Do Appraisers Adjust to Market?

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Abstract

Appraisers use comparable sales to estimate the market value of real property. They use sales of comparable properties to perform that valuation but must make adjustments to these comparables that are based on the differences in attributes between them and the subject property. These adjustments should in theory be equivalent to the market's valuation of these attributes. We develop a simple econometric model to test whether this is the case.

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1. Introduction

Participants in real estate transactions often ask for a third party appraisal of the market value of a property. Lenders, in particular, require an appraisal because the property in question serves as collateral for the buyer-borrower. Such an appraisal is necessary because of the illiquid and heterogeneous nature of real estate. Its illiquidity means that there is generally not a recent sale of the property to provide an up-to-date basis for valuations, and the heterogeneity implies that each property is a unique combination of characteristics, embodied in that particular structure (and location) so that unlike other assets, recent sales of other property do not provide *direct* evidence on the subject property's value. The services of a professional appraiser are therefore required.

The practice of appraisers is to use comparable properties, or "comps", in the valuation procedures. Comps are properties that are near the property being appraised– the subject property– and which have been recently transacted. The geographical proximity and the recentness of the transaction ensure that the comp is indeed comparable, in that the market conditions for the subject property are not too different from those of the comp. As just noted, though, the comps and the subject property will have different physical characteristics: different sizes, different land plots, number of bathrooms, garage spaces, etc. There are other features that will be different as well: view, condition, location, and characteristics of the transaction itself may all prevent the price of the comp from directly informing the price of the subject property. For this reason, the appraiser makes *adjustments* to the comps' transaction prices in order to account for these differences. For example, if the comp is larger in size than the subject property, the appraiser will adjust the sale price of the comp downward in order to provide an apples-to-apples comparison. An open question is whether these adjustments pass the market test: Do the appraiser's adjustments correspond with market evaluations of property characteristics? In this paper we propose a new empirical strategy to test whether there is such a correspondence.

In so doing we contribute to the growing academic literature on property appraisal. This litera-

ture has focused on appraisal practice and in particular on the ability and motivation for appraisers to provide informative appraisals (Nakamura et al., 2010), that is, appraisals that do not simply appraise at the subject property's contract price. Much of the evidence on this topic arises in the housing boom of 1995-2005, a period in which demand for residential property was very high and further price growth was widely expected. Appraisers are widely perceived to have inflated their valuations during this period in order not forestall transactions, with an eventual impact on default patterns in the subsequent housing crash.

In the next section we outline the procedures that are undertaken by appraisers in order to ostensibly provide market evaluations, and then review the research that suggests that appraisals are not always meeting that standard. This is followed in the next section by a description of a new, but simple, econometric procedure that can test whether one important stage in the appraisal– the adjustments that account for the differences between subject and comp– approximately replicate the market valuation of those differences.

We then discuss the database of property appraisals and transactions used in this work, and then the results of our estimation.

2. Appraisal and its Discontents

An appraiser is contracted to provide a market valuation of a property. As noted above, this is necessary because real estate is a heterogenous commodity and the individual units are not traded with sufficient frequency to be able to use a recent transaction as a basis for an evaluation.

Instead, the appraiser uses a number (usually three to five) of recently traded properties that are geographically proximate to the subject property to use as comparable properties, such that the market conditions of time and place of the comp's sale are similar to the sale of the subject property. The appraiser uses personal visits and information from county recorder data or the local Multiple Listing Service to determine the characteristics, along with the sale price, of each of the

comparable properties. These attributes are entered on an appraisal form, an example of which is shown in Figure 1.

As can be seen, the first column in the form references the subject property, and lists in each row an attribute value, in the case of a cardinally measured attribute, or the presence or absence of attributes such as pool, patio, HVAC type, and so on. In the second and subsequent columns the attributes of the comp properties are similarly displayed. Accompanying each of those comp attributes is an *adjustment*, the dollar value applied to the difference in the attributes.

For example, if the comp has 500 more square feet than the subject property then, other things equal, the comp will have a higher price. The price of the comp must therefore be adjusted downward to provide an accurate comparison. Similarly if the subject property has a swimming pool and the comp does not, the price of the comp will be adjusted upwards to reflect that difference. Clearly, the magnitude of the adjustment thus provides the appraiser's valuation of the characteristic for which the adjustment is made. For example, if the adjustment with respect to size is the subtraction of $20000 from the comp price the appraiser is valuing each marginal square foot at $40. Similarly, if the adjustment for a pool is $50000, the appraiser is identifying the implicit price of a pool at that amount. (Housing researchers will see the connection between this procedure and the concept of a hedonic price, a connection we explore in the next section.) The next step in the appraisal is to accumulate the positive and negative adjustments for each comp, and enter this sum on the line labeled in this form as "Net Adjusment". This net adjustment is then applied to the comp's sale price to create the "Adjusted Sale Price" which is in fact an appraisal of the subject property (using only the information from a single comp). The selection criteria for the comps ensures that the market conditions are the same, and the adjustments ensure that the comparison properly accounts for the differences in the units themselves.

Each one of the adjusted sales prices is a valid appraisal, but there are clear advantages to having information from multiple comps. The final step in the appraisal is to then combine the three (say) adjusted prices into a single appraisal. A natural combination method would be the

simple average of the three adjusted prices, but the appraiser is not limited to this choice and may increase or decrease the weight of any of the comps if this is felt to be desirable. This may occur, for example, if one comparison has greater or lesser uncertainty attached to it.

