

# Relational Contracts, Reputational Concerns, and Appraiser Behavior: Evidence from the Housing Market

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## Abstract

We first document that 42% of appraisals are at or near the contract value, while only 7.5% are below the contract value. Next, we study possible explanations for this phenomenon. We analyze the length of the relationship between the appraiser and lender in relation to the quality of the appraisals by exploiting the appraisal contingency clause in the sales contract. We find that appraisers are rewarded for delivering “high-quality” appraisals that facilitate housing transactions and punished for “low-quality” appraisals that are disruptive. When the long-term relationship between appraisers and lenders is broken down under the new laws, there are fewer at- and above-contract appraisals. We also find these favorable appraisals have a significant and positive effect on loan approval, a negative effect on the note rate, and the loans associated with them have higher default and prepayment risks.

Keywords: Relational contracts; appraiser; bunching; reputational concern; moral hazard; third party

JEL: G21; G28; R21; R31

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## 1. Introduction

Contracting parties rely on relationships, or relational contracts, to sustain trade when a principal and an agent engage in a repeated and open-ended relationship (Shapiro and Stiglitz 1984; Levin 2003). Akerlof (1970) observes that, in many markets, parties have imperfect information on goods at the time of sale and, consequently, the problem is resolved by relying on long-term relationships and seller reputations. Ongoing relational contracts can complement formal court-enforced contracts in mitigating holdups and facilitating transactions (MacLeod 2007). In the past three decades, considerable progress has been made in the theoretical analysis of relational contracts, with a strong focus on repeated games (e.g., Shapiro and Stiglitz 1984; Levin 2003; Halac 2012). However, there is very limited empirical evidence on the scope and relevance of relational contracts. Jiang, Wan, and Zhao (2015) study the voting records of independent directors and find that career-conscious independent directors are more likely to dissent and that dissension improves governance. Khanna, Kim, and Lu (2015) also evaluate the connections that chief executive officers (CEOs) develop with top executives and directors through their appointment decisions. The authors find that appointment-based CEO connectedness in executive suites and boardrooms increases the likelihood of fraud and decreases the likelihood of fraud detection.

In this paper, we empirically investigate the behavior of residential appraisers in the housing market, who simultaneously receive business from lenders and are paid by homeowners. Residential appraisers play an important role in the US housing market. At the height of home price run-up in 2006, nearly 100,000 licensed appraisers helped over 10 million homeowners to originate about \$2.7 trillion mortgages to finance home purchases and refinancing. This setting is good for studying the long-term relationships between principals and agents. First, the interaction between appraisers and lenders is frequently repeated. Second, the appraisal service is standard such that it is hard to evaluate the quality based on objective criteria. Third, the service fee is a fixed dollar amount, regardless of the quality, implying that appraisers are highly incentivized to increase the number of their business transactions. However, the objective function of banks is to maximize the profit of mortgages, which depends on many factors, including the approval of more loans and the reduction of buybacks due to overvalued appraisals. While banks can observe the appraisal results, they cannot observe the efforts of the appraisers. The quality of appraisals is also difficult to evaluate, since appraisers have more information about the house. Thus, appraisers might not act in banks' best interests or provide the best-quality products.

We exploit an important contingency clause in the standard home sales contract that states that the buyer may renege on the transaction if the appraised value is less than the total purchase price in the contract of sale. Empirical evidence suggests that the vast majority of transactions have been delayed, renegotiated, or canceled when the appraised value is below the contract value, which leads to a direct revenue loss for loan officers and banks (Fout and Yao, 2016). Thus the contract value is an important reference point for appraisers. Banks could disfavor below-contract appraisals and consider them a "low-quality" product because of their

disruptive effect. In a long-term relationship, banks could punish the appraiser for so-called low-quality appraisals and reward them for “high-quality” ones instead, that is, those at or above the contract price that facilitates the transaction. If the signal of low quality is common knowledge, appraisers will respond by avoiding below-contract appraisals. Expected future business in repeated games is what disciplines appraisers’ behavior.

Our empirical analysis relies on a large sample of representative data from one of the largest secondary market insurers in the United States that comprises 3,656,531 digital appraisals completed by 52,512 unique appraisers from 2012 to 2015. For each appraisal, we observe the unique identification of the appraiser, the appraisal management company (AMC) and lender, the location and structural characteristics (property condition, quality of construction, living area, age, etc.) of both the subject and comparable properties, detailed adjustments made by the appraiser, the final appraised value, the contract price, and a value estimated by proprietary automated valuation models (AVMs). Additionally, the appraisals are linked to the subsequent loan application and origination, along with performance.

We find a sharp spike of about 42% in the frequency of appraisals at or near the contract value, 31% of which are concentrated exactly at the contract price. Only 7.5% of appraisals are below the contract price, considered low quality because of their disruptive nature. This finding is in direct contrast with the distributions of appraisals based on two alternative valuation methods: One is out-of-sample appraisal for distressed properties when the appraisals are ordered by banks prior to the property being listed on the market and, thus, no contract price is available in this case. The second is the use of AVM values for the same set of appraisals in our sample. The distributions of appraisals based on alternative methods both follow approximately normal distributions, with the appraisals being symmetrically distributed on the two sides of the contract and not concentrated on any particular value. The 41% of appraisals bunched at or near the contract value reflect the role of anchoring in appraisers’ behavior, through which they try to deliver high-quality appraisals that facilitate transactions. There are many explanations for the appraisers’ behavior. We focus on three explanations that could affect their professional conduct: 1) reputational or career concerns, 2) moral hazard, and 3) the assumption that appraisals reflect true housing values.

To test the reputational or career concerns of appraisers, we use data at the appraiser–lender level to study the relation between the business volume that an appraiser receives from a lender and the so-called quality of the appraisals the appraiser has delivered in the past.<sup>1</sup> We regress the current business volume on the quality of the appraisals delivered by the appraiser in the prior month, controlling for appraiser, lender, county, and time fixed effects. We find that an increase of one extra below-contract appraisal in the past has a significant negative effect, a reduction of 3.7%, on future business volume, while there is no difference between at- and above-contract appraisals in their effect on future business, suggesting that appraisers are

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<sup>1</sup> There are only three types of quality throughout our analysis: above-, at-, or below-contract appraisals. These are descriptive measures in the context of relational contracts. We do not suggest an objective measure of appraisal quality exists.

punished for delivering low-quality appraisals, while appraisals at and above the contract price are considered of similar value because both facilitate the transactions. We also find that appraisers are punished for appraisals that are far above the contract price due to perceived appraisal bias. All else being equal, one more appraisal that is far above the contract price in the previous month reduces an appraiser's business from the same lender by 5.6%, based on the number of appraisals, and by 2.1%, based on fraction of appraisals, compared to appraisals that are less than 15% above the contract price.

Appraisals are largely relational contracts. Appraisers are expected to be rewarded with a longer business relationship for at- or above-contract appraisals and punished by termination of the business relationship for below-contract appraisals. We plot series representing different lengths (in months) of relationships over the percentage of different appraisals and find a direct relation between the length of the business relationship and the fraction of above-contract appraisals between the pair, no relation between the relationship and the volume of at-contract appraisals, and an inverse relation between the length of the relationship and the share of below-contract appraisals. We further strengthen our results on relational contracts by designing several experiments based on our data. We identify two groups of appraisers who have a "clean" history, with no below-contract appraisals in the first  $N - 1$  months, but one of the group, our treated group, delivers at least one below-contract appraisal in month  $N$ . The results confirm that appraisers are punished immediately following the delivery of below-contract appraisals. We find that appraisers are more aligned to lenders' interests when facing constraints from different parties to build long-term relationships to receive more business in the future.

There is great heterogeneity among appraisers and across markets regarding reputational or career concerns. We do so by regressing the number of at-contract appraisals on appraisers' past business volume interacted with different types of appraisers. We consider four types of appraisers with different reputational concerns: exiting appraisers, who stopped appraising at the end of our sample period and should have fewer career concerns; top-performing appraisers, appraisers near their capacity, and captive appraisers, who did the vast majority of their business with a single lender. We find that, although exiting appraisers deliver more at-contract appraisals, on average, they deliver significantly fewer such appraisals as a percentage of their past business, 10.8%, than they would otherwise under normal circumstances. Both top performers and those near their capacity show significantly greater increases in at-contract appraisals as a function of past volume than others, 18.6% and 4.9%, respectively, with the effect for the latter group being slightly weaker. The behavior of captive appraisers differs between their majority and minority lender clients. Compared to other appraisers, they deliver 25.5% more at-contract appraisals to their majority lender clients but 18.9% fewer such appraisals to their other clients, both statistically significant at the 1% level. We also find more incidences of at-contract appraisals or bunching in markets with increased competition.

In the aftermath of the financial crisis, the US government adopted strict regulations to curb perceived appraisal overvaluations and now requires that all appraisals go through an AMC for

large lenders. With AMCs standing between lenders and appraisers under the new law, appraisers have become anonymous to the lenders and thus reputational concerns have diminished due to the breakdown of long-term relationships. This setting is ideal for testing the effect of this breakdown. Although we do not have data before the financial crisis to test the impact of the regulations, we explore possible differences in appraisal quality for captive AMCs, non-captive AMCs, and no AMC at all. We first compare the average number of different appraisals for appraisers who worked with an AMC versus those who did not. Our results suggest that AMCs have established norms in the profession and help prevent extreme valuations at both tails of the distribution. We then regress indicators of at- and above-contract appraisals on different AMCs, along with many other controls. Our results show that appraisals with AMCs are less likely to deliver at- and above-contract appraisals by 1.1% and 0.7%, respectively compared to those with no AMCs involved. Captive AMCs are 1.8% more likely to deliver at-contract appraisals to their majority clients than to other clients and 0.5% more likely to do so than non-captive AMCs. Both differences are significant at the 10% level. Captive AMCs deliver a significant 0.6% more at-contract appraisals to their majority clients than to other clients but are not statistically different from non-captive AMCs in terms of their likelihood of delivering above-contract appraisals.

One alternative explanation for appraiser behavior is moral hazard. Appraisal work is characterized of many features that could induce moral hazard. Moral hazard implies that appraisers exert less effort with at-contract appraisals than with below- and above-contract ones. We measure their efforts by the number of comparable properties they choose during the appraisal process and the time they spend completing the appraisal. We find that, compared with above-contract appraisals, appraisers choose more comparable transactions (hereafter comps) for price extrapolation and thus exert more effort generating at-contract appraisals. These results do not support the contention that moral hazard is an important driver.

Our last explanation is that appraisals may reflect true housing values and even independent appraisals are very close to the contract price. We test this argument by analyzing the relation between the fraction of at-contract appraisals and appraisal–AVM price differences. Small price differences indicate that appraised values are more likely to reflect the true market value. We find no relation between bunching activities and price differences, suggesting that true market value is not a plausible explanation.

Since appraisers go out of their way to meet contract values to facilitate the transaction, we also check the actual effect of at- and above-contract appraisals on loan outcomes. We consider four loan outcomes: loan approval, note rate at origination, default, and prepayment. We regress these loan outcomes on the type of appraisal used in the loan application and their interaction terms with dummies for a high loan-to-value ratio (LTV) and a low credit score (FICO), along with many controls at the loan or appraisal level. The interaction terms capture the incremental effect on marginal borrowers compared to other borrowers who also receive favorable appraisals. The results suggest that, compared to appraisals below the contract price, those exactly at and above the contract price have a significant positive effect on loan

approvals, with both estimates at 0.7%. The effect is significant and positive for marginal borrowers. Compared to other borrowers, an above-contract appraisal can help high-LTV and low-FICO borrowers increase their chances of having their loan approved by 1.7% and 1.8%, respectively. In addition, an appraisal exactly at the contract price can help high-LTV and low-FICO borrowers increase their chances of having their loan approved by 1.8% and 2.1%, respectively.

Our second outcome is the mortgage note rate at origination. The results suggest that an above-contract appraisal can help high-LTV but not low-FICO borrowers reduce their note rate by 1.8 basis points. An appraisal exactly at the contract price can help high-LTV and low-FICO borrowers reduce their note rate by 1.0 and 1.5 basis points, respectively. Our third and fourth tests involve the effect of different appraisals on mortgage default and refinancing outcomes after loan origination, respectively. We find that, compared to below-contract appraisals, at- or above-contract appraisals have a significantly higher early default risk, with estimated effects of 0.13% (significant at the 10% level) and 0.15% (significant at the 5% level), respectively; they also have a significantly higher prepayment risk, with estimated effects of 0.36% (significant at the 10% level) and 1.18% (significant at the 1% level), respectively.

