Assessing Assessors*

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Property tax revenues – the largest discretionary source of revenue for local governments - adjust at a pace that is inconsistent with the growth and decline of property values in the US. We show that this form of revenue smoothing may be rooted in the political economy of municipalities, cities, and school districts. Measures of local budget constraints are positively related to the mark-up of a property's total dollar assessment values relative to its eventual transaction price. Using micro-evidence from school referendums in Illinois, we find that shocks to municipal liabilities lead to increases in property assessment values without significantly increasing the median transaction prices. A passing referendum over the past 3 years increases the probability that a house would be reassessed upward by 17%. This form of revenue smoothening can have costs, primarily in creating avenues for rent extraction. We find that local tax assessors: 1) have tax assessments on their own properties that are lower than neighboring properties; and 2) these tax assessments also grow significantly more slowly than neighbors. We further document a negative correlation between the underassessment of tax assessors' own properties and the tax-maximizing assessment gaps documented in the districts they operate.

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I. Introduction

Outside of federal and state transfers, property taxes are the largest source of revenue for local governments (US Census Bureau, 2023). These annual taxes are collected in proportion to individual property values - scaling to the price of a taxpayer's real estate asset. In principle, this is meant to proxy for a large component of the average taxpayer's wealth (real estate), and this tax exposes public budgets to the fluctuations of the housing market, where prices are inherently volatile. During the 2008 Financial Crisis that coincided with a housing market downturn, for instance, the financial media and many economic analysts speculated on the potential waves of municipal bankruptcies that would materialize from the implicit effect of declining housing prices on property taxes.[1]

In this analysis, we first evaluate the connection between the financial fluctuations of the housing market and local property tax revenues. We show that, despite the prevailing mandate to mark to fair market valuations, municipally assessed property prices — the precise values used to determine tax burdens — are resistant to economic fluctuations captured in the corresponding real estate indices and regional transaction prices. In multivariate regressions, 1% market implied return on house values translates to no more than 0.15% change in the dollar of assessment values. The standard proxies of property returns can only explain 8% of the variation in property assessment growth. This pattern is robust to controlling for policies that may restrict assessment values and total property tax revenue across states. In fact, states with the most freedom to assess in accordance to market values have tax revenues that are the least responsive to changes in standard proxies of market price.

The degree of disagreement between assessment and market values is connected to local government finances. Properties sales for amounts significantly below tax roll assessment values are

[1] In an April 2009 speech to the Bank of International Settlements, the former Federal Reserve Chair, Ben Bernanke, implied that absent these key local property tax revenues, "States and municipalities are scrambling to find the funding to provide critical services." (https://www.bis.org/review/r090415a.pdf). However, as far as we are aware, only Jefferson County (AL) and Harrisburg (PA) had defaults on their general obligation bonds around this crisis period.

the largest in areas of high local deficits, suggesting that assessment values are propped up in part by the budgetary demands of the municipal authorities. The probability that an existing house will be reassessed, barring any in-kind transaction, is also asymmetrically related to increases in market returns, providing evidence that reassessments are conducted to increase the tax base, and less to match assessment values to (declines in) market prices.

Micro-evidence indicates that shocks to local expenditures can lead to increases in assessment values, without substantially affecting their transaction prices. In particular, using a panel of local bond referendums from 2006 to 2015 in Illinois, we find that passing at least one referendum in the past 3 years leads 17% of the mean increase in the probability that a property will have its assessment revised upwards. This sample of referendums are not associated with increases in the market values of real estate properties- the same indicator of passing referendums lead to an insignificant decline in the median transaction price, and no visible changes in the number of residential transactions.

Smooth tax revenues can be a boon to municipal, county, and school district government-insulating their budgets against the volatility of the financial markets; beyond the benefit of avoiding bankruptcies, which can be costly (Warner, 1977), property tax revenues afford public goods that may be viewed as having been under-provisioned (Pigou, 1947; Cellini, Ferreira, and Rothstein, 2010). However, if such patterns are unexplained by the legal tenets that explicitly govern such revenues nor the financial prices that form their basis, then the circumstances under which it occurs must be investigated cautiously. We present evidence that the costs to this form of revenue flexibility are avenues for rent extraction by local public officials.

Local assessment offices hold considerable sway over the attribution of real estate wealth to individuals and businesses. To observe this, we hand collect a panel of assessor identities from the various county websites and public databases between 2012 and 2020. We show that the identity of

the assessment office has significant explanatory power over the accuracy of assessment values against actual sales. A head assessor, or a collection of possible head assessors, explains up to 15% of the variation in assessment accuracy. These changes are statistically significant- F-statistics on the goodness of fit rejects the null hypothesis that these assessors are unrelated to the accuracy of property assessments at the p-value of 0.01%. These low-profile, seemingly unimportant positions have considerable sway over allocating individual tax burdens and fine-tuning assessment accuracy.

The final assessment value- and their implied tax burdens- therefore can be a combination of market values, the financial demands of the local authority, and the local authority's own personal preference and incentives. To dissect this mishmash of determinants, we take our analysis onto the personal properties of the individual assessors themselves. Using public records parsed from LexisNexis, we collect the personal property addresses of our panel of assessors, the assessors' individual characteristics and backgrounds, and several predetermined sets of comparable neighboring properties. We find that during the contemporary period, the assessors' primary property had experienced 0.712% lower growth in assessment values compared to their LexisNexis defined neighbors and 0.955% lower growth compared to other single household properties in the same county of their authority. These differences are quantitative large- composing 18% to 24% of the average assessment growth for this sample of assessor matched properties- and statistically significant. We further use hedonic regressions of changes in yearly assessment value on assessor ownership indicators. These regressions control for past property values, square footage, number of living rooms, and other available property characteristics, and indicators of linkage to assessors remain economically meaningful.

Finally, we relate the measurable property tax benefits accrued to individual assessors to the average county level assessment markups. Counties managed by assessors who obtain the most personal tax benefits typically also have the highest assessment markup against transaction prices. Our

results indicate a tradeoff mechanism between the maximizing a tax base to provide public goods and services and potential avenues for rent-extraction and local corruption.

Local authorities have tremendous flexibility in property value assessments despite the pervasive mandate for them to capture fair market prices. This flexibility in effect allows for revenue smoothing that insulates local budgets from the financial volatilities of the real estate market. We show that this revenue smoothing isn't costless, and allows for the rent-extraction. We use this setting to dissect the objectives in local governance, capturing a new channel of the trade-off between the individual and public incentives that shapes the political economy of municipal finance.

II. Relevant Literature and Institutional Details

Our work primarily links the expanding literature on local taxes and real estate assessments- in particular its redistributive features- to the traditional literatures on public finance, public auditing, and the foundations of political economy.

A large literature ranging from academic studies and to popular press investigations examine the microdata of municipal property assessments. These works conclude that assessment offices typically place regressive burdens on the taxpayer (Paglin and Fogarty, 1972; Engle, 1975; Black, 1977; Clapp, 1990; Berry, 2021; and Amornsiripanitch, 2021), manifest in racial gaps (Kahrl, 2016; Atuahene and Berry, 2019; and Avenancio-León and Howard, 2022), and are associated with numerous cases of quid-pro-quo corruption (Newman, 2002; and Lagunes and Huang, 2015).

This body of evidence suggests that assessment offices have flexibility in influencing property assessment values and distributing tax burdens. Ours paper expands the frontier of this literature by linking such a system to public financing. 1) We show the key benefit of this form of taxing mechanism is that it smooths out the fluctuations and pricing shocks that are inherently associated

with financial assets. 2) We show that district level liabilities can lead to changes in assessment values, without substantially affecting transaction values. 3) We provide a novel benchmark for analysts and policy makers to assess assessors- the valuation of an assessor's own homes is a measurable proxy of assessor flexibility.

Given our findings on distributive effects and measurable assessor influence, the key contribution is to link the flexibilities of these offices to the foundations of political economy. Assessors, while mandated to assign market prices, are implicitly hired and funded to increase the property tax base for the local governments (Geoffrey, 2022). We show that there is a tradeoff between the costs of allocating authority into these offices, which allow for the accrual of personal gains to the assessor, and the benefits that these offices provide to local revenue and budgets.

Public finance and political economy, due to the limited availability of data and the lack of comparability between different governmental backgrounds, have focused on the national setting and the institutional divisions of power within a federal regime (Persson, Roland, and Tabellini, 2000; Acemoglu, Johnson, and Robinson, 2001; and Acemoglu, Johnson, and Robinson, 2002). In our setting of property assessments by municipal governments, our focus is the deviation between assessment and transaction implied market values. This markup of assessment values is manifestly simple to calculate and straightforward to compare. Therefore, our setting allows the use large panels of property values and numerous local governments to test theories of political economy. By analyzing the prime source of local government revenue in property taxes, we contribute by enlarging the frontier of tools useful for the analysis of public finance and political economy.

