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De jure and *de facto* property tax rates in large US cities

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Abstract

Scholars and policymakers have long been interested in measuring the relative property tax burden across cities. Most existing estimates rely on statutory rates and other official metrics to compute the prevailing tax rate in a city. Yet, a crucial feature of the property tax is that it is levied on estimated values rather than transaction prices. Without accounting for the quality of the estimated values it is impossible to know the effective tax rate. In this paper, I compute effective tax rates from micro data on property sales, aligning the tax due in the sale year with the sale price. I compare the observed effective tax rates with the best available estimates based on official sources. Relative to prior estimates, I find that effective tax rates are (a) generally lower, due to lags in estimated values; (b) widely varying even within the same city, due to errors in estimated values; and (c) usually regressive, due to biases in estimated values. I discuss the implications of these findings for taxpayers and policymakers.

Key Takeaways

- Effective tax rates are lower than nominal tax rates in most cities. The most likely reasons are that market values for tax purposes are estimated with a lag and that caps on assessment increases keep taxable values below market values.
- There is tremendous variation in effective property tax rates within the same jurisdiction, such that often some owners pay substantially more or substantially less than the prevailing rate. This variation means that comparisons across jurisdictions in terms of their average tax rates should be taken with a grain of salt.

- Within-jurisdiction variation in rates is not entirely random. In most cities, lower-priced homes pay higher effective property tax rates than higher-priced homes.

The property tax is the fiscal bedrock of US local government. The roughly $600 million collected in property taxes each year pays for vital local services such as education, public safety, and sanitation. It also represents the single greatest tax burden local governments place on their residents, and it accounts for the largest cost of home ownership aside from the mortgage itself (Begley & Palim, 2023; Siniavskaia, 2021). Because there is significant variation in property tax reliance across states and localities, scholars, public officials, and the general public have long been interested in understanding how relative tax burdens vary from jurisdiction to jurisdiction.

A central challenge in comparing property taxes across cities is that it is a tax on estimated values (e.g., Ihlanfeldt, 2013; Payton, 2012). That is, the nominal tax rate in a jurisdiction is applied to estimated market values of properties. Because of random and non-random errors in estimated values, there will typically be many different effective tax rates in a jurisdiction at any point in time. Moreover, because of the potential for systematic biases in estimated values, there is no guarantee that the effective tax rate is equal to the nominal rate even on average. This means that there will not typically be "a" tax rate in a jurisdiction, but rather a distribution of effective rates. As a result, scholars may be interested in both the distribution and central tendency of tax rates. It is impossible to know either without knowing something about how the estimated values used for tax purposes relate to actual market values in a jurisdiction. Unfortunately, few if any existing comparisons of property tax rates across jurisdictions take these considerations into account.

In this paper, I estimate the distribution and central tendency of effective tax rates for residential property in the largest US cities, based on sale prices rather than estimated market values. I compare these rates with the best available estimates of property tax rates based on estimated property values and official tax rates for the same cities, from the Lincoln Institute's, *50-State Property Tax Comparison Study* (Lincoln Institute of Land Policy and Minnesota Center for Fiscal Excellence, 2022).

The key findings are as follows. First, effective tax rates are lower than nominal tax rates in most cities. The most likely reasons are that market values for tax purposes are estimated with a lag and that caps on assessment increases keep taxable values below market values. Second, there is tremendous variation in effective property tax rates within the same jurisdiction, such that often some owners pay substantially more or substantially less than the prevailing rate. This variation means that comparisons across jurisdictions in terms of their average tax rates should be taken with a grain of salt. Third, within-jurisdiction variation in rates is not entirely random. In most cities, lower-priced homes pay higher effective property tax rates than higher-priced homes.

FOUNDATIONS OF EFFECTIVE PROPERTY TAX RATES

This section reviews the main features of the property tax, as administered in practice, that may lead to divergence between *de jure* and *de facto* tax rates.[1] The premise of the property tax is that it is applied to a property's market value. Yet there are many reasons why, in practice, the value of the property subject to taxation may not equal its market value.

[1]See Dornfest and Bennett (2012) for a primer.

To understand why the property tax rate is complicated to measure, consider an individual property's tax bill.

$$R = t\,(f\,((MV + e) - x) - c \tag{1}$$

where R is the tax due. The statutory tax rate is t, f is the jurisdiction's statutory assessment ratio, x represents the value of exemptions, such as the homestead exemption, which reduce the property's value subject to taxation, and c represents tax credits and abatements, which are deducted from the tax bill. MV represents the property's market value, which must be estimated by the local assessor. This estimate is subject to error, e. Note that (1) is a simplification that does not account for tax and assessment limitations (Haveman & Sexton, 2008), taxes levied by multiple overlapping jurisdictions (Berry, 2010), and other common features of real-world tax systems. I will consider some of these features below. Equation (1) also ignores the issue of property tax capitalization (Sirmans et al., 2008), which is beyond the scope of this paper.

The formulation in (1) allows us to define some key concepts that will be useful in the analyses that follow. There are several notions of *property value* for the purposes of taxation. The assessor's estimated market value is $EV = MV + e$; the assessed value of a property is $AV = f * EV$; and the taxable value of a property is $TV = AV - x$. The tax bill can be reformulated as $R = t * TV - c$.

Based on the above, there are several notions of the tax rate for an individual property. The effective tax rate, which I will also refer to as the *de facto* tax rate, is $ETR = R/MV$. If the assessor's market value estimate was perfectly accurate ($e = 0$), the jurisdiction did not use fractional assessment ($f = 1$), and there were no exemptions or abatements, then the statutory tax rate would equal the effective tax rate for every property in the jurisdiction.

Of course, all assessment models have errors (e.g., Krause et al., 2020), and most jurisdictions do in fact offer some kinds of exemptions or abatements (e.g., Dornfest et al., 2019). Therefore, it is clear from Equation (1) that the tax rate will not be equal for all taxpayers within a jurisdiction. I will call the variation in effective tax rates due to errors in estimated values *assessment-based* variation. Taxpayers' whose properties are over-valued by the assessor will be, as a result, over-taxed; vice versa for those whose properties are under-valued.

In addition to assessment-based variation, local policies can create variation in effective tax rates within a jurisdiction. Perhaps the most prevalent such policies are exemptions and abatements, which are not equally available to all taxpayers. Common examples include homestead, veterans, and senior exemptions, which are only available to owners who meet the ascribed criteria (Dornfest et al., 2019).

The opportunity for owners to appeal assessed values and seek a reduction generates variation in post-appeal assessment ratios and effective tax rates. While all owners have a right to appeal, prior studies suggest that minorities and owners of lower-priced properties are less likely to appeal, even though they are more likely to have been over-assessed (Avenancio-León & Howard, 2022a; Ross, 2017). While the precise reasons for this discrepancy in the propensity to appeal are not fully understood, potential explanations are that these owners are less informed about the intricacies of the tax system, less able to afford the appeal process, and have less money at stake in a reduction than owners of high priced properties.

Assessment and tax increase limits represent another important source of policy-based variation in effective tax rates. While the details vary significantly across states, many have imposed some kind of limit on the rate of increase in assessed values, property taxes, or both (Haveman & Sexton, 2008). When actual market values increase faster than the allowed rate of increase, effective tax rates may fall below t. To the extent that the rate of growth in market values varies within a jurisdiction, parcel-specific assessment and tax increase limits can introduce inequities in effective tax rates between fast- and slow-growing neighborhoods within a jurisdiction (Berry, 2021), although there is also evidence that such caps can reduce racial biases

in assessments (Avenancio-León & Howard, 2022b). The influence of assessment and tax increases is complex and not reflected in Equation (1), but will be considered below.

With the prevalence of both policy-based and assessment-based variation, scholars and other observers are naturally interested in characterizing the central tendency of the tax rate distribution in a jurisdiction, as well as its variance. This is more easily said than done.

The most satisfying expression of the effective tax rate for a property is *R*/*MV*, the tax due as a share of the property's market value. However, *MV* is not generally observable, and certainly not for all properties in a jurisdiction, which is why it must be estimated by assessors in the first place.

Given the challenges of observing *MV*, scholars and analysts have used several alternative measures of the property tax rate, with the choice often based on data availability. In principle, any of the measures of value described above (*EV*, *TV*, *AV*) could be used in place of *MV* as the denominator to compute some version of a tax rate, each with a slightly different interpretation. One common measure is *R*/*EV*, or the tax bill as a share of the assessor-estimated market value. While the estimated values may be subject to error for any particular property, if assessing errors are random they will cancel out in the aggregation. However, there are reasons to be concerned that estimated value errors are non-random. In particular, there are reasons to be concerned that estimated market values will lag local prices due to infrequent reassessment and temporal lags in the data used for estimation.

