

Property Tax Assessment Appeals in the United States Over Time and Across Space

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A detailed understanding of property assessment appeals can help improve the property tax, but we know very little about appeals from a national perspective due to the difficulty of accessing data. I present new panel data on appeals from all properties at different levels for half of the United States counties. I use these data to provide an overview of appeal rules, document several stylized facts regarding appeal rates, and explore socioeconomic and institutional predictors of appeal rates using fixed-effect models. I found that lower-level appeal rates were positively related to the house price index and higher-level appeal rates to employment. However, assessment limits lessened the effect of house prices. In addition, lower-level appeal rates were higher in more affluent, whiter counties. These findings shed light on taxpayers' behaviors when faced with rising house prices, inform research around the regressivity of assessments, and support a movement of studying local public finance questions using national panel data.

Keywords: property tax, tax appeal, property tax assessment, house price, institution

JEL codes: H21, H71, H83

Introduction

Local governments in the United States have been heavily relying on the property tax due to its several advantages, but this tax is not without a dark side (Oates and Fischel 2016; Netzer 1966; Seligman 1890; Youngman 2016). On the one hand, the property tax has significant revenue-producing capabilities, as it is responsive to growth and relatively stable during recessions. It is imposed on wealthier property owners vis-a-vis poorer non-owners and used to fund local public services. It gives local governments some flexibility to set tax rates without losing the tax base to competitors. Finally, it is transparent, allowing taxpayers to relate the tax rate to additional expenditures. On the other hand, the property tax is difficult and costly to administer, habitually resulting in horizontal and vertical inequities. Additionally, it is unpopular with taxpayers due to discrepancies between tax liabilities and income flows, the reputation of being regressive, and high visibility.

Appeals represent a discretionary cost that taxpayers can incur to reduce their property tax liability (Slemrod and Sorum 1984). A certain level of appeals is a normal part of the property tax system, given that it is impossible to assess all properties accurately. However, an unusual volume of appeals - for instance, compared to peer governments - may be a symptom of issues with the property tax. An unusually high rate may indicate poor assessment quality or lack of taxpayers' support, and an unusually low rate may signal that the appeal procedure is too burdensome. Too many or too few appeals can also be a problem in its own right, further undermining the property tax. Excessive appeals may generate compliance costs for taxpayers that often go unnoticed when thinking about total societal costs, increase administrative costs for governments, introduce unfavorable budget variances, and increase inequity. However, infrequent appeals may represent a missed opportunity to reduce assessment variability.

Previous studies have been instrumental in isolating factors affecting property owner's decision to appeal, including economic considerations such as costs and benefits as well as behavioral aspects (Avenancio-León and Howard 2020; Doerner and Ihlanfeldt 2014, 2015; Firoozi et al. 2006; Hayashi 2014; Hissong and Hawley 2012; Johnson 2015; Jones 2020; McMillen 2013; Nathan, Perez-Trugila, and Zentner 2020; Plummer 2014, 2015; Ratcliff and Pennick 1983; Ross 2017; Shybalkina 2021; Weber and McMillen 2010). However, one of the limitations of the previous literature is that it only focuses on a subset of appeals (from residential properties to the assessor and board of assessment review) in a handful of large cities, including Chicago, large cities in Texas, Miami, and New York City. In large part, that is due to the difficulty of accessing data. As a result, we know very little about property tax assessment appeals from a national perspective. For instance, we cannot compare appeal rates across places or study the effect of many institutions that do not vary within a single location.

In this study, for the first time, I assembled United States national panel county-level data on property tax assessment appeals. Also, for the first time, I included appeals from all types of properties both to the assessor and board of assessment review (lower-level appeal) and the state agency and court (higher-level appeals). Appeal data come from three publicly available sources: (1) annual reports submitted by counties to state budget and finance agencies, (2) statistics provided by state agencies and courts that hear appeals, and (3) county assessors and boards of assessment review of the 100 most populous United States counties. I obtained some appeal data (lower-, higher-level, or both) for 1,552 counties across twenty-four states from different regions of the country. These counties represent 49 percent of all counties and 68 percent of the population in the United States. While the number of years varies across data sources, I focus on the 2000-2018 period. These appeal data are further merged with several county socioeconomic

characteristics and property tax features.

In this article, I pursue three aims: (1) to provide an overview of institutional features of property tax appeals; (2) to document some previously unknown stylized facts regarding appeals; and (3) to explore socioeconomic and institutional predictors of appeals using fixed-effect models. Across the nation, taxpayers can appeal their assessment to the assessor and assessment review board and, further, to the state agency and court, but details vary significantly across the nation. I discovered much dispersion in appeal rates within and across states as well as over time. Georgia, Illinois, New York, and Texas stood out from the rest of the studied states for their high appeal rate. Lower-level (but not higher-level) appeals surged around the Great Recession but managed to return to their pre-Recession level. Lower-level appeal rates were positively related to the house price index, and higher-level appeal rates were positively associated with the employment rate. However, assessment limits lessened the effect of the house prices on the appeal rate. Lastly, lower-level appeal rates were higher in more affluent, whiter counties.

This article is by no means the last word on the subject, as significant data limitations remain. Still, it demonstrates that it is possible and valuable to study appeals from a national perspective. First, the results of this study show that taxpayers respond to soaring house prices with appeals. This behavior may explain why policymakers adjust property tax rates in response to rising house prices, which weakens the relationship between prices and property tax revenues (e.g., Alm, Buschman, and Sjoquist 2011). Second, while unequal appeal rates among income and racial and ethnic groups are not new findings (Avenancio-León and Howard 2020; Doerner and Ihlanfeldt 2014, 2015; Weber and McMillen 2010), this study uncovers these themes using national data. Hence, there is now more support for the idea that appeals are one source of regressivity in property tax assessments and bills (e.g., Avenancio-León and Howard 2020;

McMillen and Singh 2020). Third, this article supports an increasing trend of studying local public finance questions using national panel datasets and provides data for future studies. For example, it is possible to use appeals to measure property tax salience to investigate tax rates and demand for public services (e.g., Cabral and Hoxby 2012; Nguyen-Hoang and Yinger 2015).

An Overview of Property Tax Assessment Appeals

In the United States, the property tax assessment and appeal processes exhibit significant variations across and even within states. In this section, I intend to illustrate the basic structure common to all states and provide some dimensions along which variations may occur.

While many overlapping jurisdictions may have the authority to tax the same property, they all use the same assessed value to determine the property tax bill. Depending on the state, the county, municipal, or state assessor determines the assessed value. According to the Lincoln Institute's Significant Features of the Property Tax database, assessment is done primarily at the county level in thirty-two states¹. In seventeen states, cities, towns, townships, villages, and other municipalities participate in the assessment process, to one degree or another.² Except for Alaska, these seventeen states are in the East and the Midwest. Maryland and Montana carry out assessments at the state level. Places can share one assessor. Assessors can base their value estimates on comparable sales in the area (the most common method for residential properties), potential rental income, or the possible replacement cost. The reassessment can occur annually or less frequently.

Property owners who disagree with the assessor's estimate of the property's value have

¹ States in which assessment is done primarily at the county level include Texas. In Texas, the assessment is done by central appraisal districts, but these districts have the same borders as counties.

² For example, in Illinois, assessments are conducted at the township level except in counties with no township governments and in Cook County.

the right to appeal. Occasionally, this right extends to someone who is not the owner but has a vested interest in the property. Some examples include purchasers, renters, neighbors, associations (homeowner, condo, and co-op), or non-assessing taxing jurisdictions. Applicants may be able to appoint a representative if they wish to do so. Some applicants, such as corporations, may be required to obtain representation. Representatives may need credentials, such as a real estate license, an attorney license, or registration with a specific government agency. Representatives choose among charging a contingency fee (if the appeal is successful, a share of the first year's tax savings goes to the representative), an hourly fee, a flat fee, or some combination of the above; some may work pro bono.