This is not to say that property taxes were not of an important academic interest prior to this paper. Social scientists have long argued that property taxes as an institution are a relic of history (Hale, 1985), and are susceptible to corruption and inefficiencies (Whitten, 1897). Our contribution

is an assessment of the flexibility of this institution to public finance and measurable evaluations of its trade-off in benefits and costs.

As far as we can tell, we are the also first study that links a comprehensive dataset of local public officials – assessors- to the measurable efficacy and characteristic of their public office. This is much akin to the literature on executives, board members, and their characteristics in corporate finance (Bertrand and Schoar, 2003; Malmendier and Tate, 2005; Adams and Ferreira, 2009; Faccio, Marchica, and Mura, 2016; Smith, Yagan, Zidar, and Zwick, 2019; and potentially many others). We use SmartLinx from LexisNexis to identify personal backgrounds and owned properties, similar to the extraction of fund manager and CEO backgrounds (Pool, Stoffman, and Yonkers, 2015; Yonkers, 2017a; and Yonkers, 2017b).

Finally, our paper provides a fuller picture of local governmental finances. Recent literature in finance examines the micro-characteristics of municipalities by analyzing the dynamics of the municipal bond market. These papers compare the yields and the realized returns of municipal bonds as related to individual government and other local characteristics (Butler, Fauver, and Mortal, 2009; Gao, Lee, and Murphy, 2019; Gao, Lee, and Murphy, 2020; Chen, Cohen, and Liu, 2024). Given Ricardian Equivalence (Barro, 1974; Buchanan, 1976), that debt and tax revenues are substitutes, our examination of the prime source of local tax revenue complements this existing literature by describing the main sources of tax revenue that supports local expenditures.

III. Main Results

A. Property Tax Revenue and Market Value Growths

To begin our analysis, in Figure 1, we plot the Zillow US Home Value Index and the total property tax revenues of a balanced panel of US local governments between 2000 and 2020. The

Zillow US Home Value Index (ZHVI) is the time series of monthly changes in house value that is estimated by the Zillow corporation, which has considerable access to the U.S. housing market.[2] The US local government panel is derived from the US Census and contains all identifiable US local governments that have annual observations between 2000 and 2020. We provide the summary statistics of the county level data in the Panel A of Table 1.[3]

In Figure 1, we see that the main feature of the Zillow Home Value Index is the growth and decline in property value between 2006 and 2012. This feature, driven by the boom and bust of the US housing market, can also be observed in other similar value indices, such as the Case-Shiller U.S. National Home Pricing Index or the US Federal Housing Finance Agency's Transaction Price Index. This pattern is ostensibly absent from the aggregate property tax revenue levels, which are naturally based on the quantity of taxable households and their prices.

In order to reconcile the total property tax revenues with the secular decline in prices, the quantity of taxable properties must have increased dramatically to compensate. However, an immediate survey of the conditions of the housing market indicates that the quantity of taxable properties grew only modestly or even declined during this period. In Figure 2, FRED's New One Family Home Sales in the United States (Series: HNFSEPUSSA) followed the same pattern of rise and decline as the price indices. That is, the quantity and prices, at least for this sample period, were positively related. The smooth pattern of property tax revenue remains seemingly unexplained by the market conditions of both price and quantity.

[2] This time series is based on the monthly changes in the levels of Zestimate, which is the proprietary "market" value estimates of individual homes by the Zillow Corporation. In describing the Zestimate, Zillow states that these estimated individual home values are within 10% of the transaction values 95% of the time at any moment in time.
[3] Part of this panel was derived from the census, while other variables were derived using aggregation of the ZTrax database which we will describe in the following section.

This aggregate pattern of tax revenues repeats across individual states- operating within a wide spectrum of legal and institutional frameworks. In Figure 3, we decompose the aggregate property tax revenue into states with and without explicit assessment limits, to states with and without levy limits, and specifically limiting to states without any explicit limits to the assessment process. The smoothness of property tax revenues exhibits itself in every one of the following decompositions of the US properties market.

We first decompose the aggregate trend to states with and without explicit limits to the growth rate of assessment values. There are 19 states that limit possible changes in property assessment values. For instance, California's proposition 13 limits the yearly change in assessment values to 2% for non-transacted properties. It is possible that these assessment limits accumulate excess undervaluation that cushions the declines in assessment values during market corrections.

Panel A of Figure 3 plots the growth of property tax revenues for states with (blue) and without assessment limits (orange) separately. It appears that legal limits on assessment value growth have very little to do with the upward trend on property tax revenue itself. Rather contrarily, states with assessment limits tend to have revenue levels that modestly stagnate when property prices decline. States without such limits tend to have smoother upward trends in property tax revenues, indicating that these limits are likely not responsible for the modest connection between property tax revenue and property market values.

Similarly, there are 37 states that implement some form of levy limits- the total tax revenue growth that can occur annually within a local government may be capped. These limits are not placed on individual properties, but are on the total tax revenue that a local authority may collect. For example, the Property Tax Extension Law Limit (PTELL) in Illinois limits total tax revenue growth to the greater of 5% and the CPI inflation rate per annum for certain counties (Illinois Department

of Revenue, 2024). In Arizona, Levy limits allows for a cap in tax revenues to grow at 2% within the intensive margins. While this may seem restrictive, in 2024, no county, in aggregate, hit their maximum allowable levies (Arizona Department of Revenue, 2024).

In aggregate, levy limits do not seem to be the cause nor do they prevent the time series pattern of property tax revenue smoothing. Panel B of Figure 3 decompose the aggregate tax revenues into states with (blue) and without (orange) these limits. Both time series both show a pattern of revenue smoothening. Again, the constrained set of states show a greater reflection of the aggregate real estate market conditions than the unconstrained states; indicating that these limits are likely not responsible for overall smoothness of property tax revenues.

Lastly, Panel C plots the tax revenue limits for New Hampshire, Vermont, and Tennessee. These areas are known to have zero property tax restrictions at the state level. In this panel, we see a reflection of the aggregate trend in tax revenues that is divorced from prices and quantity. Collectively, these decompositions shows that aggregate smoothening of property tax revenues is likely not rooted in the legal framework of the state governments.

We further provide evidence of this revenue smoothening pattern by conducting multivariate regression analysis of the growth of property assessment values at the county levels. Table 2 regresses growth of the average single-family homes aggregated at the county level against various sets of proxies on county level growth in property values. We include various lags, and winsorize both the left-hand side and the right-hand side variables at the 2.5% and 97.5% confidence levels, to give the regression models their best chance at explaining the variation in property assessment values.

Columns 1 through 3 regresses growth in assessment values using a simple univariate specification with the prior annual market value growth with varying lags as the only explanatory variables. Column 4 includes all the lags of left-hand side variables to account for possible reporting

delays. Columns 5 and 6 regress the y-variable with year and county level fixed effects to benchmark the explanatory power without property value indices. In explaining against the growth of property tax revenues, designated market indices have only marginal explanatory power over our sample period. The simple univariate analysis explains no more than 0.5% of the variation in tax revenue growth. This is despite the legal mandate to capture market variation in prices at every state within the union.

Furthermore, the magnitudes of the relationship between market returns and property assessment growth are economically miniscule. A 1% contemporaneous market return only implies a 0.05% change in taxable property value. The explanatory power is slightly stronger at 1 to 2 year lags, where a market return of 1% translates to between 0.12% to 0.14% change in taxable value. However, for property tax evaluation schemes that are mandated to capture fair market prices at a 1 to 1 basis, there is a distinctive disconnect between the foundational source of property tax revenue and property returns.

We find that the changes in property assessment values are disjoint from market returns using the industry-standard proxy of market values. This disconnect cannot be explained by state-level restrictions of assessments and property tax levies. In the rest of the paper, we will provide evidence that this disconnect can be explained by county level budgetary characteristics, biases in the frequency of reassessments, and shocks to local liabilities. Furthermore, we will show that at the county level, assessment offices have considerable flexibility in the determination of assessment values and the levels of this assessment gap.

B. Assessment Values and Transaction Values.

The next step in our next analysis joins the panel series of property taxes to the individual transactions and assessment values. Micro data on U.S. properties capture the actual gap between a property's assessment values and its potential transaction value. We use this data to provide evidence that the disconnect in assessment prices is rooted in the budgetary characteristics of local governments.

The micro data on property values and transactions consists of the tax roll and transactions of US properties from the Zillow ZTrax database. This database contains the historic assessment values, house characteristics, and sales transactions across all 50 states. This database was provided by the Zillow corporation on an as-is basis for academic research. Specifically, it contains tax roll assessment values between 2000 and 2015 (in the historic version of this panel) and 2017 to 2020 (using the corporation's contemporaneous version of the data). Additionally, the transaction dataset contains property sales- with the acting parties, the dollar value of the sale, and the conditions of the properties at the time of the sale over their available history. We provide summary statistics on this dataset in Panel A of Table 1.