That is how the appraisal process is supposed to work. In practice, however, residential appraisers have been criticized for failing to follow these procedures and provide a true market valuation. If appraisals are truly objective, one might expect that they would be distributed as a bell curve centered around the transaction price. This is not the case. Early estimates of this distribution (Chinloy, Cho, and Megbolugbe, 1997; Cho and Megbolugbe, 1996) noted that very few appraisals were below the transaction price, up to 30 percent were above the price, and the majority were equal to or just a few percentage points away from the price. This was confirmed in numerous other studies including Calem, Lambie-Hanson, and Nakamura (2015) and Conklin et al. (2020).

The lop-sided distributions of appraisals is widely believed to arise from the incentives given to appraisers to facilitate the transaction. When an appraisal is below the contract price, lenders must use the appraisal, rather than the contract price, to value the collateral, and given the loan to value ratio determined by the credit application, the amount of the loan is reduced accordingly. This threatens the transaction, because either (a) the borrower must come up with additional down payment; or (b) the seller must renegotiate the price; and either of these could cause the transaction to be nullified. During the house price boom of 1995-2005, there were no parties to the transaction who did not wish to see it go forward, even when the collateral value was uncertain, given the seemingly endless rise in home prices during this period. Considerable pressure was thought to be put on appraisers to deliver "acceptable" appraisals (Ben-David, 2011; Griffin and Maturana, 2016; Kruger and Maturana, 2020). Conklin et al. (2020) noted that in locations with greater competition among appraisers, appraisals were more likely to appraise at the transaction price, suggesting that market pressure played a role in driving appraisals to the contract price. The preponderance of at-or-above-price appraisals led to the suspicion that appraisals were in general, inflated, and therefore more likely to default when the boom period ended and home prices fell in the post-2005 period

(Ben-David, 2011; Griffin and Maturana, 2016).

One outcome of the home price crash and subsequent recession was the legislation commonly known as the Dodd-Frank bill, which attempted to end the hands-on relationship between lenders and appraisers. This was at least partially successful, although the share of appraisals that match the transaction price is still larger than naive expectations would suggest (Ding and Nakamura, 2016).

Attention has then turned to the mechanisms through which appraisals can be directed to match the transaction price. The appraisal form in Figure 1 suggests at least four possible paths. The first is the selection of the comps themselves, however this can be discounted as an important mechanism, since in theory any property can be a comparable for any other as long as the appropriate adjustments are made including those that pertain to market conditions.

Another mechanism is reweighting. As noted above, while the default method of combining the adjusted sale prices would be to take a simple average, appraisers are free to do otherwise. Eriksen et al. (2019) finds that unequal weights are more likely if an equal weighting would have resulted in an appraisal below the transaction price, suggesting that the weights are manipulated in order to prevent a below-price appraisal.

There is also the possibility that the attributes of the comp properties are mischaracterized. This can most easily happen with characteristics that are subjectively evaluated (such as condition or view) but even physical characteristics are capable of misrepresentation. Eriksen, Kuang, and Zhu (2020) used a set of "repeat appraisals"– two appraisals done on the same property within six months of each other, and found a substantial number of differences in listed characteristics across the appraisal pair. Moreover, the direction of the differences generally served to inflate the value of the comp in order to reach the transaction price.

In this paper we examine yet another path through which the appraisal can be influenced, through selection of attribute prices– that is, the value of the adjustments to the attribute differential. It is an open question how these prices are arrived at, and there are certainly no automated

procedures. A leading real estate textbook says that these prices are determined "on the basis of experience, judgement and knowledge of how individual buyers and sellers tend to *price* these attributes in various neighborhoods, given the site and property characteristics" (Brueggeman and Fisher, 2021) which would seem to leave much to the discretion of the appraiser.

Thus it would seem to be of importance to ask whether or not the adjustments made by appraisers do pass the market test. We turn, then, to a discussion of the econometric procedures that we will use to test the hypothesis that the adjustments made by the appraiser are the same as those made in the local housing market.

3. Empirical Strategy

In this section we describe the empirical procedures that inform both the econometric discovery of the market valuation of property as well as the methods used by appraisers to evaluate properties on behalf of housing transaction participants.

First, appraisers. Figure 1 and the discussion in the previous section suggest that appraisers have a model of home prices, one in which this value is the sum of the values of all the embedded characteristics. This is expressed in the following equation:

$$P_s = X_s\beta_a + u_s \tag{3.1}$$

where P_s is the value of the property, and unknown to the appraiser, X_s is a vector of its property characteristics, and β_a is the vector of characteristic prices which are known to the appraiser[1]. The term u_s is the value of property characteristics that are not directly quantifiable or known to the appraiser. A major issue, of course, is how each appraiser determines β_a. In the end it would seem appropriate for these weights to replicate the market valuation of the characteristics, and as noted that is the central question of this research.

[1]Some of the elements of X are binary– a one indicates the presence of a feature and a zero its absence.

The appraiser gathers information on the comps. The pricing model for the comp is identical to the model for the subject:

$$P_{sj} = X_{sj}\beta_a + u_{sj} \tag{3.2}$$

where the sj subscript indexes the jth comp for subject property s.

Subtracting 3.2 from 3.1 yields:

$$\hat{P}_{sj} = P_{sj} + (X_s - X_{sj})\beta_a + (u_s - u_j) \tag{3.3}$$

where we can now replace P_s with an estimate of the subject property's value, $\hat{P}_{sj}$, the "adjusted sale price" of the jth comp of the subject property s. This is the appraisal of the subject property given only the information from property sj. Equation 3.3 displays the exact idea behind the use of comps as also reflected in the appraisal form. The appraiser values the subject property by starting with the price of the comp and adjusting it by taking account of the observable differences between the subject and the comp. That is, if the subject property has more interior square feet than the comp, the price of the comp is adjusted upward to account for that difference. As 3.3 shows, the numerical adjustment is the difference in the number of square feet times the value of each square foot. As both 3.3 and the form show, an appraisal that uses only this comp is obtained by summing all of these adjustments and obtaining the adjusted sale price. (This appraisal would be combined in some way with the others to create a final valuation.)