Across states, there are three main acceptable justifications for an appeal. The first reason is that the proposed value of the property is higher than its market value. Some pertinent evidence would include recent sales of similar properties in the neighborhood. The second reason is that the property is misclassified or denied an exemption or other relief. The third reason is a clerical error, which is a mistake in data entry or calculation but not in reasoning the value, for instance, errors in the property description. A few states may recognize some additional reasons. Thus, for example, in Georgia, Illinois, and Texas, one can claim that the property is assessed unequally compared with other properties in the community without consideration for market value (the so-called "equity" or "uniformity" appeals). In this case, some proof would include assessments for similar properties. The property's proposed value being too low can also be a reason (the so-called "reverse" appeals). For instance, in Pennsylvania, a municipality that believes that its county undervalued a property subject to the municipality's jurisdiction can use this appeal type. Taxpayers can also ask to review the value of neighboring properties - a

successful appeal would reduce the applicant's tax share.³

The appeal process consists of two levels of appeals: a lower and a higher. A lower level includes a reconsideration by the assessor who performed the assessment and a review by an independent board of assessment review that had no part in the original assessment decision. Boards or review tend to include three or more members, who can be appointed by the legislative or executive powers or elected, lay citizens or experts, paid or volunteers. Instead of or in addition to boards, places can employ hearing officers, arbitrators, or special magistrates to review more straightforward cases. Occasionally, some multi-purpose boards review assessments as one of their responsibilities. States that carry assessments primarily at the county or state level have county-level boards. States in which municipalities participate in assessment have either county (for example, Illinois) or local (for example, New York and Michigan) boards. Places can share one board. Appeals to the assessor and board are similar and may even be combined in a single process.⁴

Appeals may be accepted in person, by mail, phone, email, or online. Except for extraordinary circumstances, there is a specific annual deadline (usually including non-reassessment years, too). Applicants must present evidence supporting the requested changes. While almost any evidence is normally admissible, there may be some rules, for example, about the number of copies. The evidence may be reviewed without an applicant present, or an applicant may have to attend a hearing of some form. Some places may increase the property's value if the presented evidence points to undervaluation, while others may forbid any increase in

³ Tax share is the share between the applicant's property value and the aggregate community property value.

⁴ Taxpayers may choose between appealing to the assessor, the board, or both. Alternatively, they may be required to appeal to the assessor first and only then to the board. Accepting a reduction in value from the assessor may preclude taxpayers from board appeals.

the appeal year. If an applicant wins a reduction, some places may freeze the assessment of the property at the agreed value for several years. Governments may collect fees from all or some categories of applicants to cover the costs of the proceedings. These fees may be refunded if the appeal is successful.

A higher level of property tax appeals includes a re-examination by a state agency (an administrative review) or a court (a judicial review). Applicants may be required to file a request at a lower level before turning to a higher level. Accepting a reduction in value at a lower level may preclude taxpayers from further appeals. At this level, proceedings tend to be much more complicated, time-consuming, and costly, both for assessing jurisdictions and applicants. States may have arbitrators, small claim courts, and other similar arrangements for more straightforward cases.

Previous Research on Appeals

The body of research on appeals is not large. Data have not been publicly available or even collected.⁵ Further, institutional details are varied and complex. As a result, our knowledge of appeals is based on lower-level appeals from small residential properties in a few large cities. Chicago and Cook County in Illinois have received the most attention (Avenancio-León and Howard 2020; Johnson 2015; McMillen 2013; Ross 2017; Weber and McMillen 2010). Texas' largest counties have also been well-studied, including Harris (Houston) (Jones 2020; Plummer 2014, 2015), Dallas (Nathan, Perez-Trugila, and Zentner 2020), Tarrant (Fort Worth) (Hissong and Hawley 2012), Bexar (San Antonio) (Firoozi et al. 2006), and Travis (Austin) (Jones 2020).

⁵ In addition to appeal records, scholars have also been inventive and used other types of data. For example, Doerner and Ihlanfeldt (2014) compared the assessed value reported on the preliminary and the final tax rolls to infer successful appeals to the assessor based on any reductions. Of course, this method does not allow obtaining information on unsuccessful appeals.

The other two researched places are Miami-Dade County in Florida (Doerner and Ihlanfeldt 2014, 2015) and New York City (Hayashi 2014; Shybalkina 2021). The smallest-sized cities studied have been Allegheny County (Pittsburgh) in Pennsylvania (Shybalkina 2021) and Saint Louis in Missouri (Ratcliff and Pennick 1983).

The existing studies on appeals reveal significant variations in the appeal rate across places and across time within each location. For example, the rates reported for Chicago between 2000 and 2015 were within 5-21 percent of all small residential properties. Houston, Dallas-Fort Worth, and Austin over 2001-2020 exhibited somewhat similar rates (4-22 percent). However, appeal rates were lower in Miami in 2005-2009 (1-6 percent) and even more so in New York City in 2008-2018 and Pittsburgh in 2016-2018 (0.1-0.5 percent). Unfortunately, the literature does not explain the generalizability of these rates and why variations occur.

The main focus of the previous literature has been on individual decision-making to appeal, emphasizing the expected benefit and cost.⁶ A rational taxpayer would appeal if the net expected benefit from doing so is positive. So, the higher the expected benefit, the higher should be the appeal rate. The expected benefit is equal to the perceived probability of winning multiplied by the tax rate multiplied by the difference between the assessed and own estimates. The cost of appealing reduces the net benefit. So, the higher the cost, the lower the appeal rate (Borland and Lile 1980; Hayashi 2014).

Generally, the model finds empirical support. The probability of an appeal increases with the tax rate (Doerner and Ihlanfeldt 2015; Hayashi 2014), the tax savings (Hayashi 2014), the tax

⁶ Methodological approaches vary. Some studies use experimental or quasi-experimental methods (Avenancio-León and Howard 2020; Doerner and Ihlanfeldt 2015; Jones 2020; Hayashi 2014; Nathan, Perez-Trugila, and Zentner 2020). Other studies use either mean comparisons or conditional probabilities.

bill (Hayashi 2014), and the degree of overassessment (Doerner and Ihlanfeldt 2014). Prior successful appeal activity (Plummer 2014) and neighborhood successful appeal activity (Hayashi 2014; Plummer 2014; Weber and McMillen 2010), which inform the perceived likelihood of winning, also increase the probability of an appeal. The probability decreases with tax reliefs (Doerner and Ihlanfeldt 2015; Plummer 2014) and assessment limits (Doerner and Ihlanfeldt 2014, 2015; Nathan, Perez-Trugila, and Zentner 2020; Plummer 2014). Additionally, the owner's age (Plummer 2014), which affects tax reliefs, and recent sale and neighborhood sales activity (Doerner and Ihlanfeldt 2015; Plummer 2014; Weber and McMillen 2010), which affect the accuracy of assessment, suppress appeals. The effects of some traits are inconsistent, including the neighborhood and individual property values, homeownership (affects reliefs), and the property's age and area (affects the accuracy of assessment) (Doerner and Ihlanfeldt 2015; Plummer 2014; Weber and McMillen 2010).