Estimates of market value must be kept up to date as local housing markets change. Yet only 11 states require assessors to reassess properties every year; in some states, reassessment is required only every three or five years; in other states, there is no required frequency (Higginbottom, 2010). When assessments are infrequent, estimated market values will tend to be too low. Moreover, when there is heterogeneity in price appreciation within a jurisdiction, infrequent assessment can also be a source of inequity in assessment ratios (e.g., Hou et al., 2021).

Even when reassessment is done frequently, assessors must unavoidably rely on lagging data to estimate market values. The assessed values in place in any particular year were estimated in the prior year, if not earlier. A standard practice is for assessors to use the previous three or five years of data in their statistical models (IAAO, 2013). Even in a best-case scenario, the estimated market value in place in 2022, for example, would have been produced in 2021 based on data from 2017 through 2020. For jurisdictions that reassess less frequently, the lag between the data used in estimation and current market conditions will be even greater. As such, even if estimated market values were perfectly accurate when produced, they will always be at least somewhat out of date with respect to market conditions at the time the tax is collected.

When assessor-estimated market values lag market prices, this can lead estimates of the property tax rate based on *R/EV* to be too low in appreciating markets or too high in depreciating markets. In either case, there is no guarantee that aggregating *R/EV* will recover even the central tendency of the distribution.

Given these limitations of assessor-estimated market values, the standard method for evaluating assessments and tax rates is a sales ratio study (IAAO, 2013). In this approach, the sale price of a home is taken as the measure of its market value, the sales ratio is *EV/SP*, and the effective tax rate can be measured as *R/SP*, the tax bill in a given year as a share of the home's sale price in the same year. Although a relatively small proportion of homes sells in a particular year, there will often be enough sales to characterize the distribution of sales ratios and tax rates, especially in larger jurisdictions. While sale prices may be a noisy measure of market value in any particular transaction, the noise is random and will cancel out in aggregation (PlaHovinsak & Vicentini, 2016). Given the complexities of local property tax systems, this approach provides a simple, direct answer to the central question: what is the tax burden on a typical property?

COMPARING *DE FACTO* AND *DE JURE* TAX RATES

There have been many efforts to estimate the prevailing property tax rates in cities and other local jurisdictions (see Bell & Kirschner, 2009). Arguably the leading source for such information is the Lincoln Institute's annual "50-State Property Tax Comparison Study" (hereafter Lincoln Study), which is widely cited in popular media, academic, and governmental circles (Lincoln Institute of Land Policy and Minnesota Center for Fiscal Excellence, 2022). The Lincoln Study relies on official statements from cities and states regarding statutory local tax rates, assessment ratios, and common exemptions and credits. The study applies this information to the median property value in the jurisdiction, according to the American Community Survey (ACS), to produce estimates of the property tax rate for typical properties in a jurisdiction. I refer to these estimates as the *de jure* or nominal tax rate.

The Lincoln Study includes data on the 50 largest cities in the United States, plus the District of Columbia, as well as the largest city in each state if that city is not one of the 50 largest. The property tax systems of Chicago and New York City are considered to be sufficiently different from the rest of their respective states that one additional city is included in Illinois and New York. In total, the Lincoln Study assembles data on 74 large cities.

To measure *de facto* tax rates, I rely on tax and sale price data for homes that were sold in each city. The data are provided by First American Data & Analytics, which collects data from local assessors, recorders of deeds, and other administrative offices. I collect the sale transactions classified as residential in each of the 74 cities in the Lincoln Study. I calculated the tax rate for each property as the tax due in the sale year as a proportion of the sale price. I refer to that quantity, *R/SP*, as the effective tax rate or the *de facto* tax rate. Starting with the First American data set that includes all sale transactions, I removed any cases where the tax due or sale price was zero, and then discarded the top and bottom two percent of effective tax rates in each city to mitigate against the influence of outliers in the analyses that follow.

In the remainder of this section, I compare various aspects of the *de facto* and *de jure* tax rates in the 74 large cities included in the Lincoln Study. For most cities, I matched the data for 2021, which was the most recent year with full coverage from First American. However, the following cities utilize 2022 data: Philadelphia, PA; Seattle, WA; Las Vegas, NV; Boston, MA; Minneapolis, MN; Buffalo, NY; Manchester, NH. Chicago, IL uses 2020 data.

Median Property Tax Rates

Columns 1 and 2 of Table 1 show the nominal tax rate for the median home, as reported in the Lincoln Study, and the effective tax rate for the median-priced sold home, based on transactions reported in First American. The Lincoln Study computes the tax rate on the median property by applying the statutory tax rate, statutory assessment ratio, published sales ratio, and exemptions and credits that are claimed by a majority of properties in the jurisdiction to the median property value reported in the ACS. For comparison, I computed the median effective tax rate among the properties that sold in the same city, according to the First American data.

Figure 1 presents a scatter plot of the nominal and effective tax rates. Each dot represents one of the 74 study cities. The dashed line in the figure is the line of equality between the x and y axes, meaning that a city where the nominal and effective tax rates are equal would fall on the line. A city where the effective tax rate is higher than the nominal tax rate would lie above the line, while a city where the effective tax rate is lower would lie below the line. The figure shows strong agreement between the two sources regarding the rank ordering to city property rates. The Spearman rank correlation between the two measures is 0.81 and highly significant statistically.

TABLE 1 De facto and de jure tax rates.

City, state	De jure tax rate (median)	De facto tax rate (median)	De jure tax rate $150 K	De jure tax rate $300 K	De facto tax rate $120K–$180 K	De facto tax rate $270K–$330 K
Albuquerque, NM	1.28%	0.95%	1.26%	1.29%	1.10%	0.92%
Anchorage, AK	1.32%	1.39%	1.28%	1.30%	1.59%	1.43%
Arlington, TX	2.29%	1.78%	2.21%	2.32%	2.26%	1.71%
Atlanta, GA	0.90%	1.12%	0.25%	0.78%	1.37%	1.00%
Aurora, IL	3.11%	2.34%	2.99%	3.18%	2.23%	2.38%
Austin, TX	1.82%	1.43%	1.70%	1.80%	2.66%	1.75%
Bakersfield, CA	1.17%	1.06%	1.14%	1.17%	1.04%	1.06%
Baltimore, MD	2.22%	2.24%	2.22%	2.22%	2.14%	2.26%
Billings, MT	0.88%	0.86%	0.88%	0.88%	1.13%	0.84%
Birmingham, AL	0.67%	0.76%	0.69%	0.70%	0.65%	0.63%
Boise City, ID	0.64%	0.66%	0.52%	0.57%	1.51%	0.75%
Boston, MA	0.51%	0.69%	0.10%	0.10%	0.25%	0.85%
Bridgeport, CT	2.26%	2.29%	2.26%	2.26%	2.31%	2.28%
Buffalo, NY	1.43%	0.37%	1.43%	1.43%	0.31%	0.35%
Burlington, VT	1.62%	1.85%	1.94%	1.63%	2.71%	1.89%
Charleston, SC	0.49%	0.46%	0.49%	0.49%	0.85%	0.47%
Charleston, WV	0.59%	0.81%	0.59%	0.59%	0.79%	0.71%
Charlotte, NC	0.85%	0.67%	0.85%	0.85%	0.64%	0.64%
Cheyenne, WY	0.65%	0.57%	0.65%	0.65%	0.83%	0.57%
Chicago, IL	1.57%	1.54%	1.35%	1.58%	1.47%	1.46%
Colorado Springs, CO	0.47%	0.34%	0.47%	0.47%	0.35%	0.33%
Columbus, OH	1.66%	1.33%	1.66%	1.66%	1.19%	1.42%
Dallas, TX	2.12%	1.79%	2.04%	2.14%	1.97%	1.75%
Denver, CO	0.53%	0.46%	0.53%	0.53%	0.48%	0.48%
Des Moines, IA	2.26%	1.88%	2.26%	2.33%	1.86%	1.87%
Detroit, MI	3.27%	1.67%	3.27%	3.27%	1.07%	0.44%
El Paso, TX	2.60%	2.35%	2.61%	2.75%	2.51%	2.15%
Fargo, ND	1.19%	1.30%	1.19%	1.19%	1.35%	1.28%
Fort Worth, TX	2.32%	1.69%	2.24%	2.35%	1.88%	1.69%
Fresno, CA	1.23%	0.82%	1.21%	1.24%	0.73%	0.76%
Houston, TX	1.69%	1.38%	1.64%	1.73%	1.35%	1.24%
Indianapolis city, IN	1.15%	0.90%	1.14%	1.17%	0.95%	0.87%

TABLE 1 (Continued)

