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Abstract

Property tax appeals have increased dramatically at significant cost to local governments. Little is known about whether or how well the appeals process resolves potential assessment errors. This paper investigates the efficiency and equity of this process. Regarding the efficiency of correcting assessment error, reductions are granted for a majority of appealing homeowners who are overassessed but also for homeowners who are not overassessed, leaving them underassessed or further underassessed. Regarding the fairness of the appeals process, homeowners from particular neighborhoods receive assessment reductions more often. Tax representatives play an important role in explaining the advantage enjoyed by these homeowners.

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An Empirical Analysis of the Property Tax Appeals Process

BY WILLIAM M. DOERNER, PH.D., AND KEITH R. IHLANFELDT, PH.D.

The property tax appeals process gives owners two different chances—with an informal and a formal avenue—to question their property assessments by meeting with either the property tax assessor or questioning the assessed value with a local value adjustment board. While nationwide data on appeals are not readily available, there are numerous newspaper articles providing anecdotal evidence that the number of appeals have skyrocketed in selected areas throughout the United States (for examples, see Perry 2007, Healy 2009, Olorunnipa 2010, and Neumann and Chaudhuri 2011). These articles point to several events to explain the escalation of property tax appeals. One factor has been the large swings in housing prices that have occurred over the past decade. The housing price run-ups throughout the country in the early 2000s caused many owners to appeal their property taxes on the basis that their assessed values were rising too rapidly. During the subsequent bust in local housing markets, owners appealed because they felt their assessments were not falling rapidly enough. Another factor apparently contributing to the growth in appeals has been the emergence of a "cottage industry of tax representatives" who offer to handle the appeals at no expense to the selected property owners (as reported by Nakamura and Stewart 2009, Kestin and Maines 2010, Tugend 2010, and Stangenes 2012). Instead, the tax representatives work on a contingency fee basis, asking for as much as half of the first year's tax savings brought about by a successful appeal. These representatives are typically unregulated by state and local governments, which helps explain the dearth of knowledge surrounding their operations. Media reports suggest that representatives target affluent neighborhoods in making their solicitations, where the potential tax savings of winning an appeal are the greatest. A recent statewide audit questioned other aspects of the appeals process, like the impartiality of local officials, the qualifications of decision-making magistrates, and deviations from procedures and rules (Christensen 2014, State of Florida Auditor General 2014). An empirical approach can explore such issues and determine whether property tax reductions are warranted or should be granted from a statistical standpoint.

The cost of appeals is far from trivial; hence, the appeals process should, at the least, result in smaller assessment errors. Smaller assessment errors result in a more efficient ad valorem tax. Regarding the fairness of the process, reductions in assessed values garnered from filing appeals should not favor one group over another, after controlling for the pre-appeal assessed-to-market value ratio. Ideally, the appeals process would be characterized by two

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attributes: 1) appeals-related reductions would depend only on whether a homeowner's assessment exceeds the statutory limit and 2) all homeowners would have equal opportunity to participate in the process.

In this paper, we document two important empirical findings: 1) appeals-related reductions in assessed values do not always result in an assessment that falls in what might be considered a "correct" range, and 2) after controlling for assessment error, the probability of receiving a reduction in assessed value is highest among homeowners living in majority white neighborhoods. Both of these findings suggest that there may be shortcomings associated with the appeals process. The rest of the paper establishes a framework for analyzing the appeals process and shows how these findings are obtained empirically. Special attention is given to tax representatives and whether they create (or alleviate) assessment errors. Our analysis is based on an exceedingly rich database of roughly 50,000 property tax appeals filed by single-family homeowners in Miami-Dade County, Florida, over a five-year period. To provide some context around the empirical approach, we begin by reviewing the related literature.

Literature Review

The papers that investigate the property tax appeals process are all quite recent. Weber and McMillen (2010) use Chicago data to estimate the probability of appeal and the probability of winning an appeal. Their primary interest is in how these probabilities are affected by thin markets. However, the results also shed some light on the equity of the appeals process by finding appeals are more likely from homeowners living in higher priced neighborhoods, which suggests that appeals may aggravate regressivity. In a more thorough investigation of the latter possibility, McMillen (2013) uses the same Chicago data to study the distribution of assessment ratios before and after appeals had been decided. The paper finds that appeals reduce the spread of assessment error, but the highest priced homes tend to receive the largest assessment reductions, again suggesting that the appeals process may aggravate regressivity. Using data from Harris County, Texas, Plummer's (2011, 2014) investigation primarily focuses on the effect that the land value ratio (assessed land value/total assessed market value) has on the probability of filing an appeal and determines the appeals process can improve assessment uniformity. A related study by Hissong and Hawley (2012) shows that higher market values increase the probability of appeal and the likelihood of filing a formal in comparison to an informal appeal in Tarrant County, Texas. While these papers offer insights on the equity and efficiency of the appeals process, they only provide limited policy direction since they do not untangle where problems arise within the process. This serves as the point of departure of the present study.

Overview of the Property Tax Appeals Process

The property tax appeals process typically consists of two distinct types of appeal, henceforth labeled informal and formal. The two appeal types are largely the same across the United States, where property owners always have the right to appeal. After homeowners receive their tax bill, they have the right to request an in-person conference with their county tax assessor or his/her representative. In these conferences, after the tax assessor furnishes evidence on how the assessment was reached, homeowners have the opportunity to challenge their assessed values, and assessments can be lowered by the tax assessor. These conferences are what we refer to as "informal appeals." Independent of the right to confer, every homeowner has several weeks (the modal period across states is 30 days) after receiving his tax bill to file a grievance with his county Value Adjustment Board (VAB) for an assessment reduction. We call these petitions

"formal appeals." The petitioning homeowner is granted a hearing, during which the homeowner (or his representative) and the tax assessor present evidence favorable to their positions. A magistrate, under the auspices of the VAB, decides whether or not to grant the homeowner's appeal and lower the assessed value. There is also an option to appeal the VAB decision in Circuit or Appellate Court, but this right is seldom exercised so we focus here on the informal and formal processes. The appeals process can be expressed in probabilistic terms as:

$$P(R) = P(I) + P(F) = P(C) * P(I|C) + P(A) * P(F|A) \quad (1)$$

In words, the probability of successfully obtaining an assessment reduction, denoted as *P(R)*, is equal to the sum of the probability of a successful informal reduction, *P(I),* and the probability of a successful formal reduction, *P(F)*. The equation is written as two mutually exclusive events because our regressions do not include a single appellant who files a formal reduction after receiving an informal reduction. The probability of an informal reduction is equal to the probability of requesting a conference times the probability of obtaining a reduction at the conference (conditional on requesting one), or $P(C) \cdot P(I|C)$. The probability of a formal reduction is equal to the probability of filing a petition times the probability of winning the appeal (given a petition has been filed), or $P(A) \cdot P(F|A)$.

Our data enable us to estimate *P(I)*, *P(A)*, and $P(F|A)$, which will be useful in determining where inefficiencies and inequities arise within the appeals process. However, no data are available on homeowners who request a conference yet fail to get a reduction, precluding the estimation of *P(C)*.

Description of Data

We draw from three databases to conduct our investigation of the appeals process in Miami-Dade County, Florida and the role that tax representatives play in this process: 1) a sales file containing all single-family property sales within the county from 1995 to 2009, 2) the county's preliminary and final property tax roll for each year for which we have appeals data, and 3) all formal appeals registered within the county for the years 2005 to 2009.

The sales file is collected by the Florida Department of Revenue (FDOR) and includes the prices of all single-family properties sold in arms-length transactions. The 2010 tax roll includes, for the first time, a block group number for each parcel. Because both the sales file and tax rolls have common parcel identification numbers, the 2000 Census block group of each parcel is taken from the 2010 roll and assigned to the parcels within the sales file. This enables us to add 2000 Census data describing the income level and racial composition of each parcel's neighborhood. Along with these neighborhood variables, each sales file record includes the property's sales price, year built, lot size, and total living area.

The preliminary and final tax property tax rolls provide a basis to uncover informal appeals. The property records on these rolls contain the same neighborhood and structural descriptors as found within the aforementioned sales file. The key variable from these rolls is the assessed value of the property, which in Florida is supposed to represent the market value of the property on January 1 of the tax roll year. Another crucial detail is that property reassessments are done on an annual basis. Annual revaluations happen in 20 U.S. states and another 22 states do them at least every five years (*Significant Features of the Property Tax*). Preliminary tax rolls, with these reassessments, must be submitted to the FDOR on July 1, while the final tax rolls are due on November 1. County tax assessors mail preliminary property tax

bills to homeowners in August. Homeowners have the right to a face-to-face conference with their assessor or his/her representative. Phone interviews indicate these informal meetings are most often a time when the homeowner raises objections while the assessor explains the evaluation methods and shows supporting data but does not perform additional analysis. If the conference results in a reduction in assessed value, the assessed value reported on the final roll will be less than what is listed on the preliminary roll. Thus, by comparing the assessed values reported on the preliminary and final tax rolls within a single year, we can observe reductions in assessed values coming from informal conferences.

Data on formal appeal hearings come from the Miami-Dade County Valuation Adjustment Board. The data span all appeals filed over the years 2005–2009. For each appeal, the following information is reported: the parcel identification number (which enables us to locate the property with GIS mapping software), whether the appeal is granted, and the tax representative's name, if applicable. The file includes 104 different tax representatives who are used by single-family homeowners over the five years. To determine whether an agent has a professional license, we rely on two other public databases. First, the Florida Bar membership directory allows us to search for licensed attorneys. Second, data from the Florida Department of Business and Professional Regulation provide a way to match the remaining agents to state-issued licenses. From both sources, we determine that 34 agents are lawyers and 58 agents have other licenses (e.g., a realtor, private appraiser, or a certified public accountant) related to real estate matters and, for ease, we refer to all non-lawyer agents as realtors. The industry has a small group of active tax representatives—five of them have handled over 1,000 appeals each.