Some scholars have examined the effects of socioeconomic characteristics to understand appeal costs. Income, education, and majority status should positively correlate with confidence, knowledge, and the preparedness to bear the monetary costs and, thus, with the probability of an appeal (Weber and McMillen 2010). According to some studies, the white owner and the share of the white population (Avenancio-León and Howard 2020; Doerner and Ihlanfeldt 2014, 2015; Weber and McMillen 2010) as well as real estate expertise (Firoozi et al. 2006) increase the probability of an appeal. However, the neighborhood's share of the population with a bachelor's degree and income are either not related to the likelihood of an appeal or decrease it (Doerner and Ihlanfeldt 2015; Weber and McMillen 2010). Other studies consider appeal rules that reduce costs. Thus, the presence of tax representatives (Doerner and Ihlanfeldt 2015), allowing condominium associations to file one joint appeal on behalf of all unit owners (Shybalkina

2021),⁷ and providing information (Nathan, Perez-Trugila, and Zentner 2020) increase the likelihood of an appeal. However, previous literature's focus on a single location has limited the opportunities for examining institutional influences.

Several studies have worked to expand the model of appeal behavior. For example, Hayashi (2014) finds that escrow accounts decrease the likelihood of an appeal by reducing salience, which comes from the fact that people pay the property tax by writing one or two large checks each year (Brunner, Ross, and Simonsen 2015; Cabral and Hoxby 2012). Jones (2020) shows that the increase in the assessment relative to the prior year boosts the likelihood of an appeal by creating a reference point and triggering loss aversion.⁸ Nathan, Perez-Trugila, and Zentner (2020) find support for conditional cooperation explanation – i.e., taxpayers are less willing to appeal if they perceive the average citizen as facing a higher tax rate. Nathan, Perez-Trugila, and Zentner (2020) additionally explore partisanship as a factor. While differences are slight, relative to Democrats, Republicans are more sensitive to the potential benefit and less responsive to conditional cooperation.

Data

This article uses a novel panel dataset of the total number of appeals from all types of properties

⁷ The use of tax representatives is the highest in white, high-income, high-house value neighborhoods (Doerner and Ihlanfeldt 2014, 2015) and among properties of high assessed values (Plummer 2015). However, the direction of the distributive effect of the joint appeal rule is ambiguous and depends on the differences between condos and houses in a particular housing market (Shybalkina 2021). While representatives and joint appeals may encourage appeals, they may also be associated with lower success (Plummer 2015; Shybalkina 2021).

⁸ While not using the loss aversion framing, Doerner and Ihlanfeldt (2015), Plummer (2014), and Weber and McMillen (2010) also find that taxpayers experiencing an assessment increase were more likely to appeal. Through, the results are somewhat sensitive to years and specifications.

per year per county, separately at the lower- and the higher levels.⁹ Appeal data come from three publicly available sources. The first source is annual reports submitted by counties to state budget and finance agencies if these reports include any data on appeals. The second source is statistics provided by state agencies and courts that hear appeals. Unfortunately, some states provide data only on one of the two appeal levels, and some states do not report any pertinent information. I collected data on lower-level appeals for all counties in eleven states and higher-level ones in twelve states from the above two sources. To obtain additional data, I turned to the third source - county assessors and boards of review of the 100 most populous counties in the United States. In that way, I collected lower-level appeal data for seventeen additional counties and higher-level appeal data for five additional counties. I focus on the 2000-2018 period, but the panel is unbalanced - i.e., not all counties are present in all periods.

Altogether, some data (on lower- or higher-level appeals or both) are available for 1,552 counties, representing 49 percent of counties and 68 percent of the population in the United States. Lower-level appeal data are available for 782 counties, representing 25 percent of counties and 48 percent of the population. Higher-level data are available for 975 counties, representing 31 percent of counties and 30 percent of the population. Counties span twenty-four states across the United States, including six Western states (California, Colorado, Idaho, Oregon, Utah, and Washington), three Southwestern states (Arizona, New Mexico, and Texas), six Midwestern states (Illinois, Indiana, Iowa, Ohio, Michigan, and Missouri), four Southern states (Georgia, Florida, Louisiana, and Tennessee), four Northeastern states (New Jersey, New York, Maryland, and Pennsylvania), and Hawaii. Appendix 1 provides more information about

⁹ For lower-level appeals, some states provide data on the number of appeals at several different sublevels of the lower level. If that is the case, I chose the lowest possible stage. For example, I chose the number of appeals filed over the number of hearings.

the data.

Most original data came as the total number of appeals by county-year. However, in some instances, original data had a form of the list of appeal cases in each county-year. In those instances, I produced the total count of cases myself. If data were organized by fiscal year, I matched the fiscal year with the calendar year in which the fiscal year ends (for example, the 2017-2018 fiscal year was matched with the 2018 calendar year). An insignificant number of counties were dropped for various reasons. Ten small counties in Texas as well as Nassau County in New York were excluded because of exceptionally high appeal rates. Two counties in Texas were excluded because they share one appraisal district. Finally, I excluded the data for New York City that was reported for the entire city rather than separately for the five counties that comprise the city.

I constructed the appeal rate in each county i in each year t by dividing the number of appeals by the number of housing units.

$$Appeal\ rate_{it} = \frac{Number\ of\ appeals_{it}}{Number\ of\ housing\ units_{it}} \times 100. \quad (1)$$

Another indicator used in the article is the appeal rate in each state k . It is the ratio between the total state number of appeals and the total state number of housing units.

$$Appeal\ rate_{kt} = \frac{\sum Number\ of\ appeals_{ikt}}{\sum Number\ of\ housing\ units_{ikt}} \times 100. \quad (2)$$

The choice of the denominator was dictated, in large part, by what data are available across the nation starting from the 2000s. The number of housing units comes from the American Housing Survey (Five-Year) and the US Census Bureau Intercensal Estimates (2010-2018 and 2000-2009, respectively).

The article uses some additional data. The data on county population, the share of the black or African American population, and the share of the Hispanic or Latino population

originate from the American Housing Survey (Five-Year) and US Census Bureau Intercensal Estimates (2009-2018 and 1990-2008, respectively). The US Bureau of Economic Analysis provides data on the gross domestic product (GDP)¹⁰ (2001-2018) and personal income¹¹ (1969-2018). Unemployment data (1990-2018) come from the US Bureau of Labor Statistics. The house price index with 2000 base (1975-2018) is from the Federal Housing Finance Agency and Bogin, Doerner, and Larson (2019). Finally, the Significant Features of the Property Tax database by the Lincoln Institute of Land Policy supplies data on the level at which the assessment is performed (municipality or other) and the presence of assessment limits (2006-2017).

Empirical Strategy

I rely on the following equations to explore the predictors of appeals:

$$\Delta A_{it}^v = \delta_{kt} + \alpha \Delta \mathbf{X}_{it} + \varepsilon_{it}, \quad (3)$$

$$\Delta A_{it}^v = \theta_i + \gamma_t + \beta \Delta \mathbf{X}_{it} + \mu_{it}, \quad (4)$$

where A is the appeal rate, v is the level of appeals (lower or higher), δ_{kt} are state-by-year fixed effects, θ_i are county fixed effects, γ_t are year fixed effects, \mathbf{X}_{it} is a vector of county socioeconomic attributes, and ε_{it} and μ_{it} are idiosyncratic errors. State-by-year fixed effects account for traits relevant to a particular state in a specific year. County fixed effects control for county-specific attributes that are constant over time. Year fixed effects control for changes across all counties. The inclusion of county fixed effects boosts confidence in that the coefficients on the attributes are unbiased estimates of the impact of those attributes on the appeal rate. Appeal rate and socioeconomic attributes are expressed as percent changes from the

¹⁰ GDP is the value of the final goods and services produced.

