms, logged number of garages.
<i>Seller is Agent</i>	Indicator variable as to whether the seller himself is a real-estate agent.
<i>Single Agent</i>	Indicator variable as to whether the same agent represents both buyer and seller in a transaction.
$\text{Price}/\text{Price}_{Ask}$	The ratio of the transaction price to the most updated asking price.
<i>Price percentile</i>	Percentile rank of the transaction price in the universe of transactions that were signed on the same month.
$\Delta_{pct}(P)$	Change in the <i>Price percentile</i> for the same property between the current transaction and the last transaction of the property, or between the next transaction of the property and the current transaction.
$\Delta \log(P)$	Change in the $\log(\text{price})$ for the same property between the current transaction and the last transaction of the property, or between the next transaction of the property and the current transaction.

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## Appendix B: Identifying Seller Hints

The table presents a list of keyword that generated 90% of the seller hint flags in the data. The search for keywords was performed on the remarks field of the MLS data set, after it was compressed (i.e., spaces and special characters were removed).

Keyword	# Appearances	Percent	Rationale
(DECOR or REMOD) and (ALLOW or CREDIT)	4,576	22.08	Decorating credit, allowance for remodeling
CLOSINGCOST	3,107	14.99	Closing costs
APPRAIS	1,567	7.56	FHA Appraisal on file
REBAT	1,250	6.03	Tax rebate expected in the future
FULLPRICE and 00CASH	1,134	5.47	Cash-back with full price
WILLHELP	1,017	4.91	Seller is willing to help
FINANCE	800	3.86	Seller is willing to help
WILLINGTOHELP	800	3.86	Seller is willing to help
NOMONEY	517	2.49	No money down
MAYHELP	446	2.15	Seller is willing to help
000CREDIT	437	2.11	Credit at closing
TOWARDSCLOSING	390	1.88	Cash towards closing
BUYERATCLOS	351	1.69	Cash towards closing (to buyer)
ALLOWANCEFOR	347	1.67	Allowance for remodeling
CREDITATCLOS	313	1.51	Credit at closing
TOWARDCLOSING	281	1.36	Closing costs
SPECIALASM	258	1.24	Special assessment already paid
00CREDIT	233	1.12	Credit at closing
CREATIVEFIN	173	0.83	Creative financing
LOWANCEATCLOS	162	0.78	Allowance at closing
COUPON	161	0.78	Coupons at closing
CREDIT\$	118	0.57	Credit at closing
LIANCEALLOWANC	112	0.54	Allowance at closing
COSTCREDIT	102	0.49	Credit at closing
FORDECORAT	101	0.49	Decorating credit
Total	18,753	90.5	

## Appendix C: Estimating the Frequency of Inflated Transactions

The low estimate for the frequency of inflated transactions is computed as the fraction of seller hints that were taken by highly leveraged borrowers. The high estimate for the frequency of inflated transactions is computed as a fraction of transactions in which highly leveraged home buyers paid the full listing price or above, and cannot be explained by property and deal characteristics, except for leverage. To reduce the possibility that high prices were paid due to bidding wars, all transactions that were closed within 14 days of listing are excluded in the regressions of *Paid100*.

Entire Sample (1995-2008) (n = 768,534)					
	Leverage	Seller Hint		Paid100	
	Distribution	Coefficient (%)	(1) × [(2)+all*]	Coefficient (%)	(1) × (4)
	(1)	(2)	(3)	(4)	(5)
(a) All Mortgages		2.06		n/a	
Marginal effects:					
(b) 80% < LTV ≤ 85%	0.04	0.30	0.10	2.70	0.11
(c) 85% < LTV ≤ 90%	0.16	0.44	0.39	0.38	0.06
(d) 90% < LTV ≤ 95%	0.16	1.04	0.51	3.22	0.53
(e) 95% < LTV ≤ 100%	0.25	2.30	1.11	14.33	3.64
(f) 100% < LTV	0.02	1.47	0.07	6.88	0.15

Percent of mortgages that are inflated				
	Low	Note	High	Note
	Estimate (%)		Estimate (%)	
Out of all LTV > 80%:	3.4	(i)	7.0	(iii)
Out of all LTV > 95%:	4.3	(ii)	13.8	(iv)