Our last test involves macro outcomes. We summarize the total number of at- and below-contract appraisals at the county and year/quarter level and then regress the logarithm of the home price, total employment, and total income at the county level on these two appraisal variables, along with county and time fixed effects. There is a significant negative relation between the number of below-contract appraisals and all three macro outcomes, suggesting that these appraisals are detrimental to the housing market or economic recovery. There is a significant positive relation between the number of at-contract appraisals and home price growth, suggesting that, by validating many of the contract values, these appraisals help housing recovery even more than appraisals that come in above the contract value.

This paper provides important evidence on relational contracts based on transactional data in the US housing market. Despite considerable numbers of theoretical studies on optimal relational contracts,<sup>2</sup> empirical studies on the topic have been very limited, with most of them based on experimental laboratory settings. Gachter and Falk (2002) investigate the incentives for performance and find that long-term relationships are important for trading parties in a repeated game and reciprocity reinforces the incentives as well. Brown, Falk, and Fehr (2004) show that, without third-party enforcement, low effort or bad quality is penalized by termination of the relationship, an effective contract enforcement. To sustain successful long-term relations, principals provide generous rent sharing and agents provide high effort from the very beginning. Machiavello and Morjaria (2015) explore the prevalence of relational contracts between processing mills and farmers in Rwanda's coffee sector. They find that competition between mills undermines relational contracts by increasing the mills' processing

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<sup>2</sup> For example, see Baker, Gibbons, and Murphy (2002), Board (2011), Halac (2012), and Atkeson, Hellwig, and Ordonez (2015). MacLeod (2007) provides an excellent survey of papers that study both formal and informal contract enforcement mechanisms.

costs, lowering their capacity utilization, and reducing the quality of the coffee cherries they receive. We explore the relational contracts between appraisers and lenders and find that appraisers align the quality of their work with the interests of their lender clients to build and maintain long-term business relationships. They are rewarded for high-quality work and punished for low-quality work.

This paper also contributes to the literature that studies the behavior of professionals and the impact of their career concerns. Jiang, Wan, and Zhao (2015) study the voting records of independent directors and find that career-conscious independent directors are more likely to dissent and that dissension improves governance. Khanna, Kim, and Lu (2015) also evaluate the connections that chief executive officers (CEOs) develop with top executives and directors through their appointment decisions. The authors find that appointment-based CEO connectedness in executive suites and boardrooms increases the likelihood of fraud and decreases the likelihood of fraud detection. We find that appraisers try delivering more at- and above-contract appraisals partly out of career concerns. Conditional on their past business, the marginal increase in at- and above-contract appraisals is much greater for those who have more reputational concerns.

Our paper is also related to the effects of institution design and incentives on the behavior of financial intermediaries. Independent evaluators, such as rating analysts and real estate appraisers, play an important role in financial markets. Their professional opinions could be misleading to their clients if there is a conflict of interests inherent in the institution and contract design that hinders their independent role. Literature about relational contracts and reputation concerns suggests that, compared to one-time relationships, long-term relationships between a principal and an agent encourage agents to provide higher-quality work to principals (Brown, Falk, and Fehr 2004). Due to the appraisal contingency clause, banks (principals) might not like appraisals below the contract price. Thus, long-term relationships in the appraisers' market generate more bunching appraisals. Implementation of the Home Valuation Code of Conduct (HVCC) and the usage of AMCs provide a good setting to test the impact of long-term relationships on appraiser bunching. We find that AMCs significantly reduce the incidence of bunching. The implication for institution design is that independent examiners should be assigned anonymously or randomly to incur only one-time relationships.

By analyzing the consequences of appraisers' behavior, our paper also contributes to a broad understanding of the misconduct of professionals. Egan, Matvos, and Seru (2016) document that 7% of financial advisers have misconduct records. In mortgage markets, several studies provide significant evidence of appraisal bias that is directly related to the financial crisis (Griffin and Maturana 2016; Piskorski, Seru, and Witkin 2015; Agarwal, Ben-David, and Yao 2015). Similar to our study, Kruger and Maturana (2017) show that 45% of purchase loan appraisals exactly equal purchase prices, and that appraisal bias predicts loan delinquency. Our paper has several differences from Kruger and Maturana (2017). First, our data is the appraisal data and thus includes both complete and incomplete loan applications. This will help us to address the selection bias when studying appraisal bias (Demiroglu and James 2016). Second,

out data is collected by government-sponsored enterprises (GSEs) and is representative of appraisals by licensed residential appraisers in the country. It includes many lenders so that we can explore the interaction and the relationship contracts between appraisers and lenders. Third, we explore several mechanisms to explain appraisal bias and show that relationship contract and career concern can help to explain the appraiser behavior. Our analysis suggests that overvaluation is not an isolated phenomenon on the appraisers' side and attributable to the existing contract design as well as the relational contract nature of the housing market.

The remainder of the paper is organized as follows. We describe some of the institutional background of the appraisal industry in Section 2. In Section 3, we describe the data. Our empirical analysis is presented in Section 4. In Section 5, we study the effect of appraisal quality on loan outcomes. In Section 6, we provide macro evidence. Section 7 concludes the paper.

## **2. Institutional Background**

### **2.1. Nature of Appraisals**

In the United States and many other countries, appraisal is a third-party valuation opinion required for obtaining residential mortgages, whose purpose is to validate the contract price in home purchases and, in refinancing transactions, to serve as the benchmarked home value. Appraisers typically estimate the home value via three approaches: first, the comparable sales approach; second, the income-generating approach, primarily for investment properties; and, third, the cost approach, primarily for new constructions. The comparable sales approach is the most common in residential appraising, which requires the selection of comps, with adjustments and weighting, to arrive at the final value. A valid comp should be close to the subject, with similar structural attributes based on living area, lot size, property age, conditions, style, and so forth.

An appraisal represents an unbiased estimate of the market value of a property in a specific period. In the valuer's code, which sets appraising guidelines, a biased appraisal is defined as one that is "not reasonably supported, and favoring or promoting the cause of interest of the client, one's self, or another" (Appraisal Institute 2015). However, there are two clients to whom appraisers need to cater: first, the bank or loan officer transmitting the business to the appraiser and, second, the homeowner, who ultimately picks up the bill. A bank's objective in underwriting a loan is to minimize the credit risk of the loan over its lifetime, which is largely capped at the loan amount, some fraction of the home value. Thus, a low collateral value limits the bank's ultimate risk exposure. The homeowner, on the other hand, benefits more from a higher home value for several reasons. For a home purchase, a higher appraisal validates the sale contract between the buyer and the seller and thus facilitates the transaction. For refinancing transactions, a higher appraisal increases the home equity available, which can help



the homeowner extract more equity or lower financing costs (Agarwal, Ben-David, and Yao 2015).

The appraisal fee was fixed at around \$450 in 2017, regardless of the quality of the final report. This has two implications. First, the appraiser's largest incentive is to increase the number of appraisals. Second, the relationship with the bank and loan officer, as the ultimate buyer of repeat business, is very valuable to the appraiser. In a housing transaction, buyers and sellers agree on a contract price before applying for a mortgage from the bank. Appraisal plays an important role of validating the contract value and facilitating the transaction. For example, the LTV used in underwriting decisions is determined by the ratio of the loan amount to the minimum of the appraised and contract values. For a given down payment, a lower appraisal means a higher LTV, which leads to higher financing costs or even denial of the loan if the LTV is around the threshold (e.g., 80%). A higher appraisal, although helpful in validating the contract, could attract the lender's scrutiny and quality review due to perceived appraisal bias. Appraisals are important in housing transactions, particularly because of the appraisal contingency clause in the standard home sales contract, which states that the buyer may declare the offer null and void if the appraised value is less than the total purchase price in the contract of sale. Fout and Yao (2016) find that, when appraisals are below the contract price, only 15% of buyers and sellers proceed with the original contract price; the other 85% renegotiate a lower sale price (51%) or delay or cancel the contract (32%). When the contract does not go through, none of the involved parties, except the appraiser, are compensated.

## 2.2.Changes to Appraisals after the Financial Crisis

During the home price run-up period that led to the financial crisis of 2007–2008, much anecdotal evidence has suggested inflated appraisals associated with pressure from loan officers, lenders, and homeowners. Because lenders could sell the risk to investors through securitization, they, too, benefited from higher appraised values for more profits. Agarwal, Ben-David, and Yao (2015) quantify appraisal bias in refinancing transactions by evaluating the appraised value relative to future sales transactions. The authors find that the average valuation bias for residential refinancing transactions is about 5% relative to similar purchase mortgage transactions. The bias is greater for highly leveraged homeowners, around critical loan leverage thresholds, and for loans originated by a mortgage broker who is not incentivized to originate high-quality loans. The embedded appraisal bias contributes significantly to mortgage default for which lenders did not adequately price.

In response to perceived appraisal bias problems, the Federal Housing Finance Agency, in cooperation with the New York Attorney General's office, issued the HVCC in 2009, which was later adopted in the Dodd–Frank Act of 2010. One of the important features of the HVCC is that it specifically prohibits actions by a lender that could improperly influence the

appraiser.<sup>3</sup> Under the HVCC, both the lender and the appraiser need to conduct their business through an AMC to conduct their business. In a follow-up paper, Agarwal, Ambrose, and Yao (2017) examine the effect of regulatory action and find that the regulation reduced the incidence of inflated valuations in refinance transactions by 20% for large lenders.

### **3. Data and Summary Statistics**

#### **3.1 Data Source**

We construct a novel data set of appraisals collected by government-sponsored enterprises (GSEs) from 2013 to 2015 as part of initiatives to improve loan quality following the crisis. Prior to these initiatives, most appraisal data, except appraised values, were never captured digitally. Since about 90% of mortgages were financed by the government during the period, our sample is representative of all appraisals by licensed residential appraisers in the country. Reduced appraisals used in transactions such as those of the Home Affordable Refinance Program are not represented in the sample.

We also link the appraisal data to both the loan application data and mortgage origination, as well as performance data, based on unique identification assigned to each appraisal and captured in the loan files. For each loan application (same applicant and same lender), we capture the first and last submission, which can differ in loan amount and property value. The first submission is usually based on the contract price, which provides a first glimpse at the borrower's chances of having the loan approved. The last submission is that used in the final origination, with the contract price stated. For both submissions, we have information on whether the loan is approved for GSE or non-GSE securitization. Both approvals certify that the borrower's credit quality fulfills the underwriting criteria, while some borrowers may not be eligible for GSE pools based on their unique requirements.

Not all approved loans are ultimately originated. Our mortgage data set contains a full array of standard mortgage risk attributes used in underwriting and pricing decisions, such as the borrower's credit score and debt-to-income ratio, mortgage products, loan purpose, and occupancy status. After origination, mortgage performance is updated monthly by the servicer until the loan is terminated due to default or prepayment. We define a loan as being in default if the borrower misses one or more payments. Borrowers can also prepay the mortgage with refinancing.

Lastly, we also utilize county- and quarter-level home price data from CoreLogic and county- and quarter-level employment as well as income from the US Census Bureau's County Business Patterns files to measure regional economic outcomes.

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<sup>3</sup> See the HVCC, Section IV, "Prevention of Improper Influences on Appraisers," December 2008 ([http://www.freddiemac.com/singlefamily/pdf/122308\\_valuationcodeof\\_conduct.pdf](http://www.freddiemac.com/singlefamily/pdf/122308_valuationcodeof_conduct.pdf)).

## 3.2 Appraisal Statistics

Our data set contains 3,656,531 appraisals completed by 52,512 unique appraisers. Our sample also includes 4,716 lenders and 522 AMCs. For each of the appraisals, we observe the following information: a unique appraiser identification, an AMC, and a lender; the location and structural characteristics (property condition and prior sale price and date, gross living area, lot size, age, number of bedrooms, etc.) of the subject property; the location and structural characteristics of all comps used in the appraisals; differences in structural characteristics between the subject and comps; adjustments made by the appraiser; the final appraised value; the contract price; and the value estimated by a proprietary AVM. The AVM resembles a comparable appraiser sales approach in which comps are selected and adjustments made by the AVM, based on a set of location and structural characteristics.

<<Insert Table 1>>

Panel A of Table 1 presents summary statistics for the appraisals. The average contract price is \$298,246. The appraised value differs from the contract value by 1.4%, on average, and from the AVM value by 8.3%. The average gross living area of the subject property is about 1,968 square feet and the average lot size is about 0.6 acre. The houses in the sample are 33 years old, with about 3.3 bedrooms and two full bathrooms, on average. The property condition and house quality fields are new data fields that did not exist in any previous appraisal or loan data and are only available in this data set, both being on a scale from one to six, with six being the best and one being the worst. The average condition and quality of the homes are 3.0 and 3.5, respectively.

