An Evaluation of the Residential Property Tax Equity in New York City

This Draft: October 13, 2021

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1 Introduction

The property tax is the single largest source of revenue for American local governments. Cities, counties, school districts, and special districts raise roughly $500 billion per year in property taxes, accounting for 72% of local taxes and 47% of locally raised revenue (U.S. Census Bureau 2016).

Despite its centrality in US municipal finance, the property tax has come under increasing scrutiny. Recent research has shown that property taxes in most jurisdictions in the United States are inequitable: low-value properties face higher tax assessments, relative to their actual sale price, than do high-value properties, resulting in regressive taxation that burdens low-income residents disproportionately (Berry 2021).

There are many potential sources of regressivity in property taxes, which fall broadly into two categories: assessor errors and policy choices. Which factors contribute most to tax inequities in any particular jurisdiction will depend on the parameters of that jurisdiction's assessment and tax system.

This report evaluates property tax regressivity and its causes in New York City.

2 Data and Methods

The standard approach for evaluating the quality and fairness of assessments is through a ratio study (International Association of Assessing Officers (IAAO) 2013). The key idea of a ratio study is to compare the sale prices of recently sold homes with their assessed values. Assuming sale prices are a fair representation of market value, then the ratio of the assessed value to the sale price provides an indication of whether a property has been over- or under-valued by the assessor. A system in which less expensive homes are systematically assessed at higher rates (relative to their sale price) than more expensive homes is *regressive*.

I obtained parcel-level property sales records as well as valuation, assessment, and property tax data from the New York City open data portal. I matched each sold property to the valuation and tax data associated with the tax bill due in the year of sale. I use data for fiscal years 2017, 2018, and 2019, which are the only three years in which all the data sets are available.

A concern in the professional assessment literature is that analyses of sales ratios may be sensitive to influential outliers created by data entry errors or sales between related parties that are not arm's length (IAAO 2013). As a precaution against such concerns, I trim the data following a procedure recommended by the IAAO (2013). For each property I compute the ratio of the assessed value to the sale price. I then exclude those ratios that fall outside the interquartile range (IQR) by more than 1.5*IQR.

I compute several standard statistical measures of assessment equity. My main estimates come from regressions of the form $\ln\left(\frac{V_i}{P_i}\right) = \alpha + \beta(lnP_i) + \varepsilon_i$, where i denotes a property, P denotes sale price, and ε is idiosyncratic noise. *V* is the variable of interest, which will alternately represent estimated market values, assessed values, and taxes. The dependent variable is the natural log of the ratio *V*/*P* which can be thought of as approximately the percentage difference between assessed value and sale price, for example. The independent variable of interest is the log of the property sale price. In this specification, β represents the elasticity of the assessment ratio with respect to sale price. In principle, β should be zero because the assessment level should be the same for all properties regardless of their price. A negative coefficient means that assessment levels decline with price, indicating regressivity, while a positive value would indicate progressivity.

In addition to the regression estimates, I compute the most commonly reported metric of regressivity in the professional assessing literature, the *price-related differential*, or PRD (IAAO 2013), which is the arithmetic mean of the ratio divided by the price-weighted mean ratio. If lower-priced properties are assessed at higher ratios than higher-priced properties, the PRD will be greater than one. The IAAO has established the "acceptable" range for the PRD as being from .98 to 1.03. PRD values above 1.03 are considered regressive, while those below .98 would be considered progressive (IAAO 2013).

Finally, I use a newly proposed metric of regressivity based on comparing inequality in the distribution of assessed values to inequality in the distribution of sale prices (Quintos 2020). The key idea is that, if assessments are regressive such that low-priced homes are overassessed and high-priced homes are underassessed, then there should be less inequality in assessed values than in sale prices. Specifically, Quintos (2020) proposes comparing the Gini coefficient of sale prices, *G*, with the concentration index of assessed values ranked by sale price, *CI*. The idea is inspired by the Kakwani Index, *KI*, which was developed to measure tax progressivity by comparing the gini coefficient of pre-tax income with the concentration index of post-tax income sorted by pre-tax income. As applied in this case, KI = *CI* - *G*. Quintos (2020) suggests a modified version of the Kakwani index, *MKI*, which is the ratio, *CI*/*G* = *MKI*.

3 Results

New York City divides residential property across two tax classes with different assessment methodologies, assessment levels, and tax rates. I present results separately for properties in each class and explain the key features of the assessment process in each case.

3.1 One-, two-, and three-family homes (Class 1)

Class 1 includes single-family homes and most residential property up to three units and most condominiums under four stories. A key feature of the tax system is that Class 1 properties are subject to assessment growth limits, which prevent a property's assessed value from growing more than 6% per year or 20% over 5 years. The Department of Finance (DOF) estimates market values each year using a sales-based approach; that is, a statistical model based on data from recently sold homes. If growth in a property's estimated market value would exceed the cap, its assessed value will grow only up to the limit. This means that when market values are growing fast, assessed values will not keep up. When market values decile, assessed values may continue to increase if they had been suppressed by caps in the past. If assessment growth caps affect properties of different sale prices differently, assessed values could in principle be more or less regressive than DOF-estimates market values. However, past research has shown that assessment growth caps for Class 1 properties, in practice, benefit more expensive homes (Hayashi 2014).

The target assessment level for Class 1 properties if 6 percent of market value. However, due to assessment growth limits, actual assessed values may be less than 6 percent, and sometimes substantially less. After assessed values are computed, DOF applies various assessments and exemptions to arrive at a final tax bill.

3.1.1 DOF-Estimated Market Value

To evaluate accuracy and fairness of DOF-estimated market values, I compare the DOF-estimated market value to sale price for Class 1 properties that sold between 2017 and 2019. I define the *market value ratio* as the ratio of the DOF-estimated market value to the sale price of a property. In Figure 1, properties are divided into deciles of sale price (10 equally sized bins) and each dot shows the median sale price and median market value ratio for one decile.