Recent Period (2005-2008) (n = 146,009)					
	Leverage	Seller Hint		Paid100	
	Distribution	Coefficient (%)	(1) × [(2)+all*]	Coefficient (%)	(1) × (4)
	(1)	(2)	(3)	(4)	(5)
(a) All Mortgages		2.43		n/a	
Marginal effects:					
(b) 80% < LTV ≤ 85%	0.04	0.61	0.11	3.60	0.13
(c) 85% < LTV ≤ 90%	0.15	0.66	0.48	0.57	0.09
(d) 90% < LTV ≤ 95%	0.14	1.47	0.56	4.40	0.64
(e) 95% < LTV ≤ 100%	0.31	3.07	1.71	16.62	5.17
(f) 100% < LTV	0.01	1.17	0.05	3.29	0.05

Percent of mortgages that are inflated				
	Low	Note	High	Note
	Estimate (%)		Estimate (%)	
Out of all LTV > 80%:	4.4	(i)	9.2	(iii)
Out of all LTV > 95%:	5.4	(ii)	16.1	(iv)

Notes:

(i)  $\text{sum}((b3) \text{ to } (f3)) / \text{sum}((b1) \text{ to } (f1))$

(ii)  $\text{sum}((e3) \text{ to } (f3)) / \text{sum}((e1) \text{ to } (f1))$

(iii)  $\text{sum}((b5) \text{ to } (f5)) / \text{sum}((b1) \text{ to } (f1))$

(iv)  $\text{sum}((e5) \text{ to } (f5)) / \text{sum}((e1) \text{ to } (f1))$

**Table I**  
**Summary Statistics**

The table presents descriptive statistics. Panel A presents summary statistics for the MLS data set, matched with the Cook County Recorder of Deeds data set. Panel B presents summary statistics for the transactions data set broken up by year of closing.

**Panel A: Summary statistics**

Variable	N	Mean	Std Dev	Min	Median	Max
Seller Hint ( $\times 100$ )	768534	2.915	16.822	0.0	0.0	100.0
Paid100 ( $\times 100$ )	768534	19.532	39.645	0.0	0.0	100.0
Seller Hint $\times$ Paid100 ( $\times 100$ )	768534	0.780	8.800	0.0	0.0	100.0
LTV	768534	85.581	15.159	25.5	90.0	103.5
$80\% < LTV \leq 85\%$	768534	0.042	0.201	0.0	0.0	1.0
$85\% < LTV \leq 90\%$	768534	0.156	0.363	0.0	0.0	1.0
$90\% < LTV \leq 95\%$	768534	0.164	0.370	0.0	0.0	1.0
$95\% < LTV \leq 100\%$	768534	0.254	0.435	0.0	0.0	1.0
$100\% < LTV$	768534	0.021	0.144	0.0	0.0	1.0
$\log(1 + \text{Time on the Market})$	768534	3.240	1.246	0.0	3.4	6.6
Transaction Price	768534	248612.4	211963.2	30200	194000	6800000
$\log(\text{Transaction Price})$	768534	12.219	0.605	10.3	12.2	15.7
$\log(\text{Avg Income})$	708364	10.815	0.502	9.7	10.7	13.6
Price/Price <sub>Ask</sub> (%)	768534	97.129	4.035	50.0	97.4	200.0
$\Delta \text{pct}(\text{Price})_{t-1,t}$	384774	3.284	18.705	-95.6	0.6	99.2
$\Delta \text{pct}(\text{Price})_{t,t+1}$	217971	1.136	17.713	-98.6	0.8	96.1
$\Delta \log(\text{Price})_{t-1,t}$	384774	0.396	0.601	-6.7	0.3	14.2
$\Delta \log(\text{Price})_{t,t+1}$	217971	0.240	0.512	-13.2	0.2	5.5
Foreclosed within 1 year ( $\times 100$ )	707899	2.200	14.669	0.0	0.0	100.0
Foreclosed within 3 year ( $\times 100$ )	543594	2.245	14.814	0.0	0.0	100.0
Foreclosed within 5 year ( $\times 100$ )	388057	2.440	15.429	0.0	0.0	100.0
APR (%)	57795	6.442	1.765	0.3	6.3	14.8
Single Agent	741164	0.124	0.329	0.0	0.0	1.0
Seller is Agent	768534	0.057	0.231	0.0	0.0	1.0
Mortgage Broker	726190	0.593	0.491	0.0	1.0	1.0