To capture the degree of over or under valuation by local assessment offices, we take all single-family home transactions and match these transactions to the latest assessment values from the tax roll dataset. This enables us to calculate a property's transaction deviation to the assessment values at the individual level. A property that was assessed at $400,000, but sold for $500,000, has an assessment deviation of 25% ($100,000/$400,000). Likewise, a similar property that was assessed at $400,000, but sold for only $300,000, has a transaction deviation of -25%. We aggregate these numbers to the county-year level: all properties that were sold for prices between $100,000 and $800,000 is averaged yearly within each county to provide the average transaction deviation (*% Diff Between Sales and Assessed Value*). Similarly, we also calculate the percentage of properties that undersold their assessment values by over 10% of the assessment price as *% Sold 10% Below the Assessed Value* each year.

In Table 3, we regress *% Diff Between Sales and Assessed Value* and *% Sold 10% Below the Assessed Value* against a variable that captures the budgetary constraint facing each county. *Local Government Deficit*- the primary explanatory variable- is the ratio between total expenditure and the total revenue of local governments aggregated at the county level. Columns 1 through 4 uses *% Diff Between Sales and Assessed Value* as the left-hand side variable, while columns 5 through 8 uses *% Sold 10% Below the Assessed Value*. Columns 1 and 5 regresses these against county level deficits. Columns 2 and 6 adds local county level fixed effects as well as two additional controls for population and the importance of property tax revenues. Columns 3 and 7 uses year fixed effects. Finally, in the most demanding regression models in columns 4 and 8, we use all of the prior controls.

We observe that on average, the counties with the highest deficits tend to have the highest over-assessment. In the fully specified multivariate setting (columns 4 and 8), a 10% increase in county level expenses against revenue indicates a 3% lower average property sales price, and a 1.3% greater chance that a property will be sold at least 10% below their assessed values. This relationship is more significant without yearly fixed effects as the 2007 through 2009 financial crisis provides the most dramatic change in country level market values. Without year fixed effects, which allows for the capture of the systematic shock to the property market (columns 2 and 6), such a 10% increase translates to a 9.3% lower property sales price, and a 6.86% greater chance that the property will be sold at least 10% below their assessed values.

Furthermore, we examine the frequency of reassessments of properties outside of sales or other in-kind transfers. In Table 4, we regress the proportion of existing non-transferred properties that were reassessed (had changes in assessment values) against proxies of market returns. We primarily use the current, and two lags market returns in this specification to be consistent with table 2, even though market returns lagged by two or more years do not have any significant power on reassessment probability.

For this panel of county-year observations, we find that counties typically increase reassessments significantly when market returns are high, and less so when market returns are low. Using the specification in Column 1, one standard deviation increase (14%) in our proxy of current market returns indicates a 5% of the mean (48%) increase in the fractions of residential properties reassessed within a county. This association persists using lagged market returns, and is robust to the inclusion of year and location fixed effects (columns 2 and 3). Furthermore, despite the decrease in power, this pattern is repeated in both capped and non-capped states in columns (4) and (5).

In the large sample analysis of counties and residential properties, we show that the reassessment process, on average, prevents negative market returns from entering into tax valuations by relegating property reassessments to occur more frequently during periods of market boom. However, such a process may simply be determined by pre-existing institutional rules and standards, affording less discretion to individual authorities. It remains as a question to why this system of institutions has evolved to even attribute and grant local officials the power (if any) to evaluate and determine properties values. We argue that this form of revenue smoothing allows for increased flexibility by local authorities to meet liability shocks.

As the assessment valuation process may differ between properties across counties and states, we will focus on a specific micro-setting to show how local liabilities determine the assessment valuation process.

C. Evidence from Local Referendums

Do local liabilities lead to changes in real estate valuations? This section provides micro-evidence that property assessment values are adjusted in accordance to shocks in local expenses. In particular, using a panel of school referendums placed on Illinois ballots between 2006 and 2015, we

show that passing such a referendum increases the likelihood that local authorities would re-assess properties upwards without substantial changes in the median transaction prices.

This panel of data is hand collected from the Illinois public revenue website, and consists of total referendum dollar size, the geographic district affected by these referendums, and whether these referendums was passed by the voter base. Table 1 Panel D provides summary on these referendums. Examples of these referendums are recorded in Appendix A. The outcomes of these referendums are typically close, with an average passing rate of 57%, financing projects with a median value of $8,000,000.

A local district referendum, once passed, typically allocates funding toward an immediate investment project, such as constructing a new school building, upgrading existing equipment, or making repairs to existing school-wide infrastructure. After passing the referendum, the local district then issues a general obligation (GO) bond to finance the project in question. Such a bond then is paid off over the course of many years using the full tax levying powers of the local district, which are determined directly from property valuations. The bonds financing these referendum projects differ from revenue bonds. For instance, bonds financing sewage system, utilities, and stadiums projects are typically not determined by referendum votes, not supported by property levies, and are instead backed by the revenues associated with these projects.

We examine the consequences of referendums at the district level. Each of the school districts is matched to a single zip code. We then calculate the percent of real single home properties within the district zip code that had been re-assessed upwards around the years before, on, and after each referendum vote. Figure 3 Panel A shows the difference in the likelihood of an upward assessment between counties that had pass a referendum and counties that had failed the referendum. At the aggregated level, a passed referendum leads to higher fraction of properties having been reassessed

upward in 3 years including on and after its passing. This pattern also coincides with the average growth of property values within the district. Figure 3 Panel B shows that the average growth rate in assessment values is also higher for properties in the districts that had passed the referendum, concentrating in the 3-years immediately following the referendum passage.

To statistically assess this visual pattern, Table 5 conducts standard regression analysis to recover the economic effects of referendum passage on the assessment values of single-family homes. In this regression, the panel of data consists of single-family residential homes within the zip codes of the referendums for all of the years between 2006 and 2015. The primary explanatory variables are whether at least a single referendum was passed and the number of referendums passed in the past 3 years of the observed date. We observe that these shocks to local liabilities significant increase the assessment values of single-family homes. A passing referendum increases the annual assessment growth rate of properties by 1.26%. Similarly, these referendums increase the probability that a property would be reassessed upward. The indicator of a passed referendum increases the probability by 6%, a magnitude that is 17% of the mean likelihood that the yearly assessment value will be revised upward.

These assessment changes cannot be justified by increases or expectation of increases in actual transaction prices. Panel A of table 6 regresses the yearly change in the median transaction prices for residential properties within each district zip code each year to the same indicator variables. Since not every property is transacted every year and therefore there is an absence of actual market valuations for these properties, we calculate the median transaction value of single-family homes in each zip code within every given year, and then we the year-on-year market returns according to this average transaction value. Furthermore, because assessment values may lag in changes in market conditions, we also include indicators and the number of passed referendums up to 5 years in columns (3) and (4) to entertain this possible.

In these regressions, we do not find any significant pricing effects or quantity effects associated with these referendums in Illinois. In fact, all of these referendums lead to marginally lower median transaction prices. Panel B examines growth in the number of transactions within the zip code that the referendums affect. We also do not find any evidence that referendums change the quantity dynamics of the housing market.

It appears that, in our sample of school referendums in Illinois, shocks to municipal liabilities increase property assessment values without significantly increasing their transaction values. Our micro evidence identifies a potential causal link between local budgetary expenses and the assessment valuation used to finance these expenses. It appears that discretionary assessment valuation, our primary channel in which property prices relate to local budgets, contribute to the investment of public services, to which school investments constitute a large component. These public services may also be viewed as having been underinvested in the history of public finance (Cellini, Ferreira, and Rothstein, 2010). Given these benefits, what are the costs to this form of assessment flexibility?

Our detailed micro data on the assessment values and transaction prices allows us to link local county characteristics to the gap in the assessment valuations of residential properties. We find that counties that have greater budgetary constraints have significantly higher value assessments when compared to market transaction prices. Section III.D examines individual assessment offices and their officers to explain the variation in the degree of budgetary assessment.

D. Local Assessment Offices

We focus on the local assessment offices to show that the cost of financial flexibility endowed by are avenues for rent extraction and corruption. These institutions hold considerable sway over the attribution of real estate wealth to individuals and businesses.

To provide this evidence, we hand collect an unbalanced panel of assessor identities from the various county websites and public databases between 2018 and 2020. In this process, we collect the names and locations of available county officials from several public sources.[4] We show that the identity of the assessment office has significant explanatory power over the accuracy of assessment values against actual sales. A head assessor, or a collection of possible head assessors, explains 7% to 15% of the total variation in assessment accuracy. These changes are statistically significant- F-statistics on the goodness of fit rejects the null hypothesis that these assessors are unrelated at 0.01% levels. These small, seemingly unimportant positions have considerable power over the finances of local government through allocating individual tax burdens.