In our data, 70% of the appraisals were conducted through an AMC. A total of 92% of the appraisals were completed by appraisers affiliated with an AMC and the other 8% were carried out by independent contractors.<sup>4</sup> Based on the share of business, we define captive appraisers as those with 85% or more of their business from a single lender. Captive AMCs are defined similarly, with 85% or more of their business from a single lender. Only 6% and 15% of all appraisals are prepared and submitted by captive appraisers and AMCs, respectively. Our data also allow us to further identify business conducted by a captive appraiser or AMC for either a majority or minority lender. A majority lender is the single lender with whom a captive appraiser or AMC has the majority or all of its business connections, while minority lenders are all the other lenders. With these variables, we can differentiate lenders with different levels of market power.

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<sup>4</sup> To address concerns about HVCC implementation costs from low-volume originations, an exception to this provision was created for “small banks” that might find it cost prohibitive to comply with the HVCC’s provisions. A small bank is defined as a financial institution with aggregate assets of not more than \$250,000,000.

We also summarize the location and structural characteristics of comps relative to their respective subject properties. On average, each appraisal uses 3.9 comps. It takes 21.5 days for appraisers to deliver an appraisal report from the time the house goes under contract. Most comps are transacted in the same quarter as the appraisal, but, on average, they are transacted 1.4 quarters (or four months) earlier. Distance-wise, these comparable properties are, on average, 0.63 mile away from their subject property. The average differences in gross living area, lot size, and age are -5.5%, -7.1%, and 0.7 years, respectively. The reported condition and construction quality of the comps are very similar to those of the subject property. Appraisers also make significant adjustments to reflect these differences, with adjustments of \$15,000, on average, accounting for 5.8% of the average contract price. Adjustments for time differences alone average only \$530.

Panel B of Table 1 displays summary statistics of the variables aggregated at the appraiser–lender level. A small number of appraisals are dropped because of missing appraiser or lender information. Each appraiser in our sample completed about 9.2 appraisals per lender per month. Of all the appraisals, 5.9 (or 63.8%), 2.6 (or 28.7%), and 0.7 (or 7.5%) are above, exactly at, and below the contract price, respectively. Over the sample period, we are also able to identify about 0.6% of the appraisers who stopped working on appraisals by the end of 2015, so-called exiting appraisers. We use them to test the hypothesis of reciprocity.

### 3.3 Loan Application and Performance Statistics

Once a house is under contract, the buyer has 30 to 60 days to secure financing to settle the transaction on time. Appraisal is among the first inputs requested by a loan officer. Our data allow us to link appraisals to 1.6 million loan applications. In each loan application, the loan officer can submit borrower and loan information multiple times, each resulting in different underwriting outcomes, including the approval or rejection of the loan decision and whether they are eligible for GSE or non-GSE securitization. Our data capture information contained in the first and last submissions for each loan application. The last submission is that used at origination, where the appraised value is used to calculate the LTV, while the first submission is mostly a preapproval process in which loan officers use the contract price to calculate the LTV.

Panels C and D of Table 1 report the statistics of loan applications and performance following origination. Overall, 99.3% of loan applications are approved, reflecting the high quality of post-crisis loan applications. A total of 95.6% of them are approved for GSE securitization, while another 3.7% are approved for non-GSE securitization, which has slightly different underwriting criteria (e.g., a maximum debt-to-income ratio). The LTV at origination is calculated as the ratio of the loan amount to the minimum of the appraised and contract values, which is 81.3%, on average. The borrower’s credit score (FICO) is the representative score, calculated as the median of the three FICO scores from Equifax, TransUnion, and Experian. The average FICO score is 750, reflecting pristine borrower quality and tight underwriting

standards following the financial crisis. The cumulative default and prepayment rates as of December 2016 of all the originated loans are 0.35% and 16.7%, respectively.

### 3.4 County-Level Statistics

In addition, we obtain the following quarterly economic variables at the county level: the growth rates of median home prices, total non-farm employment, and median household income. In Panel E of Table 1, we show that the average quarterly growth rates of three economic outcomes during the sample period are 1.9%, 0.65%, and 1.84%, respectively, indicating that most of the country was in steady economic recovery.

### 3.5 Distribution of Appraisals

We first plot the relative frequency of appraisals over appraisal–contract value differences (green bars) in Figure 1. The distribution is highly right skewed, with 92.5% of appraisals at or above the contract value to help facilitate transactions. The other 7.5% of appraisals below the contract value would result in the delay, cancellation, or renegotiation of the original contracts. More strikingly, a sharp spike in the frequency of appraisals appears at or near the contract value, at about 42%. A total of 31% of appraisals are bunched exactly at the contract value and the other 11% are very close, within 0.5% of the contract value. This result suggests that the appraised value may be endogenously determined by the disclosed contract.

<<Insert Figure 1>>

It is possible that appraisers have conducted their due diligence and the distribution should be skewed. To validate the observed distribution, we plot the distribution of appraisals based on two different additional valuations. Our first series is the frequency of appraisals over the difference between ex ante AVM and ex post contract values, as plotted in Figure 1. Our second series is based on appraisals that are from the same appraisal data, not for arm’s length transactions, as in the first series, but for distressed properties owned by banks, so-called real estate–owned properties. These appraisals are ordered directly by banks, instead of loan officers, to list the property on the market for sale. Thus, no contract is readily disclosed at the time of appraisal. The third series in Figure 1 is the frequency of appraisals based on the differences between appraisals and an AVM benchmark value for the same sample on which the first series is based. The AVM does not consider the contract value to derive real-time valuations, even though this value is available. Both the AVM and appraisals employ a similar comparable–sales approach but apply different criteria or weights when selecting and adjusting comps.

The second and third series look surprisingly similar. Both follow a normal distribution with appraisals symmetrically distributed on both sides of the contract value. There is no discontinuity or spike at any particular value. The contrast with appraisal–contract differences suggests that appraisers are more aligned with loan officers and banks, delivering

disproportionally more appraisals at or above the contract value and much fewer below the contract value than they should according to alternative valuations, either in a different setting or by a different agent. The 41% of appraisals bunched at or near the contract value reflect the role of anchoring in appraisers' behavior, through which they try to deliver the most appraisals that would meet lenders' criteria for completing transactions.

#### **4. Empirical Analysis**

In this section, we conduct an empirical analysis to explain appraiser behavior. There are many explanations for appraiser behavior. We focus on three that could affect appraisers' profession conduct: 1) reputational or career concerns, 2) moral hazard, and 3) the assumption that contract prices reflect true housing values. Our main empirical strategy is to explore the panel structure of appraiser–lender pair data and use appraiser, lender, and county fixed effects to control for time-invariant variables.

##### **4.1 Reputational Concerns**

We first study the reputational concerns of appraisers.<sup>5</sup> Due to the appraisal contingency clause and LTV requirement in the underwriting process, the vast majority of transactions are delayed, renegotiated, or canceled when the appraised value is below the contract value, which would lead to a direct revenue loss for loan officers and banks. Appraisers' career concerns lead them to be more aligned with loan officers and banks than with homeowners by making sure the transactions proceed as originally contracted so that every party is compensated. In doing so, they must consider the contract value as an important reference point in appraising and produce significantly more appraisals at or above the contract price than below to avoid being disruptive. This disproportional appraisal behavior will be eventually rewarded in the marketplace in the form of more business from lenders. When an appraisal comes in below the contract price, although this may benefit homeowners' interests, the appraiser will be punished in the form of losing business from lenders.

The first prediction of reputational concerns is that appraisers will tend to avoid below-contract appraisals and a portion of appraisals just below the contract prices will be missing. In Figure 2, we plot the hypothetical response of appraisers to the contingency clause regarding below-contract appraisals. The dashed green line represents the theoretical distribution of appraisals in the absence of a contract value. It follows a normal distribution, with equal probabilities of coming in above and below the contract value. However, because of the contingency clause, which allows buyers to renege on the original contract when the appraisal comes in below the contract price, the actual distribution of appraisals will follow the solid red line. A significant amount of appraisals will be shifted upward to be exactly at the contract value. It is also

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<sup>5</sup> There is much evidence on career consequences in the performance of independent board directors (Farrell and Whidbee 2000; Yermack 2004; Coles and Hoi 2003; Harford 2003; Jiang, Wan, and Zhao 2015).

possible that part of the appraisals that used be above the contract value could be shifted downward to be exactly at the contract value, so that the overall appraisal portfolio of a particular appraiser will look less skewed. The pattern in Figure 1 is consistent with this prediction.

<<Insert Figure 2>>

The second prediction of reputational concerns is that appraisers will be rewarded with more business for at- or above-contract appraisals but punished by less business for below-contract appraisals. Appraisers will deliver more at-contract appraisals when they receive more business from lenders. We test this argument by analyzing the relation between business volume at the appraiser–lender level and the quality of appraisals transacted between the pair. We first test the effect of different appraisal types on future business and then test the effect of business volume on appraisers’ future behavior:

$$\begin{aligned} \#Appraisals_{a,l,t} = & \beta_1 \times \#AtCntrAppraisals_{a,l,t-1} + \beta_2 \times \\ & \#BelowCntrAppraisals_{a,l,t-1} + FE_a + FE_l + FE_{cnty} + FE_{yymm} + \epsilon_{a,l,t}, \end{aligned} \quad (1)$$

where we regress the number of appraisals by appraiser  $a$  to lender  $l$  in time  $t$  on the number of at- and below-contract appraisals transacted by the same appraiser–lender pair in the previous month, while controlling for the total number of appraisals in previous month and appraiser, lender, county, and appraisal year and month fixed effects. The coefficients  $\beta_1$  and  $\beta_2$  capture the effect of changes in specific types of appraisals by an appraiser to a lender on their business relationship. The results are reported in Table 2.

The results in Table 2 suggest that an increase in at-contract appraisals has a similar impact on appraisers’ future business volume compared to above-control appraisals, while an increase in below-contract appraisals has a significant negative effect on business volume. Alternatively, we can interpret the results as follows, with appraisals at or above the contract value significantly increasing future business volume relative to below-contract appraisals. All else being equal, one more below-contract appraisal in the previous month reduces the number of appraisals the appraiser will receive from the same lender next month by 0.0372, or 3.7%. We also regress the number of appraisals in the current month on the percentage of at- and below-contract appraisals and the results are reported in Column (2). The results are similar to those in Column (1), suggesting that only below-contract appraisals have a negative effect on the future business of the appraiser, of -2.0%, while there is not much difference between appraisals at and above the contract price. We also repeat the same regressions in Table 2 with additional variables, namely, the number of at- and below-contract appraisals the appraiser made for other lenders. The results suggest that appraisers are also penalized for below-contract appraisals they made elsewhere. This result is consistent with the study of Jiang, Wan, and

Zhao (2015) on the voting behavior of independent directors and the career consequences of their dissension. It also relates to the work of Khanna, Kim, and Lu (2015) that evaluates the connections CEOs develop with top executives and directors through their appointment decisions.

<<Insert Table 2>>

Our third prediction of reputational concerns is that appraisers will be also punished by less business for appraisals far above the contract price. Although above-contract appraisals generally help smooth transactions, those that are far above the contract price are perceived as having appraisal bias, which reflects poor overall loan quality as well as predicts higher default risk, as documented by Agarwal, Ben-David, and Yao (2015) and Piskorski, Seru, and Witkin (2015). In the aftermath of the financial crisis, appraisals that are significantly different from the model view as well as those with significant perceived appraisal bias are considered potential violations of representations and warrants and are ultimately subject to buybacks (Fannie Mae 2014). In Table 2, we also include the number of appraisals far above the contract price in the previous month, defined as appraisals that are at least 15% higher than the contract values. All else being equal, one more appraisal that is far above the contract price in the previous month reduces the appraiser's business from the same lender by 5.6% based on the number of appraisals and by 2.1% based on the fraction of appraisals, compared to appraisals that are less than 15% above the contract price. The magnitude of the coefficient is greater than that of below-contract appraisals. This result supports the contention that appraisers are also punished for delivering appraisals far above contract prices and thus being perceived as having a higher appraisal bias.

Related to the second and third predictions is our fourth prediction of reputational concerns regarding the length of the business relationship. For the same reason, appraisers are expected to be rewarded with a longer business relationship for at- and above-contract appraisals but punished by termination of the business relationship for below-contract appraisals. This prediction is also related to the literature on incentives and contract design. Gachter and Falk (2002) find that, based on an experimental setting, long-term relationships are important for trading parties in a repeated game and reciprocity reinforces incentives. Brown, Falk, and Fehr (2004) show that, without third-party enforcement, principals and agents in a long-term relationship have better outcomes. In our setting, banks and appraisers often form long-term relationships in a repeated game. Based on our sample, we predict a positive relation between high-quality appraisals and business volume and a negative relation between low-quality appraisals and business volume in the appraiser-lender relationship. Appraisal is largely a relational contract. In retrospect, intertemporal incentives in repeated games can strengthen the relationship when an appraiser delivers fewer low-quality appraisals.

We capture the total length of the relationship of the pair and analyze the relation between it and the quality of appraisals. We find a direct relation between the length of the business relationship and the share of above-contract appraisals between the pair, no relation between



the relationship and the volume of at-contract appraisals, and an inverse relation between the length of the relationship and the share of below-contract appraisals.