This of course leaves the $(u_s - u_i)$ term. Often, the key to a successful appraisal is choosing comps where this term can be set to zero, thus the importance of the aforementioned recentness and geographical proximity. More than that, as argued in Conklin et al. (2023), appraisers can closely observe property characteristics that are not part of standard appraisal procedures or multiple listing service databases, and match those of the subject and comp. Thus we assume in what follows that this term is indeed zero.

Now consider the econometric model of home prices. This is estimated using a database of completed transactions containing information on both the price and the characteristics of the property. The regression model takes the form for the sjth property:

$$P_{sj} = X_{sj}\beta_h + u_{sj} \tag{3.4}$$

which, again, models the home price as the sum of the contributions to value of each of the characteristics, and is in form exactly the same as the appraisers model. Again, P_i and x_i are the price and characteristics vector for the ith property. The vector β_e is the estimated (via least squares or similar procedure) characteristics prices and u_i is the value of the property characteristics unobserved by the econometrician. It has been forcefully argued (originally in Rosen (1974) but many times since) that the vector β_h (properly estimated) represent the market prices of these implicit characteristics.

Substituting Equation 3.4 into Equation 3.3 yields

$$\begin{aligned} \hat{P}_{sj} &= X_{sj}\beta_h + (X_s - X_{sj})\beta_a + u_j \\ &= X_{sj}(\beta_h - \beta_a) + X_s\beta_a + u_j \end{aligned} \tag{3.5}$$

which shows that the adjusted sale price is the sum of the appraised value of the subject property plus the weighted sum of the characteristics, where the weights are the difference between the market and the appraiser characteristic "prices".

In the next section we treat 3.5 itself as a regression model. That is, we compile a sample of appraisals, where for each appraisal we retain the appraised value, and the set of comps and their adjusted sale prices, as well as the characteristics and actual sale price of the comps. We regress the adjusted prices of the comps on those characteristics, and the appraised value of the subject property. Under the hypothesis that appraisers adjust to market, the coefficients of each character-

istic will be zero, and the coefficient of the appraised value of the subject property (common to all comps of the subject) should be one.

Given that the coefficients of X are the difference between the appraiser and market characteristic prices, testing the hypothesis that these are zero tests the hypothesis that appraisers valuations of individual characteristics are congruent with those in the market. Note that this is robust to variation in markets and time. [2]

4. Data

Our dataset was sourced from a large buyer of residential mortgage loans in the secondary market. It contains extensive information on comparable transactions used to estimate the values of subject properties in residential appraisals. The data provider's collateral valuation and mortgage underwriting platform is relied upon by a significant proportion of financial institutions, resulting in comprehensive market coverage across all 50 states from 2013 to 2017. The dataset includes information on more than 27.3 million comps used in 7.2 million residential appraisals for home purchase loan applications. As a result of multiple uses of a single sales transaction as a comp, the dataset comprises of 11.2 million separate sales transactions on 10.2 million distinct properties.[3]

The data provides a comprehensive record of basic characteristics of comparable homes, collected by appraisers. This information includes common hedonic valuation model variables such as square footage, lot size, age, and number of bathrooms. In addition, it includes other variables not typically found in standard housing databases, such as condition, quality, location, and view, which are rated using standardized criteria detailed in HUD (2015).[4] The dataset also includes a unique

[2]And note that if all of the characterisitic coefficients are zero, the adjusted sale price is the appraised value plus noise, as would be natural.

[3]The data contains a unique property identifier and the quarter-year when the comparable transaction occurred. Each comparable property-transaction quarter combination is treated as a unique sales transaction.

[4]The condition (quality) variable is ordinal, with 1 representing the best condition (quality). We recode these variables from 0 to 5, with 5 indicating the highest quality (condition), for ease of interpretation. Appraisers source information on quality, condition, location, and view in various ways, including visual inspection, MLS or public

appraisal identifier linking comps to specific appraisals, which is vital for our matching estimation method. Appraisers also record whether the comparable transaction was a real estate-owned (REO) property, a short sale, or an arm's length transaction. Additionally, the dataset records the sale price and the adjusted sales price (after accounting for differences from the subject property) of the comparable transaction.

In our study, we utilized a set of property characteristics outlined in Appendix Table A.1. To ensure the accuracy of our analysis, we excluded observations with missing housing characteristics or geographic identifiers (census tract), and only included transactions classified as arm's length, REO, or short sales, which accounted for 99.2% of the comps.[5] Additionally, we imposed certain restrictions on the homes included in our analysis, including a gross living area between 500 and 10,000 square feet, lot size between 500 and 1,000,000 square feet, and homes aged less than 150 years with less than 15 rooms and nine bedrooms. Sales price had to be between $50,000 and $1,425,000, and the homes had to be sold between 2012 and 2017.[6] This cleaned sample included 27,367,418 comparable home transactions.

Table 1 presents descriptive statistics for our sample. The average comparable sale price and adjusted sales price are quite similar, both at approximately $322,000. This is consistent with appraisers choosing comps that minimize differences between the comp and the subject property, thus requiring little in the way of value adjustment. The mean gross living area (GLA) is just under 2,000 square feet, and the properties are 33 years old, on average. Property condition ratings are tightly distributed around a rating of 3 – 93% are rated 2, 3, or 4. Quality of construction is distributed even more tightly, with 95% of the ratings falling into only two categories (2 and 3). The overwhelming majority of properties are classified as having a neutral location and a neutral

records, and communication with other industry players such as real estate agents. We treat these variables as control variables in our primary regression analysis and use a set of indicator variables.