In Table 7 we ask what- besides deficits- explains the degree of assessment gap in property price values. The explained left-hand side variables are the same *% Diff Between Sale and Assessed Value* and *% Sold 10% Below the Assessed Value* as in Table 3. We focus on whether individual head assessor identities- as explanatory variables- can rationalize the variation of this assessment gap between counties across time. We filter our initial data by requiring a county to have at least two different identified primary assessors working at different times within its available history (since a county with a single identifiable head assessor won't have any functional variation in assessor identities). Columns 1, 3, 5, and 7 report the goodness of fit for model specifications without using any assessor related variation. These regressions serve as the benchmarks that the identities of assessors are challenged to improve upon.

Columns 2, 4, 6, and 8 then takes the residual variation from these prior benchmark regressions and further regress them against the panel of assessor indicators. These assessor fixed effects have the value 1 only when an individual assessor is in office, and 0 otherwise. These

[4] For smaller counties, we rely on scraping the First Connect website for assessment officials.

regressions analyze whether the identity of the head assessment officer make any difference in the average valuation gap of single-family houses during his tenure. The rows of these columns then report the incremental goodness of fitness from the respective benchmark specifications. The F-statistics in the table represent the respective Assessor Fixed Effects' incremental explanatory power over the residuals after including County Fixed Effects (Columns 2 and 6) and both County and Time Fixed Effects (Columns 4 and 8). The p-values associated with these F-statistics are the probability that the observed correlation between individual assessors and the levels of assessment gap may be observed without any underlying associations. In all 4 cases, we reject the null that individual assessors are unrelated to the assessment gap at 0.0001 probability.

The underlying officers that man these property assessment offices matter significantly to the magnitude of the gap between a property's assessment and transaction values. We show this fact by reporting the incremental goodness of fit statistics of assessor identity fixed effects for several linear models of this assessment gap. For the next part of our analysis, we move to a natural setting to measure the flexibility and the discretion of their political offices- the valuation of an assessors' own homes.

E. Assessing Assessment Officer Properties

We use the setting of comparing assessment value assignments toward personal and nonpersonal properties to identify the interaction of private and public incentives in the municipal political economy. We ask, given the role of providing for a form of public service- by attributing taxes to individuals- do assessors internalize certain benefits? Is there a trade-off between using a flexible revenue collection system and allowing for certain pecuniary benefits to accrue to public officials?

Joining our data on assessment identities and property prices is the LexisNexis SmartLinx Comprehensive Persons Report. We query this database for information on the owned properties, employment history, the first 5 digits of the social security number, criminal arrests, immediate relatives, possible business associates, licenses, business registrations, and a gamut of other available public records of the assessors that we had hand collected.

Specifically, for each assessor-county pair, we query the database using the assessor's first name, last name, and county location. If the system returns more than a single unique match, we parse first 10 results for information that directly identify the individual's role as a property assessor.[5]

The SmartLinx system also helps us match individuals with possible alternative names and other data noise to the appropriate public records- hereby handling identification issues with using name and locations alone. For example, a query of Mike Pence from Indianapolis, Indiana gives – as the first-person report- a Michael R. Pence who currently resides in Zionsville, Indiana, actively registered as a Republican Absentee voter, having a history of addresses that span 1987 to 2023.

Name and social security number, along with other possible identifiers, link an individual's public records together in the SmartLinx database, thereby stitching the history of records such as multiple deeds, licenses, and addresses. A common problem with using individual public records is identifying whether multiple deeds with the same name actually belong to the same individual or multiple individuals with the same name. Appropriately, because of the SmartLinx algorithm, our data is able to detail an individual's current address information, his collection of possible secondary

[5] These identifying keys are 1) email addresses associated with the U.S. government – that is, emails ending in .gov and .us domains and 2) the person's job titles which include either appraiser or assessor as keywords. The first record that contains such an identifying requirement or the only unique recorded individual is matched as the public record of the assessor-county pair.

properties, and his prior addresses. In the prior example, Mike Pence's previously designated address was a 4-digit P.O. Box in Washington DC.

We then match these properties to the ZTrax dataset to obtain their recent assessment history and their recent (if any) transaction prices.We find that assessor properties have assessment values (and tax burdens) that tend to grow at a slower pace than 1) their LexisNexis defined neighbors, 2) the average single-family home within their county, and 3) the average single-family home within their county after controlling for house-related characteristics. We tabulate these results in Tables 5 and 6.

In Table 8, we record the average yearly change in assessment values, the average change in dollar property tax, and the actual assessment values between the homes owned by assessors, the comparable homes within their neighborhood, and other single-family homes within their county. We find that there is a difference of 0.712% (t = 3.063) in the appreciation rates of assessors and their LexisNexis designated neighbor, and a 0.955% (t = 5.769) difference between assessor properties and other single-family homes within his county. These differences are economically meaningful- during our sample period, assessor properties had tax-related assessment values that grew at 20% to 24% slower proportional pace than comparable properties.

The difference in assessment values is also directly related to the reported data on tax burdens.[6] There is a 0.496% (t = 2.187) difference between the growth of tax amounts for assessor properties and their LexisNexis designated neighboring properties, and 0.539% (t = 3.062) difference between assessor properties and other single-family homes within his county. In terms of proportional magnitudes, assessor properties had property tax amounts that grew at 16% to 17% slower pace than comparable properties.

[6] When present, the ZTrax tax roll dataset reports both assessment values and the actual taxed amount in the. The tax amount is populated less than assessment values in the ZTrax contemporaneous data, and significantly less in the ZTrax historic data; therefore, we focus primarily on assessment values but report both variables in the cases they're available.

We can also assess these differences using hedonic regression models that account for square footage and other property level characteristics. In Table 9, we find that in the multivariate setting, properties owned by an assessor experience about 1.19% (t = 4.546) slower growth rate in assessment value and 1.46% slower (t = 4.430) growth rate in dollar taxed amounts than those owned by non-assessors. These differences can also be seen in the levels of assessment valuation. Assessor properties generally have a lower level of assessment values- a difference of $4,270 (t = 3.750)- than comparable properties within the same county.

In Table 10, we further decompose assessor properties into ones within the county of his authority and ones located out of the county. *Within County* is an indicator for whether a property is associated with an assessor and located within the county of his influence. *Outside County* are all other properties associated with the assessors in our data. We observe that the primary effect occurs in areas that the assessor has jurisdiction in terms of property assessments. *Within County* is associated with 1.23% (t = 4.676) lower assessment value growth, 1.46% (t = 4.481) lower tax value growth, and $4,353 (t = 3.829) in assessment values. Assessor properties located outside of his county have no statistically significant association with the left-hand side variables.

There appear to be a systematic lower growth rate both in assessment values and the resulting tax burdens for the properties owned by local assessors. This systematic difference is economically meaningful for an individual assessor and will be used in the next section as measures of personal benefit to dissect the tradeoffs in the political economy of a local government.

F. Assessor Benefits and the Average Assessment Markup

Lastly, we relate the findings between assessor's own pecuniary benefits and the average assessment valuation markup. We show that there appear to be a positive association between the

markup in assessment values across a county as analyzed in section III.B and the degree of undervaluation of an assessor's own household. We argue that this fact provides evidence of a tradeoff between an assessor's ability to accrue private benefits and contributing to the fiscal health of the local government.

In Table 11, we regress the average markup of assessment values in the panel of county-time observations against the average gap in property growth rates of assessor related properties against neighboring properties. In column 1, we simply relate an assessor's slower growth in his house values against the markup in assessment values of his county. We find that the slower an assessor is to evaluate his own property upwards against his neighboring properties, the more likely homeowners in his county will sell their properties below their county assigned assessment values. These two metrics are negatively related, even after including county and time fixed effects in Columns 2 and 3. The more flexibility that an assessor has to accrue a slower increase in his own tax burden, the more likely that properties will be overvalued against their eventual transaction prices.

We present this as evidence that there is a tradeoff in the power structure of the local government. Our results show that the degree that an assessors internalize certain benefits is positively related to the overall overvaluation of properties against transaction prices within a county.

IV. Conclusion

We provide large sample evidence that local property taxes, which are municipalities' single largest source of discretionary revenue - do not grow in line with the property values that they aim to track. In particular, we find that revenues are "overly" smooth and upward sloping, nearly independent in some instances of fundamental housing price dynamics. We provide evidence that this revenue smoothing may be rooted in the political economy of these municipalities, in that there

is a marked asymmetry of property tax re-assessments based on their implication for bottom-line county revenue. They spike during positive markets - increasing tax revenue for the municipality, but fail to show the same sensitivity to negative markets - which would decrease tax revenue collected.