<--- Insert Table 1 about here --->

Table 1 summarizes the assessed value appeals data (we do not consider legal appeals in this paper). There has been a substantial increase in the number of appeals filed by single-family homeowners over time. Over the five-year period, informal reductions increase from 369 to 6,313 (a 1611 percent increase), while formal appeals grow from 3,640 in 2005 to 14,441 in 2009 (a 297 percent rise). The underlying single-family housing stock has expanded more slowly from 306,594 in 2005 to 366,196 in 2009 (the 19 percent increase is mainly driven by the FDOR reclassifying cluster homes from condominia to single-family and not new construction), which means the total number of appeals have gone from 1.3 percent to 5.7 percent of single-family homes. Other noteworthy trends in the table are the rise in the percentage of formal appeals won by homeowners and the decline in the percentage of petitioners using a lawyer tax representative to file their appeal. The latter occurs despite the fact that appeals using a lawyer record a much higher chance of obtaining a reduction in assessed value (71 percent success rate for lawyers, 61 percent for realtors, and 26 percent if the homeowner has no representative).

<--- Insert Table 2 about here --->

In order to investigate the fairness of assessed value reductions that come from appeals we construct a neighborhood typology based upon the median income and racial composition of each block group (there are typically 3–4 block groups in each Census tract). Block groups are defined as high and low income based upon whether their median income is above or below the mean median income of all block groups ($43,655). The racial categorization consists of majority black, majority Hispanic, majority white, or racially mixed (in other words, no group

holds a majority) population. Combinations of the two income and four racial groups yield eight types of neighborhoods. These neighborhood types are described in Table 2. The table shows that the characteristics of white neighborhoods, both high and low income, are much different than those of the other neighborhood groups; in particular, median housing values are much higher in the white than in the nonwhite neighborhoods. Note that housing values are high in "low income, majority white" neighborhoods because these neighborhoods contain high percentages of retirees with significant housing wealth but relatively low current incomes. In addition, homeowners living in high income, white neighborhoods comprise larger shares of the homeowners receiving informal reductions in their assessed values and filing formal appeals than their share of all homeowners on the tax roll. This suggests that they are more likely to obtain an informal reduction and to file a formal appeal. As the table's final column shows, these homeowners receive, by a considerable margin, the largest median reduction in assessed value from winning a formal appeal.

<--- Insert Table 3 about here --->

The final descriptive tables (Tables 3 and 4) show the utilization of tax representatives by type of neighborhood. Tax representatives fall into two categories—those who are attorneys and those who are realtors. For each neighborhood type, Table 3 reports the percentage of formal appeals filed using either type of representative, the percentage filed using a lawyer, and the percentage filed using a realtor. Homeowners appealing from "high income, majority white" neighborhoods use tax representatives most often (78 percent). This higher utilization is due to these homeowners relying much more on lawyers to file their appeals (44 percent of the time) in comparison to homeowners from other neighborhoods (who use lawyers roughly 33 percent of the time). The utilization of realtors is very similar across the neighborhood types, with about 30 to 35 percent of homeowners using this type of representative to file their appeal. Also shown in Table 3 is the decreasing tendency of homeowners from all types of neighborhoods to rely on representatives to file their appeals. For example, in 2005, a tax representative is used in 92 percent of the appeals filed by homeowners living in "low income, majority white" neighborhoods. This percentage declines monotonically, reaching a low of 63 percent by 2009. Homeowners appear to be gaining confidence in their own ability to file formal appeals without the assistance of a representative; this is not a complete surprise given a rise in newspaper articles, videos, and other information to guide property owners through the appeals process.

<--- Insert Table 4 about here --->

To investigate the hypothesis that tax representatives target higher-priced neighborhoods, information is needed on where they make their solicitations. While this information is not publicly available, we do know how many single-family homeowners within each neighborhood file an appeal using a tax representative. As shown in Table 4, in any given year, about four percent of the homeowners in majority white neighborhoods petition with a representative. The percentage is less than two percent in all of the other neighborhood groups. These percentages are consistent with the idea that representatives may target neighborhoods with higher home values because the highest median home values are present in "low income, majority white" and the "high income, majority white" neighborhood groups. Successful appeals in these neighborhoods would provide the largest contingency fees (see final column of Table 2).

However, it is also possible that these homeowners are more likely to decide on their own, regardless of any solicitation, to file an appeal using a tax representative.

Predictions of Market Value

In Florida, all properties are required by statute to be assessed every year at their market value as of January 1. To be precise, the assessed value is defined as 85 percent of market value to account for transfer costs involved with the property transaction. We rescale by dividing the recorded assessed value by 0.85 so that a perfectly correct AV equals the MV. According to the FDOR, there is assessment error if the ratio of assessed to market value (*AV/MV*) deviates from unity. In order to measure assessment error, the true market value of the property is needed. We mark-to-market the price that the property is sold for within the next 24 months following the month of assessment by correcting for general inflation/deflation in monthly housing values (using the Case-Shiller monthly house price index for Miami-Dade). A number of issues arise when using post-assessment sales to obtain market values. First, not all properties are sold at market value. There are short and other foreclosure-related sales as well as sales that are not arms-length. In our data, these sales are identified by the FDOR as "disqualified" and they are excluded from the post-assessment sales sample. Second, between the time when a property is assessed and when it is sold, a property could undergo a physical transformation that would affect its market value. To guard against this change, we eliminated properties with a recorded change in the square footage of the lot or the interior living space. Finally, only about 7 percent of the properties on the tax roll in any given year are sold in the post-assessment sales period; hence, there is the potential for sample selection bias. Therefore, we test and correct for any bias in the estimated models as described below.

To check the robustness of our findings, we reduce the post-assessment sales period down from 24 months to alternatively 12, 6, and 3 months. This is done for two reasons. First, restricting the post-assessment sales period reduces further the possibility that something changes about the property that may affect the market value. Second, if the metropolitan housing market is segmented into submarkets, inflation/deflation in monthly housing values may vary across submarkets, introducing measurement error into our estimate of market value. Any characteristic affecting housing values may segment a housing market. For example, there may be "new" and "existing" home submarkets, "two bedroom" and "three bedroom" submarkets, or submarkets defined by the racial/ethnic mix of the neighborhood within which the home is located. Unfortunately, market segmentation is highly controversial and the issue remains unresolved within the hedonic price literature. While one side claims there is sufficient mobility to reduce arbitrage (Linneman 1982) and another side points out how barriers are more prone to occur in the short-run and in submarkets (Watkins 2001), the entire debate is sometimes dismissed because of the difficulties with determining whether markets are segmented using statistical tests (Palmquist 2005). If market segmentation is having an important effect on our estimates of market value, this may cause us to mis-categorize a home's pre- versus post-appeal assessment status, causing us to reach erroneous conclusions regarding the ability of appeals to rectify assessment errors. In addition, our regression models all include a variable registering whether (or to what extent) a home is overassessed prior to appeal. This variable is based on our estimate of market value; hence, it will be measured with error if our market value estimate is inaccurate. If this measured error is correlated with one or more of the other explanatory variables, this may cause us to reach the wrong conclusions regarding the fairness of the appeals

process. Fortunately, using the above alternative post-assessment sales periods provides a reliable check on whether market segmentation has affected our findings. As the period is lengthened, any differential price appreciation that may result from market segmentation would have more time to impact our results. Hence, if the results are stable across alternative periods, this would suggest that the possible importance of market segmentation can be largely discounted. The 24 and 12 month samples yield highly similar results. Reducing the sample below 12 months substantially shrinks the number of observations, but nevertheless is still suggestive that market segmentation has not biased our results. In addition to the post-assessment sampling approaches, we estimate the market value of the property on the date of assessment via a hedonic model that combines a Fourier expansion with characteristics of the property's structure, location, neighborhood type, and block group (as done in Ihlanfeldt 2004, Burge and Ihlanfeldt 2005). We utilize it to expand the sample to all appeals and the results are in agreement between the hedonic and post-assessment sales sample approaches. Because of the complementary results and their voluminous nature, we report only the results obtained from our primary approach using the post-assessment sales sample over 24 months.

Results Suggestive of Defects in the Appeals Process

Two preliminary findings motivate our in-depth analysis of the appeals process: 1) the vast majority of appeals-related reductions in assessed value fall outside the range for "correct" assessments, and 2) after controlling for assessment error, appeals-related reductions in assessed values are not randomly distributed across neighborhood types but rather are more likely in majority white neighborhoods. In this section, we document these findings and thoroughly investigate their causes in subsequent sections.

<--- Insert Table 5 about here --->

We begin by comparing assessed-to-market value ratios before and after a reduction in assessed value (using all appeals, both informal and formal). Mean ratios are reported in the first two rows of Table 5 for all years, for 2005–2007, and for 2008–2009. The data are broken down into the latter two time periods because the housing bubble burst in 2007 in Florida, which may have affected the accuracy of appeals-related reductions in assessed values. In the remaining rows of the table, properties are also categorized into six groups based on the assessment status they had before and after receiving a reduction in assessed value from the appeal, where the assessment status is defined as either "low" ($AV/MV<0.95$), "correct" ($0.95\leq AV/MV\leq 1.05$), or "high" ($AV/MV>1.05$). These "correct" categorizations are not entirely *ad hoc*. In a survey by the International Association of Assessing Officers (2008), 33 U.S. states (66 percent) report that appraisals must fall within a certain standard around the statutory level. An interval of 0.90 to 1.10 is used by 23 states and 7 states choose even tighter bands, like the 0.95 to 1.05 band we define as a "correct" assessment. While Florida has no official written requirement, state regulators appear to question appraisals outside the 0.90 to 1.10 band and prefer values within 0.95 to 1.05. For completeness, frequencies are listed with percentages in parentheses for both ranges in Table 5. Since a broader "correct" assessment band fails to alter any of the overall conclusions, the text and further analyses focus on the narrower range.