<<Insert Figure 3>>

In Figure 3(a), we plot three series representing different relationships lengths (in months)—one to two months, two to five months, and six and more months—and the percentage of appraisals that come in above the contract price based on appraiser–lender-level data. There is a positive relation between the length of the business relationship that appraisers have with the lender and the share of above-contract appraisals they transact. The business relationship lasts longer when appraisers deliver more appraisals above the contract value that facilitate transactions. In Figure 3(b), we plot the same three series representing different relationship lengths and the percentage of appraisals that come in exactly at the contract price. There is no positive or negative relation between the business relationship and the volume of at-contract appraisals. In Figure 3(c), we plot the three series and the percentage of appraisals that come in below the contract price. There is a negative relation between the length of the business relationship and the share of below-contract appraisals, suggesting the business relationship lasts longer when appraisers deliver fewer below-contract appraisals.

<<Insert Figure 4>>

We further strengthen our results on relational contracts by designing several experiments based on our data. The results are plotted in Figure 4. In Figure 4(a), we identify two groups of appraisers, both with a clean history of delivering no below-contract appraisals in the first three months since their first appraisal in the sample, and report their business volume over time. One group, the control group, continues to deliver no below-contract appraisals in month 4, while the other group, the treated group, delivers at least one below-contract appraisal in that month. In the figure, all the appraisal volumes are normalized to that in month 1. The experiment resembles a difference-in-differences identification to evaluate the effect of a low-quality product, that is, below-contract appraisals. The figure shows that the two groups receive similar volumes of business before month 4, when the shock occurs to one of them; however, following the shock, the group that delivered the low-quality appraisals immediately receives fewer appraisal orders from the same lender than the other group, from month 5 onward. The gap continues to widen for about six months before it starts to shrink. In Figure 4(b), we plot the results of a similar experiment, but with the shock of negative appraisals taking place in month 7. The results similarly suggest that appraisers are immediately punished for below-contract appraisals, compared to the control group. We also conduct similar experiments based on 12 months and 18 months of history, with similar and consistent results.

We now analyze the effect of business volume on appraisers' future behavior. We focus on at-contract instead of above-contract appraisals as a proxy for appraisers' biased client-pleasing behavior for three reasons. First, above-contract appraisals could be driven by concerns of appraisal bias. Second, significant bunching at the contract value clearly reflects appraiser

anchoring bias. Third, unlike above-contract appraisals, at-contract appraisals are less likely to attract quality reviews from the lender or GSE due to perceived appraisal bias concerns. We test the effect of past business volume on the appraiser's current behavior in the following regression:

$$\#AtCntrAppraisals_{a,l,t} = \beta_1 \times \#Appraisals_{a,l,t-1} + \beta_2 \times (\#Appraisals_{a,l,t-1} \times Type\ of\ Appraiser) + \beta_3 \times Type\ of\ Appraiser + FE_a + FE_l + FE_{yymm} + \epsilon_{a,l,t}, \quad (2)$$

where we regress the number of at-contract appraisals by appraiser  $a$  to lender  $l$  in time  $t$  on the pair's total business volume in the last month, different types of appraisers, and the interaction term of the two while controlling for the number of at-contract appraisals in the previous month, the number of appraisals in the current month, and appraiser, lender, county, and appraisal year and month fixed effects. We distinguish between four types of appraisers with different reputational concerns. The first type consists of exiting appraisers who stopped appraising at the end of our sample period. The second type consists of top performers, who completed more appraisals than 50% of the appraisers in the previous year. The third type consists of appraisers near their capacity, that is, those in the 90th percentile of completed appraisals. They are near their physical capacity, given the efforts required to complete each appraisal. The last type consists of captive appraisers, who did the vast majority of their business with a single lender. We distinguish between appraisals that captive appraisers conducted with their majority lender versus minority lenders to capture the effects of different relationships. Among the four types of appraisers, the first has the fewest concerns about their career opportunities.

<<Insert Table 3>>

The results are reported in Table 3. In Column (1), we show a significant positive relation between business volume in the prior month and this month's number of at-contract appraisals, suggesting that reputational concerns motivate the appraiser to deliver more high-quality appraisals in the future. Each extra appraisal the previous month increases the number of at-contract appraisals in the current month by 0.0955, or 9.6%. With 9.2 appraisals, on average, per appraiser and lender every month, the total effect on the number of at-contract in the future is about one. In Column (2), we include a dummy variable for exiting appraisers and its interaction with appraisal volume in the previous month. The results show that, although exiting appraisers deliver 0.1466 more at-contract appraisals over the sample period, or 1.6% of the average appraisals per appraiser (= 0.1466/9.2), they deliver significantly fewer such appraisals as a percentage of their past business, namely, 0.1081 less per past appraisal, or 10.8%, than they would otherwise under normal circumstances. In Column (3), we include a dummy variable for top-performing appraisers and its interaction with appraisal volume in the previous month. Top performers, because of their success, should have recognized the importance of business relationships and managed them very well in the past. The results

suggest that, although these appraisers produce 0.3091 fewer at-contract appraisals, or 3.4% (= 0.3091/9.2) of average appraisals, on average, their marginal increase in at-contract appraisals as a function of past volume is much greater, 0.1861 more per past appraisal, or 18.6%, than for other appraisers.

In Column (4) of Table 3, we include a dummy variable for near-capacity appraisers and its interaction with appraisal volume in the previous month. Near-capacity appraisers are a subset of top performers who did so well that they are approaching their maximum physical capacity for completing appraisals. The results suggest that, although these appraisers and top performers make 0.278, or 3%, fewer at-contract appraisals, on average, the marginal increase in at-contract appraisals as a function of their past business is smaller, only 0.0489 more per past appraisal, or 4.9%, than that of the latter, suggesting that capacity constraints prevent extremely busy appraisers from being more aggressive. In Column (5), we include two dummy variables for captive appraisers doing business with their majority and minority lender clients, respectively. The results suggest that the captive appraisers, on average, deliver 0.2553 more at-contract appraisals, or 2.8%, to their majority lender client but 0.1892 fewer such appraisals, or 2.1%, to their other clients. However, the marginal change in at-contract appraisals delivered to both lender types as a function of past business is actually negative for captive appraisers, 0.0251 and 0.1540 less per past appraisal (2.5% and 15.4%), respectively. For majority clients, the marginally significant negative elasticity is likely due to an already high fraction of at-contract appraisals, whereas, for minority clients, the negative coefficient of the interaction term clearly reflects a lack of incentive to appeal to less important clients.

If appraisers bunch to satisfy their lender clients, market competition is expected to intensify the relationship. We now test the degree of market competition by regressing a bunching indicator on three measures of market competition: the Herfindahl–Hirschman Index (HHI), based on the market share of appraisers at the county, zip code, and lender levels, respectively. A higher HHI indicates less competition and greater concentration. The regressions take the following form:

$$D(\text{AtCntrAppraisal}_i \text{ or } \text{AboveCntrtAppraisal}_i) = \beta_1 \times \text{HHI}_l + \gamma \times \text{PropertyAttribute}_i + FE_a + FE_l + FE_{cnty} + FE_{yymm} + \epsilon_{a,l,t}. \quad (3)$$

The results are reported in Table 4. In all three regressions, the HHI has a significant negative effect on bunching activities. The effects are estimated at -0.0284, -0.1119, and -0.0116 for competition among appraisers at the county, zip code, and lender levels, respectively, suggesting increased competition significantly increases the incidence of bunching. The implication for institution design is that independent examiners should have greater market power.

<<Insert Table 4>>

In sum, we show that a portion of the appraisals' distribution is missing below the contract prices. Appraisers are rewarded with a larger business volume and longer business relationships for at- and above-contract appraisals but punished by a smaller business volume and termination of the business relationship for below-contract appraisals. These results are consistent with the explanation of appraisers' reputational concerns.

#### 4.2 Role of AMCs

The analysis above shows that career concerns for future business are an important driver of appraiser behavior. When appraisers receive more business from a lender, they provide more at-contract appraisals. Relative to below-contract appraisals, at- and above-contract appraisals increase future business volume. The business relationship lasts longer when the appraisers deliver more above-contract appraisals and fewer below-contract appraisals.

The explanation of reputational concerns has another prediction similar to that of Brown, Falk, and Fehr (2004): when the appraisers are anonymous to the lenders, reputational concerns diminish due to the breakdown of long-term relationships; therefore, we should observe fewer at-contract appraisals. The implementation of the HVCC provides an ideal setting to test this prediction. Under the HVCC, lenders request appraisals from AMCs and the AMCs assign appraisals to an appraiser. The lenders cannot directly choose the appraisers and, thus, there is no long-term relationship between appraisers and lenders. Since we do not have any appraisal data from before the HVCC, we cannot conduct an analysis on the impact of the introduction of the HVCC on appraiser behavior. Our empirical strategy is to explore the panel structure of appraiser–lender pair data and use appraiser, lender, and county fixed effects to control for time-invariant variables. In this case, we compare appraisals with and without AMCs from the same appraiser with the same lender in the same county in the same month.

<<Insert Figure 5>>

Figure 5 compares appraiser behavior with and without AMCs. In Figure 5(a), we plot the average number of above-contract appraisals for those appraisers who went through an AMC versus those who did not. Those who worked with an AMC delivered much fewer above-contract appraisals than others throughout the sample period. We further explore the same series based on higher thresholds, for example, appraisals that are 1%, 5%, 10%, 15%, and 20% above the contract, but did not include them in the figure. The gap in the share of above-contract appraisals between those who worked with an AMC and those who did not is consistently negative and nearly zero for lower thresholds and significantly wider for higher thresholds. These results suggest that AMCs play an important role in mitigating higher appraisal values as banks strive to combat perceived appraisal bias.

Figure 5(b) shows the average number of at-contract appraisals for appraisers who worked with an AMC versus those who did not. There is virtually no difference between the two groups of

appraisers. This result suggests that it is common practice among appraisers to bunch at the contract value, regardless of the presence of an AMC. In Figure 5(c), we plot the average number of below-contract appraisals for those who worked with an AMC versus those who do not. These are less desirable products that would disrupt the transaction. We find that appraisers who worked with an AMC delivered many more appraisals that came in below the contract throughout the sample period. We conduct *t*-tests on the differences between the two groups and find them to be statistically significant from zero. Taken together, our results suggest that AMCs have established norms in the profession that help prevent extreme valuations at both tails of the distribution.

<<Insert Table 5>>

Table 5 shows the results for appraiser behavior and AMCs. In Columns (1) and (2), we restrict our sample to at- and below-contract appraisals, respectively. In Columns (3) and (4), we restrict our sample to above- and below-contract appraisals, respectively. In Column (1), the results show that appraisals with AMCs are 1.1% less likely to come in exactly at the contract value. The coefficient is significant at the 1% level. The results are consistent with reputation concerns diminishing due to a breakdown in long-term relationships.

In Column (2) of Table 5, we separately report the results from the regression on captive AMCs and their majority or minority lenders. There are four categories of transactions in the data: business conducted by captive AMCs with majority lenders and with other lenders separately, business conducted by non-captive AMCs, and business conducted without an AMC. The last category is the benchmark, with a zero coefficient. We report the coefficients for the first three categories. These results show that, compared to appraisals with no AMC involved, those through captive AMCs have a similar likelihood of delivering at-contract appraisals. However, the chances of delivering at-contract appraisals are much smaller for non-captive AMCs, by 0.7%, as well as for captive AMCs with minority lender clients, by 1.8%. We also conduct *t*-tests comparing the coefficients for captive AMCs with a majority lender with the coefficients for captive AMCs with minority lender clients, as well as non-captive AMCs. Captive AMCs are 1.8% more likely to deliver at-contract appraisals to their majority clients than to other clients and 0.5% more likely to do either than non-captive AMCs. Both differences are significant at the 10% level. Thus, although fewer appraisals with AMCs are at the contract price, on average, captive AMCs are more likely to deliver more at-contract appraisals to their majority clients to maintain their relationships.

The results in Column (3) of Table 5 show that appraisals with AMCs are 0.68% less likely to come in above the contract value, with magnitudes smaller than those of at-contract appraisals. We also conduct *t*-tests on the coefficients of three different AMCs, as reported in Column (4). Captive AMCs deliver a significant 0.6% more at-contract appraisals to their majority clients than to other clients but are not statistically different from non-captive AMCs in terms of their likelihood of delivering above-contract appraisals.