Figure 1 shows that DOF-estimated market values are regressive: more expensive homes are valued at a lower proportion of their sale price than are less expensive homes. For instance, the median home in the bottom decile of sale price (leftmost dot) had a market value equal to 116% of its sale price, while the median home in the top decile (rightmost dot) had a market value equal to only 79% of its sale price, meaning that the market value ratio for lower priced home was roughly 150% of the ratio applied to the higher priced home.

Table 1, column (1), provides several statistical estimates of regressivity within DOF-estimated market values. Panel A shows a regression of the log of the market value ratio against the log of sale price. The negative coefficient in indictates that the market value ratio declines as sale price increases, consistent with the pattern shown in Figure 1. Panel B of Table 1 reports other statistical estimates of inequity in market values. The PRD of 1.04 for DOF-estimated market values exceeds IAAO standards, although not greatly. The MKI of less than one indicates that there is less variation in market values than in sale prices, consistent with regressivity. The COD of 20.6 also exceeds IAAO standards for uniformity.

This evident regressivity in DOF-estimated market values cannot be attributed to policy choices. It must come from the DOF methodology, either due to limits in data or statistical estimation. As to the question of whether regressivity is driven by assessment problems or policy choices, this analysis already shows that assessing errors are one important part of the story in NYC.

3.1.2 Assessment Ratios (before Exemptions)

In principle, a property's assessed value should be 6% of its DOF-estimated market value. However, as noted, assessment growth limits may cause actual assessed values to fall below this target.

Past research has shown that assessment caps disproportionately benefit more valuable properties (Hayashi 2014), and my evidence is consistent with that result. Figure 2 shows a binned scatter plot of assessment ratios (before exemptions) against sale prices. The pattern is even more regressive than for market values. The median home in the bottom decile of sale prices is assessed at 5.4% of its sale price, while the median home in the top decile is assessed at 2.2% of its sale price, meaning that the low-priced home is assessed at almost two and a half times the rate applied to the high-priced home.

Figure 3 illustrates how this works. This binned scatter plot shows assessed values as a share of market values, by sale price decile. Assessment growth limits keep average assessed values below 6% of market values for all deciles; but they disproportionately benefit more expensive properties. For the top decile of properties, assessed values are only about 3% of market value.

Column (2) of Table 1 shows that all of the regressivity statistics are worse for assessed values than for DOF-estimated market values. The coefficient in the main regression of Panel A drops from -.17 to -.46. The PRD increases from 1.04 to 1.15. The MKI drops from .89 to .56. The COD increases to 25.

These results show that assessment caps are a major source of regressivity. While DOF-estimated market values were already regressive, the caps more than double the level of regressivity across all the metrics. Although the goal of the caps may have been to increase fairness by guarding against unexpected increases in property taxes, the caps have in practice disproportionately benefited more expensive homes and worsened regressivity.

3.1.3 Effective Tax Rates

After tax caps are accounted to arrive at an assessed value, exemptions and abatements must be factored in to arrive at a property's final tax bill. Exemptions remove some portion of a property's assessed value for the purpose of computing taxable value, while abatements directly remove some portion of a property's tax liability. Exemptions and abatements are generally thought of as tax expenditures rather than elements of the assessment process per se.

Without exemptions and abatements, tax rates would be proportional to assessed values. As shown in column (3) of Table 1, tax rates before exemptions and abatements—which I refer to as nominal tax rates—have the same regressivity statistics as (pre-exemption) assessed values. Here, the nominal tax rate of a property is defined as the nominal tax bill (i.e., the bill before exemptions and abatements) divided the sale price.

For Class 1 properties, there are relatively limited exemptions and abatements available, and so we do not expect taxes after exemptions and abatements—which I refer to as effective taxes—to differ substantially from nominal taxes. I define the effective tax rate of a property as the final tax bill (i.e., the bill after exemptions and abatements) divided by the sale price. As shown in Figure 4 and in column (4) of Table 1, effective tax rates show levels of regressivity comparable to that found in assessed values and nominal tax rates.

These results have an important methodological implication. Any analysis that takes DOF-estimated market values as an unbiased estimate of sale prices will understate regressivity. For instance, IBO (2006, 2011), Furman Center (2012), and Hayashi (2014) all compute the effective tax rate of a property as its tax bill divided by its DOF-estimated market value. This will understate the extent of regressivity in the data because the market values themselves are already regressive. Figure 5 shows why this is the case. The blue line represents the effective tax rate defined with sale price in the denominator, while the red line represented the effective tax rate with DOF-estimated market value as the denominator. The market value-based estimator shows less regressivity because it ignores the inequities in market values themselves, especially at the low end of the price spectrum. In fact, if we were to see that properties with high and low DOF-estimated market values paid the same tax as a proportion of market value, this would actually constitute evidence of regressivity because the market values themselves are regressive with respect to true sale prices.

3.1.4 Class 1 by Borough

The results presented thus far were pooled for the entire city. Inequity across and within boroughs is also of concern. Table 2 shows assessment statistics by borough. While median market value ratios are roughly equal across boroughs, assessment ratios and tax rates vary widely. This is because properties located in boroughs with faster price appreciation, such as Manhattan and Brooklyn, benefit most from assessment increase limits. Statistics for Manhattan should be interpreted cautiously, however, as there are relatively few single-family homes sales in this borough.

Figure 6 shows binned scatter plots of DOF-estimated market value against sale price separately for each borough, excluding Manhattan which has too few Class 1 sales to make reliable inferences by decile. Figure 7 shows binned scatter plots of effective tax rates by sale price for each borough, again excluding Manhattan. To make the results easily comparable across boroughs, I constrained the x- and y-axes in to have the same scale for each borough within a figure. Both DOF-estimated market values and assessment ratios are regressive within each borough.