Looking at the first column (all years) in Table 5, the mean *AV/MV* ratio is 1.24 before reduction and 1.06 after reduction, which suggests that appeals are successful in moving assessments closer to their statutory mark. However, in the middle panel, the results for the

before and after *AV/MV* groups show that only 18 percent of the homeowners receiving a reduction in *AV* end up with a correct assessment. Homeowners tend to fall into two groups: "high before and high after" (40 percent of total) and "low before, low after" (24 percent of total). The size of the latter group may be of particular concern, because while the former group warrants a reduction, the latter group does not. The breakdown before and after the bust shows that "low before, low after" reductions are an especially large percentage of the total before the bust (41 percent), while the "high before, high after" reductions are an especially large percentage after the bust (48 percent).

Part of the explanation for these differences between the boom and bust periods is that, in general, *AV/MV* ratios are lower (higher) when prices are trending upward (downward). Although Florida annually reassesses all properties, January 1 *AV*s are based on comparable sales that occurred throughout the previous year. While this timing problem may account for high percentages of "low before" during the boom and "high before" after the bust, it does not explain why a higher percentage of the "low before" group received *AV* reductions during the boom or why a high percentage of the "high before" group failed to receive the full reduction in *AV* they were entitled to. Here the explanations may revolve around cyclical changes in property taxation or deliberate moves by local officials whose budgets are connected to tax revenues (such concerns are consistent with a recent report by the State of Florida Auditor General 2014). During the boom, local governments in Florida had been flush with property tax revenues (Doerner and Ihlanfeldt 2011). Assessors and magistrates may have felt little pressure from city and county politicians to keep assessment levels at their statutory maximum. Thus, homeowners may have faced less opposition in their appeal for an *AV* reduction. The bust, however, weakened the fiscal situation of many local governments (Ihlanfeldt 2012). In this new environment, assessors and magistrates may have felt powerful pressure to maintain the tax base, which would explain the tendency to reduce the *AV* of overassessed homeowners by less than the full amount warranted.

<--- Insert Table 6 about here --->

To investigate the distribution of appeals-related reductions in *AV* across the neighborhood types, we estimate probit models where the dependent variable registers whether an informal or formal appeal lowered assessed value (shown in Table 6). The observations consist of all single-family properties appended over the five tax roll years. The set of explanatory variables includes the set of dummy variables identifying neighborhood type, where "high income, majority white" serves as the reference group and a measure of overassessment. In the first column, overassessment is measured as a dummy variable, indicating whether *AV* exceeds *MV*. In the second column, overassessment is measured as *AV/MV* if *AV>MV*, otherwise *AV/MV=1*. This provides a measure of the degree of overassessment.

Regardless of how overassessment is measured, in comparison to the reference group, homeowners in all other neighborhood groups have a lower probability of receiving a reduction in assessed value. Because the estimated models include measures of overassessment, the results suggest that appeals-related reductions in assessed values favor homeowners from "high income, majority white" neighborhoods. Because the latter neighborhoods have the highest value homes (as reported in Table 2), these results imply that the appeals process contributes to the regressivity of the property tax. Below, we further explore the source of the advantage enjoyed by homeowners from "high income, majority white" neighborhoods.

Basic Incentives of the Participants in the Appeals Process

To aid in the interpretation of the results we obtain in our further investigation of the property tax appeals process, it is useful to briefly describe the incentives of each of the four groups participating in the appeals process—specifically, homeowners, tax representatives, assessors, and magistrates. As with all models, the available data limit what can be modeled. The descriptions below may appear simplistic (they are not meant to capture all aspects of reality) but they help connect motivations in the appeals process with tradeoffs expressed in Equation (1).

Homeowners

A homeowner appeals if the expected net benefit from appealing is positive (i.e., he/she saves money from the outcome of the appeals process). The expected net benefit from filing an appeal equals the expected probability of winning the appeal times the expected savings minus the cost of filing the appeal. The expected probability of winning is a positive function of the homeowner's perceived degree of overassessment and whether a tax representative is used.

In Florida, the expected savings from winning an appeal are affected by an idiosyncrasy of its property tax system—namely, a cap on increases in taxable value (*TV*) that resulted from the passage of the Save Our Homes (SOH) Act in 1992. This law limits the growth of a homesteaded property's *TV* to 3 percent per year or the rate of inflation, whichever is lower. For homesteads who are recent movers and non-homesteads, *AV* and *TV* are the same. For homesteads that have recently moved, *AV* and *TV* may no longer be equal after the first year of tenure depending on the inflation rate. If *AV* increases by more than the cap limit, then *AV* rises faster than *TV* and a wedge develops between the two values. As long as *AV* increases at a rate greater than the cap and the homesteaded owner remains in the house, the wedge between *TV* and *AV* continues to grow year after year. Controlling for this wedge may be important when estimating the probability of obtaining an *AV* reduction because the wedge weakens the incentive to appeal. A large enough wedge can render a reduction moot because a homeowner's property tax bill will not change if the reduced *AV* still lies above *TV*. Although the Florida system may seem unique, many states (all but four) have implemented some kind of property tax cap by either rate (36 states), levy (31 states), or limit (17 states). Tax wedges could arise elsewhere.

The cost of filing an appeal depends on whether a tax representative is used. Using a tax representative lowers the owner's time cost in preparing the appeal. The search cost in finding a representative is lower if the owner is solicited by the representative (rather than vice versa). The owner's perceived cost of payment to the representative may depend on whether the fee is paid up front or on a contingency basis. Owners will likely prefer contingency fees because the risk of having an appeal rejected is borne entirely by the tax representative.

Tax Representatives

In our model, a tax representative tries to maximize profit earned from filing appeals and representing homeowners in the appeals process. Given a limited time constraint, the representative would target appeals that yield the largest tax savings (and therefore the largest contingency fees). Expected tax savings equal the expected probability of winning the appeal times the perceived absolute difference between *AV* and *MV*. If the degree of overassessment in percentage terms varies less than in absolute terms across neighborhoods, representatives will first solicit homes in higher valued neighborhoods. This would explain the anecdotal evidence in recent newspaper articles that representatives only solicit within affluent neighborhoods. Another

explanation is that affluent neighborhoods have customized houses that provide a greater opportunity for inaccurate valuations if mass appraisal tools are used. Tax representatives could be poised to take advantage of potential appeals based on real estate market peculiarities.

Tax Assessors

The role of the tax assessor is to assess a homeowner's property at its market value. However, the statutory duty and other incentives may not always align. Political motivations could lead to underassessment, especially in places where assessors are elected officials. Assessors, though, cannot simply underassess all properties because the millage rate could be adjusted upward to undo the effective impact of uniform underassessments. Instead, underassessment might happen only in certain areas where homeowners are more likely to vote in return for political support (Ross 2011 found this problem in Virginia). In addition, underassessments dissuade homeownerss from appealing, which lowers the assessor's work load since vociferous homeowners can be particularly vociferous and active (as described by Fischel 2005). Similarly, as a way to balance out any underassessment, overassessments might occur where owners are not as well-informed about proper valuations. A higher authority, like the FDOR in Florida, can help ensure the duty and incentives align so that assessment error is not purposely concentrated in certain areas. To carry out that task each year, the FDOR calculates the level of assessment (LOA) for each county (as well as statistics, like dispersion and price-related differential). If the LOA falls below a threshold, the assessor's county is subject to penalties, which could include losing all homestead exemptions. Such a loss would have a major impact on local funds and has never happened, which suggests that assessments are taken seriously by local assessors and the average numbers fall within reliable ranges (however, the average numbers are computed prior to any informal or formal appeals).

Regarding appeals, the assessor has conflicting motives. On the one hand, he/she would like to grant the appeal because there are benefits associated with keeping the homeowner happy. On the other hand, the assessor wants to defeat the appeal (or, if it is granted, bring the *AV* down only so far) to discourage others from filing appeals. To date, there has been no oversight of the informal conferences between assessors and homeowners, which makes it difficult to hypothesize and compare that part of the process with outcomes from formal appeals.

Magistrates

The goal of the magistrate, who makes the final decision in the formal hearing, is to conduct a fair appeals hearing and to provide an accurate legal decision on the property assessment. Magistrates undergo training on administrative procedures and must possess experience in real estate valuation. The VABs who appoint the magistrates expect them to properly weigh, without bias, the evidence presented by the assessor and homeowner (or the tax representative) in reaching their decisions. Decisions should support denials of underassessed properties and approve reductions of overassessed properties. The magistrates are meant to be impartial decision-makers who are not part of the assessor's office or another branch of the local government. Their duty is to provide recommendations to the VAB and those recommendations are almost always followed.

AV/MV Ratios Before and After Appeals

In this section, we present before and after *AV/MV* ratios separately for informal and formal appeals. The latter are broken down into appeals filed with and without the use of a tax

representative. We also show the percent of formal appeals receiving a reduction in *AV* conditional on homeowners' pre-appeal assessment status (high, correct, or low). Finally, we present the results of a multinomial logit model exploring the role of tax representatives in obtaining a low post-assessment *AV/MV* ratio.

<--- Insert Table 7 about here --->

Table 7 reports the results for homeowners receiving an *AV* reduction from filing an informal appeal. The results for all years essentially mimic those presented in Table 5: high percentages in the "high before, high after" group (50 percent) and the "low before, low after" group (24 percent), and a low percentage ending up with a correct assessment (11 percent). Also, the comparison of boom versus bust years shows an especially high percentage in the "low before, low after" group before the bust (45 percent) and in the "high before, high after" group after the bust (68 percent).