City, state	De jure tax rate (median)	De facto tax rate (median)	De jure tax rate $150 K	De jure tax rate $300 K	De facto tax rate $120K–$180 K	De facto tax rate $270K–$330 K
Jacksonville, FL	1.27%	0.97%	1.13%	1.36%	1.13%	0.85%
Kansas City, MO	1.32%	1.09%	1.32%	1.32%	1.10%	1.09%
Las Vegas, NV	1.13%	0.31%	1.13%	1.13%	0.23%	0.28%
Little Rock, AR	1.12%	0.95%	1.08%	1.20%	0.86%	0.93%
Long Beach, CA	1.18%	0.79%	1.14%	1.16%	0.86%	0.81%
Los Angeles, CA	1.16%	0.75%	1.12%	1.15%	0.60%	0.82%
Louisville, KY	1.33%	0.92%	1.33%	1.33%	0.89%	0.92%
Manchester, NH	1.30%	1.51%	1.30%	1.30%	1.93%	1.50%
Memphis, TN	1.69%	1.11%	1.69%	1.69%	1.05%	1.18%
Mesa, AZ	0.84%	0.39%	0.84%	0.84%	0.39%	0.37%
Miami, FL	1.64%	1.43%	1.30%	1.58%	1.52%	1.49%
Milwaukee, WI	2.48%	1.98%	2.48%	2.57%	1.89%	1.98%
Minneapolis, MN	1.24%	1.22%	1.09%	1.24%	1.22%	1.17%
Nashville, TN	0.82%	0.65%	0.82%	0.82%	0.74%	0.65%
New Orleans, LA	1.00%	0.97%	0.74%	1.07%	0.93%	0.93%
New York, NY	1.20%	0.90%	1.20%	1.20%	1.28%	1.09%
Newark, NJ	3.23%	1.70%	3.23%	3.23%	2.77%	1.78%
Oakland, CA	1.36%	0.96%	1.31%	1.34%	2.30%	1.11%
Oklahoma City, OK	1.23%	1.07%	1.22%	1.26%	1.04%	1.09%
Omaha, NE	1.99%	1.63%	1.99%	1.99%	1.65%	1.60%
Philadelphia, PA	0.98%	0.78%	0.89%	1.10%	0.77%	0.75%
Phoenix, AZ	1.20%	0.40%	1.20%	1.20%	0.28%	0.37%
Portland, ME	1.21%	1.15%	1.08%	1.19%	1.77%	1.25%
Portland, OR	2.62%	1.08%	2.62%	2.62%	1.54%	1.30%
Providence, RI	1.25%	1.41%	1.25%	1.25%	1.83%	1.39%
Raleigh, NC	0.93%	0.74%	0.93%	0.93%	0.78%	0.72%
Sacramento, CA	1.10%	0.82%	1.07%	1.09%	0.75%	0.74%
Salt Lake City, UT	0.64%	0.50%	0.64%	0.64%	1.00%	0.55%
San Antonio, TX	2.54%	1.95%	2.49%	2.62%	2.11%	1.86%
San Diego, CA	1.32%	0.77%	1.27%	1.30%	0.88%	0.81%
San Francisco, CA	1.18%	0.90%	1.13%	1.16%	1.92%	1.32%
San Jose, CA	1.27%	0.80%	1.21%	1.24%	2.06%	2.28%

(Continues)

TABLE 1 (Continued)

City, state	De jure tax rate (median)	De facto tax rate (median)	De jure tax rate $150 K	De jure tax rate $300 K	De facto tax rate $120K–$180 K	De facto tax rate $270K–$330 K
Seattle, WA	0.81%	0.71%	0.81%	0.81%	1.86%	0.81%
Sioux Falls, SD	1.52%	1.20%	1.52%	1.52%	1.34%	1.17%
Tucson, AZ	1.07%	0.70%	1.07%	1.07%	0.62%	0.73%
Tulsa, OK	1.37%	1.08%	1.37%	1.41%	1.00%	1.08%
Urban Honolulu, HI	0.30%	0.31%	0.20%	0.23%	0.79%	0.33%
Virginia Beach, VA	0.89%	0.81%	0.89%	0.89%	0.84%	0.80%
Washington, DC	0.74%	0.65%	0.40%	0.62%	0.53%	0.68%
Wichita, KS	1.20%	0.95%	1.20%	1.21%	0.92%	0.96%
Wilmington, DE	1.37%	1.17%	1.37%	1.37%	0.95%	1.02%

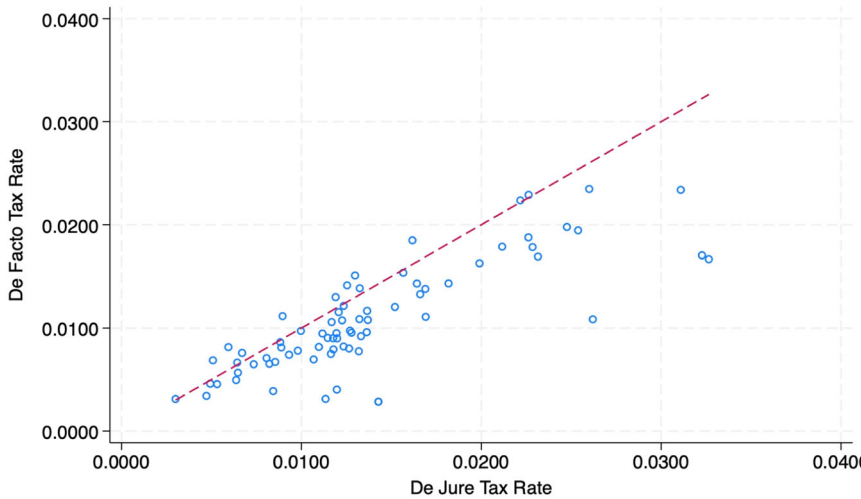

FIGURE 1 De facto and de jure residential property tax rates. Notes: The De Jure tax rate is the rate reported in the Lincoln Study (2022). The De Facto rate is computed as the ratio of the tax due to the property sale price. Each dot is one city. The dashed line is the line of equality between the x and y axes.

The two sources diverge as to the level of property taxes, however. Indeed, we can reject equality between de facto and de jure tax rates in all cities except Baltimore.[2] As evident in Figure 1, the effective tax rate is typically lower than the nominal tax rate. In fact, this is the case for 61 out of the 74 cities. Furthermore, the difference between the two can be quite substantial. Across cities, the average nominal tax rate is 1.4 percent, while the average effective tax rate is 1.1. In a handful of cities, the de jure tax rate is more than double the de facto tax rate: Buffalo, Las Vegas, Phoenix, Portland, and Mesa. For the few cities where the effective tax rate is higher

[2]I constructed the 95 percent confidence interval of the median *de facto* tax rate in each city. The *de jure* tax rate was outside that confidence interval in all cities except Baltimore.

than the nominal rate, the gap is smaller on average. In these cities, the average nominal tax rate is 1.14% while the average effective tax rate is 1.25%.

There are several possible explanations as to why *de facto* tax rates may lie below *de jure* tax rates in most cities, related to assessment practices that keep assessed values systematically lower than market values. If the assessed value of a property is lower than its market value (sale price), then the property will pay a lower effective tax rate. For example, a $250,000 home located in a city with a 1.5 percent tax rate should pay $3750 in taxes. However, if the home were assessed at only 90% of its value ($225,000), it would pay only $3375 in taxes, which is only 1.35 percent of its market value. Such a result could arise when assessed values lag market values due to data lags or lags in reassessment. Another possibility is that assessment increase caps prevent assessed values from keeping up with market values when the market is appreciating at a faster rate than the cap allows. In addition to explanations related to assessment practices, it is also possible that data issues lead to the apparent discrepancy between *de facto* and *de jure* tax rates. I will consider each of these possibilities in turn.

To explore the impact of reassessment frequency, I utilize data from Higginbottom (2010), who documents the reassessment requirements in each state. Eleven states require annual reassessment. The average ratio between *de facto* and *de jure* tax rates is actually higher for cities in states where annual reassessment is required, 1.53 versus 1.37, respectively. However, the difference between the two groups of states is not statistically significant. Moreover, a casual inspection of the city data reveals that an annual assessment is no guarantee of accuracy. For instance, Detroit and Las Vegas are among the cities with the largest gaps in nominal versus effective tax rates, yet both conduct annual reassessment. However, given the wide variety of assessment practices even among jurisdictions in the same state, further investigation into actual reassessment frequency is warranted.

To evaluate the role of assessment limits in explaining the gap between *de facto* and *de jure* tax rates, I turn to an additional set of estimates from the Lincoln Study, which are meant to account for the effects of assessment limits. For each city, they apply the assessment limit (if any) to a home with the average duration of tenure, to arrive at the implied cap on the value. They then apply the statutory tax rate to the implied capped value.[3] I will refer to this quantity as the *capped nominal tax rate*. Figure 2 shows a scatterplot of the capped nominal tax rate against the effective tax rate. In 50 cities, the nominal rate is unaffected by assessment limits. In 24, capped nominal rates are lower after accounting for assessment limits. The average capped nominal tax rate is 1.24%, versus the uncapped nominal rate of 1.38%. In these 24 cities, the average ratio of capped nominal rates to effective rates is 1.01, relative to a ratio of nominal to effective rates of 1.35 in the 50 other cities. So assessment limits do explain part of the gap between nominal and effective tax rates in some cities. However, assessment limits cannot explain the discrepancy between nominal and effective tax rates in the majority of cities.