¹¹ Personal income is received from wages and salaries, Social Security and other government benefits, dividends and interest, business ownership, and other sources.

previous year calculated as the difference of logs (for example, $\Delta A_{it} = \log(A_{it}) - \log(A_{i(t-1)})$), which makes the data stationary.¹² I added one to all appeal rates to deal with the fact that $\log 0$ is undefined. Independent variables are lagged by two years to reflect that assessments announced in year t are based on conditions in prior years. Robust standard errors are clustered on county.

Seven socioeconomic attributes include population, house price index, unemployment, GDP per capita, personal income per capita, share of the black or African American population, and share of the Hispanic or Latino population. Based on the previous research, I expect to find a positive relationship between the house price index and the appeal rate. In addition, a growing economy and high employment should drive real estate prices, including commercial, higher (NAIC n.d.) and, hence, add to the appeal rate. Personal income should increase the appeal rate, and shares of the black or African American and Hispanic or Latino populations should decrease it. The relationship between population and the appeal rate is theoretically ambiguous.

I additionally investigate the effects of two property tax features – assessment limits and municipality-level assessment – on the appeal rate. Fiscal institutions are infamous for not varying much (Rose 2010). Thus, the two dummy variables are defined at the state level. Furthermore, the municipality-level assessment dummy does not vary across years, and the assessment limits dummy vary only a little. Therefore, for each feature, I included an interaction term equal to the dummy variable multiplied by the percent change in the house price index. Property tax features data are available for a somewhat shorter period (2006-2017). Assessment limits should decrease the appeal rate. The relationship between the municipality-level assessment and the appeal rate is not entirely obvious. Perhaps, smaller assessing jurisdictions

¹² For example, Alm, Buschman, and Sjoquist (2011) use a similar data transformation to examine the effect of house prices on local government budgets.

may observe more appeals because of less accurate assessments (Eom 2008). Other institutions are assumed to be controlled for with a set of fixed effects.

Table 1 provides summary statistics for the data in 2017. The first panel includes counties for which lower-level appeal data are available, and the second panel includes counties for which higher-level appeal data are available. The third panel offers information for all the counties in the United States for comparison purposes. Table 1 shows that, on average, there was little change in the appeal rate, both to the assessor and board and the state agency and court, in 2017. In addition, there is little difference in the socioeconomic variables between the two samples and the United States as a whole. However, relative to the United States, counties with lower-level appeal data are more likely to have assessment limits and much less likely to have the municipality-level assessment. So, whether states report lower-level appeal data may not be random, and the study may lack generalizability when it comes to applying lower-level appeal findings to counties that assess properties at the municipal level.

<Table 1 here>

Findings

This section describes the dataset and then explores socioeconomic and institutional attributes that predict the appeal rate.

Some Stylized Facts from the New Dataset

I will first discuss lower-level appeal data. Box plots in Figure 1 present summaries of county appeal rates by state and by year. There are considerable variations across counties within the same state. Comparing absolute appeal rates across states should be done with extreme caution due to institutional differences. At the same time, many governments regularly engage in benchmarking to tell how well they are doing. So, such an exercise may have some merit, but it

is important to make any conclusions with a grain of salt. When looking at the median county, Texas and Georgia have the highest appeal rate. In 2017, the median appeal rate was 8.18 per 100 housing units in Texas and 1.52 per 100 housing units in Georgia. Other nine states in Figure 1, including California, Florida, Hawaii, Indiana, Maryland, New Jersey, New Mexico, Oregon, and Washington, had the median appeal rate below 1 per 100 housing units in 2017 (from 0.04 in Oregon to 1.07 in New Jersey).

<Figure 1 here>

Texas' appeal rate can be a sign of a lack of comparability. Still, it is curious and deserves a more profound exploration in future research. In principle, several factors may have contributed. First, Texas, which does not levy a personal income tax, has a relatively high property tax burden. Second, Texas is one of the few non-disclosure states, which may lead to assessment errors (Berrens and McKee 2004). Third, since 2003, Texas (along with Georgia) accepts equity appeals. Equity appeals are easier to support because a taxpayer does not need to find comparable properties that were sold at a price lower than their assessment. All they need is to find comparable properties with an assessment lower than theirs. Bell (2013) reports that, in Austin, the number of appeals doubled between 2005 and 2013. In 2013, equity appeals made up 84 percent of the total appeals, compared to 17 percent in 2005. Fourth, Texas relies heavily on an online protest program that decreases the costs of filing an appeal (potentially, this system can also ensure a more accurate account of the number of appeals compared to other states). Finally, as Hisson and Hawley (2012) explained, Texas allows speculative representatives to file appeals on behalf of property owners without owners' consent (the owner's permission is still required for the case to progress).

For Florida, Hawaii, Maryland, New Jersey, Oregon, and Washington, data extends as far

back as the early 2000s, which allows examining trends in lower-level appeal rates within those states over the last two decades. Across these six states, the median appeal rate surged around the Great Recession of 2007-2009 following the peak in house prices in 2006. Since then, the appeal rates have declined to their pre-Recession levels. Figure 2 plots year-over-year changes in county lower-level appeal rates for all the eleven states in Figure 1 combined, which allows discerning trends more easily. Panel A presents median percent changes by year, and Panel B shows the extent of variation in the percent change by year. In line with individual state plots, Figure 2 indicates that the appeal rate was on the rise between 2006-2009, with 2008 seeing the most significant increase. The appeal rate was declining between 2010-2014 and, most recently, has remained largely stable.

<Figure 2 here>

I will now discuss higher-level appeal data. Figure 3 presents appeal rates by state and by year. Unlike Figure 1 that is based on county rates (see equation 1), Figure 2 depicts total state rates (see equation 2). Compared to lower-level rates, higher-level rates are much less normally distributed within states. There tends to be a small number of counties that have a high rate and many counties with a low rate (akin to the power-law distribution). Naturally, the rate is lower for appeals to the state agency and court than appeals to the assessor and board. This factor has been one reason why the previous literature has ignored appeals to the state agency and court. There are at least two rationales for studying these appeals. First, the mean property value may be very high for appeals to the state agency and court, potentially resulting in significant variances in local budgets. For instance, across Georgia in 2017, the mean property value of the protested property was \$490,000 at the lower level and \$2,180,000 at the higher level. Second, governments may incur very high litigation costs, including hiring outside firms, as plaintiffs in

higher-level appeals tend to deploy vast resources to argue for a reduction. Both can be especially problematic for small jurisdictions (Cohen 2019).

In 2017, Colorado, Georgia, Idaho, Iowa, Louisiana, Michigan, Missouri, Ohio, Tennessee, and Washington had a higher-level total state appeal rate below about 0.2 per 100 housing units (from 0.003 in Missouri to 0.22 in Tennessee). The rate was considerably higher in New York (0.47 per 100 housing units) and Illinois (0.89 per 100 housing units). Data back to the early 2000s are available for several states, including Colorado, Illinois, Missouri, New York, Ohio, and Washington. However, it is not easy to discern any consistent trends over time. Thus, in the last two decades, higher-level appeal rates were relatively stable in Colorado and increasing in Illinois. In New York, Ohio, and Washington, they surged around the Great Recession but then decreased, similarly to lower-level appeals.

Again, it is unclear whether New York and Illinois are true outliers or the observed differences result from a lack of comparability. Future research is required to understand if and how these two states diverge from other states. A highly decentralized assessment system may, at least partially, explain appeal rates in New York, Illinois, and Michigan. In these three states, assessing jurisdictions may include townships, cities, towns, and villages. While boards of assessment review operate at the county level in Illinois, New York and Michigan have local boards in addition to local assessors. One issue is that small assessing jurisdictions tend to suffer from assessment errors (Eom 2008). In addition, such jurisdictions may have a limited capacity to process appeals, resulting in more applicants turning to the state agency and court. Illinois and New York also have one of the highest property tax burdens in the nation.

