Attribute (Mis)Reporting and Appraisal Bias *

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Abstract

This paper identifies a previously undocumented channel through which appraisal bias occurs. We assemble a property-level panel of appraiser reported attributes associated with 3.5 million loan applications from 2013 to 2017 to test whether attributes were consistently reported. We find that 98% of properties had at least one-of-seven attributes inconsistently reported, and that errors were consistent with systematic misreporting to inflate valuations. Our strongest evidence of purposeful misreporting is when an appraiser inconsistently reported attributes of the same comparable transaction selected to value different properties. We estimate that highly leveraged borrowers whose appraisals had inconsistently reported attributes were 6-to-15% more likely to become seriously delinquent in their loan payments.

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1. Introduction

The 2008 financial crisis illustrated the importance of unbiased valuation of financial assets, especially collateral associated with securitized mortgage loans.[1] Previous research has shown that asymmetric information among buyers, lenders, and regulators resulted in multiple errors in valuation and subsequently higher than expected loan defaults catalyzing the crisis (Ben-David, 2011; Griffin and Maturana, 2016). In response, subsequent regulations have attempted to reform the valuation production process by outlining stricter rules for information acquisition and disclosure in mortgage markets and elsewhere. It remains unclear whether such new regulations improve information quality and actually reduce the likelihood of future crises (Bongaerts et al., 2012). In this paper, we identify a new channel through which appraisal inflation occurs and provide evidence that current financial reforms have not eliminated bias in the disclosed collateral values associated with mortgage loans.

Similar to credit rating agencies, appraisers of residential property are crucial in mitigating information asymmetries in the mortgage market by providing an independent assessment of value. An independent assessment of value is important because prior research has shown that more informed lenders make superior decisions as compared to less informed competitors, and that independence enhances the liquidity of originated loans on the secondary mortgage market (Stroebel, 2016; Eriksen et al., 2019). It is well established that appraised values before the 2008 crisis were routinely not independent and often severely biased upwards

[1] See Griffin et al. (2020) for a review of the contributing factors of the 2008 financial crisis.

as compared to alternative Automated Valuation Model (AVM) estimates (Kruger and Maturana, 2020). Moreover, it is still unclear how bias was introduced, and whether such channels remain open after reforms were implemented as a direct result of the 2008 financial crisis. In particular, the Home Valuation Code of Conduct (HVCC) in 2009 and further appraisal-specific reforms within the Dodd-Frank Act of 2010 were implemented with the specific intent to limit previously identified financial conflicts of interest between lenders and property appraisers, but did relatively little to address other potential deficits or sufficiently improve the accuracy of future appraisals. Better understanding the motivations, mechanisms, and harm of appraisal bias is important in both designing further reforms and assessing the degree to which the economy remains exposed to future crises.

We provide direct evidence of a previously unidentified form of misbehavior by appraisers, namely their ability to misreport a property's physical attributes in order to inflate valuations. This mechanism has been unexplored due to data limitations, which we address by assembling a database of appraiser reported property attributes associated with pending loan applications. The data exist because since 2011 appraisers have been required to report attributes of both the property being appraised and comparable transactions they selected to base their valuations. This mandatory reporting of attributes of both subjects and comparable transactions routinely results in the same property having attributes reported multiple times; first as a subject and then as a comparable transaction to value other properties, often by the same appraiser. Crucial to our identification of misreporting is that when appraisers select comparable

transactions to support valuation of a new subject property, they use information from the comparable property's *own transaction* when itself was the subject of an appraisal, rather than from visiting the comparable property. Therefore, by construction, our results are not subject to differences in attributes reported for the same property across multiple appraisals (e.g., as the subject vs. as a comparable, or as a comparable for different properties) due to renovations or modifications *after* the property transacts. Properties with multiple reported attributes by the same appraiser enable us to not only test whether they were consistent in their reporting, but also whether any errors were systematically introduced to inflate values of properties that would have otherwise had an appraised value below the contract price.

In this paper, we focus on new purchase appraisals, and document systematic misreporting consistent with intentional inflation of property values. Our initial analysis focuses on 3.5 million properties that were the subject of an appraisal between 2013 and 2017, where the resulting transaction was used at least once as a comparable transaction in a future appraisal. We compare seven attributes reported for the same property across different appraisals - gross living area (GLA), property condition, quality of design, view, bedrooms, bathrooms, and lot size. Only 1.7% of properties had all seven attributes reported consistently, although some of the reporting discrepancies were due to differences in rounding and measurement. However, many discrepancies were large and economically meaningful. For example, one-quarter of properties had at least a 100 square foot difference in reported gross living area. This range would result in the same property having a +/- $23,100 difference in valuation estimate given

the median price adjustment per square foot by appraisers. This range of valuation is even larger considering multiple attributes are often inconsistently reported for the same property.

A potential explanation for the large discrepancy in reported attributes are differences in appraiser access to property information. Whereas appraisers usually inspect the subject property and often create their own measurements, they must rely on publicly available information on attributes of comparable property transactions they did not originally appraise. Common sources of public records used by appraisers to determine attributes of recent comparable transactions include property tax assessors office, with limited access to the interior of the property, and the multiple listing services populated by real estate agents. We show that differential access to information alone does not explain the reporting discrepancy in two ways. The first test is by restricting the original sample to the 366,870 property transactions where the original appraiser of the property when it was a subject, subsequently reused the resulting transaction as a comparable when appraising a different property in the future. These reported property attributes of the same transaction by the same appraiser should be identical, but almost half of the properties (49%) still had at least one of the seven attributes inconsistently reported. Most importantly, we show that when discrepancies in reported property attributes by the same appraiser occurred, that appraiser on average reported the property when a subject to be larger, and having a superior property condition, quality of design, and view than when reported as a comparable transaction.

While it is intuitive for an appraiser to overstate the desirability of a property when a

subject to inflate its valuation, it would be just as effective for an appraiser to misreport a comparable transaction as being less desirable. Our second and strongest test of intentional misreporting is therefore whether the *same appraiser* consistently reported property attributes of the *same comparable transaction* he/she selected to value different properties. While appraisers were mostly consistent in reporting attributes for the 3.4 million repeat comparable transactions in the sample, there still are some large differences that cannot be explained away by differential measurement, methods, or access to data. This manipulation (i.e., under-reporting attributes of a comparable transaction) would be most beneficial when the subject property would had otherwise been appraised below contract price thereby jeopardizing the transaction. We verify this hypothesis by testing whether the same comparable transaction was more likely to be under-reported by the same appraiser based on whether the contract price of the subject property exceeded an alternative estimate of the subject property provided by an Automated Valuation Model (AVM). Consistent with purposeful under-reporting bias to inflate valuation, an appraiser reported the same comparable transaction as having on average 4 fewer square feet and a relatively inferior condition, design, and view if the subject property's contract price exceeded the AVM estimate. As expected, subject properties with at least one under-reported comparable transaction attribute were ultimately more likely to have an appraised value equal to or above contract price than those without manipulation.

As a final exercise, we explore the economic consequences of attribute misreporting. This analysis focuses on the performance of 962,374 loans originated between 2013 and 2017 where

at least one comparable transaction was used multiple times by the same appraiser to value other properties. Controlling for lender and state-year-quarter fixed effects, we estimate that borrowers of highly-leveraged loans associated with an under-reported comparable transaction were 6-to-15% more likely to become seriously delinquent in their loan payments by the end of 2018. Taken together, our findings suggest that there are real economic consequences of appraisal bias due to attribute misreporting in mortgage appraisals, especially considering the negative consequences of foreclosures on borrowers and their neighbors (Mian and Sufi (2017)). For those who misreport property attributes in order to manipulate appraisals, not only have they failed their obligation to provide independent and accurate valuation of the collateral, but they have further increased the systemic risks in the market by inflating the collateral values for the most financially constrained borrowers purchasing over-valued properties.[2] We estimate that 65% of appraisers are serial misreporters who inconsistently report at least one attribute for a quarter of properties they appraise.

We make two main contributions to the literature. First, we document a specific channel through which appraisal bias occurs, and provide irrefutable evidence of intentional valuation biases by at least some appraisers. Our results also show that borrowers of loans associated with attribute misreporting were more likely to default. Second, our findings are based on

[2]Even if original mortgage lenders are able to capture some of the higher expected default risks due to valuation bias through differential loan pricing, understanding the linkage between appraisal bias and loan performance is still crucial to policymakers and mortgage practitioners. We further discuss these consequences in more detail in the conclusion.

are appraisals and loan applications from the post-reform period of 2013-2017, but are at odds with prior research that finds the HVCC to be effective in eliminating appraisal bias. This causal evidence of purposeful manipulation and the fact that biases remain pervasive even after recent reforms together suggest that further oversight and policy innovation is necessary to curb future crises.

2. Background and Recent Research

Property appraisal should provide an independent valuation of the underlying asset. The Real Estate Appraisal Reform Act of 1988 regulates appraisals for real estate loans originated by federally regulated financial institutions. The purpose of the appraisal is to provide an independent assessment of the stated value of collateral that a borrower pledges to the mortgage lender, which the lender may then either hold in portfolio or sell to a secondary market investor. The appraisal provides crucial information for mortgage lenders and regulators to assess a borrower's equity stake in the property and resulting default risk of underlying loans (Ding and Nakamura, 2016). An independent and accurate appraisal also provides useful information to regulators and potential secondary market investors.