<--- Insert Table 8 about here --->

Table 8 reports the results for homeowners receiving an *AV* reduction from filing a formal appeal. Again, the results match up with those presented in Table 5. For all years, there is a high percentage of homeowners in the "high before, high after" group (35 percent) and in the "low before, low after" group (24 percent). The percentage who end up with a correct assessment (22 percent) is higher than what is observed for homeowners who filed an informal appeal (11 percent). The comparison of boom versus bust years again shows a high percentage in the "low before, low after" group before the bust (38 percent) and a high percentage in the "high before, high after" group after the bust (40 percent). The formal appeal results presented in Table 8 are further split between how homeowners file their appeals (on their own versus using a tax representative) and between the type of tax representatives (using a lawyer versus a realtor). The within split patterns are highly similar between splits and mirror those previously discussed for the non-split sample.

<--- Insert Table 9 about here --->

Table 9 uses the full sample of homeowners who filed a formal appeal (both those granted reductions or "winners" and those denied or "losers") and shows the percentage of appeals that are granted conditional upon the homeowner's pre-appeal assessment status (high, correct, or low). Results are reported for the 24 and 12 month post-assessment sampling methods. Both approaches show that *AV* reductions are obtained by a majority of homeowners who are overassessed prior to appealing, which casts a favorable light on the appeals process. Nevertheless, a large minority of overassessed homeowners do not receive a reduction. In addition, each approach finds that the percentage of winners monotonically declines as we move down the columns from high to correct to low pre-appeal assessment status, which is what we would expect if appeals are granted based on the pre-appeal assessment status. Still, a significant percentage of homeowners receive a reduction despite being underassessed before the appeal.

The split between homeowners who file on their own and those who use a tax representative shows that, regardless of pre-appeal assessment status, owners who use a tax representative have a greater frequency of winning their appeal. If the homeowner's pre-

assessment status is "high", the frequency of receiving an assessed value reduction if a tax representative is used is especially high at between 70 to 74 percent. The split between using a lawyer versus a realtor shows that the frequencies of an assessed value reduction, conditional on the pre-appeal assessment status, are similar between the two types of tax representatives.

Throughout the last three tables, the results have shown that homeowners frequently receive an *AV* reduction even if their pre-appeal *AV/MV* ratio is low, or less than 0.95 (the percentage is still high even if the cutoff is 0.90). Of interest is the role played by tax representatives in generating these unwarranted reductions. To investigate this, we define formal post-appeal outcomes as belonging to three categories,

$$y = \begin{cases} 1 & \textit{high after} & \frac{AV}{MV} > 1.05 \\ 2 & \textit{correct after} & 0.95 < \frac{AV}{MV} < 1.05 \\ 3 & \textit{low after} & \frac{AV}{MV} < 0.95 \end{cases} \quad (2)$$

and then estimate a multinomial logit model ("correct after" is the reference group) as

$$P(y_i = j) = \begin{cases} \frac{exp(\mathbf{X}_i\beta_1)}{1+exp(\mathbf{X}_i\beta_2)+exp(\mathbf{X}_i\beta_3)} & j = 1 \; if \; \textit{high after} \\ \frac{1}{1+exp(\mathbf{X}_i\beta_1)+exp(\mathbf{X}_i\beta_3)} & \text{where} \quad j = 2 \text{ if } \textit{correct after} \\ \frac{exp(\mathbf{X}_i\beta_3)}{1+exp(\mathbf{X}_i\beta_1)+exp(\mathbf{X}_i\beta_2)} & j = 3 \text{ if } \textit{low after} \end{cases} \quad (3)$$

by maximizing a pseudolikelihood of $\ln L = \sum_{j=1}^{3} I_j(y_i) \ln P(y_i = j)$ where where $I_j(y_i) = 1[y_i = j]$ is the indicator function. The vector of independent variables, $\mathbf{X}_i$, contains dummy variables registering the pre-appeal assessment status and use of the two types of tax representatives (the reference group is "no representation"). As the results show in Table 10, the use of a tax representative reduces the probability of having a post-appeal high assessment, but it does not affect the probability of falling into the post-appeal underassessed group. In other words, the frequency of unwarranted reductions in *AV* is unrelated to the use of a tax representative in filing a formal appeal.

<--- Insert Table 10 about here --->

To summarize this section's results, there are a number of noteworthy findings:

1. For both informal and formal appeals, a large percentage of the homeowners who receive a reduction in their assessed value fall into the "high before, high after" category. These reductions are warranted but are too small in magnitude to bring homeowners to a correct assessment.
2. For both types of appeal, many homeowners who receive *AV* reductions come into the process with a low assessment and leave with an even lower assessment. These reductions are unwarranted and reduce the efficiency of the property tax in terms of it being an ad valorem tax. As explained in section on the incentives of the participants, any unintentional formal reductions could stem from an attempt to balance out

overassessments, garner votes, or to satisfy vocal homeowners. In the case of an informal appeal, unwarranted reductions might be a way to avoid the toils of a formal appeal.

3. To the extent that the goal of the appeals process is to rectify incorrect assessments, it is falling short per the empirical results. A relatively small percentage of the homeowners who receive *AV* reductions end up with correct assessments.
4. While the above findings cast the appeals process in a bad light, a more favorable discovery is that a majority of overassessed homeowners receive reductions in their *AV*. However, a significant percentage of overassessed homeowners lose their appeals.
5. Regardless of the homeowner's pre-appeal assessment status, the use of a tax representative is associated with a higher winning percentage, especially among the group who come in overassessed.
6. Controlling for the homeowners' pre-appeal assessment status, the use of a tax representative decreases the probability of ending up with a high assessment, but has no effect on the probability of a post-appeal underassessment.

The above findings suggest that there is a considerable degree of randomness within the property tax appeals process. Part of this can be attributed to the inherent difficulty of valuing single-family homes. But other factors also likely play a role; such as, differences among homeowners in their ability to present their case, among officials within the tax assessor's office in their willingness to concede a case, among tax representatives in their level of expertise, and among magistrates in their ability to properly weigh the evidence presented at appeals hearings. Excessive randomness in awarding *AV* reductions weakens the efficiency of the property tax and creates horizontal inequities (that is, homes with identical *MV*s have different *AV*s). As suggested above, the appeals process may also exacerbate vertical inequities in property taxation, an issue to which we now turn.

AV Reductions across Neighborhood Types: Specification Issues

Table 6 reported that, controlling for overassessment, the probability of an *AV* reduction is higher in "high income, majority white" neighborhoods than in the other five neighborhood groups. As noted, this may be the result of neighborhood differences in $P(I)$, $P(A)$, and/or $P(F|A)$. Before estimating these probabilities, it is important to rule out the possibility that Table 6's results are caused by model misspecification. One possible misspecification is sample selection bias, arising from the fact that not all properties turn over within two years of the date of assessment. A second possible misspecification is omitted variable bias, arising from a failure to account for the SOH wedge.

To test for sample selection bias, we estimated Heckman's sample selection model (Heckman 1979). This model is described in the Appendix. Regarding the SOH wedge, a large enough wedge can render an *AV* reduction moot because a homeowner's property tax bill will not change if the reduced *AV* still lies above *TV*. A wedge could be important for another reason. If it tends to vary systematically across neighborhood types, omitting a wedge may bias the estimated effects of the neighborhood type variables on the probability of obtaining an assessment reduction.

<--- Insert Table 11 about here --->

Table 11 reports the results from estimating the selection model and including a measure of the SOH wedge to the set of variables used to predict the probability of obtaining an *AV* reduction. The columns in Table 11 differ by whether the overassessment and SOH variables are dummy or continuous variables. The first column uses dummy variables where the SOH measure is simply whether there is no wedge (*TV=AV* in 27 percent of the cases) and the overassessment measure is its dummy variable version (having a value of one in 33 percent of the cases). In the second column, the SOH measure is the *TV/AV* ratio (mean = 0.65) and the overassessment measure is the degree version (mean = 1.29).

A comparison of the results in Table 11 with those in Table 6 shows that correcting for sample selection and accounting for SOH does not change the finding that homeowners from "high income, majority white" neighborhoods are more likely to receive an *AV* reduction. Thus, Table 6's results cannot be attributed to specification issues addressed in this section. We repeat the exercises for a reduction in *TV* (instead of *AV*) and the results are nearly indistinguishable. Having assuaged two possible concerns of model specification that may have accounted for the findings presented in Table 6, we proceed to the estimates of *P(I)*, *P(A)*, and *P(F|A)*.

Estimation of the Probability of Obtaining an Informal Reduction in *AV*

The first column of Table 12 reports the results from estimating the probability that a homeowner obtains an informal reduction in assessed value. The explanatory variables are the neighborhood type dummy variables, the dummy variable versions of overassessment and the SOH wedge, and the percentage of the homeowner's block group receiving an informal reduction, measured for each year. The latter variable is included to capture the possibility that an individual homeowner is more likely to request an informal conference if he sees his neighbors succeeding in obtaining informal reductions.

<--- Insert Table 12 about here --->

As expected, being overassessed increases the probability of an informal reduction in *AV*. Also, individual homeowners are more likely to obtain a reduction if they live in a neighborhood where more collective reductions are occurring. The key result presented in Table 12 is that the probability of an informal reduction in *AV* is higher in "high income, majority white" neighborhoods than in three of the other neighborhood groups: "low income, majority black", "low income, majority Hispanic", and "low income, racially mixed." The probability is no different in the other types of neighborhoods. Hence, the *AV* reduction advantage of homeowners in majority white neighborhoods can be partially attributed to the greater likelihood they have in obtaining informal reductions over some of the other neighborhood groups.

Estimation of the Probability of Filing a Formal Appeal

Next, we estimate the probability of filing a formal appeal. These models include the neighborhood type variables, the dummy variable versions of overassessment and the SOH wedge, and three variables registering the amount of appeal activity occurring during the year of observation within the homeowner's block group: the percentage of owners in the block group who are filing a formal appeal on their own without a representative, who are filing an appeal using a lawyer as the tax representative, and who are filing an appeal using a realtor as the tax representative. These variables capture the demonstration effect from other neighborhood homeowners. They may also register a solicitation effect by tax representatives: the individual

homeowner is more likely to have been contacted by a representative in a neighborhood where more homeowners are filing appeals using tax representatives.