The observed discrepancy between *de facto* and *de jure* tax rates is somewhat surprising, given that the Lincoln Study adjusts for officially stated sales ratios, which are meant to capture the ratio of estimated market values to sale prices in each city. If estimated market values lag sale prices, then, in principle, accounting for the sales ratio should correct for it. However, there are two problems with this approach in practice. First, often the published sales ratios were computed at the same time and from the same data used to estimate market values (IAAO, 2013), meaning that they will also be out of date even if they had been accurate at the time they were calculated. Second, officially stated sales ratios are subject to manipulation by the assessing offices. For example, according to the source used in the Lincoln Study (see Lincoln Institute of Land Policy, 2020), Detroit reported an average sales ratio at or near the 50% statutory limit every year between 2010 and 2016, a time when multiple academic studies showed rampant

[3]See the Lincoln Study (Lincoln Institute 2022), pp. 42–44 for details.

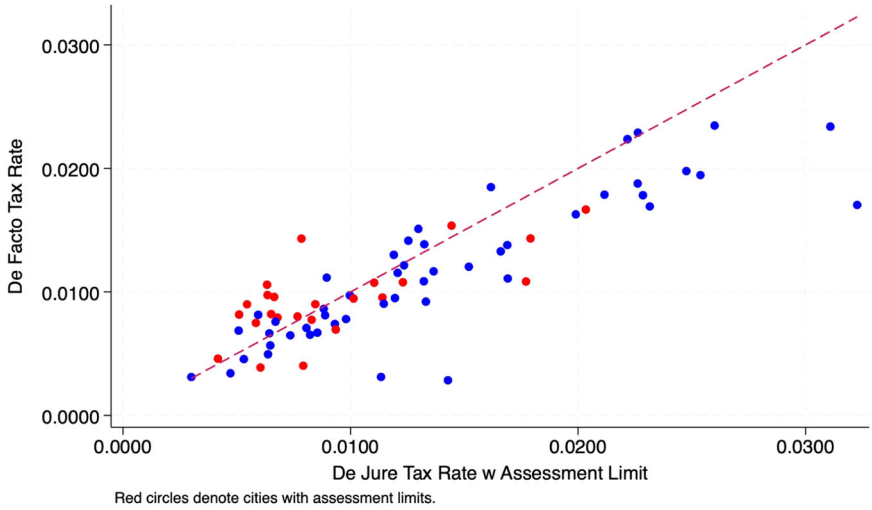

FIGURE 2 De facto and de jure tax rates with assessment limits. Notes: The De Jure tax rate in this figure is adjusted for assessment increase caps, as reported in the Lincoln Study (2022). The red dots represent cities where the cap-adjusted rate is different from the unadjusted rate. The De Facto rate is computed as the ratio of the tax due to the property sale price. Each dot is one city. The dashed line is the line of equality between the x and y axes.

over-assessment in the city, with true sales ratios well above 50% (Atuahene, 2018; Atuahene & Berry, 2019; Hodge et al., 2017). For these reasons, adjustments based on officially reported sales ratios appear to be insufficient to correct the discrepancy between *de facto* and *de jure* tax rates.

In addition to potential explanations related to assessment practices, another possibility is that biases in the data used to calculate *de facto* or *de jure* tax rates, or both, lead to spurious discrepancy between the two. One possibility is that the median value of homes that are sold is not representative of the median for all homes. Since sale prices are used in estimating the *de facto* tax rate, such compositional effects could bias the results. To explore this possibility, I collected data from the American Community Survey (ACS) for each of the cities, which is the source of the median values used in the Lincoln Study. I then compare the ACS median values with the median sale prices from the First American data. The scatter plot in Figure 3 shows the relationship between the two sources. They are very highly correlated ($r = 0.98$, $p = 0.0001$). Median sale prices are about 3 percent higher, on average, than ACS median housing values. This difference is nowhere near as large as the difference in effective tax rates. The ratio of median sale price to median ACS value is 1.03, on average, while the average ratio of de facto to de jure tax rates is 0.80. Moreover, the two ratios are not correlated across cities ($r = 0.0016$, $p = 0.98$). Adjusting median sale prices to equal median ACS values would not resolve the discrepancy in the two tax rates. Thus, the discrepancy does not appear to be the result of biases due to compositional effects in home sales.

Another concern is that there may be biases in the ACS housing values used to calculate the *de jure* tax rates in the Lincoln Study. Most notably, the ACS relies on self-reported housing values, which may suffer from their own inaccuracies. Most, but not all, studies of the accuracy of homeowners' self-reported housing values find that Americans overestimate their property values by anywhere from 1 to 5 percent.[4] However, biases due to overestimation in self-reported home values should lead to estimates of *de jure* tax rates appearing to be lower, not higher, than

[4]See Dreesen and Damen (2023) for a recent review of the literature and analysis finding that Americans overestimate the values of their homes by 1.3 percent, on average.

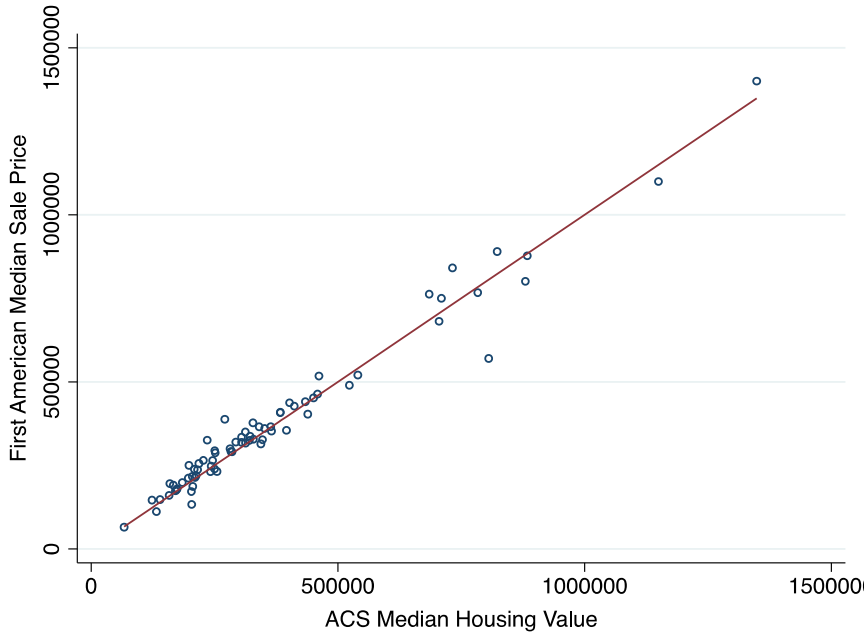

FIGURE 3 ACS median housing values vs. median sale prices. Notes: The ACS median value is the median value of owner-occupied housing reported in the American Community Survey. The First American median value is the median sale price of a home in the First American data set, following data cleaning described in the text. Each dot is one city. The dashed line is the line of equality between the x and y axes.

de facto tax rates based on actual sale prices. Thus, while relying on self-reported values may introduce some biases in the Lincoln Studies, those biases are not a viable explanation for the discrepancy between de facto and de jure tax rates documented above.

In summary, *de facto* property tax rates are significantly lower than *de jure* rates in most cities. Parcel-specific assessment caps offer a partial explanation for the observed gap in some cities, but most cities do not have them. Annual reassessment requirements do not appear to meaningfully close the gap between *de facto* and *de jure* tax rates. Compositional effects in home sales and biases in self-reported values do not appear to be large enough or in the right direction to plausibly account for these findings. These facts suggest that some combination of data lags and assessment caps are the important causes of the observed gap between nominal and effective tax rates.

Within-City Variation in Tax Rates

The preceding section compared *de facto* and *de jure* tax rates for median properties. While the principle of uniformity suggests that all properties of the same class within the same jurisdiction should face the same effective tax rate, in practice there is often substantial variation in effective tax rates even within the same city, as explained above.

Table 2 shows several quantiles of the distribution of effective tax rates in each city, as well as a summary measure of spread, the interquartile range (IQR) divided by the median. Figure 4 shows associated box plots. In most cities, there is a substantial range in effective tax rates. In the average city, the 75th percentile tax rate is 1.74 times higher than the 25th percentile tax rate, while the 90th percentile tax rate is 3.58 times higher than the 10th percentile tax rate. There are 14 cities where the 75/25 ratio is at least 2. Detroit stands out as an outlier in variation,

TABLE 2 Distribution of effective tax rates.