Table 3 presents regressions results comparable to those in Table 1, with the addition of borough fixed effects. With the inclusion of the fixed effects, identification comes from within-borough variation. The estimated regressivity of DOF-estimated market values is higher within boroughs, but otherwise the estimates are essentially unchanged. Manhattan is the excluded category for the fixed effects, hence the coefficients for other indicator variables should be interpreted as average differences relative to Manhattan. The coefficients are consistently negative, indicating that the other boroughs have lower ratios and tax rates. The lower rates for Manhattan in Table 2, therefore, are due to the fact that more expensive properties are located in Manhattan, and more expensive properties are underassessed in general. Adjusting for this price-related regressivity, Manhattan actually has higher average ratios and tax rates.

3.2 Condominiums (Class 2)

Class 2 includes a variety of multi-family properties, such as larger condominium buildings, most cooperative buildings, and larger rental buildings. In the analyses that follow, I analyze 10+ unit condominium buildings, for which individual unit assessment, tax, and sales data are readily available. I exclude smaller condominium buildings (2C), which are subject to their own specific assessment growth caps. Individual unit assessment and tax data are not available for co-ops and apartments. As a shorthand, I will refer to the property used in this analysis generically as *condominiums*, having noted the caveat that smaller Class 2 condominium buildings are not included.

The process for assessing and taxing condominiums differs from the process for Class 1 properties in several respects. I highlight three key differences that are potentially consequential for regressivity.

First, market values are estimated differently for condominiums. Whereas Class 1 market values are estimated using a comparable sales approach, condominium market values are estimated more like commercial properties, using an income approach. This approach requires DOF to use information from comparable rental buildings estimate the income that condominiums would obtain if they were rentals, and then to convert that income estimate into an estimate of the property's market value.

Second, condominiums do not enjoy assessment increase caps. Rather, changes in DOF-estimated market values, and ultimately assessments and resulting tax bills, are phased in over a period of five years. The phase in rule does not limit growth in assessed values, but it does spread out the growth in a complicated process creating a pipeline of assessment changes waiting to be implemented at all times. In addition, the target assessment level for condominiums is 45% of DOF-estimated market value, substantially higher than the 6% target for Class 1 properties.

Third, condominiums have access to a much more generous set of exemptions and abatements than those available to Class 1 properties, and these exemptions and abatements, I will show, have a significant impact on tax rates and regressivity.

3.2.1 DOF-estimated market values for condominiums

As noted, market values for condominiums are estimated using an imputed income approach, rather than the comparable sales approach used for Class 1 properties. Prior research has shown that DOF-estimated market values capture only a small fraction of sale prices for Class 2 properties on average (IBO 2006). Anecdotal evidence suggests that the income-based methodology may also be a source of regressivity if it is more difficult to find comparable apartments for high-priced condominiums (e.g., Furman Center 2012). However, within-class regressivity for condominiums has not been previously studied to my knowledge.

Figure 8 shows a binned scatter plot of DOF-estimated market values against sale price for condominiums. Consistent with prior research, DOF-estimated market values capture only a small fraction of sale price, less than 20% on average. In addition, DOF-estimated market values are highly regressive. The median property in the bottom decile is valued at roughly 22% of its price, while the median property in the top decile is valued at only 12% of its price, meaning that the less expensive property is valued at nearly double (22%/12%=179%) the level of the more expensive property. Column (1) of Table 4 confirms this impression of regressivity. Every statistic shows that DOF-estimated market values are regressive for condominiums.

Is the regressivity in DOF-estimated market values for condominiums due to policy choices or assessor errors? One suggestion is that because DOF must value condominiums using data from apartments and it is more difficult to find apartments that are comparable to expensive condos, the regressivity should be seen as the result of the choice to value condos using an income approach, rather than flaws in DOFs estimates (e.g., Furman Center 2012, IBO 2016). It may be impossible to answer this question definitively, but a couple of pieces of evidence suggests that assessor errors are important. First, the regressivity in the data is not driven entirely or even primarily by underestimates at the very top of the price scale. Figure 8 shows that market values are a declining share of sale prices throughout the entire price range. There is regressivity between the first and second deciles, for example, where it should be roughly equally easy to find comparable apartments. Moreover, if I drop the top decile, which contains the putatively hardest to value condos, the regressivity statistics on DOF-estimated market values still show substantially regressivity. Even if I drop both the top and bottom deciles, all of the metrics still show regressivity (see Appendix). This result is also evident from inspecting Figure 8 while ignoring the top and bottom deciles. It is hard to square these results with the claim that the regressivity in DOF-estimated market values for condominiums is due entirely to policy choices rather than assessor errors. Moreover, the fact that DOF-estimated market values capture less than 20% of sale prices, even in the low to middle range of the price scale, where comparable apartment buildings abound, is hard to attribute to the limits of the income-based approach rather than assessor errors.

3.2.2 Assessed Values

Figure 9 and model (2) of Table 4 show results for assessed values before exemptions but after phase ins. In contrast to class 1, there is little difference in the extent of regressivity between for DOF-estimated market values and assessed values for condominiums. This is because assessment increase caps, which are major factor for class 1, are not a factor for the condominiums used in this analysis. In other words, the phase in rule does not substantially alter regressivity.

3.2.3 Nominal and Effective Tax Rates

The nominal (i.e., before exemptions and abatements) tax rate, is proportional to assessed value, and hence regressivity metrics for these two variables are identical, as shown in model (3) of Table 4.

Figure 10 shows nominal and effective tax rates by sale price for condominiums. It is evident that exemptions and abatements counteract regressivity. This is because exemptions and abatements go largely to low- and mid-priced properties, as shown in Figure 11. For properties at the low end of the price scale, exemptions and abatements reduce the tax burden by 40 to 50 percent, whereas they reduce taxes in the top decile by less than 20%. By most indicators shown in Table 4, effective tax rates are less regressive or even slightly progressive after exemptions and abatements.