<--- Insert Table 13 about here --->

The formal appeal results are presented in Table 13. As anticipated, the probability of filing a formal appeal is higher if the homeowner is overassessed or has no SOH wedge. Also, regardless of whether appeals in the neighborhood come from homeowners filing appeals on their own or those using a tax representative, more neighborhood appeal activity increases the probability that the individual homeowner appeals. The results obtained with the neighborhood variables show that the probability of appeal is higher in "high income, majority white" neighborhoods in comparison to other neighborhoods, with the exception of "low income, majority white" neighborhoods where the estimated coefficient is negative but not significant.

The results reported in Table 13 may over- or understate the total effect of neighborhood type on the probability of appeal, because they only account for the direct effect of neighborhood type. In addition to the direct effect, there may be an indirect effect if the degree of appeal activity varies systematically across neighborhood types. For example, the probability of filing an appeal may be higher if the homeowner lives in a majority white neighborhood because he is more likely to be better educated and informed about the appeals process (a direct effect). In addition, a homeowner in a majority white neighborhood may also have a higher appeal probability because of greater neighborhood appeal activity (for example, there may be an indirect effect of neighborhood type on the probability of appeal that works through the percent of block group appealing variables). To investigate this, three auxiliary OLS regression models were estimated at the block group level with the following dependent variables: the percentage of the block group filing on their own, the percentage of the block group filing with an attorney, and the percentage of the block group filing with a realtor. Neighborhood type dummy indicators serve as the independent variables.

<--- Insert Table 14 about here --->

The results, reported in Table 14, show that homeowners in "high income, majority white" neighborhoods have a higher percentage of their neighbors filing appeals without the use of a representative in comparison to homeowners in "high income, majority black", "high income, majority Hispanic", and "high income, racially mixed" neighborhoods. The second column illustrates that the homeowners in "high income, majority white" neighborhoods have a higher percentage of their neighbors filing appeals using an attorney as the tax representative in comparison to homeowners in "low income, majority black", "high income, majority black", "high income, majority Hispanic", and "high income, racially mixed" neighborhoods. The last column has the strongest findings, which show that homeowners in "high income, majority white" neighborhoods have a higher percentage of their neighbors filing appeals using a realtor as the tax representative in comparison to all of the nonwhite neighborhood groups (except for "low income, majority Hispanic"). In contrast to the negative coefficients on the nonwhite neighborhood types, homeowners in "low income, majority white" neighborhoods have a higher percentage of their neighbors filing appeals with a tax representative than homeowners in "high income, majority white" neighborhoods. These results indicate that homeowners in majority white neighborhoods, regardless of their income level, have a higher probability of filing a

formal appeal because they tend to live in neighborhoods where more appeal activity is occurring. Thus, indirect effects, like the direct effects reported in Table 13, favor homeowners in "high income, majority white" neighborhoods.

<--- Insert Table 15 about here --->

Table 15 reports the direct, indirect, and total effects of the neighborhood type variables on the probability of filing a formal appeal. Total effects are roughly twice the size of the direct effects and strongly reinforce the conclusion that the probability of filing a formal appeal is higher among homeowners living in majority white neighborhoods (both high and low income) in comparison to homeowners living in all of the minority neighborhood groups.

Estimation of the Probability of Winning a Formal Appeal

The final set of probit models estimate the homeowner's probability of receiving a reduction in his assessed value conditional on having filed a formal appeal ($P(F|A)$). The model includes the neighborhood type variables and the dummy variables for overassessment and the SOH wedge. Results are presented in Table 16 for a reduction in *AV* (the *TV* results are qualitatively similar). The first column has a dummy variable indicating whether the appeal was filed by a tax representative. In the second column, separate dummy variables distinguish whether a tax representative was a lawyer or realtor.

<--- Insert Table 16 about here --->

Overassessed homeowners are more likely to win their appeal, as are homeowners who turn to a tax representative. A successful appeal does not depend on the type of representative utilized. Homeowners with no SOH wedge are also more likely to have a successful appeal. For these owners, a reduction in *TV* is guaranteed if they win their appeal, so they may push harder to have that occur. Regarding the neighborhood type variables, only two are statistically significant: "low income, majority white" and "high income, racially mixed." Homeowners living in these neighborhood have a lower probability of winning their appeal in comparison to homeowners in "high income, majority white" neighborhoods.

<--- Insert Table 17 about here --->

Analogous to the estimation of $P(A)$, the estimated effects of the neighborhood type variables on $P(F|A)$ may not fully capture their total effects if there are indirect effects working through the other explanatory variables. As shown in Table 3 and discussed in the section on the description of data, homeowners in majority white neighborhoods more frequently utilize a tax representative in filing their appeals. This is confirmed in Table 17, which shows the results from estimating the probability of using a tax representative as a function of the neighborhood type variables, controlling for overassessment and the SOH wedge. Hence, the total effect of neighborhood type on $P(F|A)$ includes the indirect effect that neighborhood type has working through its effect on choosing to use a tax representative.

<--- Insert Table 18 about here --->

Table 18 reports the direct, indirect, and total effects of neighborhood type on *P(F|A)*. The estimated indirect effects all show that the higher utilization of tax representatives among homeowners in "high income, majority white" neighborhoods increases their probability of winning their appeal in comparison to all of the nonwhite neighborhood groups, with the exception of the "low income, racially mixed" group. The estimated indirect effect for the "low income, majority white" and "low income, racially mixed" neighborhood types are not statistically significant. Accounting for these indirect effects substantially alters the *P(F|A)* results: in comparison to the estimated direct effects where only one of the six nonwhite neighborhood type variables is negative and significant, the estimated total (direct plus indirect) effects show that all but two of the nonwhite neighborhood type variables are negative and significant (the exceptions are "low income, majority black" which is negative but insignificant and "low income, racially mixed" which is positive but insignificant). Clearly, the higher utilization of tax representatives by homeowners living in "high income, majority white" neighborhoods improves their chances of winning their appeal relative to homeowners from nonwhite neighborhoods.

<--- Insert Table 19 about here --->

Finally, to draw together previous results, Table 19 presents a decomposition of an *AV* reduction that is based on the *P(R)* summary described by Equation (1). The purpose is to show which part of the appeals process (receiving an informal reduction, filing a formal appeal, or winning a formal appeal) carries the most weight in explaining a neighborhood's disadvantage relative to the "high income, majority white" reference group. The table is split into magnitudes and absolute percentages. The first two columns of *P(R)* compare the estimated marginal effect from Table 6 with the predicted marginal effect obtained by calculating the total derivative of Equation (1), or $dP(R) = dP(I) + dP(A) \cdot \overline{P(F|A)} + \overline{P(A)} \cdot dP(F|A)$. Means values ($\overline{P(F|A)} = 0.4947$ and $\overline{P(A)} = 0.0238$) are computed over the entire sample and the *dP(I)*, *dP(A)*, and *dP(F|A)* are the estimates reported in Tables 12, 15, and 18. There are minor differences between the estimated and predicted marginal effects (due to sample variance in the estimated coefficients) but the overall resemblances add credence to the results presented for individual components of the property tax appeals process. The next three columns report the estimated partial derivatives for *dP(I)*, *dP(A)*, and *dP(F|A)*. In the last three columns, we compare the relative impact of each part of the process by dividing by the sum of the absolute value of the components. A positive percentage value indicates that the part has the same sign as the predicted marginal effect and, therefore, helps to explain the magnitude of the marginal effect. A negative sign points out an opposing effect that reduces the absolute magnitude of the marginal effect. While the results vary across neighborhood groups, generally they show that all three parts of the appeal process play an important role in explaining the disadvantage that homeowners from nonwhite neighborhoods have in obtaining an appeals-related reduction in their assessed value (relative to homeowners from "high income, majority white" neighborhoods).

Conclusions

We have undertaken an in-depth evaluation of the property tax appeals process using a remarkably rich dataset for a large Florida county. One of our objectives is to assess whether the appeals process rectifies assessment errors. The results indicate that appeals-related reductions

in *AV* infrequently result in correct assessments and that a sizeable percentage of reductions are given to homeowners who already are underassessed prior to appeal. To be fair, we do find a positive outcome from the appeals process: a majority of overassessed homeowners receive an *AV* reduction; nevertheless, the assessment is frequently not adjusted downward enough to be classified in a "correct" range.

Our second objective is to evaluate the fairness of the appeals process. Our findings indicate that if there are two homeowners—one from a majority white neighborhood and another from a majority nonwhite neighborhood who share the same pre-appeal assessment status—the one from the majority white neighborhood is more likely to receive a reduction in *AV*. Because the latter homeowners have higher incomes, the appeals process contributes to the regressivity of the property tax. According to our results, the advantage that homeowners from white neighborhoods have in obtaining an *AV* reduction stems from them having a higher probability of receiving an informal reduction, a higher probability of filing a formal appeal, and a higher probability of winning their appeal conditional upon filing. The latter two probabilities are strongly associated with the higher utilization of tax representatives by homeowners from majority white neighborhoods. This higher utilization is consistent with the recent newspaper accounts (cited in the introduction of this paper) suggesting that these homeowners are targeted by tax representatives who attempt to maximize their contingency fees. Our data, however, do not enable us to rule out the possibility that the higher utilization of tax representatives by homeowners from majority white neighborhoods is the result of these homeowners choosing on their own, without solicitation, to use a tax representative in filing their formal appeal. The data also preclude us from knowing whether the representatives pursue appeal cases that have a higher likelihood of success. However, because we control for assessment error, endogeneity bias can only result if there is some other characteristic of the case that tax representatives use to identify a successful appeal. We can think of no such characteristic.