A growing body of literature has illustrated the presence of appraisal bias using a variety of methods. The most common approach has been to compare the appraised values of properties with an alternative value calculated by an Automated Valuation Model (AVM), where the percentage difference between the two estimates is defined as appraisal bias. Kruger and

Maturana (2020) find that 60% of mortgages have appraisals higher than the AVM valuations and Griffin and Maturana (2016) further document that 44.9% of properties have appraisals that are 5% higher than estimates by AVMs. Demiroglu and James (2016) also find that 19.7% of refinance loans have overstated appraisals compared to the AVM valuations, which is much higher than that of purchase loans.

An important limitation when comparing appraised values and AVM estimates is that current property-specific data available to calibrate AVMs and make predictions is often limited. This is especially true for AVM estimates using publicly available records, such as those using local property tax assessors databases, as information about the property may only be available based on that reported from the previous sale. Major and minor renovations of the property, especially those commonly done before a sale, would create unobserved heterogeneity and result in AVM estimates themselves being biased. In contrast, residential appraisers are required to visit the subject property of the appraisal and are aware of the current state of the property due to recent renovations and other changes otherwise undocumented in public records.[3]

Three key questions remain unresolved in the literature. The first is whether appraisal bias persisted after reforms were implemented following the 2008 financial crisis. The majority

[3]Two recent examples addressing these data limitations of public records include Agarwal et al. (2015) in comparing appraised values with future transaction prices, and Eriksen et al. (2019) showing that appraisers still target contract prices even after adjusting for their own observed differences in property attributes during reconciliation.

of research on appraisal bias uses data that pre-date the 2008 financial crisis when direct financial conflicts of interest between lenders and appraisers were known to exist. The Home Valuation Code of Conduct (HVCC) in 2009, and subsequent reforms further codified in the Dodd-Frank Act of 2010, were implemented with the intent to limit these conflicts of interest and resulting appraisal bias. Several studies have found the HVCC and other reforms to be effective in reducing the share of appraisals equal to contract price, as well as other outcomes correlated with appraisal bias, but the level of bias remains unclear. (Agarwal et al., 2015; Calem et al., 2015; Ding and Nakamura, 2016).[4]

The second question to be answered is whether the presence of biased appraisals is a result of a purposeful act, or an unintentional consequence of current appraisal practices. Appraisers need to be licensed in most states and are required to follow the Universal Standards of Professional Appraisal Practice (USPAP) to justify their valuation estimate (Vandell, 1991). While financial conflicts of interest have been identified as a motivating force for some appraisers to bias their estimates, that evidence is largely circumstantial, as the exact mechanisms through which ill-intentioned appraisers introduce bias remains largely unidentified. This is important because a significant share of biased values identified in the previous literature could be the result of well-intentioned appraisers following flawed appraisal

[4]For example, Ding and Nakamura (2016) provide empirical evidence that the Home Valuation Code of Conduct (HVCC) led to a 3% increased probability of appraisal values being less than contract price, suggesting they were at least partially effective.

practices. For example, appraisers of properties associated with home purchase loans are provided the contract price upfront and may subconsciously select evidence to confirm that value (Eriksen et al., 2020). More recently, Agarwal et al. (2019) suggest that decreasing returns to effort given current incentives may also result in similar unintentional biases. Identifying specific mechanisms for the manner in which bias is introduced is important in shaping future policies and practices. By restricting attributes reported to the same property as comparable transaction by the same appraiser, we provide the most direct evidence yet that at least some of the appraisers intentionally misreport to inflate collateral values through misreporting of property attributes.

The last unresolved question is whether appraisal bias itself results in decreased loan performance and subsequent economic losses for mortgage investors. The main constraint in the previous literature is that loans associated with biased appraised values before the 2008 financial crisis were mostly likely deficient along multiple dimensions. Griffin (ress) provides a review of the literature and argues that overstated incomes and the presence of subordinate mortgage debt were prevalent in the period immediately prior to the 2008 financial crisis. The effect of these unobserved loan and borrower attributes associated with the cohort have made it difficult to separately identify the effect of appraisal bias on loan performance outcomes.

3. Data and Estimation Samples

The empirical analysis in this paper is based on property attributes reported by appraisers to support his/her valuation estimates as required by law since 2011. Reported attributes include both objective (i.e., gross living area, lot size, bedrooms, bathrooms) and subjective measures (i.e., condition of property, quality of design, and view) of the properties.[5] These attributes could be reported for the same property more than once – initially when it was the subject of an appraisal associated with loan approval process and subsequently when used as a comparable transaction to value other properties. We are able to create a property-level panel of reported attributes because a large secondary market purchaser of mortgage loans assigned a unique identification number to each property and reporting appraiser. Properties are included in the sample if either reported as a subject itself of pending loan application, or used as a comparable transaction to support the value estimate of another property.[6]

Two main empirical issues became apparent in constructing the property-level panel. First, only the quarter of the appraisal and resulting property transaction were identified in the data for confidentiality reasons, and the two quarters may differ. For example, a property transacted in Q4 of 2014 may have been originally appraised in Q3 of 2014. Second, multiple

[5]Condition of property and quality of design are reported on a 6-point scale, while view is reported on a 3-point scale.

[6]Properties exist in our database even if the associated mortgage loan was not originated, or sold to the secondary market institution providing the data, because attributes were captured during the loan approval process.

appraisals of the same property could exist either due to an initial failed loan application triggering a new appraisal, or subsequent transactions of the same property within the sample period of 2013-2017. Although comparing reporting consistency of attributes for the same property as the subject of multiple recent appraisals is interesting, it is impossible for researchers to detect modifications that may have been made between appraisals. That said, we include in our empirical sample only the initial transaction of each property when it was the subject of an appraisal. Properties that transacted more than once in the same quarter were also excluded as the original buyer may have improved the property between transactions, rendering it unclear which transaction is referenced by a future appraiser.[7]

Our baseline sample is restricted to properties that were originally the subject of a pending home purchase appraisal, and used at least once as a comparable transaction in a future appraisal. This restriction results in 21.1 million reported attributes of 3.5 million unique properties from 2013Q1 to 2017Q4. On average, each subject property has been used as a comparable transaction in 5 subsequent appraisals. Column (1) of Table 1 shows that the average property has 1,977 square feet of GLA, 3.3 bedrooms, 2 full bathrooms, and is situated on a parcel of land with 13,276 square feet. In addition to reporting objective attributes of the property, appraisers are also required to indicate subjective attributes,

[7]Approximately, 5.9% of properties (431,106) were excluded as a result of these restrictions. The quarter of transaction of each subject property was identified when this property was later used as a comparable transaction, as quarter of own transaction is reported for all comparable transactions.

including the condition of the property, quality of the design, and the view of the property based on uniform definitions set by USPAP.[8] For ease of exposition, all subjective attributes were recoded such that a greater value indicates higher quality.

4. The Extent of Attribute Misreporting

We start by documenting the extent of attribute misreporting for the same property regardless of the appraiser. As a national database of property attributes does not exist, some discrepancies in property attributes reported by different appraisers are expected due to differences in interpretation, methods of measurement, and access to current property information. The second column of Table 1 illustrates the share of properties, used as a subject and as a comparable transaction at least once, with consistently reported attributes. Despite a uniform definition of gross living area (GLA) of residential properties according to the USPAP, only 16.2% of properties had GLA consistently reported. Similarly, only 26.2% of properties had a consistent reporting of the quality of design and 32.3% of the property's condition. In contrast, 85.2% of properties had consistently recorded number of bedrooms, and 90.7% had the number of full bathrooms similarly reported. Appraisers also agreed on their 3-point assessment of the property's view for 77.0% of properties. Although

[8] Appraisers report on a 6-point scale the condition and quality of the property based on specific attributes and features. View is reported on a 3-point scale, where: (1) property does not have a view, (2) property has some view, and (3) property has a view.

it is uncommon for appraisers to measure lot size directly and therefore most rely on public records, appraisers only reported lot size consistently for 44.1% of properties in the sample. Only 1.7% of properties in the sample had all seven attributes consistently reported.

Admittedly, some of the above reporting discrepancies were due to differences in interpretation and rounding errors. Panel A of Figure 1 illustrates the range in reported discrepancies for GLA for the 3.5 million properties. While 46% of properties had GLAs reported within 25 square feet, including the 16% with no discrepancy, one-quarter of properties had reporting discrepancy greater than 100 square feet and 10% had more than a 300-square-foot discrepancy. Given the median price adjustment to account for differences in GLA for subjects and comparable was $231 per square foot, a 100-square-foot range corresponds to a +/- $23,100 range in valuation for the same property.

Panels B through D of Figure 1 illustrate the range in reported differences for the three subjective attributes. Property condition and design quality were reported on a 6-unit scale, and the median price adjustment applied by appraisers per one-unit difference in property condition was $12,500 and $11,500 for quality of design. It was most common for appraisers to have a one-unit disagreement on a property's condition (56.4%) and quality of design (63.8%), but 10% of properties had more than a two-unit reporting discrepancy.