[5]The excluded transaction types are non-arms length sales, estate sales, court-ordered sales, and relocation sales.

[6]These data cleaning procedures aimed to remove outliers and only affected 2.5% of the original sample. The study period was constrained by the availability of appraisal data. The appraisals were completed between 2013 and 2017, but because comp sales occur before the date of the appraisal and comparable transactions were required to occur prior to the appraisal year, the earliest year of a comp sale is 2011.

view. A small share (2%) of the comparable transactions sold as either foreclosures (REO) or short sales.

5. Results

Table 2 presents the baselines results of our estimation of Equations 3.4 and 3.5 in columns (1) and (2) respectively. The first column is a standard hedonic model, albeit one with an especially rich set of characteristics with which to model home prices. The coefficients are usually economically significant and statistically so at conventional levels of Type I error. The effect of an additional square foot of floor space is $122, and an additional 1000 square feet of lot is $228. The older the home, the lower the price [7] Bathrooms add substantive value, evidently half baths detract from it[8]Basements add value, and finished basements even more. Importantly, the coefficients on the various grades for condition and quality are increasing in those grades. The value of the property strictly increases as we move from the lowest Condition 1 to the highest, condition 5, and similarly from the lowest quality 1 to the highest quality 5. In a similar vein, beneficial locations and views add value and adverse ones subtract (recall that "neutral" is the omitted category in both cases. A foreclosed property subtracts about 9% of value and a short sale about 13%.[9]

In column (3) we present the estimation of equation 3.5. In this regression we replace the sale price of the comp with the adjusted sale price and add the appraised value of the subject property as an additional regressor. Recall that the coefficients of this regression are the differences between the market price (as represented by the coefficients in column (2)) and the appraiser's adjustment.

[7]Note in Figure 1 that in the standard form, the number of rooms, bedrooms and baths along with the square footage of the structure, are jointly treated with a single adjustment. In principle, our method is able to separately identify the individual adjustments for each of these four attributes, however in practice, this proves difficult. We note from Sirmans, Macpherson, and Zietz (2005) and our own reading of the literature that when number of rooms or bedrooms is included in an hedonic model the coefficient is negative and is thus a (poor) proxy for lack of space devoted to more productive uses such as kitchen area, making interpretation difficult. For these reasons we omit rooms and bedrooms from our model and allow square feet to strictly represent the size of the unit.

[8]This may be another instance of what was described in the previous footnote.

[9]The greater discount for short sales compared to foreclosure is somewhat unusual but see Conklin et al. (2021) for some discussion of this issue.

Under the hypothesis that the appraiser marks characteristics to market these coefficients should uniformly be equal to zero. Also, according to 3.5 the coefficient on the subject appraisal should be equal to one.

A preferatory note is required. With 27 million observations the usual standards of statistical significance are not particularly useful. Almost any null hypothesis can be rejected, and so it is left to the more informal judgements of the researcher and reader. Consider, for example, the hypothesis that the coefficient on the subject appraisal is equal to one. As can be seen from 2 the estimated coefficient is 0.966, and the hypothesis is rejected at any conventional signficance level. Nevertheless, the coefficient is "very close" to unity and seems confirmatory of our model. [10]. This suggests that adjusted sale price does center on the appraised subject value (plus intercept).

Similar reasoning applies to the coefficients of the characteristics. Any standard significance test easily rejects the hypothesis stated above, that these coefficients are equal to zero. This would imply a remarkable amount of precision on the part of the appraisers. To take one example, note that the coefficient of square feet in column 1 is $114 and the coefficient in column 2 is $6. This suggests that (a) the appraiser's adjustment, on average, is roughly $108; and (b) this difference is statistically significant at any conventional level. But note the standard we are applying here, one that is almost impossible to meet. One way of seeing this is to note that the standard error on the column 3 estimate is .012, thus in order to fail to reject the null at the 5% significance level the coefficent could not be larger than approximately .024. That is, the average appraiser's adjustment would have to be within 2.5 cents of the hedonic adjustment of $114 (not accounting for the standard error on the latter figure). This is of course, a next-to-impossible level of precision, and is driven entirely by our large sample.

We are left, therefore, with a judgement call as to the ability of appraisers to approximately

[10]Note that this is not the result of appraisals largely matching the sale price of the subject, as documented above. There is no need for individual adjusted prices to match the sale price of the subject property, and they generally do not. If the appraiser is motivated to match the appraisal to the contract price it is only necessary that the adjusted prices be appropriately combined.

adjust to market. It seems appropriate to merely consider the percentage difference in the appraiser and hedonic estimates. The difference between $114 and $108 is 5.2% which seems modest under this more informal metric.

The same is true for other "headline" characteristics that normally form the basis of most hedonic models (Khoshnoud, Sirmans, and Zietz, 2023). For each of next six characteristics listed in Table 2, the appraisal error is small. For lot size the hedonic price is $228per thousand square feet, and the implied appraiser price is $211, a difference of 7.5%. Appraiser and hedonic prices for age and full baths are remarkably close, a less than 1% percent difference between the two. The difference for half-baths is larger (around 9.2%) but the negative sign makes this instance hard to interpret. Basements and finished basements are accurately appraised (4.5 and 3.2% respectively).

Things are less clear when we move to condition and quality variables. Recalling that the coefficients represent the impact of condition and quality relative to the lowest level for each, the coefficients in column 2 are much larger than those discussed above. While the coefficient for Condition level 1 is somewhat in line with previous estimates, at a 9% difference, the four higher levels indicate differences between 13 and 15%.