While the results reveal deficiencies in the appeals process, we do not suggest abridging the right to appeal. Homeowners must have recourse to challenging perceived errors in their property tax assessments and this is provided by the right to appeal. However, the results suggest changes could be made to make the appeals process more efficient and equitable:

1. There may be an incentive on the part of the tax assessor to satisfy a complaining homeowner who has filed an informal appeal. Currently, there is no requirement to record informal changes (or denials) on the tax rolls or anywhere else. The purpose of informal conferences might be limited to the tax assessor explaining to the homeowner the basis for his assessment. Based upon this explanation, the homeowner could then decide whether or not to file a formal appeal.
2. Regarding formal appeals, the data indicate that many homeowners receive unwarranted reductions in their assessed value. One policy option is to require appellants to satisfy a higher evidentiary standard showing that they are right and that the assessor is wrong. This must be done with care, however, because the results also suggest that many homeowners who merit a reduction fail to receive one. Ideally, the standard would be set so as to minimize unwarranted reductions without decreasing the chances of an overassessed homeowner receiving a deserved reduction. Unfortunately, it is no easy task to translate a statistical value into a legal standard and U.S. states use a variety of burden of proofs that include "every-reasonable-hypothesis", "the preponderance of evidence", and even "incorrect". While the first burden is extremely difficult to prove in favor of the appellant, the last burden is far too vague and invites unwarranted appeals.

Some consistency across states could encourage a better distribution of representatives across the country. Another policy option depends on whether unwarranted reductions are random or systematic with respect to individuals who represent the assessor's office at the hearings and/or the magistrate who rules on the appeal. Following our approach to obtaining *MV*, both public servants could be "graded" by using post-assessment sales to determine how often an unwarranted reduction occurs.

3. The findings suggest that the advantage homeowners from majority white neighborhoods have in obtaining a reduction in their assessed value stems largely from their greater use of a tax representative. This higher use may be the result of tax representatives targeting their solicitations toward the neighborhoods where their contingency fees will be the greatest. However, the evidence we have provided suggests that representatives are not responsible for homeowners receiving unwarranted reductions and they do assist overassessed homeowners in obtaining a reduction in their assessed value. We therefore do not recommend imposing constraints on their behavior or outlawing the use of contingency fees (as has been proposed in some state legislatures). Instead, we offer two suggestions to encourage participation. First, a public campaign could educate minority and low-income homeowners about their rights, the proper steps for lodging an appeal, and when an appeal might be appropriate. Second, we borrow two ideas from the justice system to suggest that tax representatives should be encouraged to undertake pro bono work and, where help is still needed, public tax representatives could be appointed to assist homeowners from nonwhite neighborhoods in filing formal appeals. The right to appeal would be further enhanced by this idea of a public tax representative.

The property tax appeals process is virtually identical across Florida. Moreover, the main features of the Florida system (a public assessor, informal conferences, a VAB that rules on formal appeals, and tax representatives that work on a contingency fee basis) are common to other states. Every state allows property owners the right to appeal in an informal and formal setting as we have described. The incentives that give rise to the defects we have found in the Florida appeals process are, therefore, likely to have created similar problems elsewhere. In light of the concerning empirical analysis that we find and because our effort can be considered pioneering, we strongly encourage investigations of property tax appeals processes in other places, both within and outside the United States. The techniques outlined in this paper could be helpful when evaluating property tax appeals and their outcomes.

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Appendix: The Sample Selection Model

The sample selection model consists of two equations: the primary equation, where the dependent variable is a binary indicator equal to one if the property received an *AV* reduction, and the sample selection equation, where the dependent variable is a binary indicator equal to one if the property was recorded as having a qualified arms-length sales transaction. Assuming joint normality of the error terms, the two equations can be estimated together using maximum likelihood estimation. Formally, the model is written as

$$R_i^* = \boldsymbol{X}_i\beta + \varepsilon_i \quad \text{(A1)}$$

$$S_i^* = \boldsymbol{X}_i\gamma + Z_i\delta + \omega_i \quad \text{(A2)}$$

where (ε_i, ω_i) are distributed i.i.d. $N(0,0,1,1,\rho)$ and R_i^* and S_i^* are latent variables. Unselected observations are those homes in the five-year sample that do not sell during the post-assessment period (or within two years of the month of assessment, *n=1,373,072*) and selected observations are those homes in the post-assessment sales sample (*n=80,393*), or $S_i = 1[S_i^* > 0]$. The vector of regressors, $\mathbf{X}_i$, includes the set of dummy variables that denote the neighborhood group where a property is located and whether the property was overassessed. The sample selection model must include a variable, Z_i,that predicts the censored/uncensored split and that does not belong in the primary equation. We use the time (in years) that has expired between when the house was last sold and the date of assessment. Residential mobility studies (a review can be found in Quigley and Weinberg 1977) show that the probability of turnover declines with the length of tenure, but we can think of no reason there would be a relationship between tenure duration and the probability that the homeowner receives a reduction in *AV*. The selection variable is highly statistically significant with a negative sign: the longer the time between the last sales year and the year of assessment, the less likely the house will be sold in the next two years. A Wald test indicates that the results in Table 6 contain sample selection bias.

Table 1

Characteristics of the appeals process

	Number of single-family housing units	Number of informal reductions in assessed value	Number of formal appeals	Percent of formal appeals granted	Percent of formal appeals filed using lawyer	Percent of formal appeals filed using realtor	Success rate, no tax rep.	Success rate, lawyer	Success rate, realtor
2005	306,594	369	3,640	40.6	51.6	32.8	41.5	41.5	38.7
2006	306,946	1,016	4,740	45.6	43.4	32.0	42.3	48.1	44.9
2007	307,061	1,386	6,287	50.5	41.8	36.1	40.9	53.5	52.8
2008	307,656	1,568	10,452	49.7	34.3	31.9	34.5	58.2	56.6
2009	366,196	6,313	14,441	50.8	28.4	34.3	25.7	71.3	61.2

Table 2

Neighborhood type descriptors

	Percent of homeowners receiving informal reductions	Percent of homeowners receiving formal reductions	Percent of total single-family properties	Median housing value	Median reduction in *AV* from a formal appeal
Neighborhood Type					
Low Income, Majority Black	30.8	14.0	18.5	188,184	23,736
High Income, Majority Black	0.8	1.4	3.4	220,314	29,586
Low Income, Majority Hispanic	6.8	25.9	25.9	275,913	31,486
High Income, Majority Hispanic	26.0	23.4	27.5	352,151	39,651
Low Income, Majority White	0.6	1.8	0.7	552,442	63,767
High Income, Majority White	19.4	26.4	15.0	589,499	78,012
Low Income, Racially Mixed	5.2	4.5	4.5	238,618	33,439
High Income, Racially Mixed	11.0	4.2	5.9	319,819	39,077

Note: The first three columns' percentages are calculated over the years 2005--2009 for all single-family homeowners who received an informal reduction, who received a formal reduction, and whose property was listed on the tax rolls, respectively.

Table 3

Use of tax representative in filing single-family appeals

(by type of neighborhood)

	All years	2005	2006	2007	2008	2009
Neighborhood Type						
Low Income, Majority Black						
% using representative	62	71	60	73	60	58
% using lawyer	28	36	27	31	27	28
% using realtor	33	34	34	42	33	29
High Income, Majority Black						
% using representative	63	88	47	77	58	48
% using lawyer	33	56	25	32	29	25
% using realtor	30	32	22	45	29	23
Low Income, Majority Hispanic						
% using representative	69	85	74	77	66	62
% using lawyer	35	51	42	40	35	27
% using realtor	34	34	33	37	31	34
High Income, Majority Hispanic						
% using representative	68	83	76	81	64	61
% using lawyer	32	53	44	42	31	22
% using realtor	36	30	32	39	32	39
Low Income, Majority White						
% using representative	76	92	86	79	70	63
% using lawyer	47	56	51	51	42	42
% using realtor	29	35	35	28	28	22
High Income, Majority White						
% using representative	78	87	81	81	75	72
% using lawyer	44	53	48	47	41	39
% using realtor	34	34	34	34	34	33
Low Income, Racially Mixed						
% using representative	63	83	67	70	58	58
% using lawyer	37	60	43	43	31	32
% using realtor	26	23	24	26	26	27
High Income, Racially Mixed						
% using representative	64	77	73	73	61	58
% using lawyer	35	53	50	44	32	26
% using realtor	29	24	23	30	29	32

Table 4

Percent of neighborhood filing a formal appeal using a tax representative

	Percent tax rep.	Percent lawyer	Percent realtor
Neighborhood Type			
Low Income, Majority Black	1.12	0.47	0.64
High Income, Majority Black	0.65	0.34	0.31
Low Income, Majority Hispanic	1.69	0.86	0.83
High Income, Majority Hispanic	1.63	0.76	0.87
Low Income, Majority White	4.38	2.75	1.63
High Income, Majority White	3.84	2.05	1.80
Low Income, Racially Mixed	1.57	0.93	0.65
High Income, Racially Mixed	1.38	0.76	0.62

Note: Percentages are for all single-family homeowners on the 2005--2009 tax rolls who filed a formal appeal using a tax representative, lawyer, or realtor.

Table 5

Assessment ratios (AV/MV) before and after reductions in assessed values from appeals

	All appeals		
	All years	2005—2007	2008—2009
Before AV Reduction	1.2411	1.0386	1.3497
After AV Reduction	1.0583	0.9115	1.1371
	"Correct": 0.95 ≤ AV/MV ≤ 1.05		
High Before, High After	563 (40)	114 (23)	449 (48)
High Before, Correct After	214 (15)	59 (12)	155 (17)
High Before, Low After	70 (5)	21 (4)	49 (5)
Correct Before, Correct After	45 (3)	21 (4)	24 (3)
Correct Before, Low After	109 (8)	55 (11)	54 (6)
Low Before, Low After	342 (24)	199 (41)	143 (15)
	"Correct": 0.90 ≤ AV/MV ≤ 1.10		
High Before, High After	448 (32)	75 (15)	373 (40)
High Before, Correct After	282 (20)	82 (17)	200 (22)
High Before, Low After	27 (2)	10 (2)	17 (2)
Correct Before, Correct After	179 (13)	71 (14)	108 (12)
Correct Before, Low After	137 (10)	75 (15)	62 (7)
Low Before, Low After	270 (19)	156 (32)	114 (12)
Observations	1,418	490	928

Notes: Magnitudes are shown and percentages are in parentheses. The definitions of High, Correct, and Low depend on the ``Correct" value interval. For the middle panel above, ``High" is where $AV/MV > 1.05$, ``Correct" is $.95 \leq AV/MV \leq 1.05$ , and ``Low" is $AV/MV < .95$.