Although the above ranges are large and can result in meaningful differences in valuation for the same property, they could be explained by differences in interpretation and measurement. The USPAP adopted scale for appraisers to report differences in a property's view is perhaps

the most transparent in that a value of 3 implies a property has a scenic view that adds to value of the property, and value of 1 indicates the property does not have a view. While the majority of appraisers (77.0%) agreed on which classification was appropriate for a given property, a sizable minority still disagreed. Specifically, 4.1% of properties had appraisers report the opposite classification for the same property (e.g., 1 vs. 3). The median price adjustment for a one-unit reported difference in view was $7,500, which implies up to $15,000 in price adjustments were made for some properties based on reported view alone.

Our null hypothesis is that reported attributes for the same property should not vary depending on the role the property played in the appraisal process (i.e., subject vs. comparable). There are two possible, and not mutually exclusive, ways appraisers could manipulate reported attributes to increase their supported valuation of a subject property. First, they could indicate that the subject property has superior attributes than actual. Second, they could report the underlying property attributes of comparable transactions as inferior than actual in order to justify a greater relative upward price adjustment of the subject property. We focus on whether appraisers report the same property as superior when reported as a subject of an appraisal in the remainder of this section, and examine consistency in the reporting of repeat comparable transactions in the next section.

4.1. Subject Property Reused as a Comparable Transaction

We first test whether appraisers report attributes of the same property as superior when it is the subject of an appraisal using the full sample of 21.1 million reported attributes. The baseline estimation takes the following form:

$$A_{ijk} = \beta * Subject_{ijk} + \mu_i + \epsilon_{ijk}, \tag{1}$$

where A_{ijk} is the value of one of the attributes reported for property i by appraiser j in appraisal k, $Subject_{ijk}$ is an indicator for the property being the subject of appraisal k, μ_i is a vector of property transaction fixed effects, and ϵ_{ijk} is a mean zero idiosyncratic error term.[9] The inclusion of property transaction fixed effects allows the identifying variation to come from differences in attributes reported for the same transaction across multiple appraisals. Attributes of a property's transaction could be reported by the same or different appraisers across appraisals. For example, the original appraiser of the property when the subject of a pending transaction will report attributes to support their valuation, but that same or a different appraiser may also report property attributes of that original transaction when using that sales price as a basis to support the estimated value of a different property. It is important to emphasize that potential renovations to the comparable property between

[9] A reported attribute could be uniquely identified by the combination of property i and appraisal k, where an appraiser j is noted on the record. Each appraisal k must include one subject property and at least one comparable transaction.

appraisals are irrelevant as the identifying requirement of the sales-comparison method of valuation is to use attributes of the comparable property at the time of its own transaction. The estimated coefficient on $Subject_{ijk}$ therefore captures the average difference in attributes reported for the same transaction when the subject of an appraisal, compared to when a comparable transaction in a subsequent appraisal, regardless of the appraiser.

The results of this test for gross living area and each of the 3 subjective attributes are reported in Panel A of Table 2 with robust standard errors clustered at the property level in parentheses.[10] On average, appraisers report the same property as having an additional 11.2 square feet when the subject of the appraisal. This effect is statistically different from 0 at the 1% level, and implies a $2,587 average difference in appraised value for subject properties given that the median price adjustment for differences in reported GLA per square foot was $231.

The dependent variables of the 3 subjective attributes are log-transformed to allow for interpretation of the coefficient as the percent difference in each scale when reported as a subject property. Similar to GLA, the same property's condition (1.2%), quality of design (0.9%) and view (0.9%) are all reported as superior when the subject of an appraisal. Each of these estimated effects are statistically different from 0 based on property-clustered standard errors, and implies that the average inflation of subject property value is between $68 to

[10]We focus on gross living area and the 3 subjective attributes for the remainder of the paper given these attributes have the greatest reporting discrepancies.

$150 for each subjective attribute. Together with average differences in reported GLA and median price adjustments, these estimates imply that subject properties on average have been inflated in value by $2,909, although this adjustment could be substantially higher for individual properties.

4.2. Same Appraiser Reused Subject Property as a Comparable Transaction

The observed differences in property attributes reported by different appraisers for the same property could arise due to differences in appraisers' access to property records and/or sources of information. As mentioned earlier, the original appraiser of the subject property is required by the USPAP to either create or verify existing estimates of property attributes, whereas a different appraiser using the same transaction as a comparable to value other properties generally relies on publicly available records. Differential access to information about property attributes may therefore have led to the above discrepancies in reported attributes.

To eliminate this possibility, the sample is further restricted to properties appraised as subjects and used at least once as a comparable transaction by the same appraiser. Summary statistics of these 366,870 properties are reported in the third column of Table 1. The average property in the restricted sample was similar in reported attributes to the unrestricted, and had 2.3 sets of reported attributes.

The fourth column of Table 1 reports the share of properties with consistently reported

attributes by the same appraiser. As expected, eliminating differences in access to property information results in a significant increase in the share of properties with consistently reported attributes. Most notably, properties with a consistently reported condition and quality of design increased from 32.3% to 88.9%, and 26.2% to 91.6%, respectively. Those reporting a consistent view increased from 77.0% to 97.0%. However, discrepancies still persist with only 51.4% of properties having no discrepancies reported for the property by the same appraiser. In particular, the same appraiser only reported the same GLA when as a subject and as a comparable transaction for 64.6% of properties. Over 20% of properties still had more than a 25-square-foot difference in the reported living area by the same appraiser.

Panel B of Table 2 reports the estimated average differences for each property attribute using the restricted sample. The regression specification is similar to that used to estimate Panel A, except that the fixed effects are now unique for each property-appraiser pair. More specifically, the empirical model is as follows:

$$A_{ijk} = \beta * Subject_{ijk} + \delta_{ij} + \epsilon_{ijk}, \tag{2}$$

where δ_{ij} is a vector of property-appraiser pair fixed effects. By including these property-appraiser fixed effects, the identifying variation of the model comes from the differences in attributes reported for the property by the same appraiser in different appraisals.

The estimates in column (1) of Panel B in Table 2 indicate the same appraiser reporting the same property as having an additional 5.1 square feet of living area when the property

is a subject compared when used as a comparable. Similarly, appraisers report the same property to be superior in condition (0.5%), quality (0.4%), and view (0.2%) when it was the subject. Each estimated effect is statistically significant from 0 at the 1% level with property-appraiser clustered standard errors.

5. Repeat Comparable Transactions

The results presented in the previous section suggest systematic misreporting by at least some appraisers that resulted in inflated property valuations. It still, however, remains unclear whether such misreporting is intentional because differences in an appraisers' practices in data collection for subject properties versus comparable transactions could result in these patterns. For example, some appraisers may create and report estimates of the subject property attributes gathered during their inspection, but always rely on public records for comparable transactions. To eliminate this possibility, we alternatively focus in this section on properties selected multiple times by the same appraiser as a comparable transaction to value other properties (i.e., a repeat comparable transaction sample).

Restricting the sample to properties used as a comparable transaction at least twice by the same appraiser is advantageous as it mechanically eliminates the potential for differences in appraisers' assessment approaches to explain misreporting. The exercise is also informative as it allows us to better understand appraisers' motivations by testing how pre-determined attributes of the subject property influence appraisers' variation in reported attributes. As a

matter of practice, appraisers are always informed upfront of the contract price negotiated by the buyer and seller (Conklin et al., 2020; Eriksen et al., 2019). An appraised value below contract price jeopardizes a loan origination because either the seller would have to accept a lower price than originally agreed, or the buyer would have to contribute a larger amount of equity to purchase the property (Ben-David, 2011; Eriksen et al., 2019). A failed origination would therefore have a direct financial consequence for the loan officer and real estate broker(s) associated with the transaction, who may themselves apply pressure on appraisers to justify an appraised value at least equal to the contract price (Eriksen et al., 2019). Given this information, an appraiser may have an incentive to misreport the same comparable transaction as inferior when the appraised value of the subject property would have otherwise been below contract price without manipulation. Reporting a comparable transaction as inferior would enable a greater relative price adjustment to justify a higher valuation.[11]

[11] Arguably, an easier and less incriminating way of appraisal manipulation would be to "cherry-pick" comparable transactions that achieve the targeted valuation. Unfortunately, our data do not allow us to prove or disprove the existence of such practice, as we do not observe the information set (i.e., pools of comparable transactions to choose from) for every appraiser in every appraisal. We argue that if appraisers were to cherry-pick in order to achieve higher appraisal value, they would choose, among comparable transactions of similar attributes, the ones with the highest values, or the least desirable among the ones of the same value. Given that we focus on the manipulation through attributes under-reporting, it is likely that such cherry-picking behavior would enhance rather than explain away our findings.

Column (5) of Table 1 presents the average attributes of the 3,365,938 properties used as a comparable transaction at least twice by the same appraiser. The average property in the repeat comparable sub-sample had been used 3.1 times as a comparable transaction and on average reported slightly larger (2,030 square feet), but otherwise similar to the other samples in terms of reported attributes. As expected, estimates reported in column (6) of Table 1 show appraisers to be the most likely to report property attributes consistently for repeat comparable transactions, although only 75.1% of properties had all seven attributes reported consistently by the same appraiser as a comparable transaction. Appraisers were again most likely to report bedrooms (97.6%), bathrooms (98.2%), and view (96.8%) consistently. Larger differences in reported attributes still exist for GLA (93.8%), property condition (87.0%), and quality of design (91.3%). Some significant differences persisted, with 3.4% of properties having more than a 25-square-foot difference in reported gross living area by the same appraiser.