To sum up, among the studied sample, there are significant variations in lower- and higher-level appeal rates across counties within the same state, states, and over time. There are

several possible outliers, including Georgia, Illinois, New York, and Texas. These four states (along with some other states with high rates, such as New Jersey and Michigan) share certain institutional features, such as equity appeals and decentralized assessment, and have a relatively high property tax burden. Lower-level appeal rates peaked around the Great Recession but have decreased to the pre-Recession level since then. In the case of higher-level appeal rates, there are no clear temporal trends. In the next section, I will consider some explanations for variations in appeal rates. Still, more research will be needed in the future to fully explain variations in appeal rates across places and over time.

Attributes that Predict Appeals

This subsection explores the attributes that predict appeals. Table 2 presents results for lower-level appeals. Columns (1) and (2) include socioeconomic variables only. Columns (3) and (4) additionally incorporate property tax institutions. While columns (1) and (3) include state-by-year fixed effects, columns (2) and (4) include county fixed effects and year fixed effects. Table 3 is similar to Table 2 but presents results for higher-level appeals. Dependent and independent variables are changes in logs, except for the assessment limits and municipality assessment dummy variables. All independent variables are lagged by two years. Robust standard errors are clustered on county.

Table 2 shows a positive, statistically significant relationship between lower-level appeal rates and the house price index across columns (1)-(4). A 1 percentage point increase in the house price index change leads to a 0.4-1 percentage point increase in the appeal rate change. Thus, rising house prices can trigger increases in the assessed value and tax liability, which, in its turn, can increase the monetary benefit of appealing (Doerner and Ihlanfeldt 2015; Plummer 2014; Weber and McMillen 2010) and activate loss aversion (Jones 2020). Assessments may

also be less accurate when prices change. In addition, the appeal rate is positively related to income and negatively related to share of the black or African American population. The coefficients on income are statistically significant across columns (1)-(4); the black or African American share coefficients are statistically significant in county fixed-effects models at 10 percent-level. A 1 percentage point increase in income change leads to a 0.4-0.7 percentage point increase in the appeal rate change. A 1 percentage point increase in the black or African American share change leads to a 0.04-0.05 percentage point decrease in the appeal rate change. Learning, compliance, and psychological costs may explain different appeal behavior among income and racial groups (Avenancio-León and Howard 2020; Doerner and Ihlanfeldt 2014, 2015; Weber and McMillen 2010).

<Table 2 here>

Table 2 also shows that appeal rates depend on property tax institutions. Assessment limits suppress the effect of rising house prices. The coefficients on the interaction terms are significant in both columns (3) and (4). Assessment limits prevent house price increases from translating into assessed value increases and, thus, lessen the motivations for appealing (Doerner and Ihlanfeldt 2014, 2015; Nathan, Perez-Trugila, and Zentner 2020; Plummer 2014). The municipality-level assessment also tames the effect of rising house prices. The coefficient on this interaction term is only statistically significant in the county fixed effects model – i.e., column (4). This finding is contrary to the expectation that smaller assessing jurisdictions experience more appeals than larger ones because of less accurate assessments (Eom 2008). Perhaps, municipalities reassess properties less frequently than counties, which would effectively result in an impact similar to that of assessment limits. In addition, there may be a psychological explanation for taxpayers being less willing to question the decision of a local official. Lastly,

higher-level appeals may play a more prominent role.

Table 3 indicates a positive relationship between higher-level appeal rates and employment. The coefficients are significant in county fixed effects models - columns (2) and (4). The coefficients on GDP are consistently positive but fail to reach conventional levels of statistical significance.¹³ Higher-level appeals appear more responsive to unemployment and growth than to the house price index, perhaps, due to commercial real estate prices. It is worth noting that higher-level appeals are not necessarily all from non-residential properties. For example, in 2017, residential appeals constituted 65% of all higher-level appeals in Idaho and 39% in Iowa. (For lower-level appeals, this proportion was 39% in California, 74% in New Jersey, and 59% in Texas.) The coefficients on income and race and ethnicity variables in Figure 3 are not statistically significant.

<Table 3 here>

The effect of assessment limits on higher-level appeal rates is similar to that on lower-level rates – i.e., limits suppress the impact of rising house prices. The coefficient on the assessment limits interaction term is statistically significant in the state-by-year fixed effects model - column (3). The coefficients on the municipality assessment interaction terms are positive both in columns (3) and (4) but do not reach conventional levels of statistical significance. So, it is possible that the municipality-level assessment decreases the lower-level appeal rate while increasing the higher-level rate, but a future investigation into this issue is warranted.

Overall, most estimates are consistent across models and in line with the expectations.

¹³ If the unemployment variable is removed from regressions, the coefficients on GDP become statistically significant. In addition, the coefficients on the house price index become consistently positive and statistically significant at the 10 percent-level in of the models.

These estimates suggest the following key results. First, lower-level appeal rates move with house prices. Higher-level appeal rates respond to unemployment, perhaps, through real estate prices. However, for both lower- and higher-level appeals, assessment limits diminish the positive effect of the house prices on the appeal rate. Second, lower-level appeal rates depend on the population's income and race. Specifically, the appeal rate increases more rapidly when counties become more affluent and whiter. Populations' characteristics do not impact the higher-level appeal rate.

Summary and Implications

A thorough understanding of appeals can be instrumental in improving property taxes, but we know very little about appeals from a national perspective because of the difficulty of assembling data. This article offers new data on lower- and higher-level appeal rates at the county level across twenty-four states in 2000–2018 (data may not be available for all counties, years, and appeal levels). These data are further merged with county socioeconomic characteristics and property tax features. I describe the institutional features of property tax appeals, document some stylized facts regarding appeals, and explore predictors of appeals using fixed-effect models. Thus, appeal rates varied within and across states as well as over time. Georgia, Illinois, New York, and Texas appear to experience much more frequent appeals than the rest of the studied states. Lower-level appeals surged during the Great Recession but were back to the pre-Recession level. Lower-level appeal rates were positively related to the house price index, and higher-level appeal rates were positively associated with employment. However, assessment limits lessened the effect of the house prices. Lower-level appeal rates were higher in more affluent, whiter counties.

While the article significantly expands the scope of the previous research in an area in

which data are sparse, it has several limitations that future work should address. Some limitations stem from data gaps. First, the amassed appeal data are still far from complete. It would be ideal to have data on lower- and higher-level appeals across the entire United States over time as well as data on the proportion of residential appeals, the proportion of successful appeals, the assessed value of protested properties, and the dollar amount of reductions. Second, institutional variations within and across states as well as over time may render naïve comparisons problematic. Furthermore, the included controls and fixed effects may not be fully effective in accounting for these variations, which would bias the estimates. So, it is crucial to continue accumulating more national panel data on local institutions. Third, the set of socioeconomic traits is restricted to variables available at the local level over the past two decades, which limits the scope of the analysis and may also result in biased estimates.

Yet another concern is that, while I assume that potential explanations of appeals are the same across levels of appeals and across states and time, that may not necessarily be the case (Levy 1979; Lowery and Sigelman 1981). The final problem stems from the aggregate data. For example, all that the findings prove is that counties with larger house price increases experience a more significant increase in appeals. The findings do not prove that taxpayers who saw their house price increase are more likely to appeal. This problem is known as the ecological fallacy (Cullen, Turner, and Washington 2018; Lowery and Sigelman 1981). Nevertheless, the findings are still useful as long as they are used to design policies targeted to counties, not to individuals (Cullen, Turner, and Washington 2018).