Table 6

Probability of obtaining a reduction in assessed value

How overassessment is measured:	Dummy variable	Degree
Neighborhood Type		
Low Income, Majority Black	-0.0089***	-0.0137***
	(0.0006)	(0.0006)
High Income, Majority Black	-0.0100***	-0.0125***
	(0.0006)	(0.0006)
Low Income, Majority Hispanic	-0.0094***	-0.0129***
	(0.0007)	(0.0007)
High Income, Majority Hispanic	-0.0073***	-0.0094***
	(0.0007)	(0.0007)
Low Income, Majority White	-0.0046**	-0.0054**
	(0.0020)	(0.0023)
Low Income, Racially Mixed	-0.0061***	-0.0083***
	(0.0008)	(0.0008)
High Income, Racially Mixed	-0.0066***	-0.0082***
	(0.0008)	(0.0008)
Overassessed (*yes = 1*)	0.0293***	
	(0.0013)	
Degree of Overassessment		0.0200***
		(0.0009)
Observations	83,868	83,868

Notes: Reported coefficients are marginal effects (i.e., the change in the probability for an infinitesimally small change in a continuous variable and the discrete change in the probability for a dummy variable). Robust standard errors are in parentheses.

, * indicate statistical significance at the 5% and 1% level, respectively.

Table 7

Results of informal appeal

	All years	2005—2007	2008—2009
Before AV Reduction	1.3299	0.9962	1.5216
After AV Reduction	1.1610	0.8743	1.3257
High Before, High After	222 (50)	28 (18)	194 (68)
High Before, Correct After	29 (7)	12 (8)	17 (6)
High Before, Low After	19 (4)	10 (6)	9 (3)
Correct Before, Correct After	18 (4)	12 (8)	6 (2)
Correct Before, Low After	28 (6)	20 (13)	8 (3)
Low Before, Low After	106 (24)	72 (45)	34 (12)
Observations	446	159	287

Notes: Magnitudes are shown and percentages are in parentheses. The definitions of High, Correct, and Low depend on the ``Correct" value interval. For the middle panel above, ``High" is where $AV/MV > 1.05$, ``Correct" is $.95 \leq AV/MV \leq 1.05$, and ``Low" is $AV/MV < .95$.

Table 8

Results of formal appeals

	All cases					
	All years	2005—2007	2008—2009			
Before Appeal, AV/MV Mean	1.2085	1.0597	1.2844			
After Appeal, AV/MV Mean	1.0146	0.9285	1.0586			
High Before, High After	352 (35)	87 (26)	265 (40)			
High Before, Correct After	189 (19)	48 (14)	141 (21)			
High Before, Low After	55 (6)	11 (3)	44 (7)			
Correct Before, Correct After	27 (3)	9 (3)	18 (3)			
Correct Before, Low After	83 (8)	36 (11)	47 (7)			
Low Before, Low After	238 (24)	128 (38)	110 (17)			
Observations	997	335	662			
	Without tax representative			With tax representative		
	All years	2005—2007	2008—2009	All years	2005—2007	2008—2009
Before Appeal, AV/MV Mean	1.3586	1.1473	1.4163	1.1578	1.0430	1.2281
After Appeal, AV/MV Mean	1.0799	0.9445	1.1169	0.9926	0.9254	1.0338
High Before, High After	116 (47)	17 (32)	99 (51)	236 (31)	70 (25)	166 (35)
High Before, Correct After	49 (20)	7 (13)	42 (22)	140 (19)	41 (15)	99 (21)
High Before, Low After	18 (7)	3 (6)	15 (8)	37 (5)	8 (3)	29 (6)
Correct Before, Correct After	7 (3)	1 (2)	6 (3)	20 (3)	8 (3)	12 (3)
Correct Before, Low After	15 (6)	6 (11)	9 (5)	68 (9)	30 (11)	38 (8)
Low Before, Low After	33 (13)	17 (32)	16 (8)	205 (27)	111 (39)	94 (20)
Observations	246	53	193	751	282	469
	Lawyer tax representative			Realtor tax representative		
	All years	2005—2007	2008—2009	All years	2005—2007	2008—2009
Before Appeal, AV/MV Mean	1.1503	1.0622	1.2165	1.1666	1.0133	1.2395
After Appeal, AV/MV Mean	0.9990	0.9404	1.0430	0.9852	0.9022	1.0247
High Before, High After	117 (29)	41 (24)	76 (32)	119 (34)	29 (26)	90 (38)
High Before, Correct After	78 (19)	24 (14)	54 (23)	62 (18)	17 (15)	45 (19)
High Before, Low After	17 (4)	5 (3)	12 (5)	20 (6)	3 (3)	17 (7)
Correct Before, Correct After	13 (3)	5 (3)	8 (3)	7 (2)	3 (3)	4 (2)
Correct Before, Low After	47 (12)	21 (12)	26 (11)	21 (6)	9 (8)	12 (5)
Low Before, Low After	108 (27)	67 (40)	41 (18)	97 (28)	44 (39)	53 (23)
Observations	403	169	234	348	113	235

Notes: Magnitudes are shown and percentages are in parentheses. The definitions of High, Correct, and Low are as follows: ``High" is where $AV/MV > 1.05$, ``Correct" is $.95 \leq AV/MV \leq 1.05$, and ``Low" is $AV/MV < .95$.

Table 9

Percent of formal appeals receiving reduction in assessed value
(by pre-appeal assessment status)

Post-assessment sales sample:	Total (24 months)		Restricted (12 months)	
	Cases	% reduction	Cases	% reduction
All Cases				
High	609	60	456	65
Correct	114	42	65	40
Low	251	37	75	23
No Tax Rep.				
High	196	46	165	53
Correct	25	36	18	39
Low	40	29	16	22
Yes Tax Rep.				
High	413	70	291	74
Correct	89	44	47	41
Low	211	39	59	23
Lawyer Tax Rep.				
High	212	73	143	72
Correct	60	52	29	47
Low	112	38	31	22
Realtor Tax Rep.				
High	201	67	148	76
Correct	29	34	18	33
Low	99	40	28	25

Notes: The total (restricted) property sample has post-assessment sales within 24 (12) or fewer months after the month of assessment. The definitions of High, Correct, and Low are as follows: ``High" is where $AV/MV > 1.05$ , ``Correct" is $.95 \leq AV/MV \leq 1.05$, and ``Low" is $AV/MV < .95$.

Table 10

Multinomial logistic regression of formal appeals outcomes

Dependent variable:	High After	Low After
Low, Before	-0.6051***	23.1051***
	(0.0893)	(0.1611)
Correct, Before	-23.6441***	0.4884**
	(0.1148)	(0.2008)
Tax Representative, Lawyer	-0.8762***	0.2077
	(0.1904)	(0.2462)
Tax Representative, Realtor	-0.6803***	-0.0520
	(0.1896)	(0.2675)
Observations	1,961	1,961

Notes: Robust standard errors are in parentheses. The definitions of High, Correct, and Low are as follows: ``High" is where $AV/MV > 1.05$ , ``Correct" is $.95 \leq AV/MV \leq 1.05$, and ``Low" is $AV/MV < .95$.

, * indicate statistical significance at the 5% and 1% level, respectively.

Table 11

Probability of obtaining a reduction in assessed value
(accounting for Save Our Homes and sample selection)

How overassessment is measured:	Dummy variable	Degree
Neighborhood Type		
Low Income, Majority Black	-.0196***	-.0144***
	(.0017)	(.0009)
High Income, Majority Black	-.0195***	-.0118***
	(.0034)	(.0017)
Low Income, Majority Hispanic	-.0184***	-.0126***
	(.0016)	(.0009)
High Income, Majority Hispanic	-.0157***	-.0102***
	(.0016)	(.0009)
Low Income, Majority White	-.0085*	-.0048*
	(.0047)	(.0028)
Low Income, Racially Mixed	-.0144***	-.0089***
	(.0021)	(.0012)
High Income, Racially Mixed	-.0127***	-.0078***
	(.0021)	(.0012)
Overassessed (*yes = 1*)	.0410***	
	(.0015)	
Degree of Overassessment		.0184***
		(.0008)
No SOH (*TV/AV = 1*, *yes = 1*)	.0312***	
	(.0024)	
TV/AV		.0443***
		(.0034)
Observations	80,393	80,393
Wald χ^2 Test (ρ=0)	4.62	0.05
Prob > χ^2(1)	0.03	0.8192

Notes: Reported coefficients are marginal effects from the primary equation of the Heckman model (i.e., the change in the probability for an infinitesimally small change in a continuous variable and the discrete change in the probability for a dummy variable). Robust standard errors are in parentheses. Only primary probit equation results and uncensored observations are reported.

***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table 12

Probability of obtaining an informal reduction
(accounting for Save Our Homes and sample selection)

Dependent variable:	Assessed value
Neighborhood Type	
Low Income, Majority Black	-.0084*
	(.0049)
High Income, Majority Black	-.0101
	(.0090)
Low Income, Majority Hispanic	-.0103**
	(.0046)
High Income, Majority Hispanic	.0005
	(.0039)
Low Income, Majority White	.0102
	(.0121)
Low Income, Racially Mixed	-.0126**
	(.0054)
High Income, Racially Mixed	.0006
	(.0051)
Overassessed (*yes = 1*)	.0224***
	(.0028)
No SOH (*TV/AV = 1*, *yes = 1*)	.0077
	(.0054)
% BG Reduction	.0039***
	(.0003)
Observations	80,393
Wald χ^2 Test (ρ=0)	5.20
Prob > χ^2(1)	0.02

Notes: Reported coefficients are marginal effects from the primary equation of the Heckman model (i.e., the change in the probability for an infinitesimally small change in a continuous variable and the discrete change in the probability for a dummy variable). Robust standard errors are in parentheses. Only primary probit equation results and uncensored observations are reported.