5.1. Subject's Contract Price is Greater than AVM Estimate

We are interested in testing whether attribute A of comparable transaction i is more likely to be reported by appraiser j as inferior when appraising subject property in appraisal k whose appraised value would have otherwise been below contract price if reported consistently. Unfortunately, the counter-factual appraised value with consistently reported attributes of comparable transactions is unobserved, therefore we use the AVM estimate of the subject

property provided by the financial institution as a proxy.[12] Our assumption is that even though an AVM estimate is not always precise, it is independent from potential conflicts of interest and may signal to appraisers a property in the greatest danger of having an appraised value under contract price without manipulation.[13] Similar to our earlier tests, our null hypothesis is that there were no systematic differences in reported attributes by an appraiser for the same comparable transaction across appraisals. We estimate the following empirical model:

$$A_{ijk} = \theta * I(Contract > AVM)_k + \delta * Refinance_k + \sigma_{ij} + \epsilon_{ijk}, \tag{3}$$

where $I(Contract > AVM)_k$ is an indicator for whether the subject property associated with appraisal k has a contract price higher than the AVM estimate, and $Refinance_k$ indicates that a contract price does not exist because appraisal k is associated with a refinancing loan application. The reference group in this model, therefore, are purchase loan applications with contract prices less than or equal to AVM estimates. Together with the inclusion of

[12]It is important to note that an AVM estimate of a subject property would itself be biased if property attributes misreported by appraisers were used as inputs to generate the prediction. For example, an appraiser might report a subject property as having an additional 100 square feet than the previous sale based on their own measurements, in which case some AVMs may use this potentially biased information. In contrast, the misreporting of attributes associated with a comparable transaction would not have a direct effect on the AVM estimate of the subject property.

[13]The contract price was estimated to exceed the AVM estimate for approximately 47% of the subject properties.

property-appraiser fixed effects, the identifying variation in the model comes from differences in attributes reported by the same appraiser for the same property as comparable transactions across appraisals with contract prices above or below AVM estimates. We hypothesize that the estimated coefficient, θ, is negative because appraisal bias is related to the contract price exceeding AVM. In other words, an appraiser is more likely to report the same comparable transaction as lower quality when the associated subject property is at greater risk to be appraised for less than the contract price.

Estimates of Equation (3) presented in Table 3 confirm that appraisers are on average more likely to report the same comparable transaction as inferior if the contract price associated with the pending loan application was greater than the AVM estimate of the subject property. More specifically, appraisers report the same comparable transaction to be on average 4.0 square feet smaller, with a 0.9% worse property condition, a 0.7% lower quality of design, and a 0.3% worse view, when the subject property has a contract price above the AVM estimate. Appraisers are also more likely to report the same comparable transaction as inferior for appraisals associated with refinance loans. Although there are no contract prices for appraisers to target when the appraisal is associated with refinancing an existing loan, a higher appraised value would enable some borrowers to extract a greater amount of equity in cases of a cash out refinancing. Similar to purchased properties with a contract price above an AVM estimate, the estimated differences associated with refinancing are consistently smaller than those of a home purchase with a contract price greater than the AVM estimate.

In all instances the above measured effects are statistically significant at the 1% level with robust standard errors clustered at the subject property level (i.e., appraisal level).

Figure 2 illustrates how reported property attributes of comparable transactions change with contract price relative to AVM. The estimates are from a spline specification allowing for non-linearity in effects, using a vector of indicators of the measured percent difference between the subject property's contract price and AVM estimate in 5-percent intervals. Each panel of Figure 2 illustrates these average estimated differences in reported GLA and the three subjective attributes where the dashed lines represent a 95% confidence interval based on robust standard errors clustered at the subject property level. The omitted category is the case when the subject property's contract price was more than 10% below the AVM estimate. Similar to the specification in Table 3, an indicator for attributes reported associated with refinancing of prior debt is also included in the model.

The lines in Figure 2 would be flat and estimates equal to 0 if there were no relationship between the subject contract price (relative to the AVM estimate) and the likelihood that appraisers misreported comparable attributes. In all four instances, an inverse relationship is observed where appraisers were more likely to report the same comparable transaction as inferior as the distance between the contract price and AVM estimate increases. These estimated differences are always statistically different from zero, and consistent with appraisers on average reporting the same comparable transaction as having almost 9 fewer square feet of GLA, a 1.5% inferior property condition and quality of design, and a 0.5% lower view score

if the contract price was more than 10% above the AVM estimate for the subject property.

5.2. Comparable Attribute Under-Reporting and Final Appraisal Bias

We next examine the relation between under-reporting of a comparable transaction's attributes and the probability that the associated subject property is eventually appraised at a value equal to or above the contract price. In other words, we test whether under-reporting comparable attributes is effective in sufficiently inflating the subject property's final appraised value. This is not a given, because the multi-step procedure predominantly used by appraisers to value residential property (i.e., the sales-comparison approach) could theoretically undo any erroneous reporting of attributes through differences in price adjustments and/or weighting of comparable transactions. We continue to focus on properties that have been used multiple times as a comparable transaction by the same appraiser as intent is the most cleanly identified in this restricted sub-sample.

We are interested in testing whether the subject property associated with appraisal k was more likely to have an appraised value at least equal to contract price if appraiser reported attributes of comparable transaction i as inferior (e.g., having a smaller gross living area) than when appraising a different property with the same comparable transaction.[14] The

[14]Using our previous notation, we compare each attribute A of comparable transaction i reported by appraiser j in appraisal k with that of appraisal(s) other than k.

dependent variable, I(Appraisal $\geq$ Contract) is an indicator for contract price confirmation, which is equal to 1 if the appraised value of subject property k is equal to or exceeds contract price.[15] More specifically, we estimate the following model:

$$I(Appraisal \geq Contract)_{ikst} = \beta * Underreported_{ik}^{A} + \sigma_{st} + \epsilon_{ikst}, \tag{4}$$

where the variable of interest, $Underreported_{ik}^{A}$, is an indicator for whether attribute A of comparable transaction i in appraisal k was misreported as inferior. To control for idiosyncratic effects across time and housing markets, the specification also includes 1,080 state-year-quarter fixed effects (σ_{st}). The sample is restricted to the 2,220,624 subject properties with a repeat comparable transaction appraised due to a pending home purchase loan as since a contract price does not exist when an appraisal is motivated by the refinancing of an existing loan.[16]

Results of this specification for each of the four main attributes are listed in columns (1), (3), (5), and (7) of Table 4. Robust standard errors clustered at the subject appraisal level are reported in parentheses. On average, 93.0% of subject properties had an appraised value

[15]The notation $I(Appraisal \geq Contract)_{ikst}$ refers to comparable transaction i associated with appraisal k which was conducted in state s quarter t, where each appraisal k could be associated with more than one comparable transaction i.

[16]There are 4,691,333 observations because some subject properties had more than one repeat comparable transaction.

equal to or exceeding contract price. Subject properties with a comparable transaction where condition, quality, and view were under-reported by the same appraiser were statistically more likely to have an appraised value equal to or exceeding contract price. The effect sizes are not large, and that on gross living area (GLA) was negative and statistically insignificant. Having a comparable transaction with an under-reported subjective attribute corresponds to a subject property being 3.0-to-11.4% less likely to have an appraised value below contract price.[17]

The benefit to appraisers of manipulating comparable attributes reported to inflate subject property valuation would be largest for the properties that would have otherwise had an appraised value below contract price without manipulation. In columns (2), (4), (6), and (8) of Table 4, we test for this hypothesis directly by adding an indicator for the contract price of the subject property is above the AVM estimate, $I(Contract > AVM)_k$, as well as its interaction term with the under-reported indicator for each of the four potential attributes. As expected, subject properties with a contract price greater than the AVM estimate were about 9.7 percentage points less likely to have an appraised value at least equal to the contract price. However, as indicated by the coefficients on the interaction terms, under-reporting of comparable transaction attributes significantly increased the likelihood of an appraised value equal to or greater than the contract price of the subject property. The estimated coefficients

[17]For example, under-reporting view of a comparable transaction decreases the likelihood of an appraisal being below contract price by 11.4%, which is calculated as 0.0080/(1-0.9297).

on all four attributes are statistically significant at the 1% level. These interacted effects imply that under-reporting of comparable transaction attributes with a contract price above the AVM estimate decreases the probability that subject properties had an appraised value below contract price significantly. The sub-sample of appraisals with contract price above the AVM estimate on average have a 11.9% probability of being appraised less than the contract price. The estimates range from a 12.8% decrease for view to a 17.8% decrease for quality of design.[18]

6. The Consequences of Misreporting

The previous results suggest but do not prove that appraisal bias found in this study affects loan performance. Several recent studies have shown properties with an appraised value greater than alternative AVM estimates were more likely to default during the Great Recession. However, Griffin (ress) and others have shown this cohort of loans were also poorly documented with overstated borrower incomes, lower credit scores, and a common presence of unknown simultaneously originated second mortgage loans, making it difficult to identify the effect specific to appraiser introduced biases (Ding and Nakamura, 2016; Kruger and Maturana, 2020). Significant reforms have subsequently been enacted to improve reporting and income

[18]For example, for those with higher-than-AVM contract price, under-reporting view of a comparable transaction decreases the likelihood of an appraisal being below contract price by 12.8%, which is calculated as (0.0084+0.0068)/0.1190.

documentation, but we have shown in previous sections that purposeful appraisal bias persists at least through property attribute misreporting. In this section, we illustrate that attribute misreporting is directly associated with borrowers being more likely to become seriously delinquent in their loan payments.