**Table I: Summary Statistics (Cont.)**

**Panel B: Selected Summary statistics, by year of closing**

Year	Obs	Time on the Market (# days)	Average Leverage	Seller Hint (%)		Paid100 (%)	
				LTV $\leq$ 80%	LTV $>$ 80%	LTV $\leq$ 80%	LTV $>$ 80%
1995	30170	58.2	84.5	2.0	2.6	5.5	10.6
1996	40285	56.0	84.8	2.2	2.7	6.1	10.4
1997	42155	55.4	85.1	2.2	2.9	6.6	11.3
1998	47754	50.9	84.8	1.9	2.7	8.8	12.7
1999	51660	42.2	85.2	1.9	2.6	14.0	19.7
2000	52840	34.6	85.5	1.8	2.9	18.4	27.0
2001	57229	33.5	85.2	1.6	2.9	17.6	27.2
2002	65964	35.8	85.2	1.8	3.2	15.2	26.2
2003	75344	39.5	85.0	1.9	3.1	14.2	26.1
2004	80193	45.2	85.3	1.9	3.4	15.4	28.2
2005	89053	47.0	86.2	2.1	3.7	16.4	30.2
2006	75252	57.9	87.4	2.2	4.3	12.8	25.9
2007	54537	74.9	86.8	3.1	5.5	10.1	21.2
2008	6098	92.2	85.4	3.9	6.2	12.8	20.2

**Table II**  
**Inflated Transactions and Financial Constraints**

The table presents baseline regressions. The sample used for the regression in columns (4) and (5) is restricted to transactions that took place at least 14 days following the listing date. Variable definitions are provided in Appendix A. All regressions are OLS regressions. \*, \*\*, \*\*\* denote two-tailed significance at the 10%, 5%, and 1% levels, respectively. Standard errors are clustered at the zip code level.

	Seller Hint ( $\times 100$ )			Paid100 ( $\times 100$ )	Seller Hint $\times$ Paid100 ( $\times 100$ )
	(1)	(2)	(3)	(4)	(5)
$80\% < LTV \leq 85\%$	0.30*** (0.10)	0.06 (0.08)	6.00*** (2.12)	2.70*** (0.31)	0.11* (0.06)
$85\% < LTV \leq 90\%$	0.44*** (0.08)	-0.06 (0.06)	4.51*** (1.42)	0.38** (0.17)	-0.04 (0.03)
$90\% < LTV \leq 95\%$	1.04*** (0.12)	0.14** (0.06)	10.67*** (1.57)	3.22*** (0.31)	0.11*** (0.04)
$95\% < LTV \leq 100\%$	2.30*** (0.18)	0.79*** (0.10)	17.45*** (1.94)	14.33*** (0.44)	0.85*** (0.06)
$100\% < LTV$	1.47*** (0.20)	0.41** (0.16)	9.83** (4.19)	6.88*** (0.50)	0.41*** (0.09)
log(Avg Income)			0.29*** (0.11)		
$\times 80\% < LTV \leq 85\%$			-0.54*** (0.19)		
$\times 85\% < LTV \leq 90\%$			-0.42*** (0.13)		
$\times 90\% < LTV \leq 95\%$			-0.97*** (0.14)		
$\times 95\% < LTV \leq 100\%$			-1.55*** (0.18)		
$\times 100\% < LTV$			-0.86** (0.39)		
log(1 + Time on the Market)		0.54*** (0.03)	0.54*** (0.03)	0.06 (0.11)	0.24*** (0.02)
log(Transaction Price)		-2.34*** (0.14)	-2.29*** (0.13)	-5.16*** (0.48)	-0.78*** (0.07)
Intercept	2.06*** (0.10)				
Property Characteristics		Yes	Yes	Yes	Yes
Zip code $\times$ Quarter FE		Yes	Yes	Yes	Yes
Observations	760028	760028	700234	523512	523512
Adj. R <sup>2</sup>	0.00	0.02	0.02	0.10	0.01

**Table III**  
**Property Prices and Inflated Transactions**

The table presents regressions analyzing whether the prices in transactions identified as inflated are higher than otherwise. Variable definitions are provided in Appendix A. All regressions are OLS regressions. \*, \*\*, \*\*\* denote two-tailed significance at the 10%, 5%, and 1% levels, respectively. Standard errors are clustered at the zip code level.