In Columns (5) and (6) of Table 5, we further analyze the relation between appraiser behavior and AMCs at the appraiser–lender level. In Column (5), we study the relation between the number of at-contract appraisals and the AMC indicator. We find 0.0618, or 0.7% ( $= 0.0618/9.2$ ), fewer at-contract appraisals in the appraiser–lender pair when AMCs are involved. The coefficient is significant at the 1% level. In Column (6), we study whether AMCs diminish the relation between business volume in the prior month and the current month’s number of at-contract appraisals. First, the coefficients for the three different AMCs are all negative, with captive AMCs with majority clients having most at-contract appraisals. The results are very similar to those in Column (2). Second, consistent with Table 3, there is a significant positive relation, with an elasticity of 0.0896, between business volume in the previous month and the current month’s number of at-contract appraisals. Third, the coefficient of the interaction term of the past business volume and captive AMCs with other lenders is -0.0350 and significant at the 5% level. This finding suggests that the relation between past business and at-contract appraisals now diminishes when captive AMCs conducting business with other lenders are involved, compared to appraisals with no AMCs, in the appraiser–lender pair. The coefficient of the interaction term between past business volume and captive AMCs with majority lenders is +0.0186 ( $0.2\% = 0.0186/9.2$ ) and significant at the 5% level, suggesting that the relation is stronger for appraisals by captive AMCs for majority lenders. There is no statistically different relation between past business volume and current at-contract appraisals for non-captive AMCs compared to that for no-AMC appraisals.

In sum, we show that appraisals with AMCs are less likely to come in exactly at the contract value. This result suggests that reputation concerns diminish due to the breakdown of long-term relationships. The implication for institution design is that independent examiners should be assigned anonymously or randomly to incur only one-time relationships. The analysis for appraiser–lender pairs is also consistent: the relation between business volume and the number of at-contract appraisals is weakened. These results further support the explanation of appraisers’ reputational concerns.

#### 4.3 Moral Hazard

One alternative explanation for appraiser behavior is moral hazard. The appraisal work is characterized by features that induce moral hazard. First, the actual effort is unobserved and there are no objective criteria for evaluating the quality of appraisals. Second, the service fee is fixed, regardless of the quality. Naturally, an appraiser maximizes his or her profits by maximizing the number of appraisals completed in a given time or by minimizing the amount of time or effort spent on individual appraisals. Thus, appraisers are likely to produce more bunching appraisals to minimize their efforts after they observe the contract prices, but not necessarily for their career concerns. In this section, we test this hypothesis as a possible explanation for the observed appraiser behavior. Moral hazard implies that appraisers exert less effort on at-contract appraisals than on below- and above-contract ones. We measure their

efforts by the number of comparable properties they choose during the appraisal process and the time they spend on completing the appraisal. We estimate a linear probability regression of the following form:

$$Effort = \beta_1 \times D(AtCntrAppraisal_i) + \beta_2 \times D(BelowCntrtAppraisal_i) + \gamma \times PropertyAttribute_i + FE_a + FE_l + FE_{cnty} + FE_{yymm} + \epsilon_{a,l,t}, \quad (4)$$

where  $\beta_1$  and  $\beta_2$  measure the differences in effort for at- and below-contract appraisals, respectively, relative to above-contract appraisals. The results are reported in Table 6.

<<Insert Table 6>>

The results in Column (1) of Table 6 show significantly more comps, 0.0346 (0.9% = 0.0346/3.865) more, used in at-contract appraisals and 0.1977 (5.1% = 0.1977/3.865) more used in below-contract appraisals relative to above-contract appraisals. This result suggests appraisers prepare the most comps in below-contract appraisals, the second most in at-contract ones, and the fewest in above-contract appraisals. Appraisers seem to deliberately choose more comps and exert more effort to generate at-contract appraisals, compared with above-contract appraisals, which is not consistent with moral hazard. Reputational concern can help to explain the choices of comps: since appraisers know they will be punished for delivering below-contract appraisals, they can immediately complete above-contract appraisals with the least effort. However, with below-contract appraisals, they need to find more comps to try to move the appraisal up to be at or above the contract price so that the housing transaction can proceed smoothly. If the appraisals are still below the contract price, the appraisers will have to spend more effort to make sure the report is well justified. The results in Column (2) show that appraisers spend significantly less time completing both at- and below-contract appraisals than comparable above-contract appraisals, by 5.7% and 3.0%, respectively. A *t*-test between the two coefficients confirms that they are not statistically different from zero, suggesting appraisers spend similar amounts of time on at- and below-contract appraisals, but significantly less than for above-contract appraisals. Nevertheless, all these results do not support moral hazard as a plausible explanation for the observed bunching of appraisals.

We also explore possible differences in the structural characteristics of the subject properties as well as the comps used in the three types of appraisals, namely, below-, at- and above-contract appraisals (see Tables A1 and A2 in the Online Appendix). We find that above-contract appraisal properties are more likely to be larger, older, and in much worse condition, compared to below-contract ones. It is possible these houses are less liquid in the housing market, there are fewer comps available, and appraisers thus have to spend more time on these appraisals.

#### 4.4 Contract Prices Reflect True Housing Values

Another possible explanation of appraiser behavior is that contract prices reflect the true housing values and independent appraisals are supposed to be near the contract values. This

explanation implies that we should observe more appraisals concentrated around contract values when the appraisals reflect the true housing price. When the appraisal is farther from the true housing values, the proportion of at-contract appraisals should be lower. We use AVM values as a proxy for true housing prices to test the explanation by analyzing the relation between the fraction of at-contract appraisals and appraisal–AVM price differences.

<<Insert Figure 6>>

In Figure 6, we plot the fraction of at-contract appraisals ( $x$ -axis) among all appraisals over the percentage difference between appraised and model values ( $y$ -axis). The smaller absolute difference indicates that appraised values are more likely to reflect true market values. We find that about 30% of appraisals are exactly at the contract price when the difference between the appraisal and the AVM price is less than 1%. Although the proportion of at-contract appraisals diminishes as the contract value becomes smaller than the AVM value, the proportion actually increases as the appraised value becomes greater than the AVM value. Overall, there is a direct relation between the fraction of at-contract appraisals and the differences between appraised and model values. Therefore, bunching is unlikely to be explained by true market values.

## 5. Loan Outcomes

We have shown that career concerns play an important role in contributing to observed appraiser behavior. We now conduct several analyses to verify if the desired appraisals actually make a difference to lenders and homeowners.

### 5.1 Loan Approval

Our first test concerns the effect of different appraisals on mortgage underwriting outcomes. We estimate the following linear probability regressions:

$$\begin{aligned} \text{LoanApproval}_i = & \beta_1 \times \text{AboveCntrAppraisals}_i + \beta_3 \times \text{AtCntrAppraisals}_i + \gamma_1 \times \\ & \text{BorrowerAttribute}_i + \gamma_2 \times \text{PropertyAttribute}_i + FE_a + FE_l + FE_{cnty} + FE_{yyymm} + \\ & \epsilon_{a,l,t} \end{aligned} \quad (5)$$

and

$$\begin{aligned} \text{LoanApproval}_i = & \beta_1 \times \text{AboveCntrAppraisals}_i + \beta_2 \times (\text{AboveCntrAppraisals}_i \times \\ & \text{BorrowerAttribute}_i) + \beta_3 \times \text{AtCntrAppraisals}_i + \beta_4 \times (\text{AtCntrAppraisals}_i \times \\ & \text{BorrowerAttribute}_i) + \gamma_1 \times \text{BorrowerAttribute}_i + \gamma_2 \times \text{PropertyAttribute}_i + FE_a + \\ & FE_l + FE_{cnty} + FE_{yyymm} + \epsilon_{a,l,t}, \end{aligned} \quad (6)$$



where we include two of the most important borrower and loan attributes in mortgage underwriting, the LTV and the FICO score. We define two dummy variables for a high LTV and a low FICO, respectively. These are transactions just at the margin of loan approval and are very likely to break down with less desirable appraisals. In addition, we control for a wide variety of property attributes, loan attributes such as the debt-to-income ratio, loan purpose, occupancy status and first-time homebuyer indicator, and lender, appraiser, county, and time fixed effects. The results are reported in Columns (1) and (2) of Table 7.

<<Insert Table 7>>

The results in Column (1) of Table 7 show that, compared to below-contract appraisals, those exactly at or above the contract value have a significant positive effect on loan approvals, both with estimates of 0.70%. In Column (2), when we add the interaction terms of these two types of appraisals with the dummy variables for a high LTV and a low FICO, the coefficients of the four interaction terms are significant and positive, suggesting that the higher approval rates for at- and above-contract appraisals are mostly for marginal borrowers. An above-contract appraisal can help high-LTV and low-FICO borrowers increase their chances of having their loan approved by 1.7% and 1.8%, respectively. In addition, an appraisal exactly at the contract price can help high-LTV and low-FICO borrowers increase their chances of having their loan approved by 1.8% and 2.1%, respectively. Slightly larger magnitudes of the coefficients for at-contract appraisals confirm the greater gain for these marginal borrowers from appraisals exactly at the contract price. The coefficients of at- and above-contract appraisals are significant and negative, suggesting that the positive effect of desirable appraisals for marginal borrowers is at the expense of a negative effect for borrowers with a high FICO and a low LTV.

## 5.2. Note Rate

Our second test concerns the effect of different appraisals on the mortgage note rate at origination. We estimate equations (5) and (6) with the dependent variable changed to the note rate. The results are reported in Columns (3) and (4) of Table 7 respectively.

The results in Column (3) of Table 7 show that, compared to below-contract appraisals, those exactly at or above the contract value do not have a significant effect on the mortgage rate. In Column (4), when we add the interaction terms of these two types of appraisals with the dummy variables for a high LTV and a low FICO, three of the four coefficients of the interaction terms are significant and negative, suggesting that the note rate is actually significantly lower for marginal borrowers with an at- or above-contract appraisal. An above-contract appraisal can help high-LTV but not low-FICO borrowers reduce their note rate by 1.8 basis points. In addition, an appraisal exactly at the contract price can help high-LTV and low-FICO borrowers reduce their note rate by 1.0 and 1.5 basis points, respectively. The coefficients of at- and above-contract appraisals are significant and positive, suggesting that the positive effect of at-

and above-contract appraisals for marginal borrowers is at the expense of a negative effect for borrowers with a high FICO and a low LTV. The finding is similar to that for loan approvals.

### 5.3.Default

Our third test concerns the effect of different appraisals on mortgage default after loan origination. Since default over a shorter horizon is less affected by changes in the economic environment and has more to do with loan quality at origination, we focus on early default defined as loans that are at least one month past due observed in the first 12 months after origination. We estimate equations (5) and (6) with the dependent variable being a dummy variable for early default. The results are reported in Columns (5) and (6) of Table 7, respectively.

The results in Column (5) of Table 7 show that, compared to below-contract appraisals, at- or above-contract appraisals have a significantly higher early default risk, with estimated effects of 0.13% (significant at the 10% level) and 0.15% (significant at the 5% level), respectively. In Column (6), when we add the interaction terms of these two types of appraisals with the dummy variables for a high LTV and a low FICO, none of the coefficients of the interaction terms are significant, suggesting that the high default risk in at- or above-contract appraisals is not driven by marginal borrowers. How do at- and above-contract appraisals predict higher default risk? One plausible answer is that these borrowers have their mortgages approved through inflated property values and are thus less sustainable compared to others with similar characteristics. We find that, for the same loan amounts, these borrowers' LTV is significantly lower than that of others. Compared to others with a similar LTV and other loan attributes, these borrowers have a lower ability to pay (Agarwal, Ben-David, and Yao 2015).

### 5.4.Refinancing

Our last test concerns the effect of different appraisals on mortgage refinancing outcomes after loan origination. We estimate equations (5) and (6) with the dependent variable being a prepayment indicator. The results are reported in Columns (7) and (8) of Table 7 respectively.

The results in Column (7) of Table 7 show that, compared to below-contract appraisals, those exactly at or above the contract value have a significantly higher prepayment risk, with estimated effects of 0.36% (significant at the 10% level) and 1.18% (significant at the 1% level), respectively. In Column (6), when we add the interaction terms of these two types of appraisals with the dummy variables for a high LTV and a low FICO, none of the coefficients of the interaction terms are significant, suggesting that the high prepayment risk in at- or above-contract appraisals is not due to these marginal borrowers. These homeowners are likely to have higher perceived home value and thus greater perceived home equity available. We also

repeat the regression in Column (7) with additional variables: the change in the interest rate from origination to the last performance month and its interaction with different appraisal types. The results suggest that, with similar changes in interest rate, borrowers with at- and above-contract appraisals are more likely to refinance.