We next test the linkage between comparable attribute under-reporting and the subsequent loan performance of the subject property. Our empirical test is similar to that used in Section 5.2 by focusing on properties where the appraiser reused a comparable transaction, but the sample is further restricted to the 962,374 home purchase loans originated and eventually purchased by the secondary market financial institution providing our data.[19] Our dependent variable is if the borrower of the loan associated with the subject property k became 60-days delinquent in their loan payments by the end of 2018, where 60 days is considered the minimum period when a borrower is considered seriously delinquent and foreclosure proceedings initiate.

We test whether there is a systemic and significant connection between misreporting of comparable transactions and the subsequent loan performance, by estimating the following specification:

$$Delinquent_{ikst} = \beta * Underreported_{ik} + \sigma_{st} + \epsilon_{ikst}, \tag{5}$$

[19]There are 1,880,791 observations since appraisers may have used multiple repeat comparable transactions for the same subject property.

where $Underreported_{ik}$ indicates if at least one of the four attributes associated with comparable transaction i is under-reported in appraisal k, and σ_{st} again represents a unique state-year-quarter fixed effect to simultaneously control for both time at risk of delinquency and unique market conditions for each loan cohort. Our main coefficient of interest β is defined as the effect on delinquency associated with whether at least one of the four main property attributes (GLA, condition, quality, and view) of comparable transaction i was under-reported by appraiser in appraising the subject property of appraisal k.

Consistent with the general conservativeness of underwriting standards during the analysis period as noted by Rappaport and Willen (2014) and others, only 1.01% of the 962,374 loans in the sample became seriously delinquent over this period. The first column of Table 5 indicates borrowers of loans collateralized by a subject property with an under-reported comparable transaction were not more likely to become seriously delinquent on average. The coefficient β is not statistically distinguishable from 0 based on subject-property clustered standard errors.

The incentive to and likelihood of default varies directly with the equity of a borrower, which is most often measured by loan-to-value (LTV) at origination. We investigate whether borrowers with highly-leveraged loans (i.e., an LTV greater than 80%) with under-reported comparable attributes were more likely to become delinquent.[20] The base specification of

[20]Borrowers with an LTV over 80% are most likely liquidity and/or credit constrained as they have to pay a higher effective interest rate associated with private mortgage insurance (Calem et al., 2015).

Equation (5) is expanded to account for differences in borrower leverage using indicators I(80 <LTV $\leq$ 90) and I(LTV >90) interacted with an indicator for a comparable transaction being under-reported.[21] Results presented in the second column of Table 5 first omit interactions and show the borrowers of loans with LTV greater than 80% were indeed more likely to default. Borrowers of loans with an initial LTV greater than 80% and less than or equal to 90% were 0.5 percentage points more likely to default, and those with an initial LTV greater than 90% were 0.9 percentage points more likely to default. The estimated coefficient on whether at least one attribute of a comparable transaction was under-reported, *beta*, remains statistically insignificant and economically small.

Results presented in the third column of Table 5 include interactions of borrower LTV and whether a comparable transaction was under-reported. The omitted reference category in this, and the remainder of results presented in Table 5, are borrowers with an LTV less than or equal to 80% and a comparable transaction was not under-reported by an appraiser. Borrowers of properties with an LTV greater than 90% and at least one under-reported property attribute are estimated to be 0.1 percentage points more likely to default at the 5% level of statistical significance. Suggestive of a possible exchange in positive soft borrower information between lenders and appraisers, borrowers of properties with a misreported

[21] Different from Equation (5), $Underreported_{ik}^{A}$ in this case is equal to 1 if the attribute A, indicated by the column title, of comparable transaction i is under-reported in appraisal k, which is the same as in Equation (4).

comparable transaction were 0.1 percentage points less likely to default if they have an initial LTV less than or equal to 80%. Given that an average 0.7% of borrowers with an initial LTV less than or equal to 80% with no under-reported comparable attributes became seriously delinquent over this period, these two estimates imply that, for borrowers with greater than a 90% LTV, the under-reporting of one or more property attributes results in a 5.0% increase in the probability of becoming seriously delinquent in their loan payments.[22] Comparable transactions with misreported property attributes were not associated with a higher delinquency rate if the borrower's initial LTV was between 80% and 90%.

A potential form of unobserved heterogeneity and explanation for the above results are differences in underwriting standards across mortgage lenders. In particular, a misreporting appraiser may also be more likely to work with a mortgage lender with less strict underwriting standard making it difficult to identify separate effects. To guard against this possibility, the specification associated with results presented in column (4) includes separate fixed effects for the each of the 4,329 originating mortgage lenders of loans in the sample. Reassuringly, the combined estimated effects of attribute misreporting of borrowers with a greater than 90% LTV slightly increase to 5.9% and remain statistically significant.[23] The last four columns

[22]More specifically, the combined effect of under-reporting for properties with a greater than 90% LTV is 0.0008, which divided by 0.0070 + 0.0090 is 5.0%. Alternatively, a 0.0008 percentage point increase in the probability of delinquency is 7.9% of the full sample mean.

[23]The combined effect of under-reporting for properties with a greater than 90% LTV is 0.0009, which divided by 0.0070 + 0.0083 is 5.9%. A 0.0009 percentage point increase in the probability of delinquency is

of Table 5 report results associated for each of the four main specific property attributes most commonly misreported by appraisers with lender fixed effects. The interaction of under-reporting with an LTV greater than 90% remain statistically significant at least at the 10% level for three of the four variables, with property condition being the exception. The statistically significant estimates range from 7.8% for quality, 12.9% for gross living area, and 14.8% for view.[24] Alternatively, the combined effects of under-reporting for properties with a greater than 90% LTV in the magnitude of 0.0012 (quality), 0.0020 (GLA), and 0.0023 (view) percentage points correspond to 11.9%, 19.8% and 22.8% of the full sample mean of delinquency probability. Taken together, our results demonstrate the real consequences of misreporting of property attributes, which is especially profound in the highly-leveraged segment of the market.

7. The Prevalence of Attribute Misreporting

It is important to determine whether a large fraction of misreporting is by a few misbehaving appraisers being exceptionally active, or whether such behavior is more pervasive. Table 6 reports summary statistics of misreporting by appraisers with at least 10 appraisals. The first column of estimates corresponds to the 16,962 appraisers that used a subject property

also 9.9% of the full sample mean.

[24]For example, the combined effect of under-reporting for properties with a greater than 90% LTV is 0.0020, which divided by 0.0070 + 0.0085 is 12.9%.

at least once as a comparable transaction, and the second column to that of the 42,002 appraisers who used the same property as a comparable transaction more than once. The average appraiser in each sample was associated with 45.8 and 246.0 appraisals, respectively.

Inconsistency in reported attributes was most common for appraisers reusing subject properties as future comparable transactions. Panel B of Table 6 shows that 53.2% of appraisers had a property where they inconsistently reported at least one attribute and 25.9% of appraisers misreported 2 or more attributes on average. According to Panel C of Table 6, gross living area (38.8%) was the most common attribute inconsistently reported by appraisers on average, followed by lot size (18.9%) and property condition (12.6%). Panel A in Figure 3 illustrates the distribution of appraisers by the share of properties with at least one reporting inconsistency for appraisers that used a subject property at least once as a comparable. The distribution is nearly uniform with 9.6% of appraisers having less than 10% of associated properties with a reporting discrepancy. According to Figure 4, appraisers in this sub-sample are most likely to misreport GLA (84.7%), lot size (69.3%), and condition (66.0%), while almost half of the appraisers (49.9%) on average misreport at least 3 attributes for their associated properties.

It is less common for appraisers to report attributes of repeat comparable transactions inconsistently, although 27.7% of appraisers on average misreported at least one attribute for a property they reused, and 9.9% on average misreported 2 attributes (Table 6 Panel B). The most common inconsistently reported attribute for these appraisers was property condition

(13.2%), followed by quality of design (9.0%) and living area (6.1%), as in Table 6 Panel C. According to Panel B of Figure 3, the distribution for appraisers with repeat comparable transaction is more right-skewed. In both samples, at least 65% of appraisers had one or more misreported attribute for almost one-quarter of properties they reported.

It is evident that misreporting attributes is not a rare case conducted by a few misbehaving appraisers in the sample. Rather, it is a common practice shared by a significant share of appraisers that results in some properties having a significantly biased appraised value.