We find that measures of local municipal budget constraints are further positively related to amount taxed per unit value – finding a significant relation between municipal budget issues and a property's total dollar assessment value relative to its eventual transaction price.

Using passing referendums from the state of Illinois between 2006 and 2015, we show that these quasi-shocks to local liabilities lead to increases in the assessed values of zip-code level properties, without affecting their actual transaction prices. The flexibility that endows the institutions that make assessment valuations can be interpreted as a means to provide public goods and services without having to be susceptible to the adverse financial pricing shocks of the real estate market.

Turning to the costs of this form of tax revenue smoothing, we examine the individual tax assessors and their offices directly. We hand-collect detailed data on their backgrounds and each property they own. We find that they appear to hold sway in the property assessment process, assessing their own personal properties at significantly lower values than neighbors (which are otherwise hedonically identical); and having tax bills that grow significantly slower than these neighbors. Furthermore, we find a link between this individual assessor behavior and that of the municipalities they serve, in that the tax assessment gap between their properties and neighbors is significantly positively associated with the tax-maximizing municipality behaviors observed.

Overall, we contribute to the nexus between public economy and real estate finances. While theory dictates that market pricing shocks can adversely affect a gamut of real economy outcomes, we find that- in the realm of municipal finances- institutes are built with flexibility to smooth out these shocks. Our primary proxy of rent-seeking within assessment offices- the pricing of an assessor's own

home- indicates the primary trade-off cost for the form revenue flexibility, namely potential avenues for opportunistic behavior.

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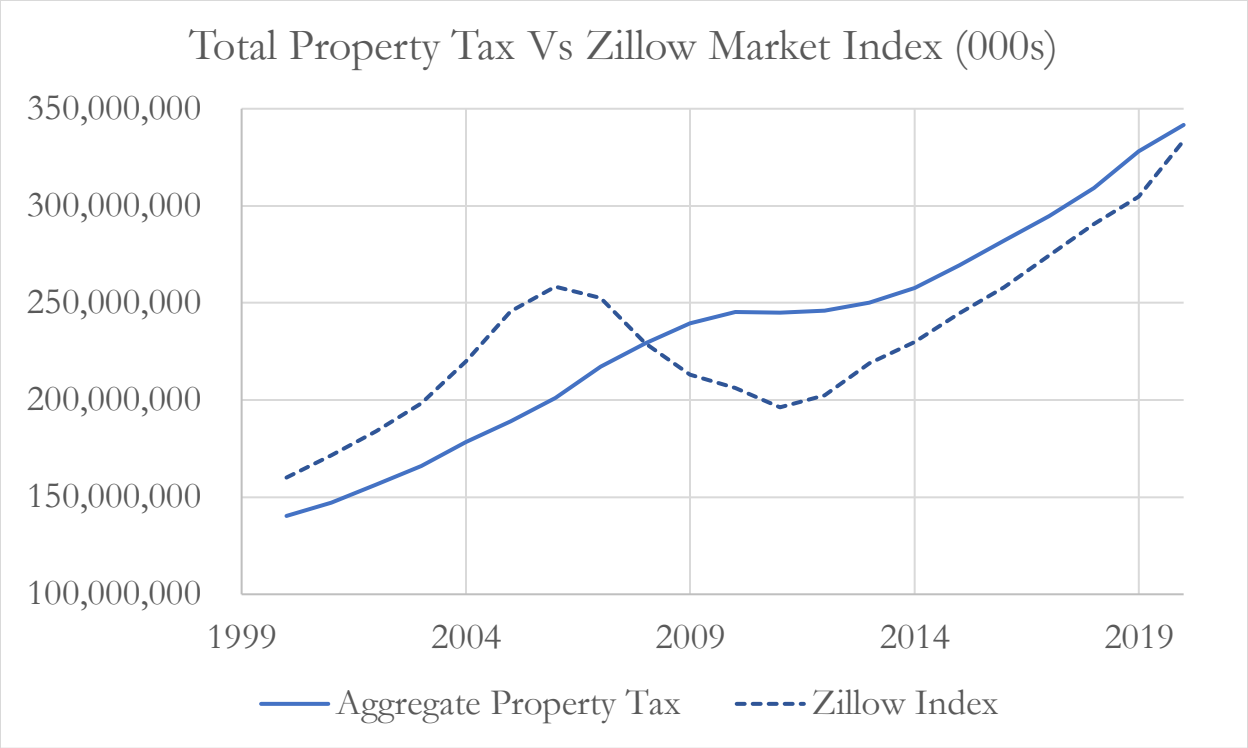


Figure 1. The Aggregate Property Tax revenue and the Zillow US Home Index. The Aggregate Property Tax time series, in blue, is calculated as the sum of all property tax revenues from local US governments that are observed annually (in a balanced panel) in the U.S. Census. The Zillow US Home Index is plotted in the dash-blue, and is normalized by the 2008 aggregate property tax revenue.

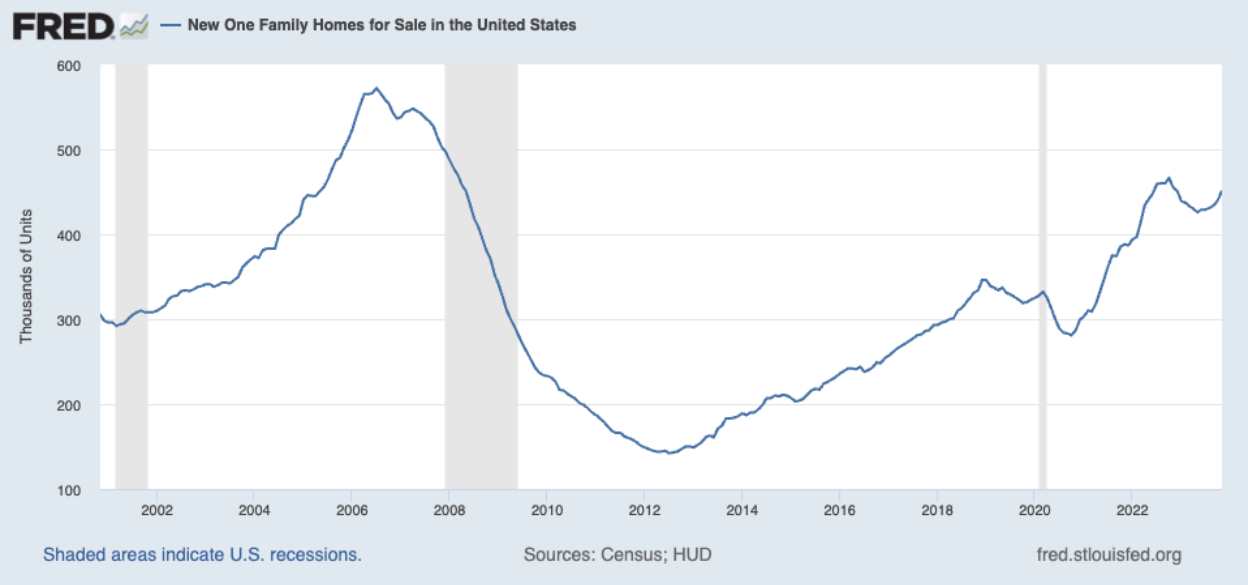
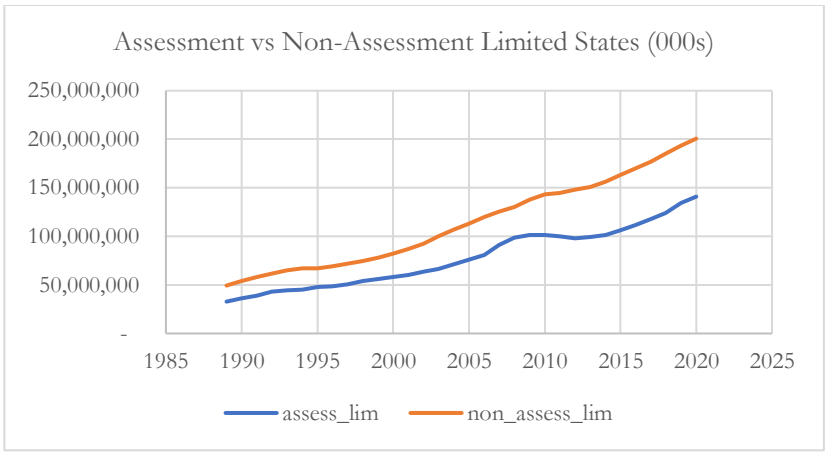
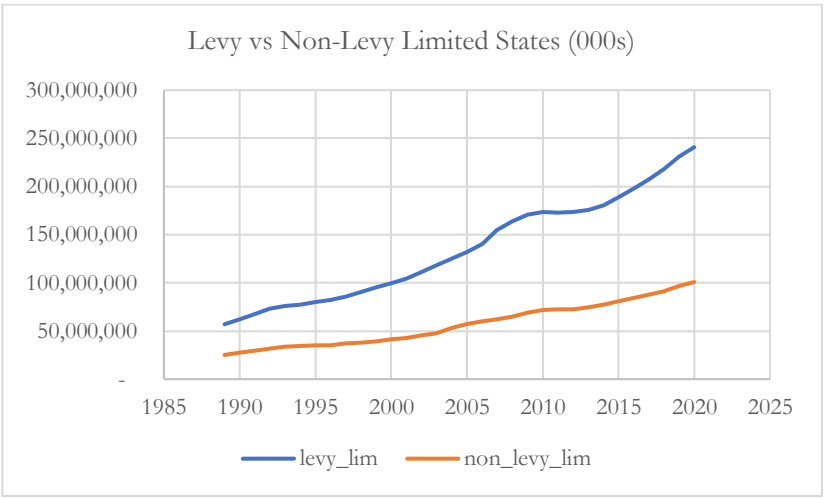


Figure 2. Federal Reserve Economic Data's New Family Homes for Sales in the United States Time Series.