## **6. Macro Evidence**

Our last test involves macro outcomes. We summarize the total number of at- and below-contract appraisals separately by year and quarter and then regress the logarithm of the home price, total employment, and total income on these two appraisal variables along with county, year, and quarter fixed effects. In this specification, above-contract appraisals are the missing benchmark. The results are reported in Table 8. There is a significant negative relation between the number of below-contract appraisals and all three macro outcomes, suggesting that appraisals that come in below the contract value do not help the housing market or economic recovery. There is a significant positive relation between the number of at-contract appraisals and home price growth, suggesting that, by validating many of the contract values, these appraisals help housing recovery even more than appraisals that come in above the contract value. This is possibly because the true value of these transactions that receive appraisals exactly at the contract value could be much lower than the value of those transactions that receive appraisals above the contract value. There is no difference in employment between counties with higher or lower numbers of at-contract appraisals. There is a significant negative relation between the number of at-contract appraisals and income growth, suggesting that the income in these markets is not consistent with appraisal activities.

<<Insert Table 8>>

## **7. Conclusions**

We analyze the behavior of residential appraisers at the loan as well as appraiser–lender levels. The profession faces many constraints from different parties involved in the housing transactions. We focus on an existing contingency in the standard home sales contract that allows the buyer to pull out of a transaction if the appraised value comes in below the contract value. Based on the clause and the literature, we make several theoretical predictions regarding appraiser behavior and we test them using novel data that contain detailed appraisal information linked to loans.

Our empirical study presents several key takeaways. First, there is a sharp spike in the frequency of appraisals at or near the contract value, at about 42%, 31% of which are bunched exactly at the contract value. Only 7.5% of the appraisals come in below the contract value, which would result in a delay, cancellation, or renegotiation of the original contract. This result is in contrast with the distributions of appraisals based on two alternative valuation methods.

Second, we find a significant negative relation between the number of below-contract appraisals and the appraiser's future business volume from the same lender, while the effect of at-contract appraisals is very similar to that of above-contract appraisals. This relation weakens with increasing lender competition. The results suggest that below-contract appraisals, due to their adverse impact on the transaction, are considered less desirable than the other two types and appraisers are punished for producing them. We also show this result using a cleaner experimental setting. Third, we find that top-performing and captive appraisers whose businesses are dominated by a single lender deliver more desirable appraisals overall, as well as conditional on their past business, out of career concerns. Fourth, intermediary AMCs mandated by the HVCC play an active role in mitigating extreme appraisals. Fifth, appraisers are also incentivized to produce more desirable appraisals to minimize their efforts and please important clients.

We also confirm that such appraiser behavior, in the end, helps homeowners and other parties close the deal and reduce the mortgage rate, especially marginal borrowers. Affected homeowners with favorable appraisals tend to be associated with higher default and refinance risks. These effects also have a macro impact.

Our results have several implications for the institution design in the market of appraisers. First, we find that increased competition among appraisers significantly increases the incidence of bunching. The implication for institution design is that independent examiners should have greater market power. We also find that AMCs significantly reduce the incidence of bunching. The implication for institution design is that independent examiners should be assigned anonymously or randomly to produce one-time relationships.

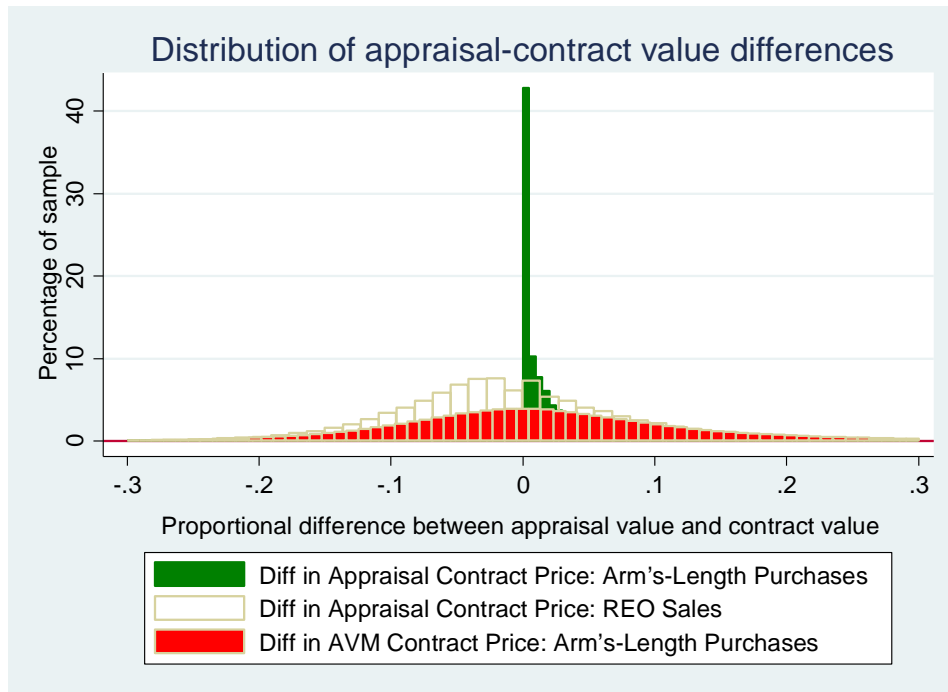
With the development of information technology, the appraisal process has become mostly computerized. One policy implication in the appraiser market is the design of a two-stage mechanism that uses automatic appraisals to replace some human appraisals. In the first stage, all loan officers use automatic appraisals. If buyers or sellers do not agree with the appraisal, they can request a human appraisal to reevaluate the house. With a sophisticated appraisal program, automatic appraisals could potentially reduce costs, avoid bunching problems, and thus improve the independence and quality of appraisers.

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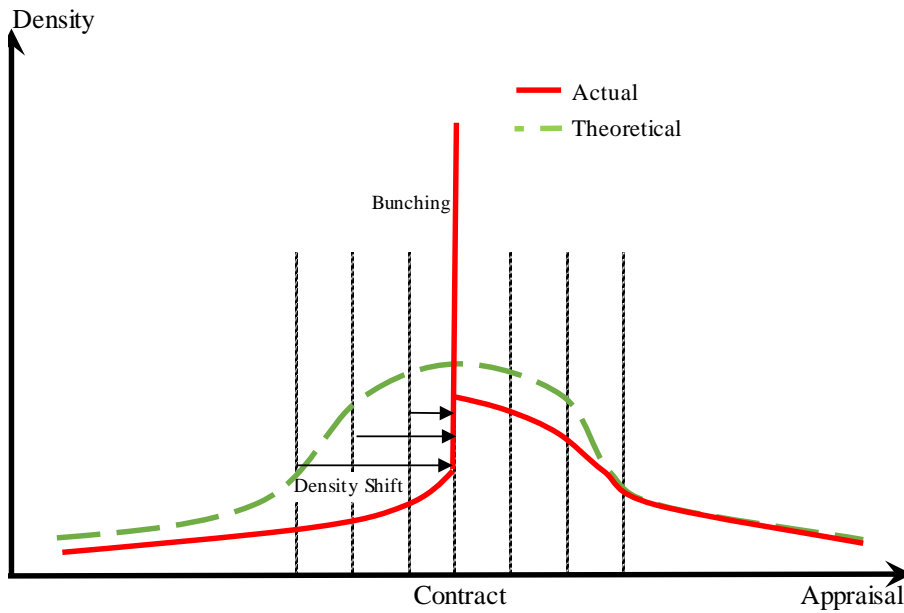
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Figure 1 Distribution of Appraisal–Contract Differences



Note: This figure plots the relative frequency of appraisals over appraisal–contract values or AVM–contract value differences. The green bars denote the frequency of appraisals over the difference between appraised and contract values for arm's length transactions. The white bars denote the frequency of appraisals over the difference between appraised and ex post contract values for distressed properties owned by banks, so-called real estate–owned properties. The red bars denote the frequency of appraisals based on the difference between appraisals and an AVM benchmark value.

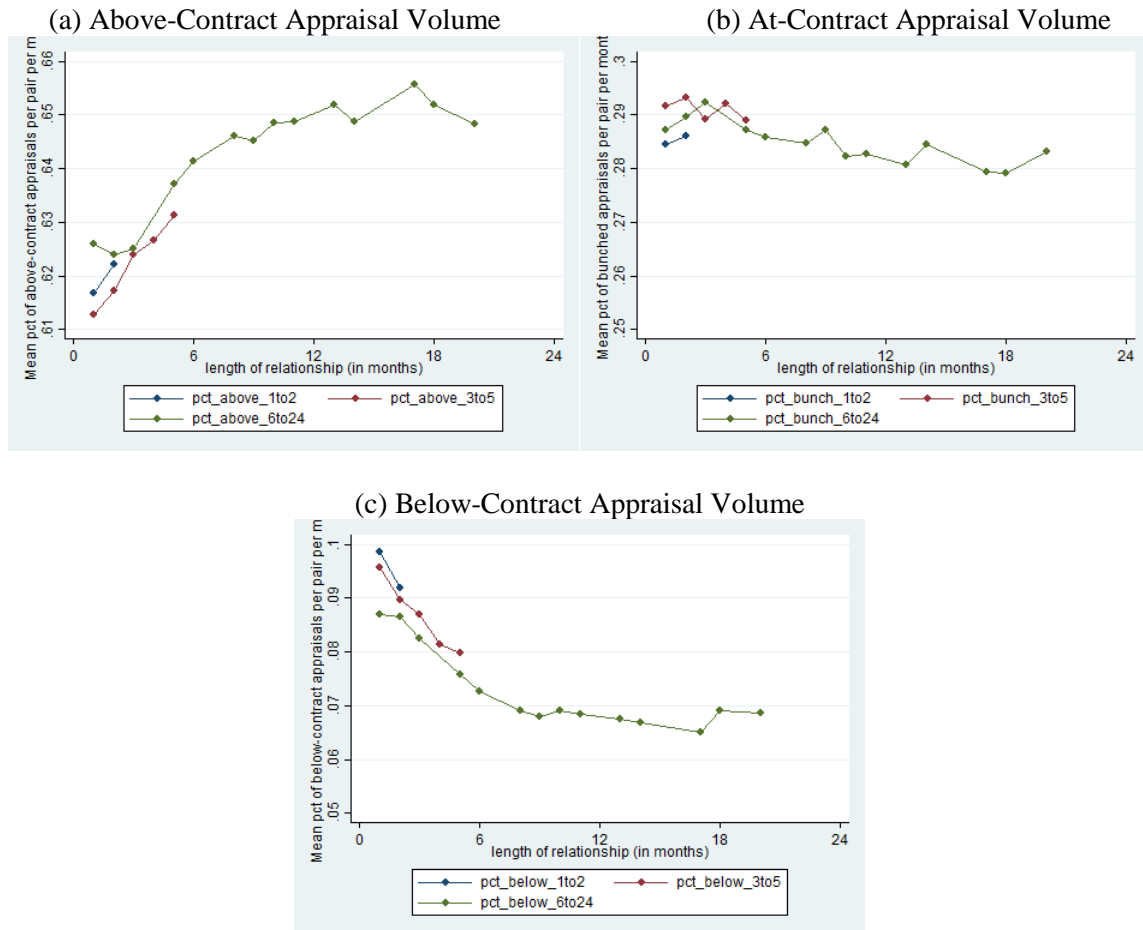
Figure 2 Expected Intensive Appraisal Responses



Note: This figure shows the hypothetical response of appraisers to the contingency clause regarding below-contract appraisals. The dashed green line represents the theoretical distribution of appraisals in the absence of the contract value. The actual distribution of appraisals will follow the solid red line. Because of the disruptive nature of below-contract appraisals, appraisers would shift the appraisals from the left to exactly at or slightly above contract values, causing a significant amount of bunching at the contract value.