	log(Price)	P/P <sub>Ask</sub> (%)	<i>t</i> - 1 → <i>t</i>		<i>t</i> → <i>t</i> + 1	
			$\Delta \log(P)$	$\Delta pct(P)$	$\Delta \log(P)$	$\Delta pct(P)$
	(1)	(2)	(3)	(4)	(5)	(6)
Seller Hint	-0.19*** (0.01)	-0.01 (0.07)	-0.02 (0.01)	-0.92** (0.37)	0.04*** (0.01)	1.94*** (0.49)
×80% < <i>LTV</i> ≤ 85%	-0.02 (0.02)	0.25 (0.22)	0.01 (0.03)	-0.06 (0.93)	-0.01 (0.03)	-0.87 (1.12)
×85% < <i>LTV</i> ≤ 90%	-0.02 (0.01)	-0.16 (0.10)	0.02 (0.02)	0.12 (0.52)	-0.05** (0.02)	-1.56** (0.74)
×90% < <i>LTV</i> ≤ 95%	0.04*** (0.01)	0.04 (0.09)	0.03* (0.02)	0.66 (0.50)	-0.06*** (0.02)	-2.10*** (0.67)
×95% < <i>LTV</i> ≤ 100%	0.08*** (0.02)	0.19** (0.09)	0.06*** (0.02)	1.92*** (0.44)	-0.08*** (0.02)	-2.47*** (0.62)
×100% < <i>LTV</i>	0.04** (0.02)	0.21 (0.22)	0.07 (0.05)	1.98 (1.23)	-0.15** (0.06)	-3.93*** (1.43)
80% < <i>LTV</i> ≤ 85%	-0.05*** (0.01)	0.29*** (0.03)	-0.01* (0.01)	-0.13 (0.17)	0.00 (0.01)	0.21 (0.21)
85% < <i>LTV</i> ≤ 90%	-0.12*** (0.01)	0.22*** (0.02)	-0.01*** (0.00)	-0.59*** (0.11)	0.05*** (0.00)	1.87*** (0.15)
90% < <i>LTV</i> ≤ 95%	-0.24*** (0.01)	0.54*** (0.03)	-0.02*** (0.00)	-1.17*** (0.16)	0.05*** (0.00)	2.52*** (0.19)
95% < <i>LTV</i> ≤ 100%	-0.33*** (0.01)	1.17*** (0.04)	0.01* (0.01)	-1.12*** (0.24)	0.03*** (0.01)	2.14*** (0.31)
100% < <i>LTV</i>	-0.30*** (0.02)	0.54*** (0.05)	-0.03*** (0.01)	-2.69*** (0.27)	0.02* (0.01)	1.88*** (0.39)
log(1 + Time on the Market)	0.01*** (0.00)	-0.51*** (0.01)	0.00*** (0.00)	0.13*** (0.04)	-0.01*** (0.00)	-0.49*** (0.05)
Property Characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Zip code × Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	760028	760028	448870	448870	223302	223302
Adj. R <sup>2</sup>	0.48	0.08	0.05	0.08	0.07	0.09

**Table IV**  
**Intermediaries' Role in Inflated Transactions**

The table presents regressions of the determinants of inflated transactions, particularly with regard to the role of intermediaries. The sample used for the regression in column (2) is restricted to transactions that took place at least 14 days following the listing date. Variable definitions are provided in Appendix A. All regressions are OLS regressions. \*, \*\*, \*\*\* denote two-tailed significance at the 10%, 5%, and 1% levels, respectively. Standard errors are clustered at the zip code level.

	Seller Hint ( $\times 100$ ) (1)	Cash-Back Hint $\times$ Paid100 ( $\times 100$ ) (2)
$80\% < LTV$		
$\times$ Single Agent	0.60*** (0.16)	0.35*** (0.10)
$\times$ Seller is Agent	1.51*** (0.26)	0.84*** (0.14)
$\times$ Mortgage Broker	0.31*** (0.09)	0.32*** (0.06)
$\times$ $\log(\text{Avg Income})$	-0.95*** (0.11)	-0.49*** (0.07)
$\times$ $\log(1 + \text{Time on the Market})$	0.27*** (0.04)	0.24*** (0.04)
$80\% < LTV \leq 85\%$	9.27*** (1.22)	4.28*** (0.77)
$85\% < LTV \leq 90\%$	9.10*** (1.21)	4.08*** (0.76)
$90\% < LTV \leq 95\%$	9.26*** (1.21)	4.21*** (0.75)
$95\% < LTV \leq 100\%$	9.83*** (1.22)	4.89*** (0.75)
$100\% < LTV$	9.58*** (1.22)	4.44*** (0.76)
Single Agent	0.26*** (0.09)	0.12** (0.05)
Seller is Agent	0.65*** (0.15)	0.12** (0.06)
Mortgage Broker	-0.09 (0.06)	-0.00 (0.03)
$\log(1 + \text{Time on the Market})$	0.37*** (0.03)	0.09*** (0.02)
$\log(\text{Transaction Price})$	-2.28*** (0.14)	-0.69*** (0.07)
Property Characteristics	Yes	Yes
Zip code $\times$ Quarter FE	Yes	Yes
Observations	635836	437603
Adj. R <sup>2</sup>	0.02	0.01