The appearance of equity is somewhat illusory, however. As the next section shows, effective tax rates within every borough are highly regressive, and pooling them together creates the impression of equity only because the most expensive properties are in Manhattan, which is generically over-taxed relative to the other boroughs.

3.2.4 Condominiums by Borough

Table 5 shows median ratios and tax rates by borough for condominiums. There is some inequity across boroughs in DOF-estimated market values, which range from roughly 16 percent of sale price in Queens to 26 percent in the Bronx. However, exemptions and abatements alter the picture substantially, with disproportionate benefits reaching Brooklyn. Manhattan stands out as having the highest effective rate. The impact of assessment and abatements is well illustrated in the comparison between Brooklyn and Manhattan. Nominal tax rates are 40% higher in Manhattan. However, *effective tax rates are more than 10 times higher in Manhattan than in Brooklyn*. Indeed, Brooklyn, with a median effective tax rate of only .07%, stands out for having, by far, the lowest taxes in the city.

Table 6 shows results of regressions with the addition of borough fixed effects. The inclusion of the fixed effects means estimates are based on within-borough variation. Manhattan is the omitted category and coefficients for other borough indicators can be interpreted as differences relative to Manhattan. Two results stand out from these analyses. First, properties with the same sale price are assessed differently in different boroughs. Consistent with Table 5, Manhattan is indeed taxed at a higher rate than the other boroughs (i.e., all the other borough coefficients are negative), and this difference holds after controlling for sale price differences across boroughs. Second, the sale price coefficients are larger in these regressions, relative to those in Table 4, indicating that the level of regressivity within boroughs is even greater than the level of regressivity considered citywide.

Figure 12 shows binned scatter plots of nominal and effective tax rates against sale price separately for each borough, excluding the Bronx and Staten Island, which have relatively few condominium sales. Again, the x- and y-axes have the same scale in all the plots to facilitate comparisons across the boroughs, but the sale price deciles are defined separately for each borough. Nominal tax rates are regressive in each borough, and abatements and exemptions do not undo the regressivity.

The totality of the evidence shown in Figure 12 and Table 6 suggests an explanation for the apparently absence of regressivity in effective tax rates at the citywide level for condominiums, as seen in Table 4 and Figure 10. The most expensive properties in the city are located disproportionately in Manhattan. Properties located in Manhattan are over-assessed at every price point, relative to the other boroughs. Exemptions and abatements disproportionately benefit low- and mid-priced properties located in boroughs other than Manhattan. Hence, when data are pooled together for entire city (as in Figure 10), the most expensive properties are taxed at a higher level because they are located in Manhattan, which is has higher effective tax rates at every price point. Because the most expensive properties in the city are taxed at a higher rate, citywide effective tax rates do not show regressivity even though there is regressivity within every borough.

In sum, both assessing errors and policy choices likely contribute to regressivity in condominium assessments. As explained above, regressivity in DOF-estimated market values (even when the top and bottom deciles of sale price are excluded) is hard to attribute to anything other than assessing errors. Nor is it obvious how the requirement to produce income-based rather than sales-based assessments would constrain estimated market values to only 20 percent of sale price, especially for price points at which comparable apartment buildings are easily found. While the law requiring DOF to value condos using an income-based approach is certainly a constraint, this constraint is not likely the primary cause of within-class regressivity or to inequities in average assessment levels across boroughs.

3.3 Class 1 vs Condominium nominal and effective tax rates

The preceding analyses have considered each tax class separately because so many aspects of the assessment process are different between the two classes. However, it is instructive to compare the tax rates faced by properties at the same price point in different tax classes. In principle, the nominal tax rate should be higher for condominiums because they are assessed at a much higher fraction of market value (45% vs. 6%). For example, a $1 million single-family home would have an assessed value of $60,000 and, in 2019, an official tax rate of 20.9%, leading to a tax bill of $12,540 (assuming the DOF-estimated market value was accurate and ignoring assessment caps, exemptions, and abatements). Meanwhile, a $1 million condominium would have an assessed value of $450,000 and, in 2019, an official tax rate of 12.6%, leading to a tax bill of $56,700 (again assuming the DOF-estimated market value was accurate and ignoring assessment caps, exemptions, and abatements).

It is clear that the DOF practice of valuing condominiums at only about 20% of their sale price will greatly reduce the disparity in effective tax rates between single-family homes and condominiums. In the preceding example, if the $1 million condominium were valued at only 20% of its sale price, its tax bill would be $11,340, slightly below the single-family home's tax bill. It is easy to wonder if this result could be merely a coincidence.

Moving beyond hypothetical examples, Figure 13 displays nominal tax rates for class 1 properties and condominiums. Nominal tax rates reflect applicable assessment growth limits (which disproportionately affect class 1 properties) but not exemptions and abatements (which disproportionately affect condominiums). Sale price deciles are computed separately for two types of property. Condominiums face higher nominal tax rates at most price levels, although for the least expensive properties the rates are roughly equal to Class 1 rates. The difference in rates increases for more expensive homes.

Importantly, however, exemptions and abatements further tip the balance in favor of condominiums relative to Class 1 properties. Figure 14 shows effective tax rates by sale price for each type of property. Because exemptions and abatements are especially generous for condominiums, most condos actually pay a lower effective tax rate than a class 1 property at the same price point. The differences are particularly stark at the low end of the price spectrum. Only the most expensive Class 1 properties have a lower effective tax rate than condominiums.

In sum, a combination of systematic undervaluation of condominiums properties and generous exemptions and abatements actually lead condos to enjoy lower effective tax rates than class 1 properties, contrary to expectations based on officially prescribed assessment levels and tax rates.

3.4 Tax Shift

The preceding analyses establish that market values, assessed values, and tax rates are highly regressive for both single-family homes and condominiums in New York City. Such regressivity effectively shifts taxes from properties that are over-assessed onto those that are under-assessed. That is, holding the aggregate tax levy constant, when one property is under-taxed, other properties must pay higher taxes to compensate for the lost revenue. In this section, I evaluate the total and average shift in the tax burden across sale price deciles, following methods developed in Berry (2018). I estimate the tax shift separately for Class 1 properties and for condominiums.