8. Conclusions

In this paper, we document a specific channel through which appraisal bias was introduced, and provide strong evidence that some appraisers continue to manipulate appraised values after reforms enacted following the 2008 financial crisis to curb such behavior. The specific channel identified is that appraisers inflate the valuation of the subject property by under-reporting property attributes of comparable transactions, especially when the alternative appraisal would have been below the contract price suggested by an AVM estimate. This misreporting has real economic consequences as borrowers of the loans for properties associated with attribute manipulation were found to be more likely to become seriously delinquent in their loan payments, especially those with the highest leverage.

Several important caveats of the research are important to disclose. First, while the dataset used to arrive at the above findings is compiled from 21 million loan applications from

2013-2017, it does not represent the complete universe of loan applications over this period. Most notable absent from the data are jumbo and other non-conforming loan applications. It is also important to note that most housing markets were also relatively stable during this period, so it is unclear how the results would generalize to periods with greater levels of price volatility. Last, it is also important to recognize that while a relatively high percentage of appraisers have engaged in at least some type of misreporting, at least some of this misreporting is accidental by appraisers faced with the impossible task of doing more with increasingly limited resources.

Our findings have important implications for the economy and financial institutions that are directly and indirectly involved in mortgage investment and the MBS securitization process, especially issuers who often provide guaranty to principal and interest payment of the underlying mortgage. Even if original mortgage lenders were able to capture some of the higher expected default risks through differential loan pricing, it is unclear this would be priced correctly by regulators and issuers unaware of such biases. This will lead to lower capital reserves than otherwise required, and greater exposure for taxpayers. More importantly, a non-biased valuation may have prevented some inexperienced borrowers paying a purchase price above market value, and the eventual economic costs of foreclosure upon themselves and surrounding property owners.

An important suggestion of our research is that a unified database of property transactions and associated attributes should be created. Our results show that all facts are not created

equal, especially when incentives exist for some individuals to distort them. Currently, appraisers must rely on a mixture of their own estimates and publicly available records, and then are scrutinized when discrepancies exist between estimates created by others. This burden is especially problematic when the only records available of recent comparable transactions are from Multiple Listing Services, with fields populated by real estate agents with an explicit goal to inflate property values. The creation of a national database of property transactions and attributes could be populated by the original appraiser of a property when a subject based on objective and verifiable attributes, which could be then provided to future appraisers using that transaction to value future properties. The creation of such a database would be important to both enforce uniform property definitions across appraisers and to enhance liquidity of financial products supported by such valuations. This database would also be helpful to the further automation of valuation processes, who often use data indiscriminately regardless of source. The potential for this database and the degree to which appraisal biases are priced into loans remain open questions of research.

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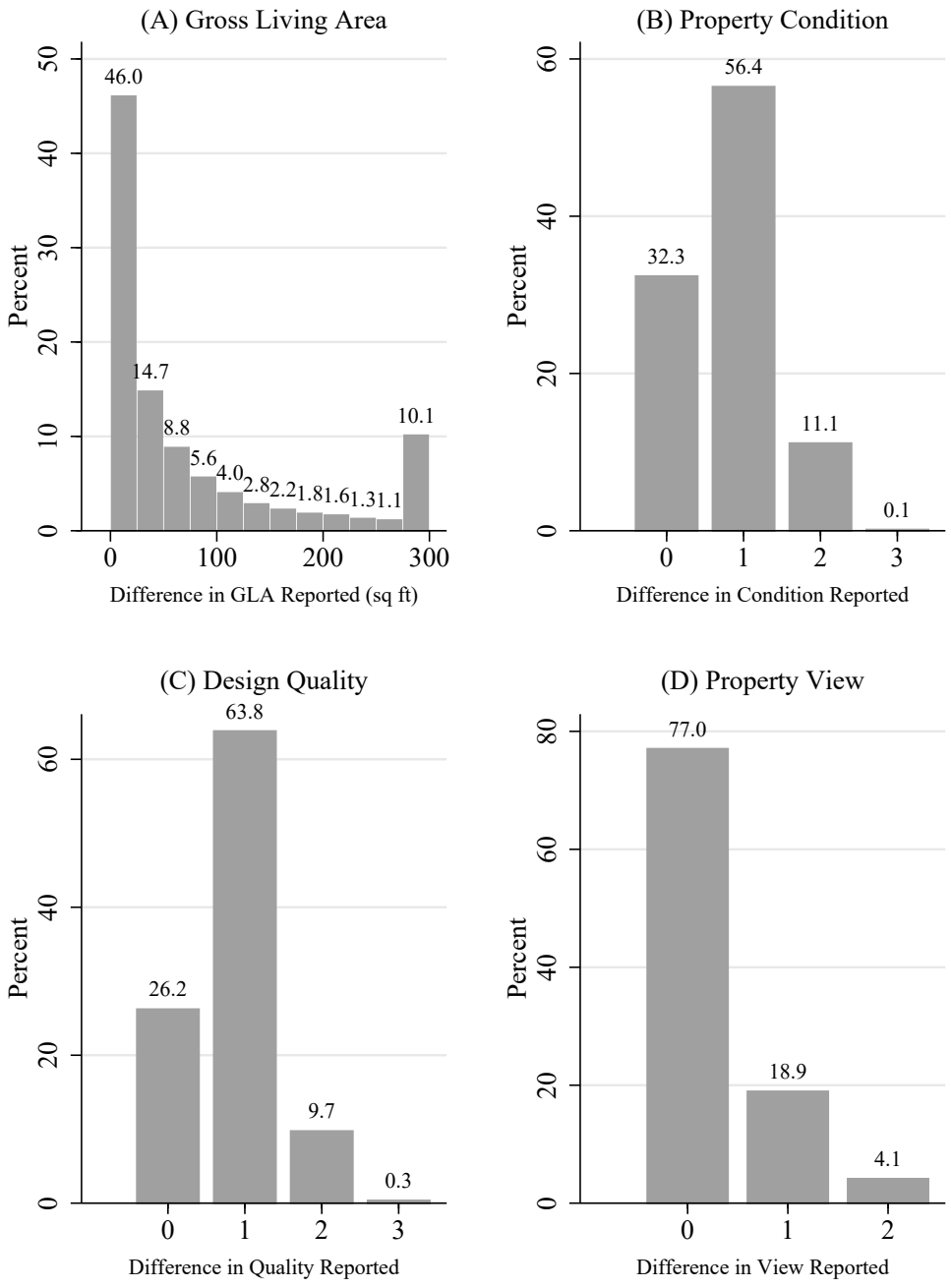
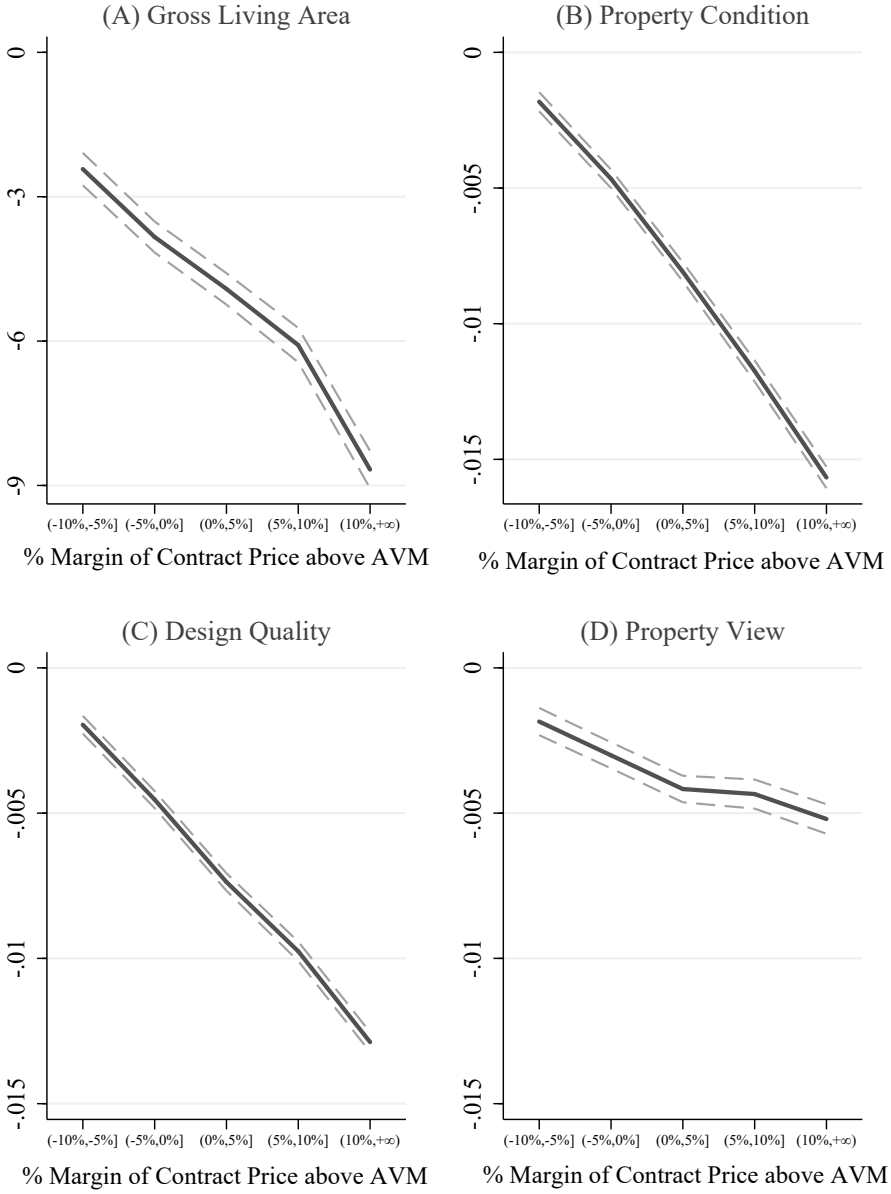
Figure 1: Histogram of Differences in Reported Attributes for the Same Property