City, state	De facto tax rate (10th percentile)	De facto tax rate (25th percentile)	De facto tax rate (median)	De facto tax rate (75th percentile)	De facto tax rate (90th percentile)	Ratio: interquartile range/median
Albuquerque, NM	0.70%	0.81%	0.95%	1.14%	1.38%	0.35
Anchorage, AK	0.88%	1.18%	1.39%	1.61%	1.86%	0.31
Arlington, TX	0.65%	1.34%	1.78%	2.18%	2.60%	0.47
Atlanta, GA	0.43%	0.78%	1.12%	1.47%	1.70%	0.62
Aurora, IL	1.81%	2.11%	2.34%	2.60%	2.87%	0.21
Austin, TX	0.68%	1.10%	1.43%	1.85%	2.31%	0.52
Bakersfield, CA	0.73%	0.90%	1.06%	1.20%	1.36%	0.29
Baltimore, MD	0.75%	1.37%	2.24%	3.35%	4.49%	0.88
Billings, MT	0.65%	0.75%	0.86%	1.01%	1.21%	0.30
Birmingham, AL	0.33%	0.53%	0.76%	1.44%	2.31%	1.19
Boise City, ID	0.38%	0.49%	0.66%	0.92%	1.29%	0.64
Boston, MA	0.27%	0.43%	0.69%	0.93%	1.09%	0.73
Bridgeport, CT	1.81%	2.02%	2.29%	2.60%	2.99%	0.25
Buffalo, NY	0.25%	0.29%	0.37%	0.51%	0.75%	0.61
Burlington, VT	1.18%	1.54%	1.85%	2.14%	2.44%	0.32
Charleston, SC	0.30%	0.37%	0.46%	1.04%	1.37%	1.45
Charleston, WV	0.53%	0.66%	0.81%	1.15%	1.94%	0.60
Charlotte, NC	0.48%	0.58%	0.67%	0.76%	0.84%	0.26
Cheyenne, WY	0.43%	0.50%	0.57%	0.67%	0.80%	0.30
Chicago, IL	0.54%	1.13%	1.54%	1.88%	2.29%	0.49
Colorado Springs, CO	0.27%	0.30%	0.34%	0.41%	0.57%	0.31
Columbus, OH	0.77%	1.06%	1.33%	1.60%	1.83%	0.40
Dallas, TX	0.95%	1.41%	1.79%	2.21%	2.64%	0.45
Denver, CO	0.36%	0.41%	0.46%	0.51%	0.62%	0.23
Des Moines, IA	1.38%	1.65%	1.88%	2.13%	2.51%	0.26
Detroit, MI	0.24%	0.47%	1.67%	3.72%	7.08%	1.95
El Paso, TX	1.07%	1.83%	2.35%	2.81%	3.33%	0.41
Fargo, ND	1.01%	1.15%	1.30%	1.57%	1.87%	0.32
Fort Worth, TX	0.36%	1.00%	1.69%	2.16%	2.56%	0.68
Fresno, CA	0.45%	0.61%	0.82%	0.97%	1.10%	0.44
Houston, TX	0.55%	0.89%	1.38%	1.85%	2.25%	0.70
Indianapolis city, IN	0.46%	0.71%	0.90%	1.14%	1.56%	0.47

TABLE 2 (Continued)

City, state	De facto tax rate (10th percentile)	De facto tax rate (25th percentile)	De facto tax rate (median)	De facto tax rate (75th percentile)	De facto tax rate (90th percentile)	Ratio: interquartile range/median
Jacksonville, FL	0.29%	0.58%	0.97%	1.30%	1.55%	0.74
Kansas City, MO	0.46%	0.82%	1.09%	1.35%	1.68%	0.49
Las Vegas, NV	0.18%	0.23%	0.31%	0.39%	0.46%	0.49
Little Rock, AR	0.54%	0.76%	0.95%	1.18%	2.12%	0.44
Long Beach, CA	0.26%	0.50%	0.79%	0.98%	1.10%	0.60
Los Angeles, CA	0.25%	0.47%	0.75%	0.96%	1.11%	0.64
Louisville, KY	0.65%	0.79%	0.92%	1.05%	1.19%	0.28
Manchester, NH	1.23%	1.36%	1.51%	1.72%	2.02%	0.24
Memphis, TN	0.46%	0.63%	1.11%	1.38%	1.69%	0.67
Mesa, AZ	0.18%	0.29%	0.39%	0.49%	0.60%	0.52
Miami, FL	0.87%	1.20%	1.43%	1.62%	1.80%	0.29
Milwaukee, WI	1.30%	1.64%	1.98%	2.38%	2.98%	0.37
Minneapolis, MN	0.87%	1.04%	1.22%	1.44%	1.97%	0.33
Nashville, TN	0.38%	0.56%	0.65%	0.75%	0.83%	0.29
New Orleans, LA	0.43%	0.70%	0.97%	1.25%	1.68%	0.57
New York, NY	0.32%	0.65%	0.90%	1.24%	1.75%	0.66
Newark, NJ	1.15%	1.38%	1.70%	2.11%	2.71%	0.43
Oakland, CA	0.40%	0.65%	0.96%	1.26%	1.51%	0.64
Oklahoma City, OK	0.53%	0.89%	1.07%	1.20%	1.34%	0.30
Omaha, NE	1.29%	1.47%	1.63%	1.83%	2.10%	0.23
Philadelphia, PA	0.30%	0.53%	0.78%	1.04%	1.32%	0.65
Phoenix, AZ	0.17%	0.29%	0.40%	0.52%	0.63%	0.58
Portland, ME	0.88%	1.00%	1.15%	1.33%	1.68%	0.29
Portland, OR	0.73%	0.89%	1.08%	1.34%	1.60%	0.41
Providence, RI	0.86%	1.05%	1.41%	1.80%	2.15%	0.53
Raleigh, NC	0.58%	0.66%	0.74%	0.83%	0.91%	0.23
Sacramento, CA	0.37%	0.57%	0.82%	1.02%	1.17%	0.56
Salt Lake City, UT	0.35%	0.41%	0.50%	0.61%	0.83%	0.41
San Antonio, TX	0.73%	1.55%	1.95%	2.31%	2.72%	0.39
San Diego, CA	0.27%	0.48%	0.77%	0.95%	1.10%	0.61
San Francisco, CA	0.23%	0.56%	0.90%	1.15%	1.34%	0.66
San Jose, CA	0.27%	0.51%	0.80%	1.05%	1.23%	0.67

(Continues)

TABLE 2 (Continued)

City, state	De facto tax rate (10th percentile)	De facto tax rate (25th percentile)	De facto tax rate (median)	De facto tax rate (75th percentile)	De facto tax rate (90th percentile)	Ratio: interquartile range/median
Seattle, WA	0.51%	0.62%	0.71%	0.80%	0.89%	0.25
Sioux Falls, SD	0.92%	1.06%	1.20%	1.40%	1.83%	0.28
Tucson, AZ	0.39%	0.55%	0.70%	0.82%	0.93%	0.38
Tulsa, OK	0.67%	0.88%	1.08%	1.27%	1.49%	0.35
Urban Honolulu, HI	0.08%	0.23%	0.31%	0.38%	0.76%	0.49
Virginia Beach, VA	0.70%	0.76%	0.81%	0.87%	0.95%	0.14
Washington, DC	0.30%	0.50%	0.65%	0.75%	0.85%	0.39
Wichita, KS	0.46%	0.65%	0.95%	1.17%	1.45%	0.55
Wilmington, DE	0.41%	0.77%	1.17%	1.87%	2.85%	0.95

where the respective ratios the 75/25 ratio is 7.9 and the 90/10 ratio is a whopping 29.5. At the opposite extreme, there are 9 cities where the 75/25 ratio is less than 1.3. Virginia Beach shows the greatest uniformity in effective tax rates, with a 75/25 ratio of 1.14 and a 90/10 ratio of "only" 1.36.

Such variation in effective tax rates means that comparing cities based only on median tax rates may provide an incomplete picture of the relative tax burden between cities. For instance, Baltimore has a higher median effective tax rate than Houston. Yet a quarter of the properties in Baltimore experience an effective tax lower than the median in Houston. Meanwhile, Boston has a lower effective tax rate than Louisville, yet a quarter of the properties in Boston pay a higher effective tax rate than the median in Louisville. Portland, Maine, and Wilmington, Delaware, for example, have roughly the same median effective tax rates. Yet the spread in tax rates (IQR/median) is more than three times greater in Wilmington. Understanding the spread of tax rates could be important for prospective home buyers considering their likely tax burdens in different cities.

Clearly, there can be a great deal of variation in effective tax rates within a city. While some amount of random error in assessor estimates of market value is to be expected, there are reasons to be concerned that the variation in tax rates is not entirely random. In particular, a growing body of literature indicates that property taxes are regressive, meaning that lower priced properties pay higher effective tax rates than do higher priced properties, and the proximate cause is regressivity in the market values estimated by assessors (Avenancio-León & Howard, 2022a; Berry, 2022; McMillen & Singh, 2023). While prior studies have established evidence of widespread regressivity, they have not considered the implications of regressivity when comparing effective tax rates across jurisdictions.