Panel A



Panel B



Panel C .

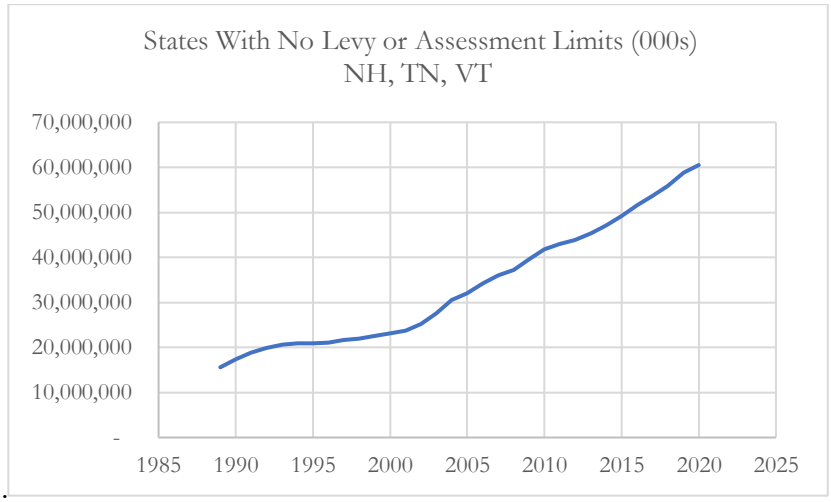
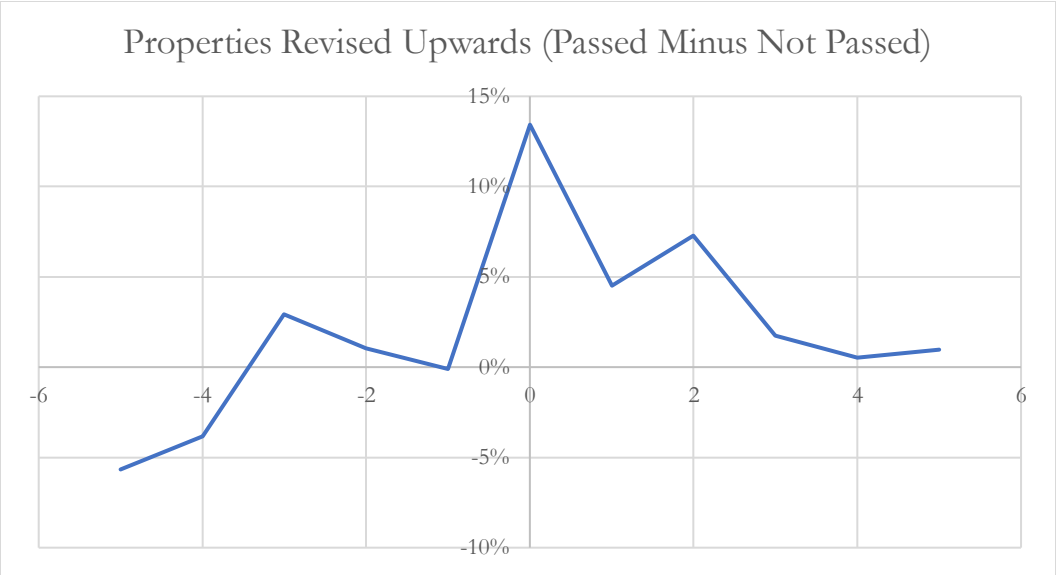


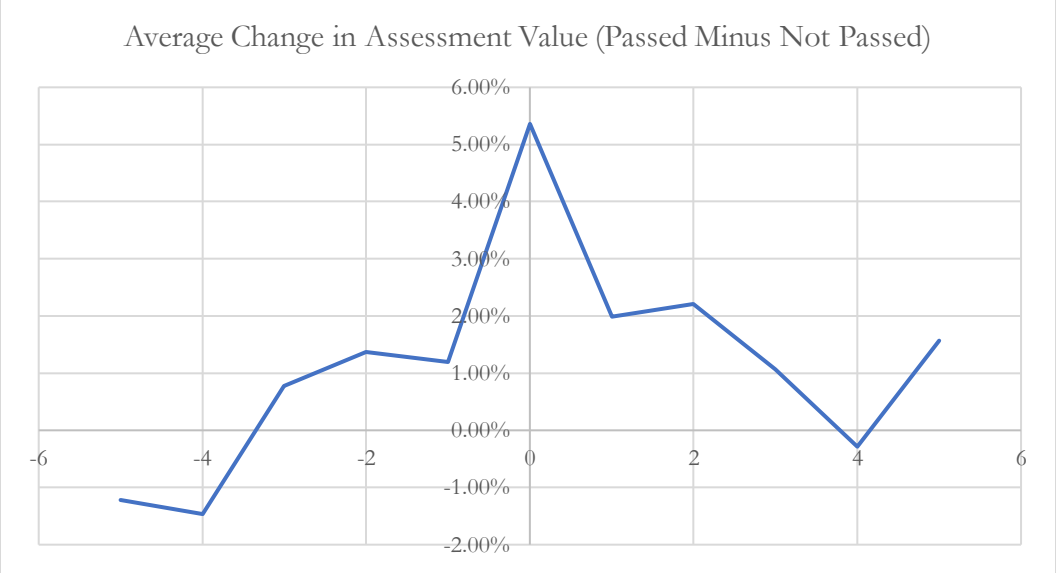
Figure 3. Decomposing the dollar of property tax revenue into (Panel A) assessment and non-assessment limited states, (Panel B) levy and non-levy limited states, and (Panel C) states with the fewest restrictions on property tax revenue limits.

Figure 4. Event Time Change in Assessment Levels Around Passing a School District Referendum

Panel A. Fraction of Zip Code Properties Revised Upwards



Panel B. Average Change in Assessment Value



The figures plot the event time characteristics around passing a school district referendum in Illinois between 2006 and 2015. Panel A is the average fraction of single-family residential properties re-assessed upward at the zip code level for districts passing a referendum minus that of districts rejecting the referendum. Panel B is the average growth in the assessment values of single-family residential properties at the zip code level for districts passing a referendum minus that of districts rejecting the referendum.

Table 1. Summary Statistics

	Local Government Level					
	10th P.	Median	90th P.	Mean	Std.	N
% Diff Between Sales and Assessed Value	-13.3%	16.3%	97.1%	29.0%	48.3%	6,559
% of Properties Over Assessed	4.36%	16.5%	58.9%	24.8%	22.0%	6,559
Deficit	-5.73%	1.86 %	11.1%	2.38%	6.61%	6,559
Population	101,941	274,339	977,6950	493,325	771,318	6,559
Property Tax as % of Total Tax	58.2%	79.0%	98.06%	78.3%	15.4%	6,559

Panel A.

	Property Transactions					
	10th P.	Median	90th P.	Mean	Std.	N
Sales Price	$43,500	$165,000	$516,000	$276,083	$498,998	119,425,837
Transaction Year	1998	2008	2018	2008	7.5	119,425,837
Sellers Per Transaction	1	1	2	1.54	0.90	119,005,541
Buyer Per Transaction	1	1	2	1.47	0.68	118,975,012

Panel B.

	Property Characteristics					
	10th P.	Median	90th P.	Mean	Std.	N
Assessment Value (Contemporary)	$136,980	$282,635	$676,000	$369,146	$360,153	16,895,963
Assessment Year	2018	2019	2020	2019	0.62	16,895,963
YoY % Change in Assessed Value	0%	2.00%	13.49%	5.43%	24.25%	16,895,963
Tax Amount	$2,059	$4,655	$10,852	$6,140	$8,321	16,895,963
YoY % Change in Tax Amount	-1.74 %	2.31 %	12.91%	7.24%	54.28%	16,895,963
Year Built	1940	1978	2006	1975	25	16,440,858
Square Footage	1,004	1,681	3,080	2,047	3,189	15,729,806

Panel C.