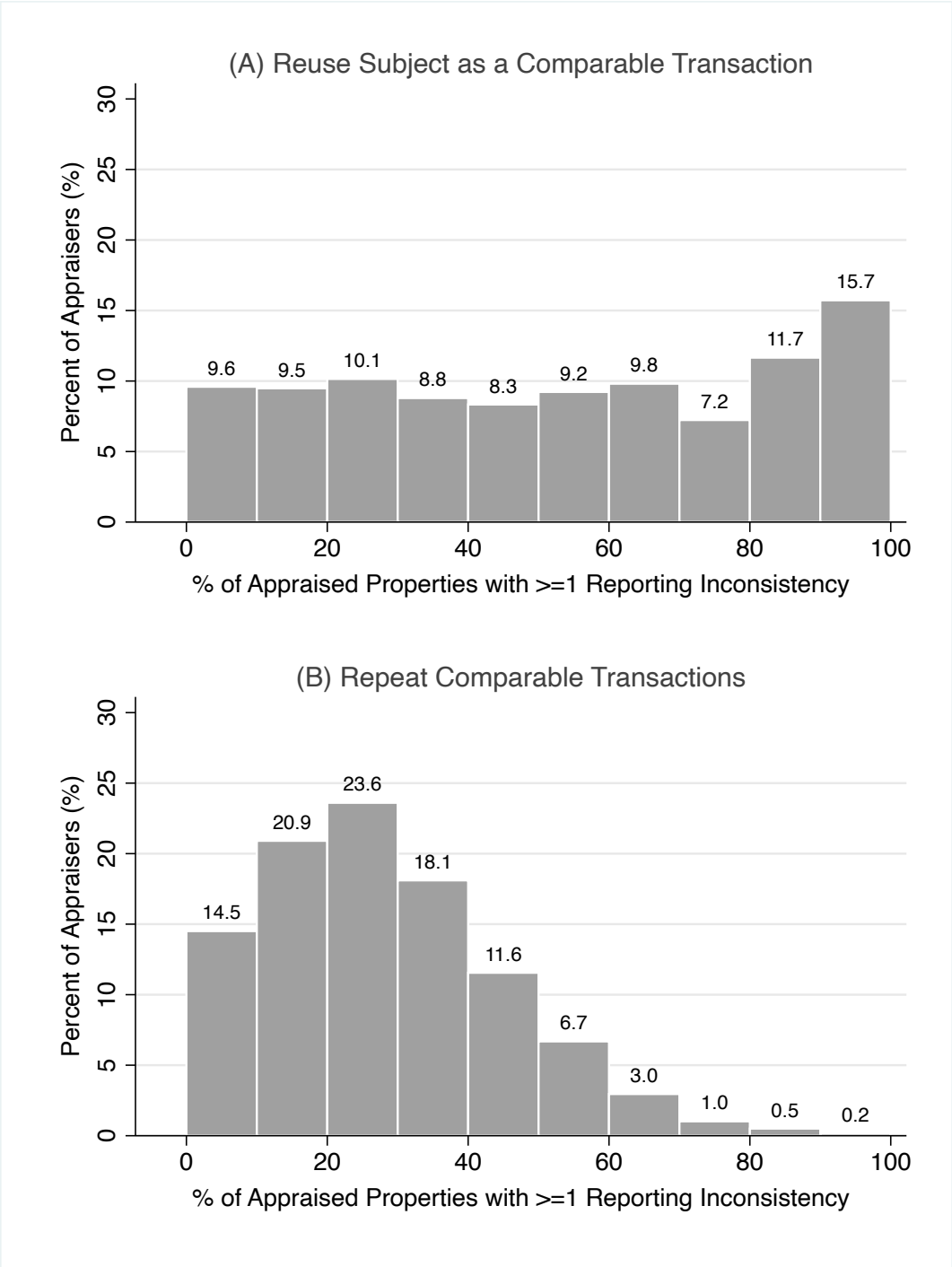
Notes: Sample A includes subject properties used as a comp at least once (N=3,476,599). The 1st column of Panel (A) includes 16.16% of properties with consistently reported GLA.

Figure 2: Estimated Differences in Attributes Reported as a Comparable Transaction by the Same Appraiser when Subject's Contract Price is Above AVM Estimates



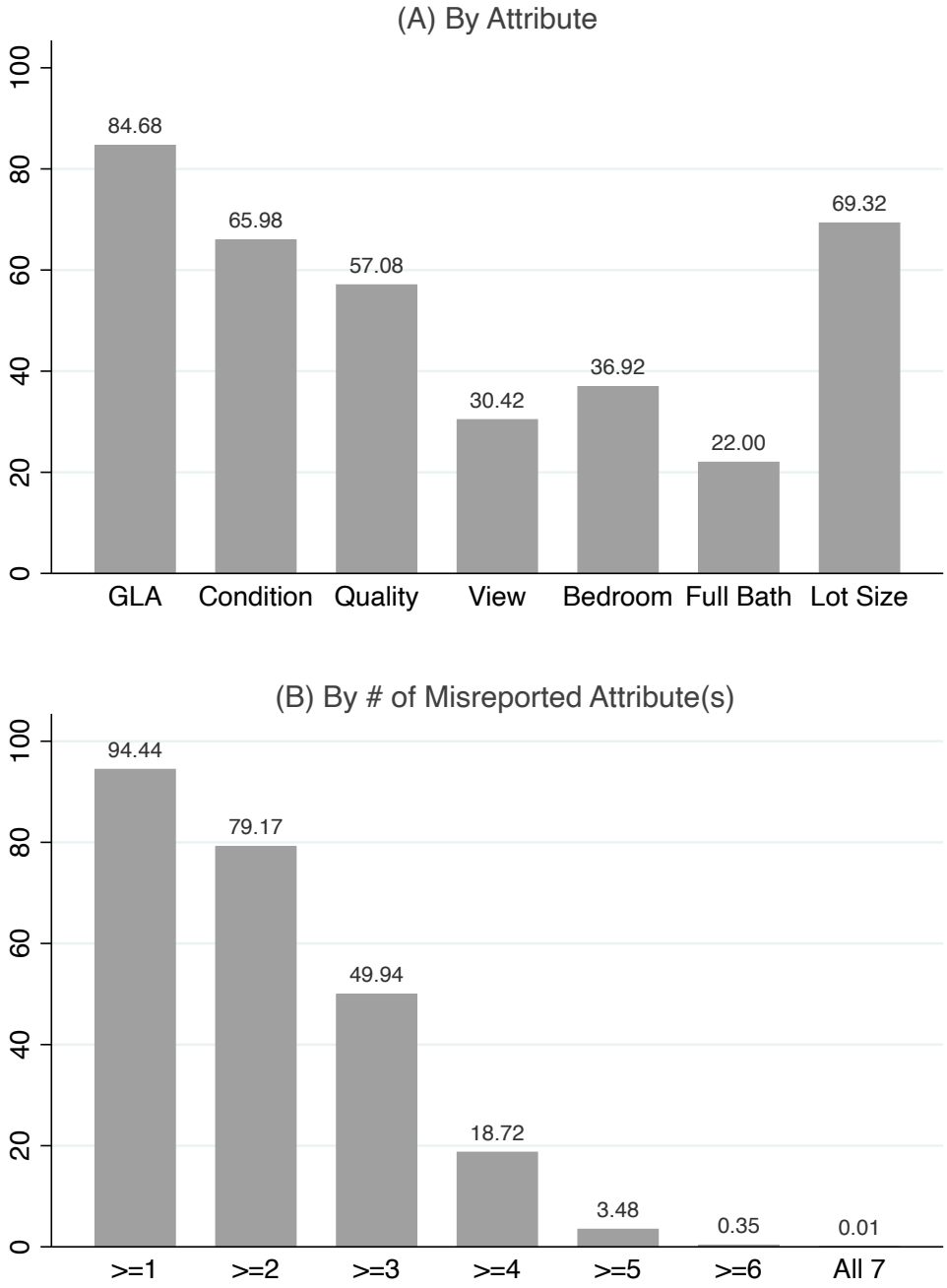
Notes: The graph plots the estimated regression coefficients in Equation (**??**) on indicators of percent difference between a subject property's contract price and the AVM estimate. The dependent variable of each regression is listed in the sub-title of each panel and the omitted category is if the contract price is more than 10% below the AVM estimate. The specification includes property-appraiser pair fixed effects and an indicator for appraisals associated with refinance loans. A negative estimate is consistent with an appraiser being more likely to report the same comparable transaction as inferior as the contract price increases relative to the alternative estimate. GLA is in square feet. Condition, Quality, and View are in natural logarithms. The dash lines represent 95% confidence intervals based on standard error clustered at the property-appraiser level.