***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table 13

Probability of filing a formal appeal

(accounting for Save Our Homes and sample selection)

How tax representation is measured:	One type	Split up
Neighborhood Type		
Low Income, Majority Black	-.0207***	-.0210***
	(.0016)	(.0017)
High Income, Majority Black	-.0159***	-.0162***
	(.0030)	(.0031)
Low Income, Majority Hispanic	-.0116***	-.0116***
	(.0016)	(.0016)
High Income, Majority Hispanic	-.0120***	-.0117***
	(.0015)	(.0015)
Low Income, Majority White	-.0041	-.0049
	(.0044)	(.0045)
Low Income, Racially Mixed	-.0121***	-.0121***
	(.0021)	(.0021)
High Income, Racially Mixed	-.0098***	-.0099***
	(.0021)	(.0021)
Overassessed (*yes = 1*)	.0251***	.0261***
	(.0013)	(.0013)
No SOH (*TV/AV = 1*, *yes = 1*)	.0356***	.0364***
	(.0021)	(.0022)
% BG Appeal, Tax Representative	.0032***	
	(.0001)	
% BG Appeal, Lawyer		.0043***
		(.0002)
% BG Appeal, Realtor		.0022***
		(.0003)
Observations	80,393	80,393
Wald χ^2 Test (ρ=0)	1.91	2.21
Prob > χ^2(1)	0.17	0.14

Notes: Reported coefficients are marginal effects from the primary equation of the Heckman model (i.e., the change in the probability for an infinitesimally small change in a continuous variable and the discrete change in the probability for a dummy variable). Robust standard errors are in parentheses. Only primary probit equation results and uncensored observations are reported.

*** indicates statistical significance at the 1% elvel.

Table 14

OLS models of percent of neighborhood filing formal appeal

(without a tax representative, with a lawyer, and with a realtor)

Dependent variable:	No tax rep.	Lawyer	Realtor
Neighborhood Type			
Low Income, Majority Black	0.0416	-1.3778***	-1.1799***
	(0.1384)	(0.2169)	(0.1404)
High Income, Majority Black	-0.5392***	-1.0689*	-0.9993***
	(0.1117)	(0.5714)	(0.3208)
Low Income, Majority Hispanic	0.2353	0.0051	0.1320
	(0.1437)	(0.2471)	(0.2132)
High Income, Majority Hispanic	-0.2740***	-1.3126***	-0.8361***
	(0.0775)	(0.1663)	(0.1503)
Low Income, Majority White	-0.0449	8.9323***	5.7540***
	(0.1901)	(2.0251)	(2.0457)
Low Income, Racially Mixed	-0.0709	0.3359	-0.7726***
	(0.1228)	(0.5783)	(0.2669)
High Income, Racially Mixed	-0.3422***	-1.2603***	-0.9045***
	(0.0954)	(0.2046)	(0.2901)
R^2	0.00	0.05	0.04
Observations	4,482	4,482	4,482

Notes: Reported coefficients are marginal effects. Robust standard errors are in parentheses.

* and *** indicate statistical significance at the 10% and 1% level, respectively.

Table 15

Total probability of filing a formal appeal

	Accounting for the effects		
	Direct	Indirect	Total
Neighborhood Type			
Low Income, Majority Black	-.0104***	-.0063***	-.0167***
	(.0007)	(.0005)	(.0009)
High Income, Majority Black	-.0079***	-.0067***	-.0146***
	(.0016)	(.0013)	(.0021)
Low Income, Majority Hispanic	-.0062***	-.0043***	-.0105***
	(.0007)	(.0005)	(.0009)
High Income, Majority Hispanic	-.0052***	-.0046***	-.0097***
	(.0007)	(.0006)	(.0009)
Low Income, Majority White	-.0026	.0046**	.0020
	(.0021)	(.0020)	(.0037)
Low Income, Racially Mixed	-.0071***	-.0044***	-.0116***
	(.0010)	(.0007)	(.0012)
High Income, Racially Mixed	-.0053***	-.0047***	-.0100***
	(.0010)	(.0007)	(.0012)

Notes: Reported coefficients are marginal effects from a non-linear combination of partial derivatives from seemingly unrelated regressions (i.e., the change in the probability for an infinitesimally small change in a continuous variable and the discrete change in the probability for a dummy variable). Robust standard errors are in parentheses.

** and *** indicate statistical significance at the 5% and 1% level, respectively.

Table 16

Probability of reduction in assessed value given a formal appeal

How tax representation is measured:	One type	Split up
Neighborhood Type		
Low Income, Majority Black	.0023	-.0235***
	(.0434)	(.0085)
High Income, Majority Black	-.1074	-.0690***
	(.1152)	(.0228)
Low Income, Majority Hispanic	-.0133	-.0226***
	(.0340)	(.0067)
High Income, Majority Hispanic	-.0499	-.0147***
	(.0308)	(.0057)
Low Income, Majority White	-.1970**	-.0153
	(.0882)	(.0158)
Low Income, Racially Mixed	.0557	-.0058
	(.0562)	(.0097)
High Income, Racially Mixed	-.1483***	-.0226**
	(.0529)	(.0529)
Overassessed (*yes = 1*)	.2431***	.2444***
	(.0234)	(.0234)
No SOH (*TV/AV = 1*, *yes = 1*)	.3351***	.3336***
	(.0298)	(.0299)
Tax Representative	.1821***	
	(.0255)	
Tax Representative, Lawyer		.1958***
		(.0286)
Tax Representative, Realtor		.169***
		(.0297)
Observations	1,961	1,961

Notes: Reported coefficients are marginal effects from a non-linear combination of partial derivatives from seemingly unrelated regressions (i.e., the change in the probability for an infinitesimally small change in a continuous variable and the discrete change in the probability for a dummy variable). Robust standard errors are in parentheses.

** and *** indicate statistical significance at the 5% and 1% level, respectively.

Table 17

Probability of using a tax representative in filing a formal appeal

Dependent variable:	Tax rep.
Neighborhood Type	
Low Income, Majority Black	-.1293***
	(.0437)
High Income, Majority Black	-.3792***
	(.1043)
Low Income, Majority Hispanic	-.1239***
	(.0329)
High Income, Majority Hispanic	-.0807***
	(.0292)
Low Income, Majority White	-.0840
	(.0890)
Low Income, Racially Mixed	-.0319
	(.0540)
High Income, Racially Mixed	-.1241**
	(.0542)
Overassessed (*yes = 1*)	-.1913***
	(.0205)
No SOH (*TV/AV = 1*, *yes = 1*)	.0204
	(.0333)
Observations	1,961

Notes: Reported coefficients are marginal effects (i.e., the change in the probability for an infinitesimally small change in a continuous variable and the discrete change in the probability for a dummy variable). Robust standard errors are in parentheses.

** and *** indicate statistical significance at the 5% and 1% level, respectively.

Table 18

Probability of winning a formal appeal

	Accounting for effects		
	Direct	Indirect	Total
Neighborhood Type			
Low Income, Majority Black	.0023	-.0235***	-.0213
	(.0434)	(.0085)	(.0172)
High Income, Majority Black	-.1074	-.0690***	-.1764**
	(.1152)	(.0228)	(.0838)
Low Income, Majority Hispanic	-.0133	-.0226***	-.0359**
	(.0340)	(.0067)	(.0177)
High Income, Majority Hispanic	-.0499	-.0147***	-.0646***
	(.0308)	(.0057)	(.0245)
Low Income, Majority White	-.1970**	-.0153	-.2123**
	(.0882)	(.0158)	(.0894)
Low Income, Racially Mixed	.0557	-.0058	.0499
	(.0562)	(.0097)	(.0794)
High Income, Racially Mixed	-.1483***	-.0226**	-.1709***
	(.0529)	(.0529)	(.0515)

Notes: Reported coefficients are marginal effects from a non-linear combination of partial derivatives from seemingly unrelated regressions (i.e., the change in the probability for an infinitesimally small change in a continuous variable and the discrete change in the probability for a dummy variable). Robust standard errors are in parentheses.

** and *** indicate statistical significance at the 5% and 1% level, respectively.

Table 19

Examining the probability of reduction in assessed value by marginal effects of each component

	Magnitudes of derivatives					Absolute percentages		
	P(R)		Informal	Formal		Informal	Formal	
	Estimated	Predicted	*dP(I)*	*dP(A)*	*dP(F|A)*	Reduction	Appeal	Win
Neighborhood Type								
Low Income, Majority Black	-0.0089	-0.0172	-0.0084	-0.0167	-0.0213	48.63%	48.40%	2.97%
High Income, Majority Black	-0.0100	-0.0215	-0.0101	-0.0146	-0.1764	46.42%	33.87%	19.71%
Low Income, Majority Hispanic	-0.0094	-0.0164	-0.0103	-0.0105	-0.0359	61.59%	32.98%	5.43%
High Income, Majority Hispanic	-0.0073	-0.0058	0.0005	-0.0097	-0.0646	-5.94%	71.22%	22.84%
Low Income, Majority White	-0.0046	0.0061	0.0102	0.0020	-0.2123	-61.35%	-6.32%	32.33%
Low Income, Racially Mixed	-0.0061	-0.0171	-0.0126	-0.0116	0.0499	63.97%	29.85%	-6.18%
High Income, Racially Mixed	-0.0066	-0.0084	0.0006	-0.0100	-0.1709	-5.25%	51.97%	42.78%