The first step is to estimate the *fair tax* for each property in the sales sample. The fair tax is the tax the property would pay if taxes were proportional to sale price. For example, if a given property's sale price represented 1% of the total tax base in a given year, that property's fair tax would be 1% of the total tax levy in that year. The *fair tax rate* for an individual property is its fair tax divided by its sale price. For an individual property, the difference between its fair tax and its actual tax is its tax shift. Importantly, this tax shift estimate encapsulates the deviations from proportional taxation that are due to biases in DOF-estimated market values and assessment growth caps, but not those due to exemptions and abatements. Exemptions and abatements are better understood as tax expenditures and should be considered separately.

The procedure just described requires information on the sale price of each property. Therefore, the individual tax shift estimates can be produced only for homes that have sold. The procedure starts by estimating the aggregate value of sale prices and nominal tax bills in the sample of sold homes, which serve as the levy and the base, respectively. Based on these values, it is straightforward to compute the fair tax and the tax shift for each property in the sales sample.

In order to scale up the estimates for sold properties to arrive at an estimate of the aggregate tax shift, it is necessary to have a procedure to extrapolate from the sample of sold properties to the full population of properties. The simplest approach is to assume that sold properties are a representative sample of the population of all properties. Then scaling up simply requires computing the proportion of properties that sold, p, and multiplying the sample total by $1/p$ to get the population total. However, representativeness is a strong assumption, and estimates can often be improved by stratification, which produces weights according to the probability of sale within strata (see Berry 2018 for details). In the estimates to follow, I stratify by borough and deciles of DOF-estimated market value. This approach generates estimates of population-level totals that closely match the values in the real data for market values and nominal taxes, increasing confidence that the weighting scheme is adequate to recover known population-level totals.

Using the stratification strategy just described, I estimated the aggregate tax shift for each price decile. I produced estimates separately for Class 1 properties and for condominiums, because the share of revenue taken from each class is fixed, meaning over/under taxation of a property in one of the classes has implications for other properties in the same class, but not for properties in a different class.

The results for Class 1 for 2019 are shown in figure 15 and the underlying estimates are shown in Table 7. The top decile was under-taxed by nearly $450 million, on net, in 2019, and the 9th decile was undertaxed by roughly $47 million. Those taxes were spread among the other deciles.

In the other words, the top 20% of properties were under-taxed by roughly $500 million, and that tax was shifted onto the bottom 80% of properties.

The estimates for condominiums in 2019 are shown in Figure 16 and the underlying estimates are shown in table 8. The top decile was under-taxed by nearly $300 million, on net, in 2019. All of the other deciles were over-taxed on net. As shown in table 8, the average condo in the top decile paid approximately $20,000 too little in taxes, while the average condo in the bottom decile paid about $1,000 too much. Other deciles were over-taxed to varying degrees.

4 Conclusion

Assessing errors and policy choices generate property tax regressivity in New York City. Market values estimated by the Department of Finance are regressive for both Class 1 and condominium properties. The regressivity of those estimates is likely due to data and modeling limitations. At the same time, policy choices substantially exacerbate property tax regressivity. For Class 1 properties, assessment growth caps disproportionately benefit properties with higher sale prices, compounding the regressivity already evident in DOF-estimated market values. For condominiums, the requirement to use income-based valuation (a policy choice) may contribute to regressivity in DOF-estimated market values, but cannot alone explain the regressivity or the generically low valuation of these properties. Exemptions and abatements partially offset the regressivity of DOF-market values for condominiums, but effective tax rates remain highly regressive within each borough.

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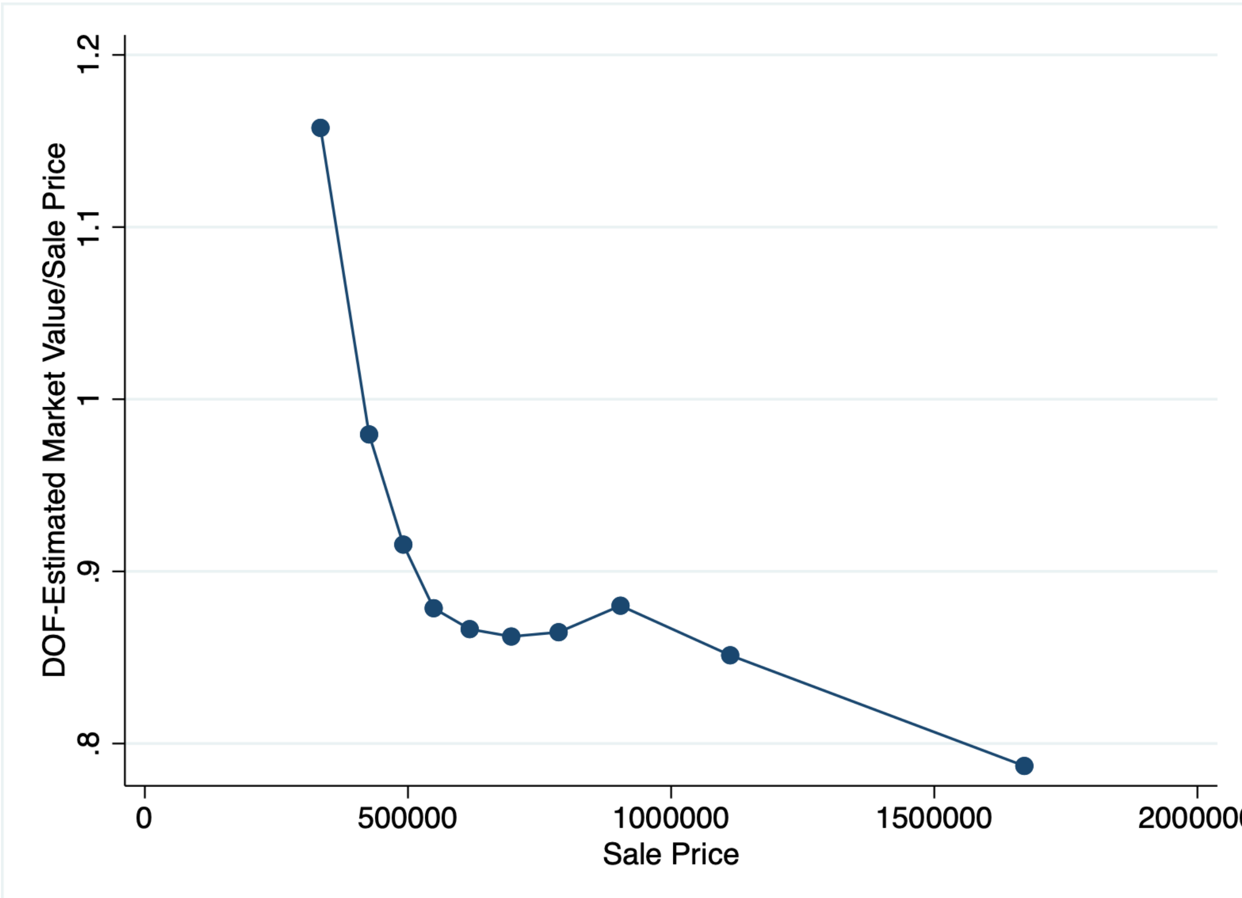