The above limitations notwithstanding, this study contributes to scholarship and practice in a variety of ways. First, this study sheds additional light on the connection between house prices and local finances. Previous studies conclude that property tax revenue does respond to

house prices, but this response is moderate (e.g., Alm, Buschman, and Sjoquist 2011, Chernick, Reschovsky, and Newman 2021; Cornia and Walters 2006; Doerner and Ihlanfeldt 2011; Folain and Giertz 2016; Lutz, Molloy, and Shan 2011). Assessment lags and limits are a part of the explanation. Another part is that policymakers adjust property tax rates. The assumption is that the increase in the tax bills generates a backlash among taxpayers, and policymakers tame this reaction by reducing rates. However, there has not been much research into actual taxpayer's sentiments and behaviors other than some related work on delinquencies and foreclosures (e.g., Alm and Leguizamon 2018). The present study suggests that one way that taxpayers respond to rising house prices is with appeals. Appeals, then, can serve as a signal of backlash to policymakers. In such light, governments may consider various policies to help taxpayers deal with house price fluctuations, such as reliefs and deferrals (Bowman 2006).

Second, this study suggests that unequal appeal rates among income and racial and ethnic groups may generalize beyond a few previously studied cities (Avenancio-León and Howard 2020; Doerner and Ihlanfeldt 2014, 2015; Weber and McMillen 2010). There has been considerable evidence that, empirically, property assessments and taxes are regressive when measured with regard to house prices, income, and racial and ethnic majority status (e.g., Avenancio-León and Howard 2020; Ihlanfeldt 1982; McMillen 2013; McMillen and Singh 2020; Ross 2017; Sirmans et al. 2008). If more affluent, white taxpayers are more likely to appeal, win, and receive a larger reduction than poorer, minority taxpayers, appeals may be one source of the detected regressivity. Counties may attempt to reduce the cost of appealing by offering incentives for tax representatives to work pro bono (Doerner and Ihlanfeldt 2015), partnering with community organizations (Shybalkina 2021), and providing information (Nathan, Perez-Trugila, and Zentner 2020).

Third, this article supports an increasing trend of studying local public finance questions using national panel datasets rather than a subset of local governments or a single state. This trend opens up opportunities for more generalizable results, comparisons, and studying effects of various institutions. These appeal data can also be used in future national studies. For instance, scholars can study horizontal and vertical equity across the United States. As another example, researchers can use appeals as a measure of the property tax salience. So far, researchers, mainly, have used escrow accounts to gauge salience or awareness (Cabral and Hoxby 2012; Hayashi 2014). Nguyen Hoang and Yinger (2015) used appeals to measure the awareness of assessments in New York State. The salience of the property tax may be used to study, for instance, tax rates and the demand for public services.

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Tables

Table 1. Descriptive statistics, 2017

Variable	N of counties	Mean	Standard deviation	Minimum	Maximum
Lower-level appeal data available:					
Appeals per 100 housing units	753	0.002	0.393	-2.361	2.861
Population	782	0.004	0.015	-0.148	0.086
House price index	601	0.050	0.046	-0.235	0.280
Unemployment	782	-0.137	0.086	-0.604	0.211
GDP per capita	781	0.029	0.078	-0.313	0.584
Personal income per capita	781	0.020	0.041	-0.229	0.366
Share black or African American	769	0.000	0.246	-1.418	2.479
Share Hispanic or Latino	782	0.026	0.111	-0.851	1.391
Assessment limits dummy	782	0.799	0.401	0.000	1.000
Municipality assessment dummy	782	0.033	0.179	0.000	1.000
Higher-level appeal data available:					
Appeals per 100 housing units	928	-0.002	0.100	-1.903	0.500
Population	975	0.000	0.012	-0.089	0.096
House price index	819	0.040	0.045	-0.244	0.257
Unemployment	975	-0.145	0.093	-0.511	0.137
GDP per capita	975	0.017	0.068	-0.476	0.537
Personal income per capita	975	0.012	0.026	-0.160	0.188
Share black or African American	955	0.023	0.257	-1.818	2.640
Share Hispanic or Latino	975	0.030	0.177	-1.297	1.802
Assessment limits dummy	975	0.477	0.500	0.000	1.000
Municipality assessment dummy	975	0.349	0.477	0.000	1.000
United States:					
Population	3,142	0.000	0.014	-0.148	0.125
House price index	2,397	0.038	0.044	-0.244	0.280
Unemployment	3,141	-0.129	0.102	-0.639	0.606
GDP per capita	3,089	0.016	0.086	-0.639	0.648
Personal income per capita	3,089	0.011	0.045	-0.589	0.366
Share black or African American	3,025	0.017	0.314	-2.996	3.166
Share Hispanic or Latino	3,130	0.032	0.216	-2.875	2.607
Assessment limits dummy	3,142	0.371	0.483	0.000	1.000
Municipality assessment dummy	3,142	0.268	0.443	0.000	1.000

Note: Variables are changes in logs, except for the assessment limits and municipality assessment dummy variables.

Table 2. Determinants of lower-level appeals

	(1)	(2)	(3)	(4)
Population	-0.402 (0.364)	0.479 (0.475)	-0.303 (0.410)	0.270 (0.525)
House price index (HPI)	0.419*** (0.149)	0.508*** (0.142)	0.980*** (0.264)	0.618*** (0.197)
Unemployment	0.023 (0.078)	-0.087 (0.076)	0.021 (0.087)	-0.129 (0.091)
GDP per capita	-0.222* (0.115)	-0.198 (0.131)	-0.195 (0.122)	-0.183 (0.143)
Personal income per capita	0.464** (0.226)	0.739*** (0.247)	0.420* (0.247)	0.710*** (0.269)
Share black or African American	-0.039 (0.026)	-0.046* (0.027)	-0.039 (0.026)	-0.049* (0.027)
Share Hispanic or Latino	-0.035 (0.047)	-0.048 (0.043)	-0.037 (0.047)	-0.060 (0.045)
Assessment limits x HPI			-0.683** (0.306)	-0.257* (0.154)
Municipality assessment x HPI			-0.724 (0.724)	-1.360*** (0.375)
Constant	-0.012 (0.025)	-0.029 (0.022)	-0.052* (0.030)	-0.021 (0.028)
State-by-year FE	Yes		Yes	
County FE		Yes		Yes
Year FE		Yes		Yes
N	3,582	3,582	3,035	3,035
R-squared	0.096	0.034	0.089	0.022

Note: Dependent and independent variables are changes in logs, except for the assessment limits and municipality assessment dummy variables. All independent variables are lagged by two years. Robust standard errors clustered on county are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