**Table V**  
**Mortgage Performance and Interest Rates**

The table presents regressions of the likelihood of a foreclosure (columns (1) to (3)) and the determinants of APR (column (4)). Variable definitions are provided in Appendix A. All regressions are OLS regressions. \*, \*\*, \*\*\* denote two-tailed significance at the 10%, 5%, and 1% levels, respectively. Standard errors are clustered at the zip code level.

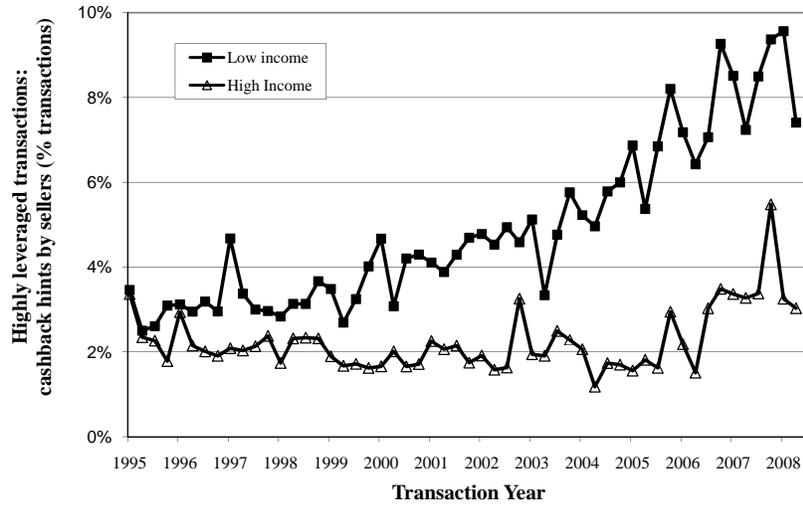
	Foreclosed Within... ( $\times 100$ )			APR (%)
	1 year	3 years	5 years	
	(1)	(2)	(3)	(4)
Seller Hint	0.14 (0.19)	0.30 (0.23)	0.51* (0.30)	0.12** (0.06)
$\times 80\% < LTV \leq 85\%$	0.86 (0.81)	1.21 (1.02)	1.00 (1.18)	0.39*** (0.15)
$\times 85\% < LTV \leq 90\%$	0.62 (0.41)	0.25 (0.54)	-0.05 (0.65)	0.20** (0.09)
$\times 90\% < LTV \leq 95\%$	0.43 (0.40)	0.05 (0.49)	0.43 (0.61)	0.17* (0.09)
$\times 95\% < LTV \leq 100\%$	0.72** (0.37)	1.06** (0.45)	1.40** (0.58)	0.05 (0.08)
$\times 100\% < LTV$	3.93*** (1.25)	4.41*** (1.44)	5.36*** (1.55)	0.22 (0.31)
80% < LTV $\leq$ 85%	0.40*** (0.08)	0.35*** (0.10)	0.44*** (0.12)	0.80*** (0.04)
85% < LTV $\leq$ 90%	0.09 (0.06)	0.03 (0.07)	0.02 (0.08)	0.72*** (0.03)
90% < LTV $\leq$ 95%	0.23*** (0.06)	0.13* (0.07)	0.11 (0.09)	0.74*** (0.03)
95% < LTV $\leq$ 100%	1.98*** (0.11)	1.69*** (0.13)	2.09*** (0.16)	1.05*** (0.03)
100% < LTV	1.68*** (0.23)	1.77*** (0.25)	2.38*** (0.30)	0.63*** (0.06)
log(1 + Time on the Market)	0.15*** (0.02)	0.18*** (0.02)	0.20*** (0.03)	0.04*** (0.01)
log(Transaction Price)	-1.04*** (0.18)	-1.11*** (0.20)	-0.68*** (0.20)	-0.54*** (0.03)
Property Characteristics	Yes	Yes	Yes	Yes
Zip code $\times$ Quarter FE	Yes	Yes	Yes	Yes
Observations	699378	535136	381595	57495
Adj. R <sup>2</sup>	0.03	0.03	0.03	0.40

Figure 1. Photos of Seller Proposals on Signs in Chicago, 2006-2007



Sample of photos taken in Chicago between 2006 and 2007 of public signs in which sellers offer to include additional items in the selling price.