Figure 1: DOF-estimated market value ratio by sale price decile, Class 1

Notes: Properties are sorted into deciles of sale price. Each dot represents the median sale price and median market value ratio in the decile. The market value ratio for an individual property is the property's DOF-estimated market value divided by its sale price.

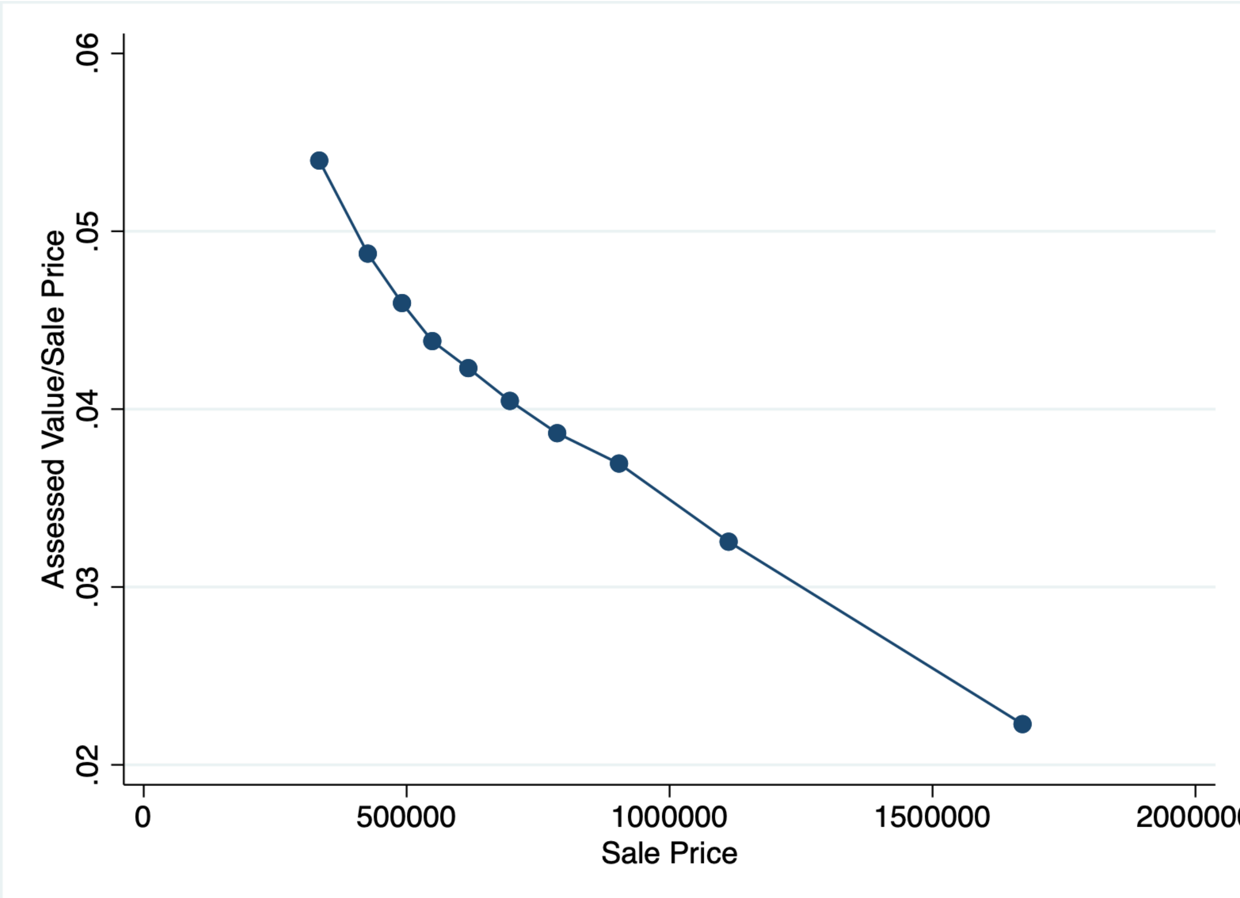

Figure 2: Assessment ratio by sale price decile, Class 1

Notes: Properties are sorted into deciles of sale price. Each dot represents the median sale price and median assessment ratio in the decile. The assessment ratio for an individual property is the property's assessed value (prior to exemptions) divided by its sale price.