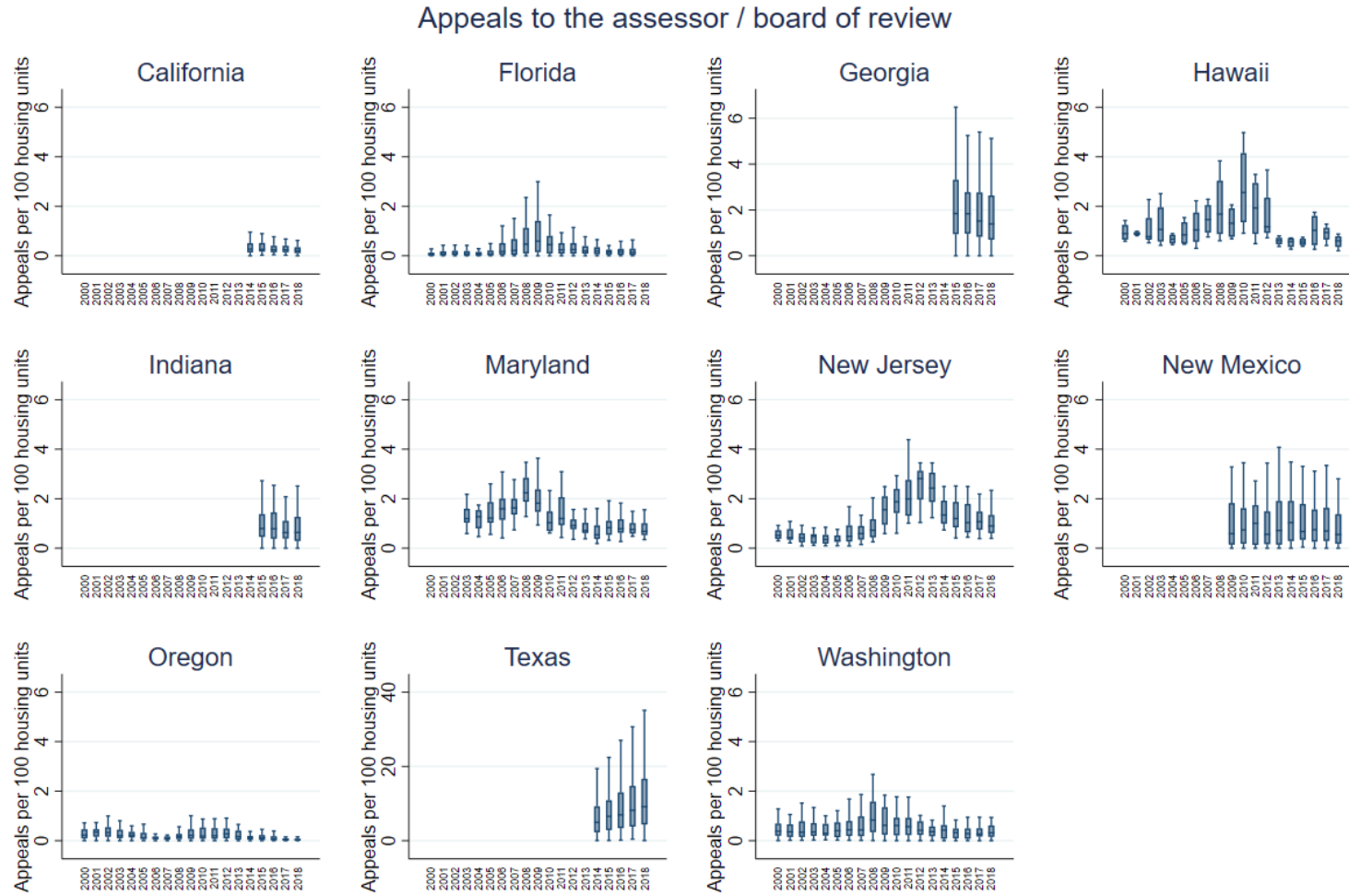
Table 3. Determinants of higher-level appeals

	(1)	(2)	(3)	(4)
Population	-0.055 (0.078)	0.016 (0.102)	-0.062 (0.090)	0.003 (0.112)
House price index (HPI)	-0.016 (0.031)	-0.014 (0.031)	0.059 (0.053)	-0.005 (0.045)
Unemployment	0.001 (0.013)	-0.026** (0.011)	0.007 (0.015)	-0.031** (0.013)
GDP per capita	0.025 (0.018)	0.022 (0.020)	0.028 (0.019)	0.024 (0.022)
Personal income per capita	-0.059 (0.038)	-0.021 (0.036)	-0.052 (0.043)	-0.015 (0.040)
Share black or African American	-0.006 (0.008)	-0.007 (0.007)	-0.006 (0.008)	-0.008 (0.007)
Share Hispanic or Latino	0.012 (0.010)	0.014 (0.010)	0.013 (0.010)	0.015 (0.010)
Assessment limits x HPI			-0.161** (0.078)	-0.100 (0.067)
Municipality assessment x HPI			0.059 (0.077)	0.085 (0.074)
Constant	-0.038*** (0.007)	-0.009** (0.004)	-0.068*** (0.013)	-0.014*** (0.005)
State-by-year FE	Yes		Yes	
County FE		Yes		Yes
Year FE		Yes		Yes
N	6,392	6,392	5,414	5,414
R-squared	0.062	0.014	0.060	0.015

Note: Dependent and independent variables are changes in logs, except for the assessment limits and municipality assessment dummy variables. All independent variables are lagged by two years. Robust standard errors clustered on county are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