	Referendums					
	10th P.	Median	90th P.	Mean	Std.	N
Passed Indicator	0	1	1	0.57	0.50	497
Referendum Year	2006	2008	2014	2009	3	497
Dollar Amount	$400,000	$8,000,000	$54,900,000	$22,500,000	$39,200,000	497

Panel D.

This table summarizes the main variables used in the study. Panel A contains county-year characteristics. *% Diff Between Sales and Assessed Value* is the average deviation between sales and assessed values at the county-year level for the transacted properties. *% Sold 10% Below the Assessed Value* is the percent of transacted properties that are sold at least 10% below their assessed values in the county-year. *Non-Property Tax Decline* is an indicator for a nominal decline in the aggregate non-property tax revenues collected by all local governments within a county. *Log Population* is the natural log of the last available census population survey. *Number of Tax Authorities* is the number of different independent local governments operating in a county. *Assessment Capped* is whether there is a limit to assessment prices increases in the state of a county. The data on property transactions and assessment values are provided using Zillow ZTRAX. The sample period is from 2000 to 2020. Panel B contains the summary statistics on the transaction characteristics in the historic transaction roll. Panel C contains characteristics of individual properties as derived from the contemporaneous assessment data. *Sales Prices* are the transaction prices of an individual sale. *Assessment Prices* are the observed residential property assessment values per year. *Over Assessed* is an indicator for whether a property is sold at a 10% discount to the previous year's *Assessment Price*. Panel D summarizes bond referendums in Illinois between 2006 and 2015. *Passed Indicator* represents whether the referendum was passed. Referendum Year is the year of the referendum. *Dollar Amount* is the total value of the bond construction.

Table 2. Average Changes in Assessment Value Against Property Market Returns

	(1)	(2)	(3)	(4)	(5)	(6)
	Value Weighted Average Growth in Assessment Value$_t$					
Market Return$_t$	0.0483***			0.0321***	0.0329***	0.0378***
	(6.341)			(4.036)	(4.042)	(4.482)
Market Return$_{t-1}$		0.121***		0.122***	0.0737***	0.0718***
		(12.69)		(14.09)	(8.117)	(7.471)
Market Return$_{t-2}$			0.142***	0.139***	0.0600***	0.0530***
			(14.77)	(16.60)	(7.565)	(6.416)
Year FE	No	No	No	No	Yes	Yes
County FE	No	No	No	No	No	Yes
Observations	8,221	7,528	6,819	6,813	6,813	6,679
Adjusted R-squared	0.005	0.033	0.045	0.080	0.175	0.243

This table regresses changes in property assessment values against property market returns. *The Value Weighted Average Growth in Assessment Value* is aggregated at the county level. *Market Return* are measured using the Zillow US Home Value Index at the county level. This index uses Zillow's proprietary Zestimates, which captures individual home values within 10% of their transaction values 95% of the time at any moment in time. The t-statistics reported in parentheses are clustered yearly. *, **, *** indicates statistical significance at the 90%, 95%, and 99% level respectively.

Table 3. Over-Assessments

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	% Diff Between Sale and Assessed Value				*% Sold 10% Below the Assessed Value*			
Local Government Deficit	-1.009***	-0.937***	-0.477***	-0.301***	0.741***	0.686***	0.161***	0.129***
	(-10.57)	(-9.244)	(-4.137)	(-3.557)	(11.40)	(9.484)	(3.223)	(2.867)
Log Population		0.176**	0.0979***	0.433***		-0.151*	-0.0168***	-0.201***
		(2.195)	(6.392)	(3.406)		(-1.663)	(-2.938)	(-3.033)
Property Tax as % of Tax Revenue		-1.034***	0.356***	-0.657***		0.679***	-0.0563*	0.276***
		(-5.245)	(4.843)	(-4.513)		(4.708)	(-1.878)	(3.668)
County Fixed Effect	No	Yes	No	Yes	No	Yes	No	Yes
Year Fixed Effect	No	No	Yes	Yes	No	No	Yes	Yes
Observations	5,899	5,272	5,306	5,272	5,899	5,272	5,306	5,272
Adjusted R-squared	0.399	0.404	0.267	0.578	0.219	0.229	0.551	0.703

This table regresses the average percentage difference between the sale price of properties and their prior public assessment value against local characteristics. The panel consists of counties-year observations between 2000 and 2020 with at least one thousand properties transactions in the *ZTrax* database. *% Diff Between Sale and Assessed Value* is the average percentage difference between the sale price of homes and their prior assessed value within a county. *% Sold 10% Below the Assessed Value* is the percentage of homes sold for 10% less than their assessed values. The sample of sold homes aggregated at the county-time level consists of those with between $100,000 and $2,000,000 in assessed value. *Local Government Deficit* is the percentage difference between the total expense and total revenue expressed as a percentage of the total revenue over the county. The local governments used for the county level aggregation consist of County, Municipal, Townships, and School Districts. *Log Population* is the natural log of a county's population. *Property Tax as % of Tax Revenue* is total property tax divided by the total observed tax. The t-statistics reported in parentheses are clustered yearly. *, **, *** indicates statistical significance at the 90%, 95%, and 99% level respectively.

Table 4. Reassessment Tendency

	(1)	(2)	(3)	(4)	(5)
	% of Observed Properties Reassessed$_t$				
	All States			Capped States	Non-Capped
Market Return	0.184***	0.215***	0.0719**	0.289***	0.124**
	(6.021)	(5.859)	(2.128)	(5.678)	(2.392)
Market Return$_{t-1}$	0.209***	0.237***	0.0794**	0.262***	0.172***
	(6.509)	(6.139)	(2.412)	(4.804)	(3.170)
Market Return$_{t-2}$	0.0142	0.0344	-0.0333	0.0512	-0.0104
	(0.444)	(0.935)	(-1.070)	(1.054)	(-0.196)
Time FE	No	Yes	Yes	Yes	Yes
County FE	No	No	Yes	No	No
Observations	6,813	6,679	6,679	3,445	3,368
Adjusted R-squared	0.008	0.473	0.485	0.027	0.014

This table regresses the year-county panel of % of observed non-transacted properties that were reassessed against current and lagged market returns. *% of Observed Properties Reassessed* is the percentage of residential properties valued between $100,000 and $2,000,000 whose assessment value changed in each county. *Market Returns* is the yearly percentage change in the average transaction price of properties within the county last year. Columns (1), (2), and (3) conducts the regression across all states. Column (4) conducts the regression on states that explicitly limit changes in a property's assessment value. Column (5) conducts the regression on states with no explicit limits. The t-statistics reported in parentheses are clustered yearly. *, **, *** indicates statistical significance at the 90%, 95%, and 99% level respectively.

Table 5. School Referendums and Assessment Values

	(1)	(2)	(3)	(4)
	% Growth		Reassessed Upward	
Passed Referendum	0.0126**		0.0596***	
	(2.438)		(3.004)	
# of Passed Referendums		0.00493*		0.0410***
		(1.894)		(3.661)
Year FE	Yes	Yes	Yes	Yes
Observations	8,461,562	8,461,562	8,461,562	8,461,562
Adjusted R-squared	0.211	0.210	0.312	0.313

This table regresses the assessed property value growth (*% Growth*) and the indicator of upward reassessment (*Reassessed Upward*) on a panel of single-family homes in Illinois between 2006 and 2015. The panel of properties consists of homes located in zip codes of school districts that had initiated but not necessarily a referendum ballot measure. *Passed Referendum* indicates that at least one referendum was passed in the past 3 years including the contemporaneous one. *# of Passed Referendums* are the number of referendums passed in the same period. The t-statistics reported in parentheses are clustered yearly. *, **, *** indicates statistical significance at the 90%, 95%, and 99% level respectively.

Table 6. School Referendums, Median Transaction Price, and the Number of Transactions

	(1)	(2)	(3)	(4)
	Price Return			
Passed Referendum (3 Yr)	-0.00719			
	(-0.196)			
# of Passed Referendums (3 Yr)		-0.00640		
		(-0.428)		
Passed Referendum (5 Yr)			-0.0290	
			(-0.714)	
# of Passed Referendums (5 Yr)				-0.0150
				(-1.020)
Year FE	Yes	Yes	Yes	Yes
Observations	1,803	1,803	1,803	1,803
Adjusted R-squared	0.008	0.008	0.008	0.008

Panel A.