Although the Lincoln Study does not contain much information on within-city variation in tax rates, it does estimate the nominal tax rates faced by properties at two different price points, $150,000 and $300,00. At the time this feature was introduced into the annual Lincoln Studies, these two price points were meant to represent relatively low- and relatively high-priced properties. While that may still be the case in some places, in many cities both of these price points would be considered relatively low in today's market. That issue notwithstanding, this is the only available information on differences in *de jure* tax rates for properties at different price points. The key source of differences in rates across the two price points is the homestead exemption. Because homestead exemptions allow property owners to exempt a fixed amount of

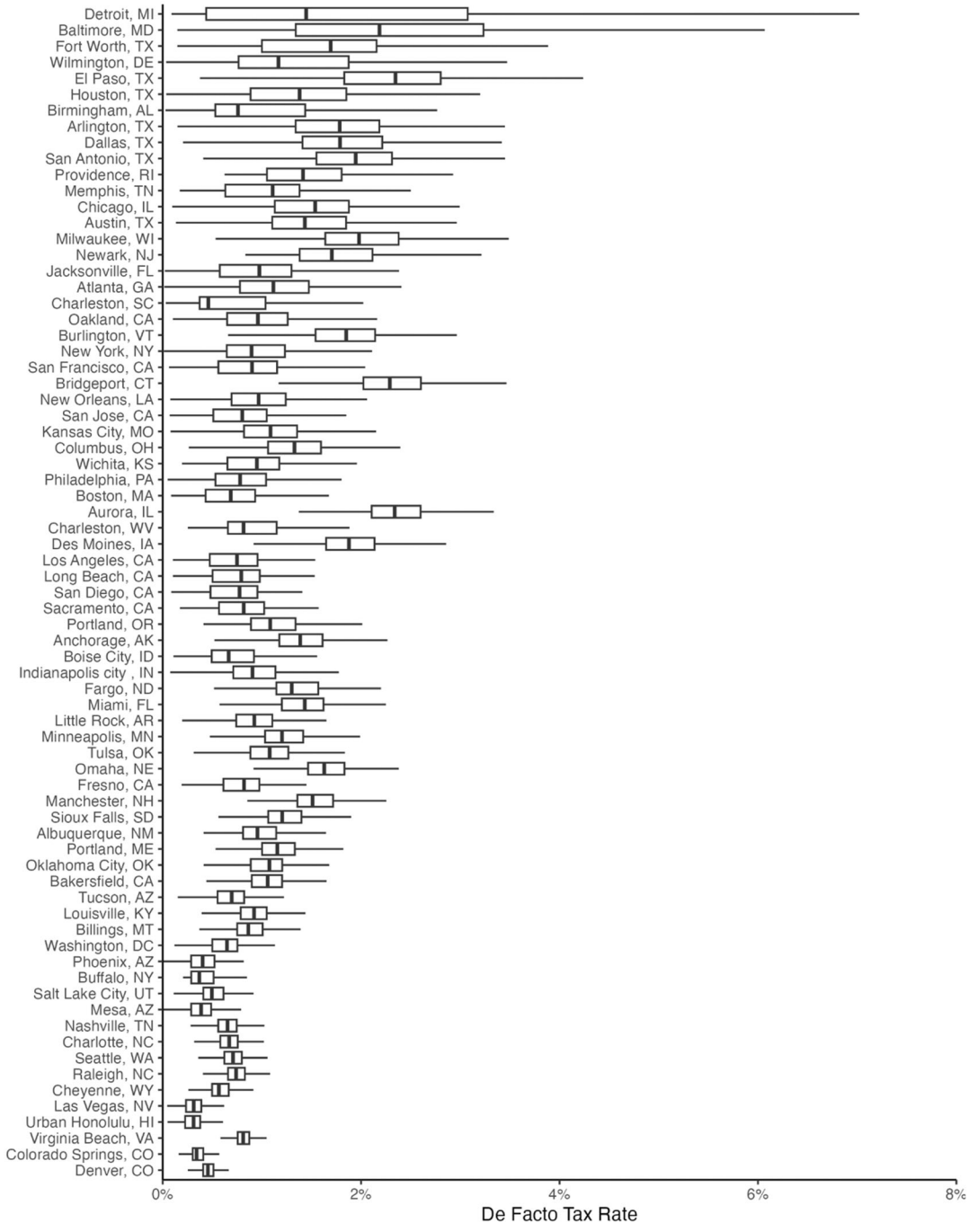

FIGURE 4 Box plots of de facto tax rates. Notes: The De Facto rate is computed as the ratio of the tax due to the property sale price. The boxes denote the 50th, 25th, and 75th percentile values. The whiskers represent the 5th and 95th percentile values.

their property's value from taxation, that fixed amount will result in a larger proportion of total value removed for lower-priced homes. Hence, all else equal, the homestead exemption should introduce a degree of progressivity into the tax system, resulting in lower priced properties paying a lower effective tax rate.

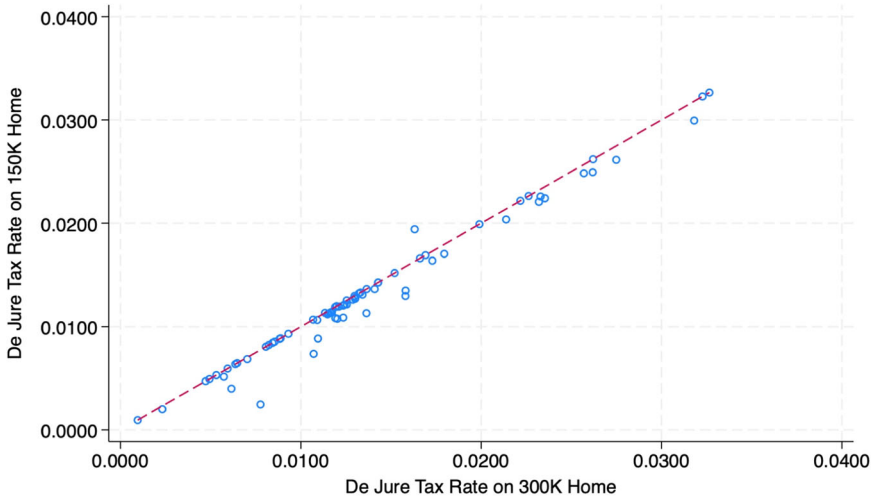

FIGURE 5 De jure tax rates on $150,000 and $300,000 homes. Notes: De Jure tax rates for $150,000 and $300,000 homes as reported in the Lincoln Study (2022). Each dot is one city. The dashed line is the line of equality between the x and y axes.

Figure 5, and columns 3 and 4 in Table 1, depict the nominal tax rate on $150,000 versus $300,000 homes, as reported in the Lincoln Study. In 39 cities, the nominal tax rate on the lower-priced home is lower than the nominal tax rate on the pricier home; the opposite is true in only one city, Burlington, Vermont. In the remaining cities, the nominal tax rate is equal across the two price points. In general, these results comport with the conventional wisdom that the homestead exemption makes the property tax more progressive. However, the differences are fairly small. In the 39 cities with progressive nominal rates, the average rate on the $300,000 home is 1.46% while the average rate on the $150,000 home is 1.35%. Based on the reported nominal rates, the most progressive city would appear to be Atlanta, where the rate on a $300,000 home is roughly three times the rate on a $150,000 home.

A key assumption in the Lincoln Study is that the sales ratio is the same for properties at different price points. In other words, they assume that homes at different price points were assessed with equal accuracy and then calculate the mechanical effect of applying the homestead exemption. However, a growing body of research shows that homes at different price points are not assessed with equal accuracy, and, in particular, that lower-priced homes tend to be systematically over-assessed (Berry, 2022; Avenancio-Leon and Howard 2022). Regressivity in assessment ratios can outweigh the progressive impact of the homestead (and other) exemptions, potentially reversing conclusions reached based on assuming equal assessment ratios (see McMillen & Singh, 2020).[5]

Furthermore, even in jurisdictions where a homestead exemption is available, not all homeowners take advantage of it, due to a lack of knowledge or simple inaction (Ihlanfeldt, 2021). If owners of higher-priced properties are more likely to be aware of and apply for a homestead exemption, relative to owners of lower-valued properties, the progressive impact of the homestead exemption may be dulled, even where assessment ratios are uniform.

The data on actual tax bills for sold properties in each city allow us to overcome both of these issues. Because the tax bill accounts for the assessed value of the property and the impact

[5]For a different view, see Ihlanfeldt and Rodgers (2022), who find that the progressivity of the homestead exemption generally outweighs the regressivity of assessments in Florida counties.