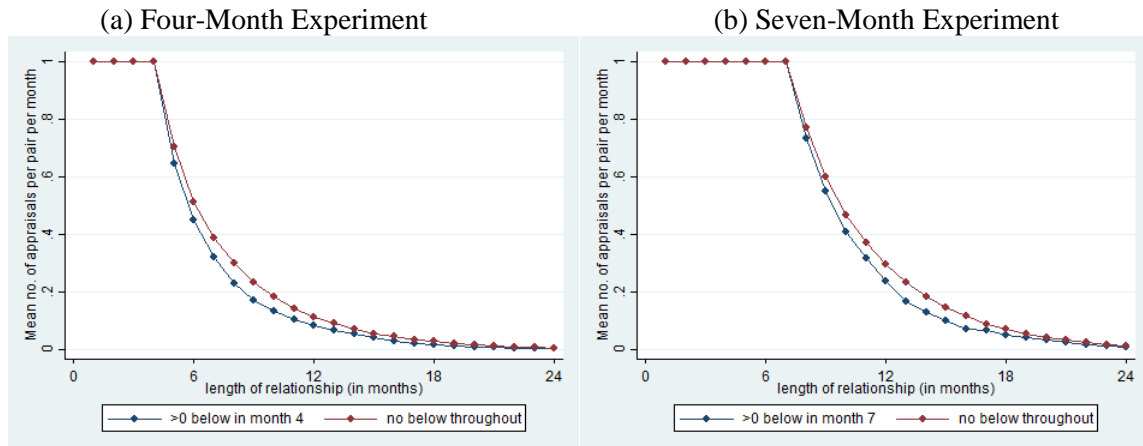


Figure 3 Different Appraisals and the Length of the Business Relationship



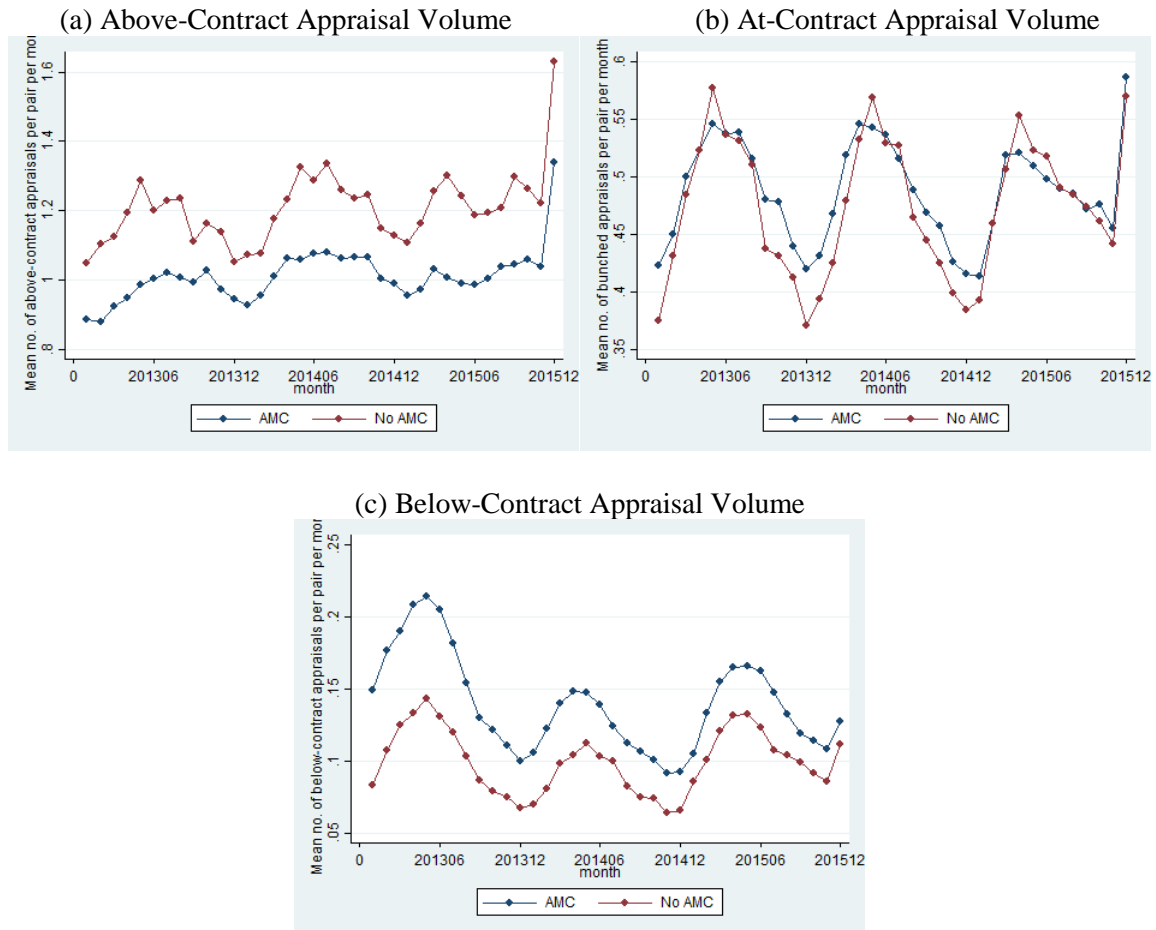
Note: In panel (a), we show that the percentage of above-contract appraisals increases with the length of the relationship, regardless of the total length. This result suggests that above-contract appraisals help appraisers retain longer-term relationships and long-term relationships reinforce reputation effects. In panel (b), we show that the percentage of bunched appraisals does not vary with the length of the relationship. In panel (c), we show that the percentage of below-contract appraisals decreases with the length of the relationship. The longer the overall relationship, the more damaging the effect on business volume. This finding suggests that below-contract appraisals have a detrimental effect on long-term relationships and long-term relationships reduce the incidence of non-cooperation.

Figure 4 Below-Contract Appraisal Experiments



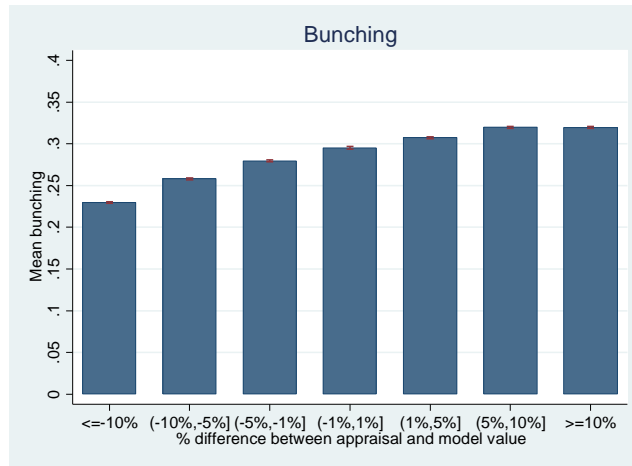
Note: In a cleaner setting, we show lenders' responses in assigning business to appraisers who deliver different types of appraisals. As soon as lenders receive any below-contract appraisals that terminate the entire deal, appraisers will receive less business.

Figure 5 Role of AMCs



Note: We show the difference in appraisal quality between appraisers working for AMCs and independent appraisers. The three charts show that those with AMCs deliver fewer above-contract appraisals and more below-contract appraisals. Since, in the case of AMCs, loan officers and lenders cannot directly contact the appraisers, the results suggest that independent appraisers are more responsive in delivering more desirable appraisals.

Figure 6 Bunching and Model-Contract Differences



Note: This figure shows the relation between the fraction of at-contract appraisals and contract-AVM price differences. The horizontal axis represents the difference between the contract price and the AVM value. The vertical axis represents the proportion of bunching appraisals. The smaller absolute difference between the appraisal and model value indicate that appraisals are more likely to be true market values. The overall direct relation between the fraction of at-contract appraisals and value differences suggests that the proportion is not the highest where the appraisal is closest to the model value.

Table 1 Summary Statistics

<u>Panel A: Appraisal Level Stats</u>		<u>Panel A - continued</u>	
<i>Values</i>		Difference in Ln(Lot)	-7.144 (0.908)
Contract Price	298,246 (168,062)	Difference in Age	0.696 (10.82)
% Diff b/w Appr and Contract Values	0.0143 (0.0481)	Difference in Condition	0.00368 (0.341)
At-Contract Appraisals	0.305 (0.460)	Total Adjustments (\$1,000)	14.94 (14.05)
% Diff b/w Appraisal and Model Values	0.0833 (0.0822)	Adjustments for Time (\$1,000)	0.530 (2.913)
Appraisal within 5% of Model Value	0.421 (0.494)		
<i>Subject Properties</i>		<u>Panel B: Appraiser-Lender Pair Level Stats</u>	
Gross Living Area (GLA)	1967.7 (750.5)	No of At-Contract Appraisals	2.450 (18.82)
Lot Size	25816.7 (88853.9)	Pct of At-Contract Appraisals	0.287 (0.367)
Property Age	33.37 (27.28)	No of Below-Contract Appraisals	0.673 (5.705)
No of Bedrooms	3.260 (0.793)	Pct of Below-Contract Appraisals	0.0756 (0.215)
No of Bathrooms	2.040 (0.668)	No of Appraisals	9.222 (72.99)
Condition	2.978 (0.706)	No of Comps	3.843 (0.795)
Quality	3.532 (0.584)		
<i>Appraiser's Business Connections</i>		<u>Panel C: Loan Application Stats</u>	
AMC is used	0.702 (0.457)	Approval	0.993 (0.0847)
Affiliated Appraisers	0.923 (0.267)	Approval for GSE Securitization	0.956 (0.204)
Captive Appraisers w/ Minority Lender	0.00359 (0.0598)	Approval for Non-GSE Securitization	0.0365 (0.187)
Captive Appraisers w/ Majority Lender	0.0596 (0.237)	Last_LTV	81.34 (13.87)
Captive AMCs w/ Majority Lender	0.00402 (0.0633)	Last_FICO	750.4 (46.66)
Captive AMCs w/ Minority Lender	0.148 (0.356)		
<i>Comparables</i>		<u>Panel D: Loan Performance Stats</u>	
No of Comparables	3.865 (0.877)	Default	0.00352 (0.0592)
Time from Contract to Appraisal (Days)	21.47 (67.01)	Prepay	0.167 (0.373)
Difference in Time (in Quarters)	1.388 (0.784)		
Ln(Proximity)	-0.459 (0.998)	<u>Panel E: County-Level Econ Outcomes</u>	
Difference in Ln(GLA)	-5.511 (0.302)	HP Growth	0.0184 (0.230)
		Employment Growth	0.0065 (0.042)
		Income Growth	0.019 (0.079)

Table 2 Appraisal Quality and Volume

Dep. Var.	Monthly No of Appraisals	
	Appraiser-Lender Pairs	
	(1)	(2)
No of Way Above-Contract Appraisals in Prev. Month	-0.0563*** (0.0101)	
No of At-Contract Appraisals in Prev. Month	0.0033 (0.0064)	
No of Below-Contract Appraisals in Prev. Month	-0.0372*** (0.0059)	
Pct of Way Above-Contract Appraisals in Prev. Month		-0.0205*** (0.0079)
Pct of At-Contract Appraisals in Prev. Month		-0.0005 (0.0023)
Pct of Below-Contract Appraisals in Prev. Month		-0.0195*** (0.0045)
No of Appraisals in Prev. Month	0.4154*** (0.0065)	0.4134*** (0.0058)
Appraiser FE	Yes	Yes
Lender FE	Yes	Yes
County FE	Yes	Yes
YYMM FE	Yes	Yes
Observations	1572655	1572655
Adjusted R-squared	0.404	0.404

Note: In this table, we explore the effects of appraiser behavior on future business volume at the appraiser–lender pair level. Robust clustered (at the county level) standard errors are in brackets. The superscripts \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 3 Reputational Concerns

Dep. Var.	Monthly No of At-Contract Appraisals				
	Appraiser-Lender Pairs				
	(1)	(2)	(3)	(4)	(5)
No of Appraisals in Prev. Month	0.0955*** (0.0020)	0.0957*** (0.0020)	-0.0369*** (0.0043)	0.0786*** (0.0017)	0.0970*** (0.0021)
x Exiting Appraisers		-0.1081*** (0.0106)			
x Top Performers			0.1862*** (0.0050)		
x Near Capacity				0.0489*** (0.0041)	
x Captive Appraisers w/ Majority Lender					-0.0251* (0.0128)
x Captive Appraisers w/ Minority Lender					-0.1540*** (0.0546)
Exiting Appraisers		0.1466*** (0.0155)			
Top Performers			-0.3096*** (0.0122)		
Near Capacity				-0.2780*** (0.0148)	
Captive Appraisers w/ Majority Lender					0.2553*** (0.0326)
Captive Appraisers w/ Minority Lender					-0.1892*** (0.0711)
No of At-Contract Appraisals in Prev. Month	0.0777*** (0.0052)	0.0778*** (0.0052)	0.2495*** (0.0080)	0.0797*** (0.0052)	0.0776*** (0.0052)
No of Appraisals in Curr. Month	0.0441*** (0.0019)	0.0441*** (0.0019)	0.0305*** (0.0021)	0.0466*** (0.0020)	0.0445*** (0.0019)
Appraiser FE	Yes	Yes	No	Yes	No
Lender FE	Yes	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes	Yes
YYMM FE	Yes	Yes	Yes	Yes	Yes
Observations	1572655	1572655	1575366	1454401	1534106
Adjusted R-squared	0.315	0.315	0.629	0.320	0.318

Note: This table reports the effects of business volume on future appraiser behavior at the appraiser–lender pair level. The regressor *Exiting Appraisers* is an indicator variable that equals one if the appraiser is in the last period of work and this period is before October 2015 and zero otherwise. The regressor *Top Performers* is an indicator variable that equals one if the appraiser completed more appraisals than 50% of the appraisers during the sample period and zero otherwise. The regressor *Near Capacity* is an indicator variable that equals one if the appraiser completed more appraisals than 90% of the appraisers during the sample period and zero otherwise. The regressor *Captive Appraisers w/ Majority Client* is an indicator variable that equals one if the appraiser obtains more than 85% of his or her deals from a lender in the pair and zero otherwise. The regressor *Captive Appraisers w/ Minority Client* is an indicator variable that equals one if the appraiser obtains more than 85% of his or her deals from a lender outside the pair and zero otherwise. Robust clustered (at the county level) standard errors are in brackets. The superscripts \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 4 Role of Competition

Dep. Var.	D(At-Contract Appraisals)		
	(1)	(2)	(3)
HHI (county level)	-0.0284*** (0.0072)		
HHI (zip code level)		-0.1119*** (0.0234)	
HHI (lender level)			-0.0116*** (0.0038)
Property Attributes	Yes	Yes	Yes
Appraiser FE	Yes	Yes	Yes
Lender FE	Yes	Yes	Yes
County FE	Yes	Yes	Yes
YYMM FE	Yes	Yes	Yes
Observations	3625058	3625058	3625146
Adjusted R-squared	0.164	0.164	0.164

Note: This table reports the effects of competition among appraisers (measured by the HHI) on appraiser behavior at the appraisal level. The dependent variable *D(At-Contract Appraisals)* is an indicator variable that equals one if the appraiser reports an appraisal value equal to the contract value and zero otherwise. Robust clustered (at the county level) standard errors are in brackets. The superscripts \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.