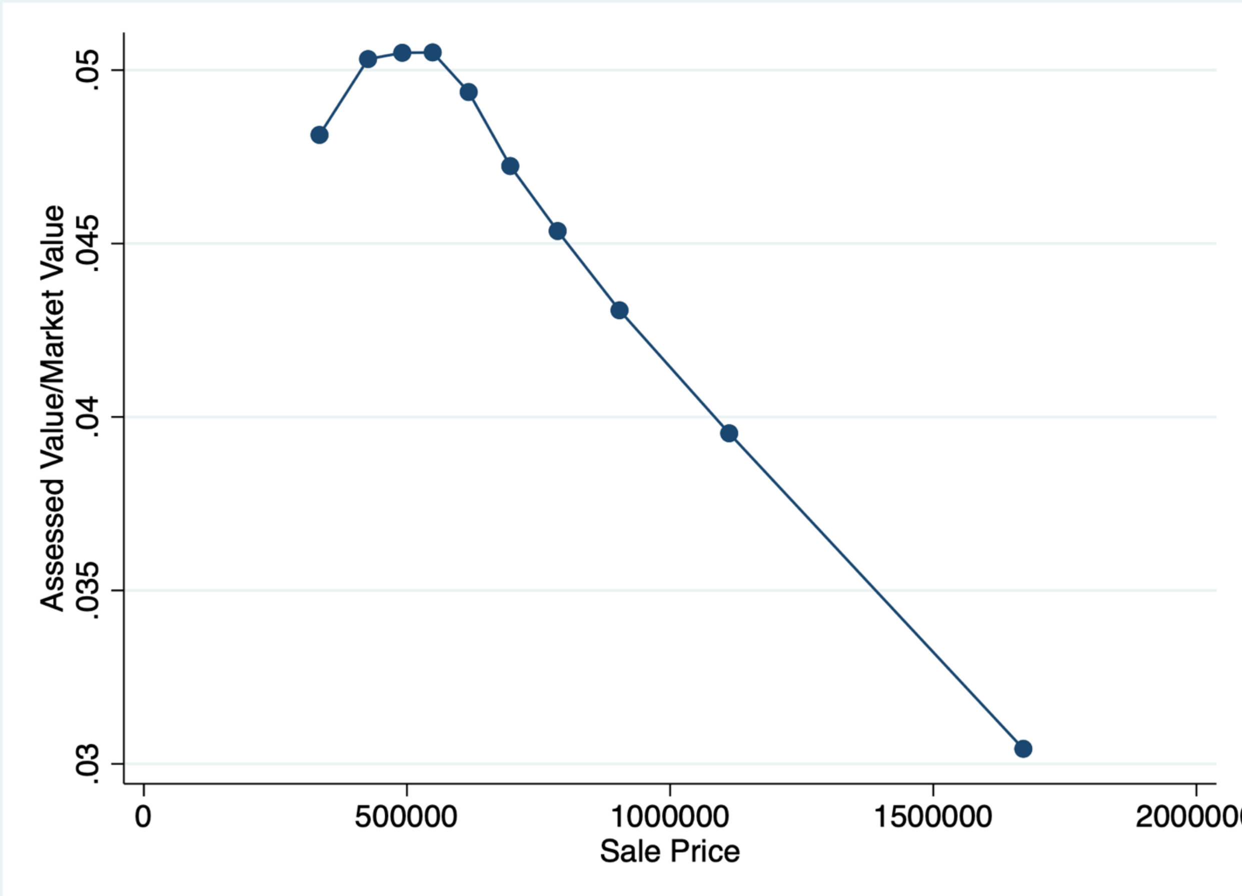

Figure 3: Assessed value as share of DOF-estimated market value, by sale price decile, Class 1

Notes: Properties are sorted into deciles of sale price. Each dot represents the median sale price and median ratio of assessed value to DOF-estimated market value in the decile.