The first two quality indicators (which references the two levels of quality above the omitted, lowest level) both show an estimate of 3.5 that is actually greater than the hedonic coefficient. This indicates that the average adjustment by appraisers is negative, indicating that their adjustment for properties in this category is of greater magnitude than the adjustment for those in the lowest category. This is perhaps not surprising. Table 1 notes that the number of properties in our sample from the very bottom category is quite small and appraisers would be quite unfamiliar with their evaluation as a comparable. Regardless, the appraisal error in the the other three categories are large.

The differences between hedonic and appraiser prices of beneficial view and location are in the reasable range, while those for adverse view and location are above 10%. Finally the errors for foreclosure and short sale are quite large, around 20% in both cases.

Three remarks can be made:

1) The differences between appraisal and hedonic attribute prices are quite reasonable for those attributes that are most commonly used to characterize the caliber of a property. Size of the house, size of the lot, the age,basement and the number of (full) baths, are all easily measured and important characteristics, and more importantly, in practice the appraiser needs to make these adjustments in every appraisal. The greater experience in making adjustments on these ”headline” characteristics will presumably lead to more accurate and more standardized adjustments. By contrast, adjustments of categorical variables, such as condition and quality, are automatically more difficult, since measurement is ordinal rather than cardinal. With six different categories, the appraiser is faced with thirty distinct possible pairs of qualities across subject and comp for which distinct dollar adjustments must be made. It is natural to find accuracy is eroded in such circumstances.

2) For almost every characteristic the coefficient in column 3 is the same sign as that in column 2. This suggests that the appraisal adjustment almost always lower in magnitude than the hedonic price. This belies the notion that appraisers ”bump up” the value of a comp's attributes in order to inflate the adjusted sale price and thereby the appraisal itself.

In order to explore this idea a little further, in Table 3 we present regressions using sample splits based on circumstances where the appraiser might be more or less compelled to inflate the adjustment in order to meet some target, such as the contract price for the subject property. There are three such splits.

In columns 1 and 2, we split the sample into ”thick” and ”thin” markets where thickness is measured by the number of available comps, as stated by the appraiser on the appraisal report. There are then two effects to consider. The first is that in thin markets the matching of subject property to comps is more difficult, and that this would compromise the accuracy of the adjustments made by the appraiser. This would lead to higher coefficients in thin markets (column 2) than in thick markets because the adjustment would be less prone to match the market. The countervailing effect

is that in thin markets one might expect that exaggeration of the value of the comp's characteristics could be more necessary if the appraiser is attempting to hit a target. This would suggest larger appraiser adjustments and therefore smaller coefficients (note 3.5. Thus it is of interest to note that the coefficients in column 2 are generally smaller than those in column 1, sometimes substantially so, as in the estimates for full baths and the lower condition categories. On this interpretation appraisers are increasing the value of these characteristics relative to what they would do in a thick comps situation, presumably in order to hit the target (though somewhat ironically, bringing these adjustments closer to their market value).

In columns 3 and 4, the sample is split along the lines suggested by Eriksen et al. (2019), such that the sample in column 3 consists of properties where the an equal weighting of the appraisals would result in an appraisal less that or equal to the contract price and column 4 uses appraisals in which equally weighted comps would provide an appraisal above the contract price. The difference in incentives is less clear here, although one could suspect that when the appraised value is greater than what would be achieved with an equal split, this is acheived through manipulation of the adjustment. Regardless, the comparison between these two reveals less systematic differences.

Finally, columns 5, 6, and 7 are samples where the final appraisal is greater, less than, or equal to, said contract price. Following Calem, Lambie-Hanson, and Nakamura (2015) we can think of the last category as uninformative appraisals, because when the appraisal is exactly the same as the contract price, the appraisal contains no information on the value of the property and the appraiser merely targeted the contract price. The second category of appraisals is informative because the appraiser was clearly not targeting the contract price in preparing the evaluation, so that the adjustments might better reflect the market. The first category might fall somewhere in between, in that the relative information contained in such appraisals is less clearly targeted compared to the below price category, but may yet be inflated. In general, it is the case that the coefficients in column 7, where the appraisal hits the target price, have larger coefficients, that is, do not mark to market as well as the informative appraisals of column 6 (except for the quality indicators). But also note that

the coefficients are generally even larger in column 5, the above-price appraisals, again excepting the quality categories.

6. Conclusion

Residental appraisal has come under some criticism for its role in the great housing boom and subsequent crash. We investigate one possible channel of misappraisal, the role of adjustments to comp values due to differences in attribute values between comp and subject. We find that for cardinally measured, common attributes such as lot size and interior square feet, appraisers do reasonably well in matching their adjustments to market values of the attributes. For more subjectively-measured attributes, there is less correspondence between appraisal adjustment and market value. There is also some indication that accuracy is compromised when appraisers are trying to hit a target like the contract price.