Table 5 Role of AMCs

Dep. Var.	D(At-Contract Appraisals)		D(Above-Contract Appraisals)		No. of At-Contract Appraisals	
	At-Contract vs Below-Contract		Above-contract vs Below-contract		All	
Sample	Appraisal Level				Appraiser-Lender Pairs	
	(1)	(2)	(3)	(4)	(5)	(6)
AMC	-0.0113*** (0.0020)		-0.0068*** (0.0010)		-0.0618*** (0.0037)	
Non-Captive AMC		-0.0065*** (0.0016)		-0.0037*** (0.0008)		-0.0383*** (0.0094)
Captive AMCs w/ Majority Lender		-0.0017 (0.0029)		-0.0050*** (0.0018)		-0.0039 (0.0154)
Captive AMCs w/ Minority Lender		-0.0184** (0.0090)		-0.0112** (0.0050)		-0.0243 (0.0220)
No of Appraisals in Prev. Month						0.0896*** (0.0041)
x Non-Captive AMC						0.0077 (0.0051)
x Captive AMCs w/ Majority Lender						0.0186** (0.0091)
x Captive AMCs w/ Minority Lender						-0.0350** (0.0140)
No of At-Contract Appraisals in Prev. Month						0.0773*** (0.0056)
No of Appraisals in Curr. Month						0.0441*** (0.0019)
Appraiser FE	Yes	Yes	Yes	Yes	Yes	Yes
Lender FE	Yes	Yes	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes	Yes	Yes
YYMM FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1179745	1291677	2290648	2521971	1934186	1572648
Adjusted R-squared	0.194	0.193	0.157	0.156	0.237	0.316

Note: This table reports the effects of AMCs on appraiser behavior at the appraiser–lender pair level. The dependent variable *D(At-Contract Appraisals)* is an indicator variable that equals one if the appraiser reports an appraisal value equal to the contract value and zero otherwise. The dependent variable *D(Above-Contract Appraisals)* is an indicator variable that equals one if the appraiser reports an appraisal value above the contract value and zero otherwise. The dependent variable *No. of At-Contract Appraisals* is the number of at-contract appraisals in the current month at the appraiser–lender pair level. The regressor *AMC* is an indicator variable that equals one if an AMC was involved in the appraisal and zero otherwise. Robust clustered (at the county level) standard errors are in brackets. The superscripts \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 6 Moral Hazard

Dep. Var.	No. of Comps	Ln(No of Days to Appraisal)
	(1)	(2)
At-Contract Appraisals	0.0346*** (0.0011)	-0.0573*** (0.0032)
Below-Contract Appraisals	0.1977*** (0.0040)	-0.0301*** (0.0054)
Appraiser's no. of appraisals in current month	-0.0018*** (0.0002)	0.0013*** (0.0002)
Appraiser FE	Yes	Yes
Lender FE	Yes	Yes
County FE	Yes	Yes
YYMM FE	Yes	Yes
Observations	3548480	3453718
Adjusted R-squared	0.457	0.134

Note: This table reports the relation between appraiser effort and appraiser behavior at the appraisal level. The dependent variable *No. of Comps* is the number of comparable transactions used in each appraisal report. The dependent variable *Ln(No of Days to Appraisals)* is the number of days it takes the appraiser to complete the report from the date the contract is signed to the appraisal date. Robust clustered (at the county level) standard errors are in brackets. The superscripts \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 7 Implications of Appraisal Quality

Dep. Var.	Approval x 100		Note Rate		Early Default		Prepay	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Above-Contract Appraisals	0.6983*** (0.0582)	-0.0858*** (0.0329)	-0.0002 (0.0012)	0.0088*** (0.0021)	0.1472** (0.0723)	0.2416*** (0.0931)	1.1812*** (0.2000)	1.3465*** (0.3503)
x Last_LTV >= 90		1.7081*** (0.1276)		-0.0184*** (0.0032)		-0.1238 (0.1470)		-0.6847 (0.4877)
x Last_FICO < 660		1.8206*** (0.4161)		-0.0086 (0.0072)		0.9933 (0.7210)		0.7804 (0.8195)
At-Contract Appraisals	0.7232*** (0.0600)	-0.0941*** (0.0353)	-0.0005 (0.0013)	0.0017 (0.0018)	0.1296* (0.0756)	0.1935* (0.1016)	0.3625* (0.1989)	0.6843** (0.3150)
x Last_LTV >= 90		1.8344*** (0.1288)		-0.0101*** (0.0028)		-0.0599 (0.1623)		-0.5960 (0.4268)
x Last_FICO < 660		2.1320*** (0.4744)		-0.0146** (0.0071)		0.9981 (0.8337)		0.8316 (0.9085)
Property Attributes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan Attributes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Appraiser FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lender FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
YYMM FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1603081	1603081	983577	681650	983577	983577	983577	983577
Adjusted R-squared	0.021	0.030	0.712	0.707	0.023	0.019	0.116	0.115

Note: This table reports the relation between appraiser behavior and loan outcomes at the appraisal level. The indicator variable *At-Contract Appraisals* equals one if the appraiser reports an appraisal value equal to the contract value and zero otherwise; *Above-Contract Appraisals* is an indicator variable that equals one if the appraiser reports an appraisal value above the contract value and zero otherwise; *Approval* is an indicator variable that equals one if the loan application is approved and zero otherwise; *Note Rate* is the note rate of the mortgage; *Default* is an indicator variable that equals one if the borrower is at least one month past due in the first 12 months after origination and zero otherwise; and *Prepay* is an indicator variable that equals one if the borrower prepays the loan and zero otherwise. Robust clustered (at the county level) standard errors are in brackets. The superscripts \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 8 Macro Evidence

Dep. Var.	100 x Log (HPI) (1)	100 x Log (Employment) (2)	100 x Log (Income) (3)
No of At-Contract Appraisals	1.7095*** (0.3042)	-0.0118 (0.0692)	-1.4930*** (0.1643)
No of Below-Contract Appraisals	-0.5799** (0.2821)	-0.6752*** (0.1434)	-0.4873* (0.2735)
County FE	Yes	Yes	Yes
YYQQ FE	Yes	Yes	Yes
Observations	15057	10094	10094
Adjusted R-squared	0.955	1.000	0.999

Note: This table reports the relation between appraiser behavior and macroeconomic outcomes at the county level. All variables are aggregated at a quarterly frequency. Robust clustered (at the county level) standard errors are in brackets. The superscripts \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

## **Appendix: Differences in Subject and Comp Properties**

Our last analysis explores how appraisers work out different appraisals, especially how they arrive at exactly the contract value. Our specification is similar to equation (4), but for characteristics of the subject and comparable properties in the appraisal, along with many controls at the appraisal level.

Table A1 reports the regression results on the location and structural characteristics of the subject. Column (1) shows a negative relation between the contract value and the incidence of at-contract appraisals, suggesting expensive homes are less likely to be appraised at exactly the contract value. This is partly due to the fact that luxury homes are less liquid and fewer comps are available. Markets with a faster turnover and rapid home price appreciation see more appraisals exactly at the contract value than elsewhere. This finding is further explained by the regression on detailed property attributes in Column (2). Large houses with more living space and bedrooms and those in good condition and of high quality are more subject to at-contract appraisals, while new constructions are less likely to be appraised exactly at the contract value. Columns (3) and (4) report the results from regressions of above-contract appraisals on the subject's property attributes. There is no significant relation between the contract values and the incidence of above-contract appraisals or local home price growth. Markets with a faster turnover see more appraisals above the contract value than elsewhere. In Column (4), we see that houses that more likely to receive appraisals at the contract price are also more likely to receive appraisals above the contract price.

We also conduct similar regressions on the location and structural characteristics of the comps relative to the subject, as well as adjustments made by the appraiser. The results are reported in Table A2. In Column (1), the results show that the comps used in at-contract appraisals are more likely to be recent and to have a similar living area, lot size, and age relative to the subject, but with different conditions and geographically closer to the subject. In Column (2), we find that appraisers also make significantly smaller adjustments such that the final appraisal is exactly at the contract value. The results in Column (3) show that the comps used in the above-contract appraisals are more likely to be recent and to cover a similar living area, lot size, and age relative to the subject, but with different conditions and geographically farther from the subject. In Column (4), we find that appraisers also make significantly larger total adjustments such that the final appraisal is above the contract value.

Table A1 Differences between At- and Above-Contract Appraisals

Dep. Var. Sample	At-Contract Appraisals		Above-Contract Appraisals	
	At-Contract vs Below-Contract		Above-Contract vs Below-Contract	
	(1)	(2)	(3)	(4)
Ln(Contract Price)	-0.0191*** (0.0021)		-0.0027 (0.0025)	
Ln(GLA)		0.0319*** (0.0027)		0.0557*** (0.0036)
Ln(Lot)		-0.0004 (0.0007)		0.0027*** (0.0006)
Ln(Property Age)		0.0069*** (0.0010)		0.0087*** (0.0010)
Ln(No of Bedrooms)		0.0234*** (0.0039)		0.0111*** (0.0038)
Ln(No of Bathrooms)		-0.0056*** (0.0019)		0.0001 (0.0014)
Ln(Condition)		0.0532*** (0.0039)		0.0320*** (0.0038)
Ln(Quality)		0.0062* (0.0036)		0.0204*** (0.0024)
County HP Growth in Prior 3 Months	-0.0237* (0.0127)		-0.0158 (0.0106)	
County Housing Turnover	3.3109** (1.3571)		1.6472* (0.9470)	
Appraiser FE	Yes	Yes	Yes	Yes
Lender FE	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes
YYMM FE	Yes	Yes	Yes	Yes
Observations	1170858	1146355	2185681	2043312
Adjusted R-squared	0.191	0.193	0.152	0.161

Note: This table reports the relation between appraiser behavior and the characteristics of the subject house at the appraisal level. The indicator variable *At-Contract Appraisals* equals one if the appraiser reports an appraisal value equal to the contract value and zero otherwise. The indicator variable *Above-Contract Appraisals* equals one if the appraiser reports an appraisal value above the contract value and zero otherwise. Robust clustered (at the county level) standard errors are in brackets. The superscripts \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table A2 Comp Selection and Adjustments

Dep. Var.	At-Contract Appraisals		Above-Contract Appraisals	
Sample	At-Contract vs Below-Contract		Above-Contract vs Below-Contract	
	(1)	(2)	(3)	(4)
Difference in Time (in Quarters)	-0.0161*** (0.0008)		-0.0129*** (0.0006)	
Ln(Proximity)	-0.0051*** (0.0007)		-0.0010 (0.0006)	
Difference in Ln(GLA)	0.0003 (0.0023)		-0.0303*** (0.0031)	
Difference in Ln(Lot)	-0.0128*** (0.0009)		-0.0080*** (0.0009)	
Difference in Age	-0.0003*** (0.0000)		-0.0003*** (0.0000)	
Difference in Condition	0.0361*** (0.0022)		0.0295*** (0.0021)	
Ln(Total Adjustments)		-0.0003*** (0.0000)		0.0001*** (0.0000)
Ln(Adjustments for Time)		-0.0019*** (0.0002)		-0.0028*** (0.0002)
Appraiser FE	Yes	Yes	Yes	Yes
Lender FE	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes
YYMM FE	Yes	Yes	Yes	Yes
Observations	1290505	1291447	2517407	2521454
Adjusted R-squared	0.192	0.190	0.152	0.149

Note: This table reports the relation between appraiser behavior and the characteristics of the comps used by the appraiser at the appraisal level. The indicator variable *At-Contract Appraisals* equals one if the appraiser reports an appraisal value equal to the contract value and zero otherwise. The indicator variable *Above-Contract Appraisals* equals one if the appraiser reports an appraisal value above the contract value and zero otherwise. Robust clustered (at the county level) standard errors are in brackets. The superscripts \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.