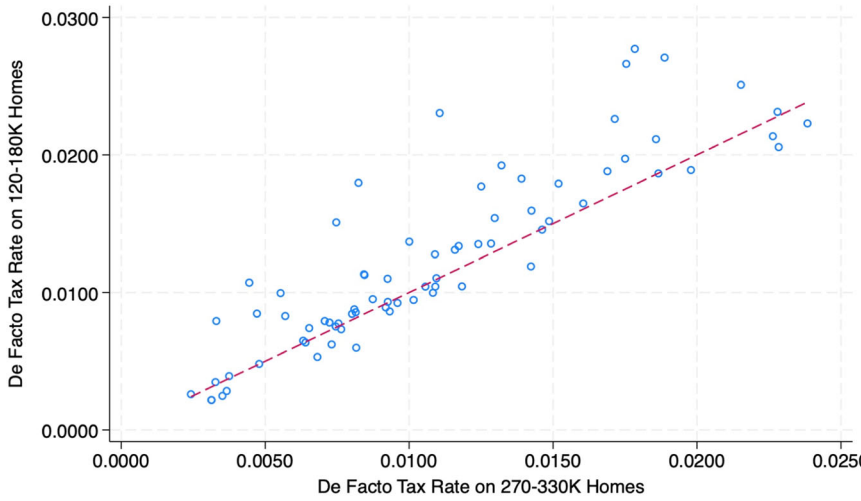

FIGURE 6 De facto tax rates on ~$150,000 and ~$300,000 homes. Notes: The de facto rate is computed as the ratio of the tax due to the property sale price. The x-axis represents the median effective property tax rate among homes that sold for between $270,000 and $330,000. The y-axis represents the median effective property tax rate among homes that sold for between $120,000 and $180,000. Each dot is one city. The dashed line is the line of equality between the x and y axes.

of exemptions, dividing the tax bill by the property's sale price provides a better measure of the effective tax rate. Figure 6 shows *de facto* effective tax rates for properties at roughly the same price points used in the Lincoln Study. In order to have a sufficient number of observations, the lower priced properties are selected as those that sold for $120,000 to $180,000 and the higher priced properties are selected as those that sold for $270,000 to $330,000. In contrast to Figure 5, Figure 6 shows that effective tax rates are typically higher for the lower-priced properties. This is the case in 50 of the 74 cities under study. In those 50 cities, the average tax rate on lower properties was 1.36%, while the average tax rate on higher-priced properties was 1.07%. In other words, the tax rate on the lower priced properties was 27% higher than the tax rate on the higher priced properties. In sum, *de facto* tax rates are typically regressive, in contrast with the *de jure* tax rates that fail to account for assessment regressivity or differential take-up of exemptions, a result consistent with McMillen and Singh (2020).

As noted, the price points of $150,000 and $300,000 used in the Lincoln report may not realistically represent high- and low-valued properties in today's market in many cities. To facilitate more meaningful comparisons of properties within a jurisdiction, I next divided properties into quintiles of sale price within the city. Because they are defined separately for each city, the quintiles represent meaningfully different price points within the local market. Median effective tax rates within each price quintile, by city, are reported in Table 3. The data show consistent regressivity of effective property tax rates within cities. The average ratio of the first to fifth quintile median tax rate is 1.29, meaning that the median home in the bottom quintile pays an effective tax rate that is 29 percent higher than the median home in the top quintile in the same city. In 60 of the 74 cities studied, the median effective tax rate in the first quintile (lowest priced) is higher than the median effective tax rate in the fifth quintile (highest priced). We can reject the the null hypothesis that the median effective tax rates are equal in the top and bottom quintiles, according to a Brown-Mood test, for all cities except Bakersfield, Baltimore, and Kansas City.

To facilitate comparison, Figure 7 displays the median effective tax rates for first and fifth quintile homes by sale price in each city. Detroit is an extreme case where the bottom quintile pays an effective tax rate that is roughly five times higher than the average rate in the top

TABLE 3 Effective tax rates by price quintile.

City, state	Median de facto tax rate (top quintile)	Median de facto tax rate (upper-middle quintile)	Median de facto tax rate (middle quintile)	Median de facto tax rate (lower-middle quintile)	Median de facto tax rate (bottom quintile)	Ratio of bottom to top quintile
Albuquerque, NM	0.94%	0.92%	0.93%	0.94%	1.08%	1.15
Anchorage, AK	1.26%	1.31%	1.39%	1.45%	1.56%	1.24
Arlington, TX	1.62%	1.70%	1.70%	1.85%	2.15%	1.33
Atlanta, GA	1.13%	1.05%	0.99%	1.10%	1.38%	1.22
Aurora, IL	2.39%	2.40%	2.27%	2.33%	2.26%	0.94
Austin, TX	1.26%	1.41%	1.39%	1.47%	1.83%	1.45
Bakersfield, CA	1.06%	1.08%	1.06%	1.03%	1.06%	1.00
Baltimore, MD	2.32%	2.26%	2.11%	2.19%	2.27%	0.98
Billings, MT	0.76%	0.80%	0.85%	0.90%	1.07%	1.41
Birmingham, AL	0.52%	0.62%	0.66%	1.19%	2.11%	4.07
Boise City, ID	0.65%	0.57%	0.60%	0.65%	1.06%	1.64
Boston, MA	0.74%	0.68%	0.61%	0.48%	0.88%	1.18
Bridgeport, CT	2.14%	2.19%	2.36%	2.53%	2.33%	1.09
Buffalo, NY	0.31%	0.28%	0.24%	0.28%	0.38%	1.21
Burlington, VT	1.79%	1.83%	1.77%	1.83%	2.01%	1.12
Charleston, SC	0.46%	0.44%	0.41%	0.45%	0.66%	1.43
Charleston, WV	0.77%	0.71%	0.75%	0.87%	1.35%	1.75
Charlotte, NC	0.71%	0.69%	0.66%	0.64%	0.65%	0.92
Cheyenne, WY	0.53%	0.55%	0.57%	0.57%	0.66%	1.24
Chicago, IL	1.60%	1.57%	1.46%	1.42%	1.72%	1.07
Colorado Springs, CO	0.39%	0.36%	0.33%	0.32%	0.33%	0.85
Columbus, OH	1.47%	1.39%	1.29%	1.22%	1.25%	0.85
Dallas, TX	1.75%	1.73%	1.80%	1.77%	1.96%	1.12
Denver, CO	0.44%	0.44%	0.45%	0.47%	0.48%	1.09
Des Moines, IA	1.86%	1.84%	1.88%	1.85%	2.11%	1.14
Detroit, MI	0.78%	1.31%	1.85%	2.74%	4.35%	5.58
El Paso, TX	2.09%	2.26%	2.40%	2.51%	2.67%	1.27
Fargo, ND	1.22%	1.26%	1.30%	1.31%	1.41%	1.16
Fort Worth, TX	1.55%	1.55%	1.69%	1.83%	1.91%	1.24
Fresno, CA	0.89%	0.89%	0.82%	0.73%	0.75%	0.84
Houston, TX	1.47%	1.49%	1.31%	1.18%	1.36%	0.93
Indianapolis city, IN	0.87%	0.88%	0.90%	0.95%	1.01%	1.17

TABLE 3 (Continued)

City, state	Median de facto tax rate (top quintile)	Median de facto tax rate (upper-middle quintile)	Median de facto tax rate (middle quintile)	Median de facto tax rate (lower-middle quintile)	Median de facto tax rate (bottom quintile)	Ratio of bottom to top quintile
Jacksonville, FL	0.87%	0.87%	0.86%	1.03%	1.27%	1.47
Kansas City, MO	1.05%	1.11%	1.09%	1.10%	1.07%	1.02
Las Vegas, NV	0.39%	0.36%	0.31%	0.26%	0.24%	0.61
Little Rock, AR	0.96%	0.93%	0.89%	0.79%	1.87%	1.96
Long Beach, CA	0.74%	0.79%	0.75%	0.82%	0.87%	1.17
Los Angeles, CA	0.76%	0.72%	0.74%	0.73%	0.79%	1.03
Louisville, KY	0.96%	0.92%	0.87%	0.88%	1.00%	1.04
Manchester, NH	1.39%	1.45%	1.50%	1.52%	1.75%	1.25
Memphis, TN	1.19%	1.12%	1.05%	0.93%	1.25%	1.05
Mesa, AZ	0.43%	0.40%	0.37%	0.38%	0.36%	0.82
Miami, FL	1.31%	1.37%	1.43%	1.47%	1.54%	1.18
Milwaukee, WI	1.97%	1.88%	1.88%	2.01%	2.38%	1.21
Minneapolis, MN	1.20%	1.19%	1.17%	1.20%	1.53%	1.28
Nashville, TN	0.63%	0.64%	0.64%	0.65%	0.70%	1.11
New Orleans, LA	0.96%	0.99%	0.90%	0.87%	1.23%	1.28
New York, NY	0.78%	0.91%	0.90%	0.90%	0.96%	1.22
Newark, NJ	1.58%	1.55%	1.61%	1.78%	2.35%	1.49
Oakland, CA	0.80%	0.90%	1.00%	1.07%	1.20%	1.50
Oklahoma City, OK	1.08%	1.09%	1.08%	1.06%	1.05%	0.96
Omaha, NE	1.62%	1.59%	1.60%	1.65%	1.78%	1.10
Philadelphia, PA	0.75%	0.77%	0.73%	0.76%	0.95%	1.27
Phoenix, AZ	0.44%	0.47%	0.41%	0.37%	0.33%	0.75
Portland, ME	1.12%	1.08%	1.10%	1.15%	1.33%	1.19
Portland, OR	1.16%	1.02%	1.01%	1.03%	1.26%	1.09
Providence, RI	1.28%	1.30%	1.39%	1.44%	1.72%	1.34
Raleigh, NC	0.75%	0.74%	0.71%	0.73%	0.77%	1.03
Sacramento, CA	0.84%	0.88%	0.83%	0.76%	0.75%	0.89
Salt Lake City, UT	0.45%	0.46%	0.48%	0.51%	0.62%	1.39
San Antonio, TX	1.84%	1.84%	1.93%	2.03%	2.18%	1.18
San Diego, CA	0.74%	0.73%	0.76%	0.81%	0.85%	1.15
San Francisco, CA	0.80%	0.82%	0.81%	0.92%	1.13%	1.41