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Figures and Tables

Table 1. Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Sale Price	27,367,418	$322,313	$199,765	$50,000	$1,400,000
Adj. Price	27,367,418	$321,554	$198,612	$50,000	$1,400,000
Sq. ft.	27,367,418	1984	796	500	10000
Lot Size (000s)	27,367,418	21	52	1	1000
Age	27,367,418	33.44	26.92	0	150
Full baths	27,367,418	2.03	0.70	1	9
Half baths	27,367,418	0.42	0.52	0	9
Basement	27,367,418	0.42			
Finished Basement	27,367,418	0.28			
Condition0	27,367,418	0.00			
Condition1	27,367,418	0.00			
Condition2	27,367,418	0.18			
Condition3	27,367,418	0.65			
Condition4	27,367,418	0.10			
Condition5	27,367,418	0.06			
Quality0	27,367,418	0.00			
Quality1	27,367,418	0.01			
Quality2	27,367,418	0.55			
Quality3	27,367,418	0.40			
Quality4	27,367,418	0.03			
Quality5	27,367,418	0.00			
Neutral location	27,367,418	0.91			
Beneficial location	27,367,418	0.06			
Adverse location	27,367,418	0.03			
Neutral view	27,367,418	0.89			
Beneficial view	27,367,418	0.10			
Adverse view	27,367,418	0.01			
Foreclosure	27,367,418	0.01			
Short Sale	27,367,418	0.01			
Year	27,367,418	2015	1	2011	2017

Note: Descriptive statistics for the comparable property sales. Variables where the standard deviation, minimum, and maximum are blank are 0,1 indicator variables.

Table 2. Regressions of Price and Adjusted Price

	(1) Price	(3) Adj. Price
Sq. ft.	114***	6***
	(0)	(0)
Lot Size (000s)	228***	17***
	(0)	(0)
Age	-261***	-2***
	(1)	(0)
Full baths	11,220***	-106***
	(32)	(10)
Half baths	-3,186***	-294***
	(31)	(10)
Basement	23,867***	1,077***
	(60)	(19)
Finished Basement	30,064***	1,031***
	(46)	(15)
Condition1	31,706***	2,866***
	(1,692)	(547)
Condition2	67,282***	10,141***
	(1,674)	(541)
Condition3	82,544***	12,437***
	(1,674)	(541)
Condition4	101,206***	14,888***
	(1,675)	(541)
Condition5	106,806***	14,156***
	(1,676)	(542)
Quality1	1,644	5,438***
	(3,158)	(1,021)
Quality2	2,395	5,609***
	(3,156)	(1,020)
Quality3	13,848***	5,969***
	(3,156)	(1,020)
Quality4	78,885***	11,399***
	(3,157)	(1,021)
Quality5	142,707***	21,204***
	(3,175)	(1,026)

Table 2. (cont.) Regressions of Price and Adjusted Price

	(1) Price	(3) Adj. Price
Beneficial location	25,172***	1,826***
	(60)	(19)
Adverse location	-15,116***	-1,745***
	(73)	(24)
Beneficial view	33,795***	2,259***
	(49)	(16)
Adverse view	-10,329***	-1,117***
	(129)	(42)
Foreclosure	-29,066***	-4,604***
	(114)	(37)
Short Sale	-40,080***	-8,271***
	(158)	(51)
Appraised Value		0.966***
		(0.000)
Constant	-36,770***	-17,046***
	(3,466)	(1,121)
Observations	27,364,613	27,364,487
Adjusted R-squared	0.89	0.99
Appraised Value	N	Y
Tract FE	Y	Y
Year/Qtr FE	Y	Y

Note: The dependent variable is sale price in column 1 and adjusted sales price in column 2. *** p<0.001, ** p<0.01, * p<0.05)

Table 3. Adjusted Price Regressions

	(1) Thick	(2) Thin	(3) Value $\leq$ EW	(4) Value $>$ EW	(5) Value $>$ Price	(6) Value $<$ Price	(7) Value $=$ Price
Sq. ft.	6***	5***	4***	3***	6***	4***	5***
	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Lot Size (000s)	20***	13***	18***	4***	18***	11***	16***
	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Age	-3***	-1*	11***	-23***	-5***	-16***	4***
	(0)	(1)	(0)	(0)	(0)	(1)	(1)
Full baths	-128***	-27	-193***	-255***	-42**	-122***	-202***
	(12)	(23)	(11)	(16)	(13)	(32)	(19)
Half baths	-336***	-125***	-218***	-201***	-260***	-321***	-324***
	(11)	(23)	(11)	(15)	(13)	(30)	(18)
Basement	1,278***	566***	533***	831***	1,125***	1,119***	905***
	(22)	(40)	(21)	(31)	(24)	(66)	(36)
Finished Basement	1,020***	999***	762***	521***	1,250***	385***	741***
	(17)	(30)	(16)	(24)	(19)	(53)	(28)
Condition1	2,780***	3,682***	1,126	4,493***	3,407***	775	2,669**
	(633)	(1,111)	(634)	(767)	(770)	(1,352)	(918)
Condition2	10,163***	10,664***	7,330***	11,834***	11,075***	5,714***	9,850***
	(626)	(1,097)	(627)	(759)	(762)	(1,335)	(908)
Condition3	12,455***	13,025***	9,414***	13,905***	13,387***	7,244***	12,365***
	(626)	(1,097)	(627)	(759)	(762)	(1,335)	(908)
Condition4	14,892***	15,587***	11,756***	15,640***	15,753***	9,139***	15,180***
	(626)	(1,098)	(627)	(759)	(763)	(1,336)	(908)
Condition5	14,191***	14,809***	10,153***	15,797***	14,712***	9,155***	14,722***
	(627)	(1,098)	(627)	(759)	(763)	(1,337)	(909)
Quality1	6,518***	3,058	2,525*	8,265***	3,209*	16,103***	6,487***
	(1,208)	(1,964)	(1,214)	(1,369)	(1,354)	(2,723)	(1,868)
Quality2	6,665***	3,321	2,537*	8,508***	3,296*	16,276***	6,733***
	(1,208)	(1,963)	(1,214)	(1,368)	(1,353)	(2,721)	(1,867)
Quality3	7,057***	3,572	2,612*	8,711***	3,690**	16,607***	6,901***
	(1,208)	(1,963)	(1,214)	(1,368)	(1,353)	(2,722)	(1,867)
Quality4	12,566***	8,732***	7,632***	11,707***	9,332***	20,670***	12,122***
	(1,208)	(1,964)	(1,214)	(1,369)	(1,353)	(2,723)	(1,867)
Quality5	21,649***	19,940***	18,666***	15,824***	18,921***	30,681***	22,693***
	(1,215)	(1,974)	(1,220)	(1,379)	(1,359)	(2,750)	(1,883)