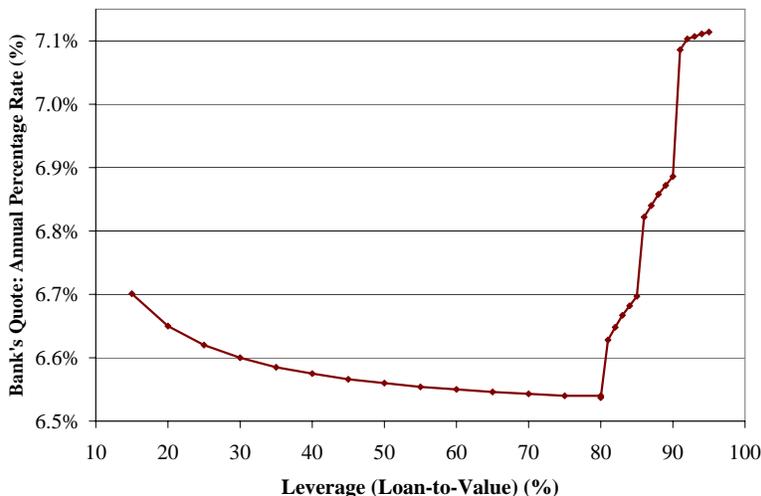
Figure 2. Time-Series of Seller Hints



Time series of the percentage of transactions in which buyers have leverage higher than 80% and in which sellers offer inflated transactions, stratified by zip code quintile (top and bottom income quintiles are presented). For most dates, standard errors are smaller than 0.5%.

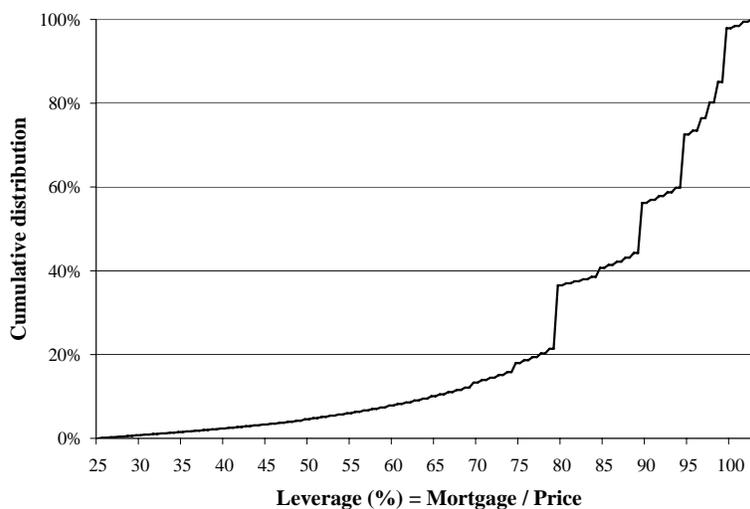
Figure 3. APRs and Leverage Cumulative Distribution

Figure 3a. Quoted APRs



Quoted APRs (annual percentage rate) for a 30-year mortgage from the First National Bank of Chicago. The quote is for a \$400,000 newly purchased single family home in Chicago. The leverage sought is computed as the fraction of the loan requested out of the purchase price. The base interest rate is 6.5% fixed over the period. Source: First National Bank of Chicago website (<http://www.fnbgreatbanc.com>).

Figure 3b. Cumulative Leverage Distribution



The figure presents a cumulative distribution of sample transactions as a function of the leverage in the transaction. Leverage is defined as the sum of mortgages scaled by transaction price.

Figure 4. Indicators of Inflated Transactions

Figure 4a. Seller Hints



Percentage of transactions in which sellers offer inflated transactions as a function of buyers' leverage. Leverage is defined as the sum of mortgages scaled by transaction price. Broken lines represent 2 standard error bounds.

Figure 4b. Paying the Full Listing Price (or Above)



Percentage of transactions in which buyers paid at least the full listing price. Leverage is defined as the sum of mortgages scaled by transaction price. Broken lines represent 2 standard error bounds.