	(1)	(2)	(3)	(4)
	% Growth in Transactions			
Passed Referendum (3 Yr)	-0.00617			
	(-0.431)			
# of Passed Referendums (3 Yr)		0.000430		
		(0.0563)		
Passed Referendum (5 Yr)			-0.00404	
			(-0.296)	
# of Passed Referendums (5 Yr)				0.000681
				(0.161)
Year FE	Yes	Yes	Yes	Yes
Observations	1,803	1,803	1,803	1,803
Adjusted R-squared	0.008	0.008	0.008	0.008

Panel B.

This table regresses the market conditions in the panel of zip codes from Illinois between 2006 and 2015. The panel of properties consists of the zip code characteristics of school districts that had initiated but not necessarily a referendum ballot measure. *Passed Referendum* indicates that at least one referendum was passed over the past 3 or 5 years including the contemporaneous one. # of *Passed Referendums* is the number of referendums passed in the same period. Panel A regresses the change in the median transaction price (*Price Return*). Panel B regresses the percentage growth in the number of property transactions (% *Transaction Growth*). The t-statistics reported in parentheses are clustered yearly. *, **, *** indicates statistical significance at the 90%, 95%, and 99% level respectively.

Table 7. Assessment Officials and Goodness of Fit

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	% Diff Between Sale and Assessed Value				*% Sold 10% Below the Assessed Value*			
F-Stat		1.99		1.42		2.74		1.64
Probability > F		0.0000		0.0001		0.0000		0.0000
County Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	No	No	Yes	Yes	No	No	Yes	Yes
Official Fixed Effect	No	Yes	No	Yes	No	Yes	No	Yes
Observations	1,342	1,342	1,342	1,342	1,342	1,342	1,342	1,342
Adjusted R-squared	0.408	0.551	0.575	0.645	0.206	0.462	0.687	0.749

This table reports the goodness of fit of regressions using identified officials fixed effects and other fixed effects. *% Diff Between Sale and Assessed Value* is the average percentage difference between the sale price of homes and their prior assessed value within a county. *% Sold 10% Below the Assessed Value* is the percentage of homes sold for 10% less than their assessed values. The sample of sold homes aggregated at the county-time level consists of those with between $100,000 and $2,000,000 in assessed value. The F statistics for the inclusion of officials FE are calculated by first residualizing the left-hand side variable against all other fixed effects, and then regressing these residuals against assessor fixed effect indicators.

Table 8. Assessment Official Properties (Sample Averages)

Panel A. Assessor Primary Address Comparison with Lexis Nexis Neighbors

	% Change in Assessed Value	% Change in Tax Amount	Total Assessed Value
Assessor Properties	2.762%	2.642%	$391,251
Neighbor Properties	3.475%	3.138%	$400,121
Difference	-0.712%	-0.496%	-$8,870.01
T-Stat	(-3.063)	(-2.187)	(-1.071)
N	422	397	422

This panel compares the yearly assessment characteristics of an assessor's primary legal address with that of his Lexis-Nexis defined neighbors. The sample is between 2018 and 2020.

Panel B. Assessor Primary Address Comparison with Residential Properties Within a County

	% Change in Assessed Value	% Change in Tax Amount	Total Assessed Value
Assessor Properties	2.995%	2.926%	$400,726
Neighbor Properties	3.951%	3.465%	$381,245
Difference	-0.955%	-0.539%	$19,481
T-Stat	(-5.769)	(-3.062)	(2.306)
N	603	567	603

This panel compares the yearly assessment characteristics of an assessor's primary legal address with that of all single-family homes within the same county. The sample is between 2018 and 2020.

Table 9. Assessment Officials (Hedonic Regressions)

	(1)	(2)	(3)	(4)	(5)	(6)
	% Change in Assessed Value		% Change in Tax Amount		Total Assessed Value	
Assessor	-0.0121***	-0.0119***	-0.0169***	-0.0146***	-3,348	-4,270***
	(-5.257)	(-4.546)	(-4.770)	(-4.430)	(-0.415)	(-3.750)
Prior Assessed Value		-6.70e-08***		-3.53e-08**		1.012***
		(-7.740)		(-2.511)		(128.1)
Square Footage		8.71e-05		1.39e-06		-30.64
		(0.939)		(0.00916)		(-1.221)
Other Hedonic Controls	No	Yes	No	Yes	No	Yes
County X Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	16,895,963	15,573,810	16,895,963	15,573,810	16,895,963	15,573,810
Adjusted R-squared	0.183	0.209	0.080	0.093	0.320	0.939

This table regresses indicators of a property owned (including non-primary homes) by local assessment official on growth in assessed property value (*% Change in Assessed Value*), yearly changes in tax value (*% Change in Tax Value*), and dollar levels of total assessed property value (*Total Assessed Value*). Other hedonic controls are property level characteristics- the number of rooms, bathrooms, and effective year built. The t-statistics reported in parentheses are clustered by county x year. *, **, *** indicates statistical significance at the 90%, 95%, and 99% level respectively.

Table 10. Assessor Administration

	(1)	(2)	(3)	(4)	(5)	(6)
	% Change in Assessed Value		% Change in Tax Value		Total Assessed Value	
Within County	-0.0128***	-0.0123***	-0.0172***	-0.0147***	-2,565	-4,353***
	(-5.596)	(-4.676)	(-4.877)	(-4.481)	(-0.316)	(-3.829)
Outside County	0.00244	0.00653	-0.0389*	-0.0342*	82,726**	3,248
	(0.133)	(0.353)	(-1.857)	(-1.776)	(2.511)	(0.568)
Prior Assessed Value		-6.70e-08***		-3.53e-08**		1.012***
		(-7.740)		(-2.511)		(128.1)
Square Footage		8.71e-05		1.39e-06		-30.64
		(0.939)		(0.00918)		(-1.221)
Other Hedonic Controls	No	Yes	No	Yes	No	Yes
County X Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	16,895,963	15,573,810	16,895,963	15,573,810	16,895,963	15,573,810
Adjusted R-squared	0.183	0.209	0.080	0.093	0.320	0.939

This table regresses indicators of a property owned (including non-primary homes) by local assessment official on growth in assessed property value (% Change in Assessed Value), yearly changes in tax value (% Change in Tax Value), and dollar levels of total assessed property value (Total Assessed Value). The table splits the indicator of property owned by an assessor into *Within County* and *Outside County* variables. *Within County* indicates that the property is located in the same county as the assessor's jurisdiction. *Outside County* indicates all other assessor properties. Other hedonic controls are property level characteristics- the number of rooms, bathrooms, and effective year built. The t-statistics reported in parentheses are clustered by county x year. *, **, *** indicates statistical significance at the 90%, 95%, and 99% level respectively.

Table 11. Assessor Undervaluation and the Assessment Gap.

	(1)	(2)	(3)
	% Diff Between Sale and Assessed Value		
Assessor Property Undervaluation	-2.239**	-9.238***	-8.298***
	(2.095)	(3.159)	(2.978)
County FE	No	Yes	Yes
Year FE	No	No	Yes
Observations	135	102	102
Adjusted R-squared	0.010	0.875	0.881

This table correlates the degree to which assessor properties under appreciate their peers with county level overassessment measure. *Assessor Property Undervaluation* is the growth difference between an assessor's own home and his neighboring properties (Higher means lower growth). *% Diff Between Sale and Assessed Value* is the average percentage difference between the sale price of homes and their prior assessed value within a county (Lower means homes are sold for lower than assessed values). The t-statistics reported in parentheses are clustered yearly. *, **, *** indicates statistical significance at the 90%, 95%, and 99% level respectively.

Appendix A.

Example of referendums in Illinois.

State	County	Area	Year	Month	Passed	Dollar Amount	Zip Code
Illinois	DeKalb, Kane	Central CUSD 301	2006	3	1	34,000,000	62054
Illinois	St. Clair	Central School District 104	2006	3	1	4,500,000	62269
Illinois	Multiple	Centralia City Schools District 135	2006	3	0	3,400,000	62872
Illinois	Champaign	Champaign CUSD 4	2006	3	0	65,940,000	61821
Illinois	Lake	Fox Lake Grade School District 114	2006	3	1	3,750,000	60020
Illinois	Lake	Fremont School District 79	2006	3	1	22,000,000	60060
Illinois	Tazewell	Tremont CUSD 702	2006	3	1	9,500,000	61568
Illinois	Madison	Triad CUSD 2	2006	3	1	44,136,283	62294
Illinois	Multiple	Barrington CUSD 220	2006	3	0	107,100,000	62054
Illinois	Madison	Edwardsville CUSD 7	2006	3	0	45,800,000	62025
Illinois	Cook, DuPage	Elmhurst CUSD 205	2006	3	1	41,000,000	60189
Illinois	Will	Fairmont School District	2006	3	0	1,650,000	60441

This appendix table contains a sample of 12 referendums that were voted on in Illinois in 2006.