Figure 3: Distribution of Appraisers by % of Properties with At Least One Inconsistently Reported Attribute, by Sample



Notes: The sample in panel A is restricted to 16,962 appraisers with at least 10 properties where they reused a past subject of an appraisal as a comparable transaction when appraising a different property in the future. The sample in panel B alternatively restricted to the 42,002 appraisers that used the same comparable transaction when appraising different properties.

Figure 4: Share of Appraisers who Misreported Attributes At Least Once, by Attribute



Notes: The sample is restricted to 16,962 appraisers with at least 10 properties where they reused a past subject of an appraisal as a comparable transaction when appraising a different property in the future.

Table 1: Summary Statistics on the Estimation Samples

	Properties Used as a Subject and Comparable at Least Once		Properties Used as a Subject and Comparable at Least Once by Same Appraiser		Properties Used as a Comparable at Least Twice by Same Appraiser	
	(1)	(2)	(3)	(4)	(5)	(6)
	Average	Consistently Reported (%)	Average	Consistently Reported (%)	Average	Consistently Reported (%)
Gross Living Area (GLA)	1,977.3	16.2	1,974.9	64.6	2,030.0	93.8
Property Condtion	4.0	32.3	4.1	88.9	4.0	87.0
Quality of Design	3.5	26.2	3.5	91.6	3.5	91.3
View	1.1	77.0	1.1	97.0	1.1	96.8
Bedrooms	3.3	85.2	3.2	96.5	3.3	97.6
Full Bathrooms	2.0	90.7	2.0	98.3	2.1	98.2
Lot Size	13,276.0	44.1	15,544.4	82.8	15,534.9	93.9
All Attributes Consistently Reported (%)	1.68		51.44		75.06	
Observations	21,178,364		844,247		10,361,464	
Unique Properties	3,476,599		366,870		3,365,938	

Notes: GLA and Lot Size are in square feet. Property Condition and Quality of Design are on a six-point scale and View is on a three-point scale, where a higher value always indicates a property with a superior attribute.

Table 2: Estimated Difference in Reported Property Attributes: Subject vs. Comparable

	GLA	Condition	Quality	View
	(1)	(2)	(3)	(4)
	Panel A. Subject property used at least once as a comparable transaction			
Subject of Appraisal	11.206***	0.012***	0.009***	0.009***
	(0.069)	(0.001)	(0.001)	(0.001)
Property Fixed Effects	✓	✓	✓	✓
Observations	21,178,364	21,178,364	21,178,364	21,178,364
Unique Properties	3,476,599	3,476,599	3,476,599	3,476,599
	Panel B. Subject property used at least once as a comparable transaction by the same appraiser			
Subject of Appraisal	5.063***	0.005***	0.004***	0.002***
	(0.137)	(0.001)	(0.001)	(0.001)
Property-Appraiser Fixed Effects	✓	✓	✓	✓
Observations	844,247	844,247	844,247	844,247
Unique Properties	366,870	366,870	366,870	366,870

Notes: Dependent variables are the reported property attributes indicated in the column titles. GLA is gross living area and specified in square feet. Condition, quality, and view are log-transformed. A positive coefficient indicates that appraisers reported the same property as superior when the subject of an appraisal. Robust standard errors are clustered at the property level in Panel A and at the property-appraiser level in Panel B.

Table 3: Difference in Reported Attributes of the Same Property used as Comparable Transaction Repeatedly by Same Appraiser

	GLA	Condition	Quality	View
	(1)	(2)	(3)	(4)
I (Contract Price >AVM)	-4.011***	-0.009***	-0.007***	-0.003***
	(0.095)	(0.001)	(0.001)	(0.001)
Refinancing of Subject	-1.110***	-0.005***	-0.003***	-0.001***
	(0.086)	(0.001)	(0.001)	(0.001)
Property-Appraiser Fixed Effects	✓	✓	✓	✓
Repeat Comparable Transactions	10,361,464	10,361,464	10,361,464	10,361,464
Unique Properties	4,702,077	4,702,077	4,702,077	4,702,077

Notes: Dependent variables are the reported property attributes indicated in the column titles. GLA is gross living area and specified in square feet. Condition, quality, and view are log-transformed. A coefficient value less than 0 indicates that the same appraiser reported the same comparable transaction as inferior. Contract price is the accepted offer price of the property and AVM is the estimate generated by an automated valuation model. Robust standard errors are clustered at the subject property level.

Table 4: The Effect of Misreported Attributes of Comparable Transactions on Likelihood of being Appraised At Least Equal to Contract Price

	GLA		Condition		Quality		View	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Underreported	-0.0004	-0.0005	0.0021***	0.0021***	0.0051***	0.0017***	0.0080***	0.0068***
	(0.0008)	(0.0006)	(0.0006)	(0.0005)	(0.0007)	(0.0007)	(0.0011)	(0.0010)
I(Contract >AVM)		-0.0978***		-0.0971***		-0.0978***		-0.0970***
		(0.0005)		(0.0005)		(0.0005)		(0.0005)
Underreported × I(Contract >AVM)		0.0088***		0.0132***		0.0195***		0.0084***
		(0.0014)		(0.0011)		(0.0013)		(0.0022)
State-Quarter Fixed Effects	✓	✓	✓	✓	✓	✓	✓	✓
Observations	4,691,333	4,691,333	4,691,333	4,691,333	4,691,333	4,691,333	4,691,333	4,691,333
Unique Subject Properties	2,220,624	2,220,624	2,220,624	2,220,624	2,220,624	2,220,624	2,220,624	2,220,624

Notes: The dependent variable associated with each column of results is an indicator if subject property has an appraised value equal to or exceeds the contract price. Underreported is an indicator for whether the appraiser misreported a comparable transaction attribute as inferior when valuing the subject property. Contract price is the accepted offer price of the property and AVM is the estimate generated by an automated valuation model. Robust standard errors are clustered at the property-appraiser level.

Table 5: The Effect of Misreporting of Comparable Transaction Attribute(s) on Loan Delinquency

	One or More Attribute Misreported				Attribute Misreported			
					GLA	Condition	Quality	View
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Underreported	-0.0002	-0.0001	-0.0006*	-0.0005*	-0.0007	0.0004	-0.0009**	-0.0025***
	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0005)	(0.0004)	(0.0005)	(0.0006)
I(LTV >90)		0.0092***	0.0090***	0.0083***	0.0085***	0.0086***	0.0084***	0.0085***
		(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
Underreported × I(LTV >90)			0.0014**	0.0014**	0.0020*	-0.0004	0.0021*	0.0048**
			(0.0006)	(0.0006)	(0.0011)	(0.0009)	(0.0011)	(0.0019)
I(80 <LTV ≤ 90)		0.0047***	0.0046***	0.0041***	0.0042***	0.0041***	0.0041***	0.0042***
		(0.0003)	(0.0004)	(0.0004)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
Underreported × I(80 <LTV ≤ 90)			0.0007	0.0007	-0.0001	0.0009	0.0019	-0.0025*
			(0.0008)	(0.0008)	(0.0012)	(0.0011)	(0.0014)	(0.0015)
State-Quarter Fixed Effects	✓	✓	✓	✓	✓	✓	✓	✓
Lender Fixed Effects	×	×	×	✓	✓	✓	✓	✓
Observations	1,880,791	1,880,791	1,880,791	1,880,791	1,880,791	1,880,791	1,880,791	1,880,791
Unique Subject Properties	962,374	962,374	962,374	962,374	962,374	962,374	962,374	962,374

Notes: The dependent variable associated with each column of results is an indicator if the borrower of the loan of the subject property becomes 60-day delinquent in their payments. Underreported is an indicator for whether the appraiser misreported a comparable transaction attribute as inferior when valuing the subject property. Robust standard errors are clustered at the property level are in parentheses.

Table 6: The Prevalence of the Misreporting by Same Appraiser for Same Property

Panel A. Summary Statistics of Reporting		
	As Subject and Comparable	As Comparable More than Once
Number of total appraisals	45.8	246.0
Number of subject appraisals	19.7	111.6
Number of times same property used as a comp	1.3	2.2
Number of attributes misreported	0.5	0.2

Panel B. Average Shares of Appraisers Misreported by Number of Attributes		
	As Subject and Comparable	As Comparable More than Once
At least 1	53.2	27.7
At least 2	25.9	9.9
At least 3	8.2	3.0
At least 4	1.9	0.8
At least 5	0.3	0.2
At least 6	0.0	0.0
All 7	0.0	0.0

Panel C. Average Shares of Appraisers Misreported by Attributes		
	As Subject and Comparable	As Comparable More than Once
Gross Living Area (GLA)	38.8	6.1
Property Condtion	12.6	13.2
Quality of Design	9.5	9.0
View	3.5	3.0
Bedrooms	4.0	2.4
Bathrooms	2.0	1.9
Lot Size	18.9	6.0
Observations	777,002	10,330,619
Unique Appraisers	16,962	42,002

Notes: All three samples only include appraisers with at least 10 appraisals in the corresponding sample. GLA and Lot Size are in square feet.