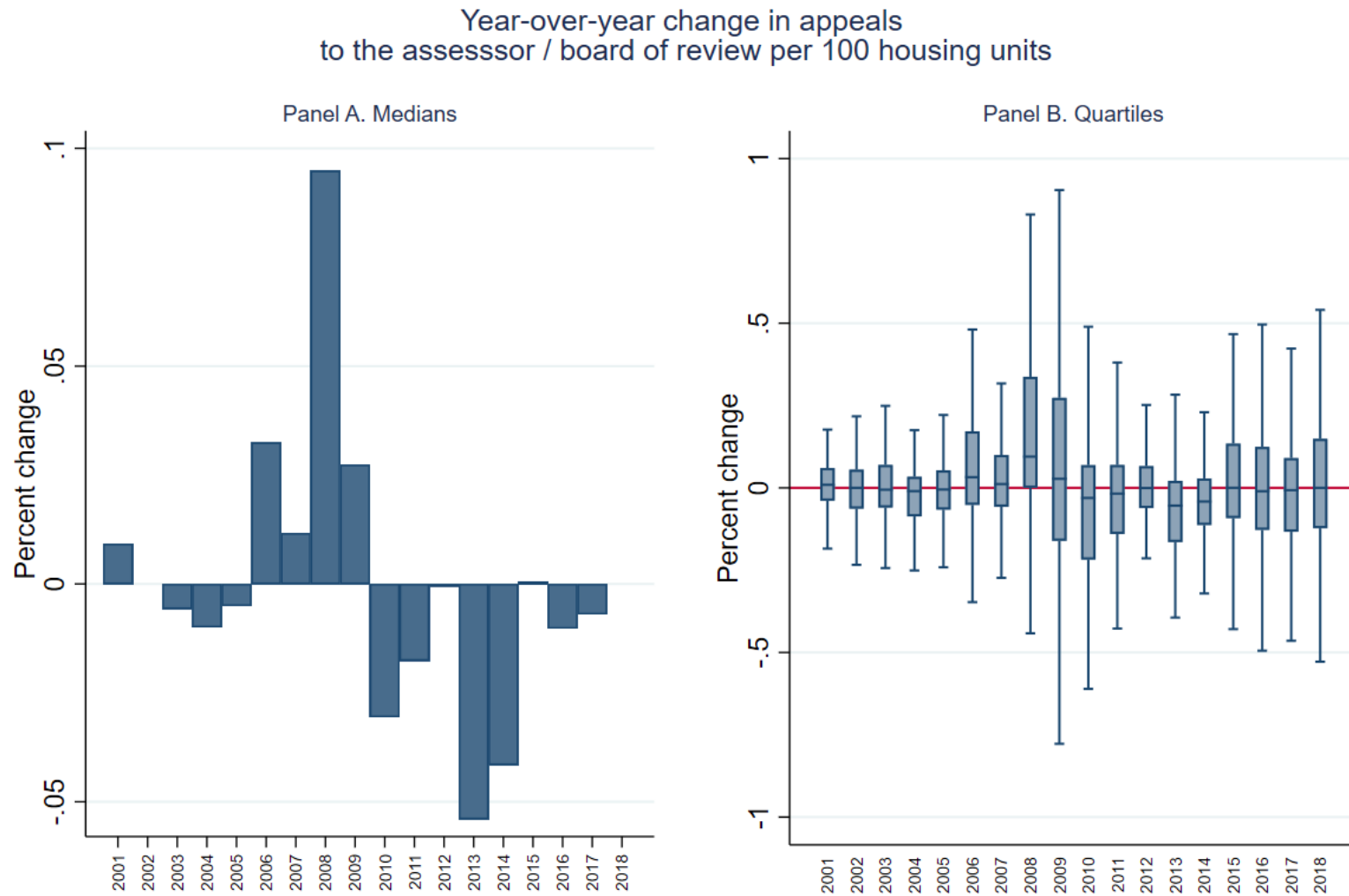
Figures

Figure 1. The variations in lower-level appeal rates by state



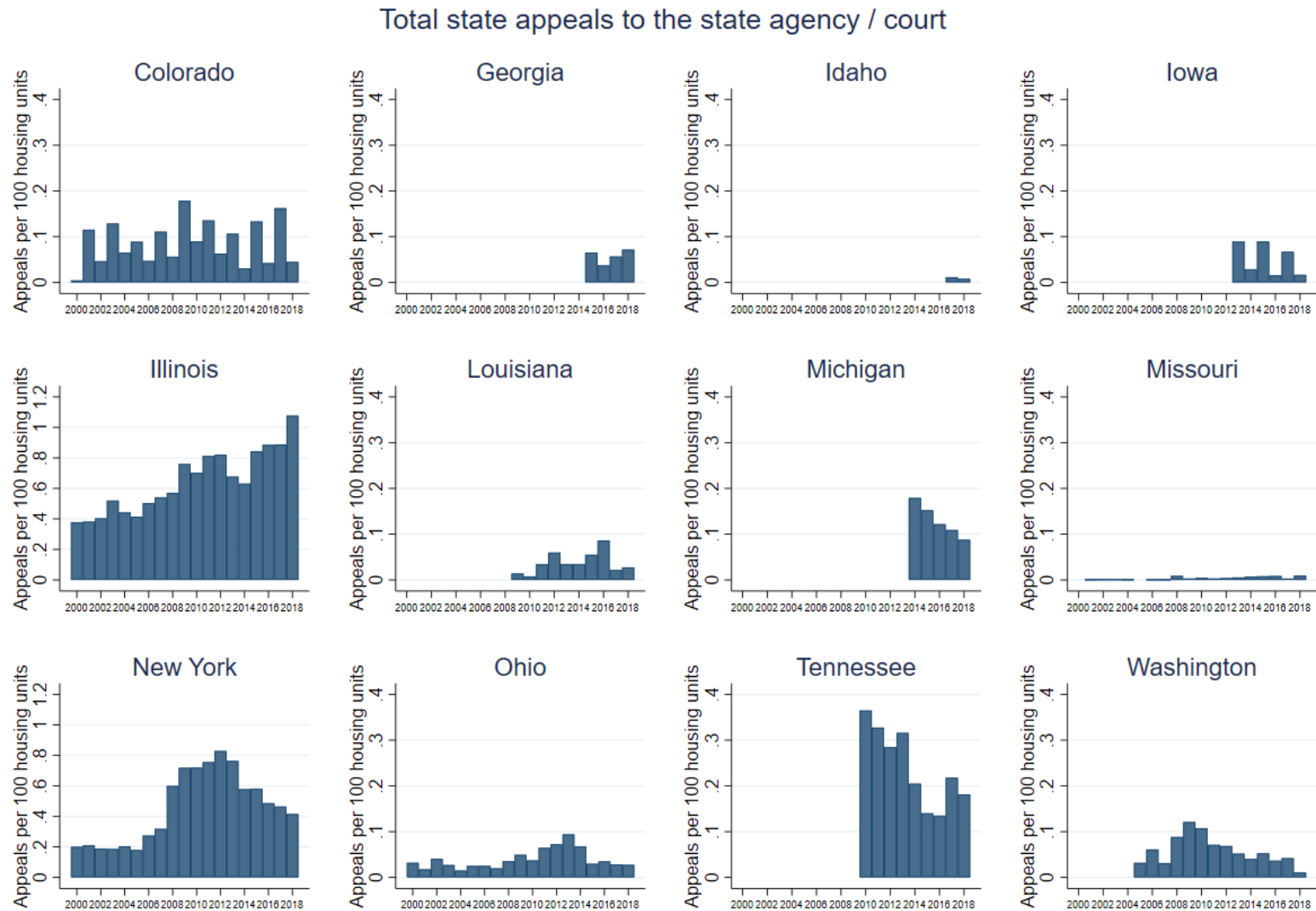
Texas has a different y-axis scale. Only states for which data are available for all counties are plotted. The line in the box is the median; the box signifies 25th and 75th percentiles; whiskers are 75th percentile + 1.5interquartile range (IQR) and 25th percentile - 1.5IQR. Outside values are not plotted.

Figure 2. The variations in changes in lower-level appeal rates



Only states for which data are available for all counties are plotted. Percent changes from the previous year are calculated as the difference of logs. For panel B, the line in the box is the median. The box are 25th and 75th percentiles. Whiskers are 75th percentile + 1.5interquartile range (IQR) and 25th percentile - 1.5IQR. Outside values are not plotted.

Figure 3. The variations in total state higher-level appeal rates



Illinois and New York have a different y-axis scale. Only states for which data are available for all counties are plotted.

Appendix 1. Data Inventory

No	State	Main data				Additional data		
		Data Source	Years	No of Counties	Assessor / Board	State Agency / Court	Assessor / Board	State Agency / Court
1.	Arizona						Maricopa (2015-18)	
2.	California	State Board of Equalization	2014-18	58	X		Alameda (1997-2017), Riverside (1997-2018), Sacramento (1994-2018), San Francisco (1999-2016), Santa Clara (1990-2018)	
3.	Colorado	Board of Assessment Appeals	1997–2018	64		X		
4.	Florida	Department of Revenue	2000-18	67	X			
5.	Georgia	Department of Revenue	2015-18	159	X	X		
6.	Hawaii	Department of Budget and Fiscal Services	1982-2018	5	X			
7.	Idaho	Board of Tax Appeals	2017-18	44		X		
8.	Illinois	Property Tax Appeal Board	2000-18	102		X	Cook (1998-2018)	
9.	Indiana	Indiana Gateway	2015-18	92	X			
10.	Iowa	Property Assessment Appeal Board	2013-18	99		X		
11.	Louisiana	Tax Commission	2009-18	64		X		
12.	Maryland	Department of Assessment and Taxation	2003-18	24	X			

13.	Michigan	Tax Tribunal	2014-18	83		X	
14.	Missouri	Tax Commission	2001-18	115		X	
15.	New Jersey	Department of the Treasury	1990–2018	21	X		
16.	New Mexico	Taxation and Revenue Department	2009-18	33	X		
17.	New York	Department of Taxation and Finance	1990–2018	62		X	Kings, Queens, New York, Bronx (2016-18)
18.	Ohio	Board of Tax Appeals	1984-2018	88		X	Cuyahoga (2006-18)
19.	Oregon	Department of Revenue	1997–2018	36	X		
20.	Pennsylvania						Philadelphia (2014), Allegheny (2015-18)
21.	Tennessee	State Board of Equalization	2010-18	95		X	
22.	Texas	Office of the Comptroller	2014-18	254	X		Harris (2002-18), Tarrant (2012-18)
23.	Utah						Bexar (2018), Dallas (2014-18), Fort Bend (2016-18), Harris (2002-18)
24.	Washington	Department of Revenue	1999–2018	39	X	X	Salt Lake (1994-2018)

Note: County data come from either the county assessor or board.