(Continues)

TABLE 3 (Continued)

City, state	Median de facto tax rate (top quintile)	Median de facto tax rate (upper-middle quintile)	Median de facto tax rate (middle quintile)	Median de facto tax rate (lower-middle quintile)	Median de facto tax rate (bottom quintile)	Ratio of bottom to top quintile
San Jose, CA	0.65%	0.72%	0.80%	0.87%	1.03%	1.57
Seattle, WA	0.60%	0.66%	0.72%	0.76%	0.79%	1.31
Sioux Falls, SD	1.14%	1.18%	1.18%	1.20%	1.52%	1.33
Tucson, AZ	0.71%	0.74%	0.70%	0.67%	0.63%	0.89
Tulsa, OK	1.17%	1.05%	1.01%	1.00%	1.23%	1.06
Urban Honolulu, HI	0.31%	0.29%	0.28%	0.30%	0.37%	1.17
Virginia Beach, VA	0.81%	0.81%	0.80%	0.81%	0.83%	1.03
Washington, DC	0.63%	0.66%	0.65%	0.63%	0.66%	1.05
Wichita, KS	0.95%	0.98%	1.01%	0.87%	0.85%	0.89
Wilmington, DE	0.89%	0.89%	1.02%	1.62%	2.40%	2.70

quintile. In three other cities, Wilmington, Birmingham, and Little Rock, the bottom quintile's tax rate is more than double the top quintile's rate. In several cities, notably Columbus, Las Vegas, and Phoenix, the pattern is reversed, with the bottom quintile paying a lower median effective tax rate than the top quintile, perhaps because of progressivity introduced by targeted exemptions with more accurate market value estimates, as in Ihlanfeldt and Rodgers (2022).

SUMMARY AND DISCUSSION

Four key points emerge from the preceding analyses. First, city-level *de facto* and *de jure* property tax rates are highly correlated and the rankings of cities do not typically differ dramatically between the two measures. Second, *de facto* tax rates are lower than *de jure* tax rates in most cities, in some cases substantially so. The divergence cannot be explained by laws governing reassessment frequency or assessment increase limits; it most likely results from lags in data used for market valuation. Third, there can be tremendous variation in effective tax rates across properties within the same city, and the extent of uniformity in effective tax rates differs substantially across cities. Fourth, some of the within-city variation is related to house prices, with effective tax rates being regressive in most cities.

These findings have implications for taxpayers and public officials. Taxpayers can have confidence that existing sources such as the Lincoln Study reflect the relative ranking of the tax burdens across cities fairly accurately, even if they may overstate the effective tax rate at any point in time. However, it may be just as important for taxpayers to understand the variance of tax rates within a prospective city. In many cities, there are homes paying a wide range of effective tax rates, which might place some of them well above or below the median of a comparison city. Taxpayers considering the relative burden across cities should ask not only about "the" property tax rate in a city, but the property tax rate at particular price points.

For public officials and budget professionals, the finding that *de facto* tax rates are often significantly lower than *de jure* tax rates suggests that cities may be leaving money on the table. It appears that the discrepancy is due to lags in estimated market values relative to actual

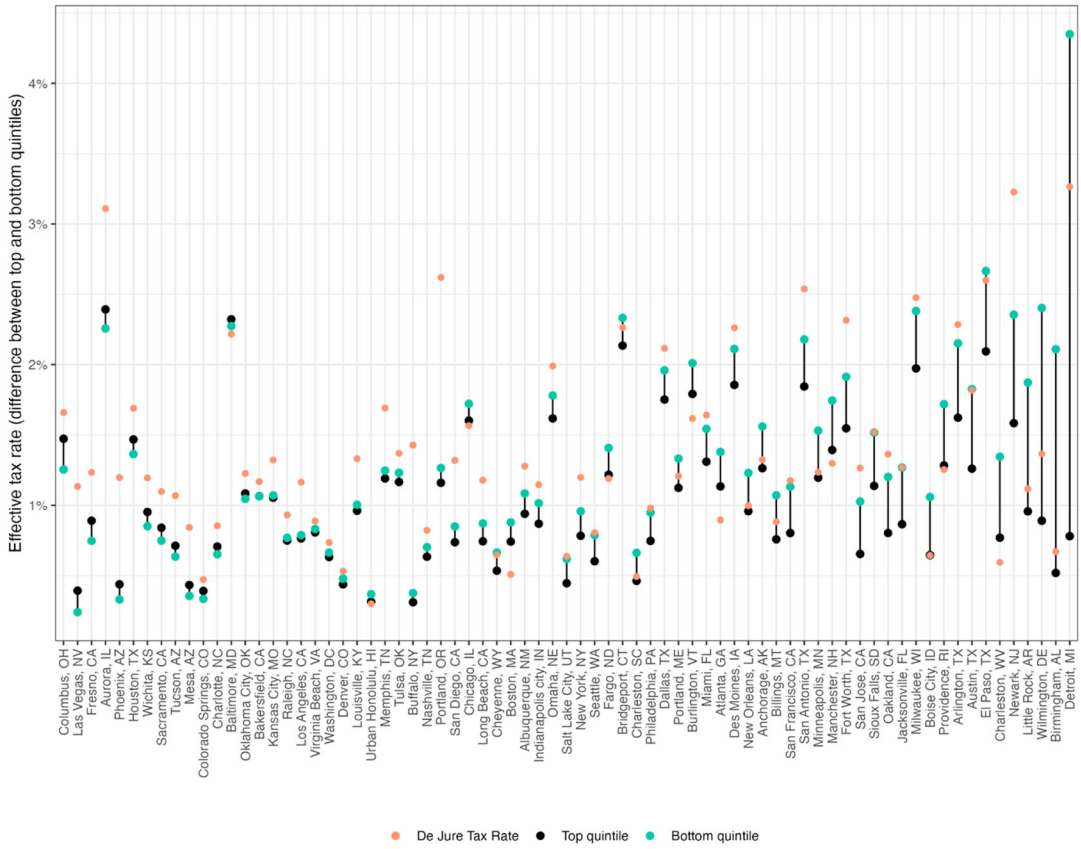

FIGURE 7 De facto tax rates for high-priced versus low-priced homes. Notes: The De Facto rate is computed as the ratio of the tax due to the property sale price. The black dots represent the median de facto tax rate in the top price quintile of the city. The green dots represent the median de facto tax rate in the bottom price quintile of the city. The pink dots represent the de jure tax rate as reported in the Lincoln Study (2022).

market values. If so, cities could collect more revenue without raising the statutory tax rate, or collect the same revenue at a lower statutory tax rate, by keeping estimated market values more up to date. How to do so is an open question, as requiring annual reassessment appears to be insufficient.

The lack of uniformity in effective tax rates in some cities is striking, while widespread regressivity challenges the narrative that homestead exemptions lead to progressivity in property taxes. Such unpredictability and inequity in taxation may undermine public support for tax increases at a time when the property tax remains widely unpopular (e.g., Higham, 2024). Yet, while property tax regressivity raises concerns about equity, it also presents opportunities for revenue-enhancing reforms. Rectifying the undervaluation of high-end properties, in particular, could lead to substantial revenue increases. For example, studies indicate that the top 10 percent of properties in New York City are under-taxed by approximately $1 billion per year (Berry, 2021), while the top 10 percent in Chicago were undertaxed by roughly $200 million per year (Berry, 2018). Fixing these problems could not only improve public confidence in the tax system, but generate much needed revenue at the same time.

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