Table 3. (cont.) Adjusted Price Regressions Across Locations

	(1) Thick	(2) Thin	(3) Value $\leq$ EW	(4) Value $>$ EW	(5) Value $>$ Price	(6) Value $<$ Price	(7) Value $=$ Price
Beneficial location	1,741***	1,941***	1,649***	1,066***	1,870***	1,793***	1,808***
	(22)	(44)	(22)	(30)	(25)	(57)	(37)
Adverse location	-1,706***	-2,046***	-1,896***	-641***	-1,897***	-530***	-1,714***
	(25)	(65)	(26)	(36)	(34)	(64)	(38)
Beneficial view	2,116***	2,737***	1,773***	1,166***	2,450***	1,091***	2,139***
	(17)	(39)	(18)	(25)	(21)	(47)	(29)
Adverse view	-1,073***	-1,425***	-1,233***	-415***	-1,324***	-192	-931***
	(44)	(115)	(46)	(64)	(56)	(110)	(73)
Foreclosure	-4,360***	-5,607***	-3,447***	-5,588***	-5,308***	-3,066***	-3,873***
	(40)	(89)	(41)	(55)	(49)	(95)	(67)
Short Sale	-8,158***	-8,795***	-6,094***	-10,215***	-8,407***	-7,557***	-8,147***
	(55)	(129)	(58)	(74)	(70)	(124)	(89)
Appraised Value	0.964***	0.970***	0.993***	0.962***	0.963***	0.963***	0.973***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	-17,764***	-16,526***	-13,489***	-19,165***	-16,041***	-20,832***	-17,587***
	(1,329)	(2,141)	(1,333)	(1,501)	(1,510)	(2,942)	(2,005)
Observations	21,892,840	5,449,042	19,606,526	7,754,291	16,999,826	2,307,770	8,049,763
Adjusted R-squared	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Appraised Val	Y	Y	Y	Y	Y	Y	Y
Tract FE	Y	Y	Y	Y	Y	Y	Y
Year/Qtr FE	Y	Y	Y	Y	Y	Y	Y

Note: The dependent variable is adjusted sales price. *** p<0.001, ** p<0.01, * p<0.05)

Figure 1. Page 2 of Fannie Mae standard appraisal form

Uniform Residential Appraisal Report

File #

There are comparable properties currently offered for sale in the subject neighborhood ranging in price from $ to $.

There are comparable sales in the subject neighborhood within the past twelve months ranging in sale price from $ to $.

FEATURE	SUBJECT	COMPARABLE SALE # 1		COMPARABLE SALE # 2		COMPARABLE SALE # 3	
Address							
Proximity to Subject							
Sale Price	$		$		$		$
Sale Price/Gross Liv. Area	$ sq. ft.	$ sq. ft.		$ sq. ft.		$ sq. ft.	
Data Source(s)							
Verification Source(s)							
VALUE ADJUSTMENTS	DESCRIPTION	DESCRIPTION	+(-) $ Adjustment	DESCRIPTION	+(-) $ Adjustment	DESCRIPTION	+(-) $ Adjustment
Sale or Financing Concessions							
Date of Sale/Time							
Location							
Leasehold/Fee Simple							
Site							
View							
Design (Style)							
Quality of Construction							
Actual Age							
Condition							
Above Grade Room Count	Total / Bdrms. / Baths	Total / Bdrms. / Baths		Total / Bdrms. / Baths		Total / Bdrms. / Baths	
Gross Living Area	sq. ft.	sq. ft.		sq. ft.		sq. ft.	
Basement & Finished Rooms Below Grade							
Functional Utility							
Heating/Cooling							
Energy Efficient Items							
Garage/Carport							
Porch/Patio/Deck							
Net Adjustment (Total)		☐ + ☐ -	$	☐ + ☐ -	$	☐ + ☐ -	$
Adjusted Sale Price of Comparables		Net Adj. % Gross Adj. %	$	Net Adj. % Gross Adj. %	$	Net Adj. % Gross Adj. %	$

SALES COMPARISON APPROACH

I ☐ did ☐ did not research the sale or transfer history of the subject property and comparable sales. If not, explain

My research ☐ did ☐ did not reveal any prior sales or transfers of the subject property for the three years prior to the effective date of this appraisal.

Data source(s)

My research ☐ did ☐ did not reveal any prior sales or transfers of the comparable sales for the year prior to the date of sale of the comparable sale.

Data source(s)

Report the results of the research and analysis of the prior sale or transfer history of the subject property and comparable sales (report additional prior sales on page 3).

ITEM	SUBJECT	COMPARABLE SALE # 1	COMPARABLE SALE # 2	COMPARABLE SALE # 3
Date of Prior Sale/Transfer				
Price of Prior Sale/Transfer				
Data Source(s)				
Effective Date of Data Source(s)				

Analysis of prior sale or transfer history of the subject property and comparable sales

Summary of Sales Comparison Approach

Indicated Value by Sales Comparison Approach $

RECONCILIATION

Indicated Value by: Sales Comparison Approach $ Cost Approach (if developed) $ Income Approach (if developed) $

This appraisal is made ☐ "as is", ☐ subject to completion per plans and specifications on the basis of a hypothetical condition that the improvements have been completed, ☐ subject to the following repairs or alterations on the basis of a hypothetical condition that the repairs or alterations have been completed, or ☐ subject to the following required inspection based on the extraordinary assumption that the condition or deficiency does not require alteration or repair:

Based on a complete visual inspection of the interior and exterior areas of the subject property, defined scope of work, statement of assumptions and limiting conditions, and appraiser's certification, my (our) opinion of the market value, as defined, of the real property that is the subject of this report is $, as of , which is the date of inspection and the effective date of this appraisal.

Do Appraiser's Adjust to Market?

Appendix

This appendix supplements the empirical analysis in Conklin, Coulson, and Diop (2022). Below is a list of the sections contained in this appendix.

Table of Contents

A.1. Variable Descriptions

Table A.1. Variable Names

Variable	Description
Sale Price	Sale price of the comparable
Adj. Price	Adjusted sales price of the comparable
Sq. ft.	Gross living area (sq. ft.)
Lot size	Lot size (sq. ft.)
Age	Property age
Full Baths	Number of full baths
Half Baths	Number of half baths
Basement	Indicates the existence of a basement
Finished Basement	Indicates the existence of a finished basement
Condition0	
Condition1	Condition is a categorical variable defining condition of the property
Condition2	according to USPAP. Original variable is re-scaled to 0-5 with 5
Condition3	representing the best condition. Condition1 - Condition5
Condition4	are indicators of condition.
Condition5	
Quality0	
Quality1	Quality is a categorical variable defining construction quality
Quality2	of the property according to USPAP. Original variable is re-scaled
Quality3	to 0-5 with 5 representing the highest quality. Quality0 - Condition5 are
Quality4	indicators of quality.
Quality5	
Neutral Location	Neutral location according to USPAP.
Beneficial Location	Location has a beneficial effect on value according to USPAP
Adverse Location	Location has an adverse effect on value according to USPAP
Neutral View	Neutral view according to USPAP.
Beneficial View	View has a beneficial effect on value according to USPAP
Adverse View	View has an adverse effect on value according to USPAP
Foreclosure	Property sold as real estate owned (REO)
Short Sale	Property sold as a short-sale
Year	Year the property was sold

Note: Variable names and descriptions.

Figure A.1. Page 2 of Fannie Mae standard appraisal form

Uniform Residential Appraisal Report

File #

There are comparable properties currently offered for sale in the subject neighborhood ranging in price from $ to $.

There are comparable sales in the subject neighborhood within the past twelve months ranging in sale price from $ to $.

SALES COMPARISON APPROACH

FEATURE	SUBJECT	COMPARABLE SALE # 1		COMPARABLE SALE # 2		COMPARABLE SALE # 3	
Address							
Proximity to Subject							
Sale Price	$		$		$		$
Sale Price/Gross Liv. Area	$ sq. ft.	$ sq. ft.		$ sq. ft.		$ sq. ft.	
Data Source(s)							
Verification Source(s)							
VALUE ADJUSTMENTS	DESCRIPTION	DESCRIPTION	+(-) $ Adjustment	DESCRIPTION	+(-) $ Adjustment	DESCRIPTION	+(-) $ Adjustment
Sale or Financing Concessions							
Date of Sale/Time							
Location							
Leasehold/Fee Simple							
Site							
View							
Design (Style)							
Quality of Construction							
Actual Age							
Condition							
Above Grade Room Count	Total / Bdrms. / Baths	Total / Bdrms. / Baths		Total / Bdrms. / Baths		Total / Bdrms. / Baths	
Gross Living Area	sq. ft.	sq. ft.		sq. ft.		sq. ft.	
Basement & Finished Rooms Below Grade							
Functional Utility							
Heating/Cooling							
Energy Efficient Items							
Garage/Carport							
Porch/Patio/Deck							
Net Adjustment (Total)		☐ + ☐ -	$	☐ + ☐ -	$	☐ + ☐ -	$
Adjusted Sale Price of Comparables		Net Adj. % Gross Adj. %	$	Net Adj. % Gross Adj. %	$	Net Adj. % Gross Adj. %	$

I ☐ did ☐ did not research the sale or transfer history of the subject property and comparable sales. If not, explain

My research ☐ did ☐ did not reveal any prior sales or transfers of the subject property for the three years prior to the effective date of this appraisal.

Data source(s)

My research ☐ did ☐ did not reveal any prior sales or transfers of the comparable sales for the year prior to the date of sale of the comparable sale.

Data source(s)

Report the results of the research and analysis of the prior sale or transfer history of the subject property and comparable sales (report additional prior sales on page 3).

ITEM	SUBJECT	COMPARABLE SALE # 1	COMPARABLE SALE # 2	COMPARABLE SALE # 3
Date of Prior Sale/Transfer				
Price of Prior Sale/Transfer				
Data Source(s)				
Effective Date of Data Source(s)				

Analysis of prior sale or transfer history of the subject property and comparable sales

Summary of Sales Comparison Approach

Indicated Value by Sales Comparison Approach $

RECONCILIATION

Indicated Value by: Sales Comparison Approach $ Cost Approach (if developed) $ Income Approach (if developed) $

This appraisal is made ☐ "as is", ☐ subject to completion per plans and specifications on the basis of a hypothetical condition that the improvements have been completed, ☐ subject to the following repairs or alterations on the basis of a hypothetical condition that the repairs or alterations have been completed, or ☐ subject to the following required inspection based on the extraordinary assumption that the condition or deficiency does not require alteration or repair:

Based on a complete visual inspection of the interior and exterior areas of the subject property, defined scope of work, statement of assumptions and limiting conditions, and appraiser's certification, my (our) opinion of the market value, as defined, of the real property that is the subject of this report is $, as of , which is the date of inspection and the effective date of this appraisal.