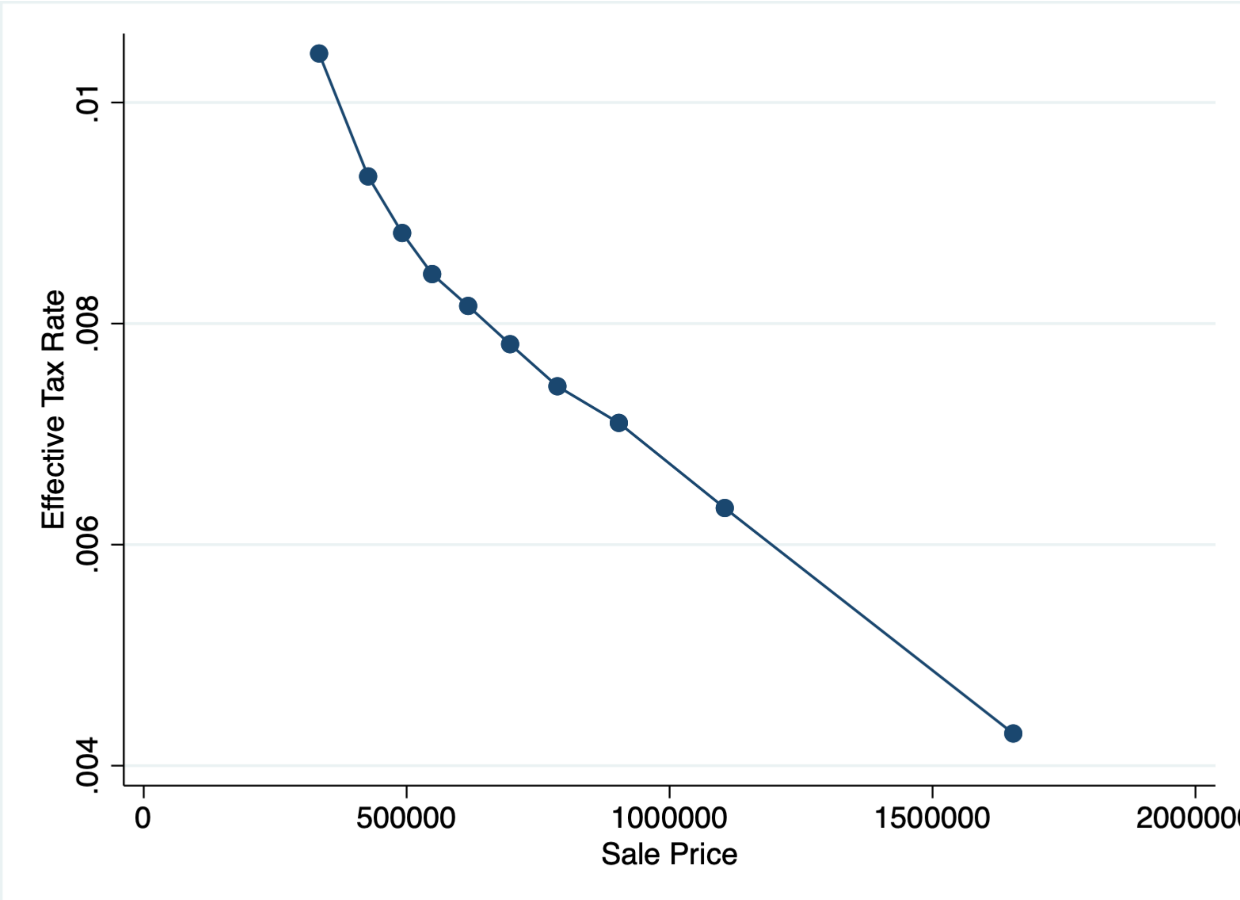

Figure 4: Effective tax by sale price decile, class 1

Notes: Properties are sorted into deciles of sale price. Each dot represents the median sale price and median effective tax rate in the decile. The effective tax rate for an individual property is the property's tax bill (after exemptions and abatements) divided by its sale price.

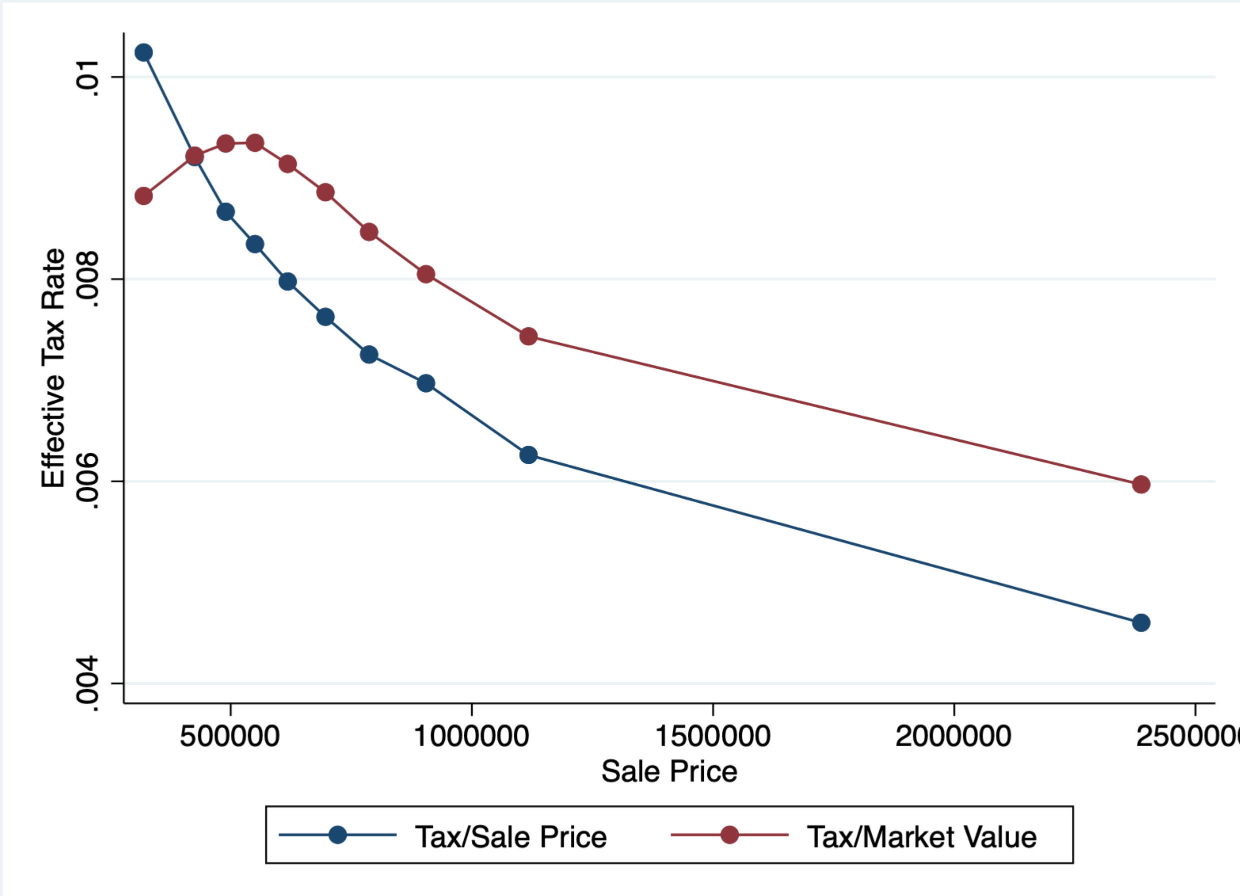

Figure 5: DOF-estimated market value-based ETR vs. Sale price-based ETR, by sale price decile, Class 1

Notes: Properties are sorted into deciles of sale price. Each dot on the red line represents the median sale price and median ratio of tax (after exemptions and abatements) to DOF-estimated market value in the decile. Each dot on the blue line represents the median sale price and median ratio of tax (after exemptions and abatements) to sale price in the decile.

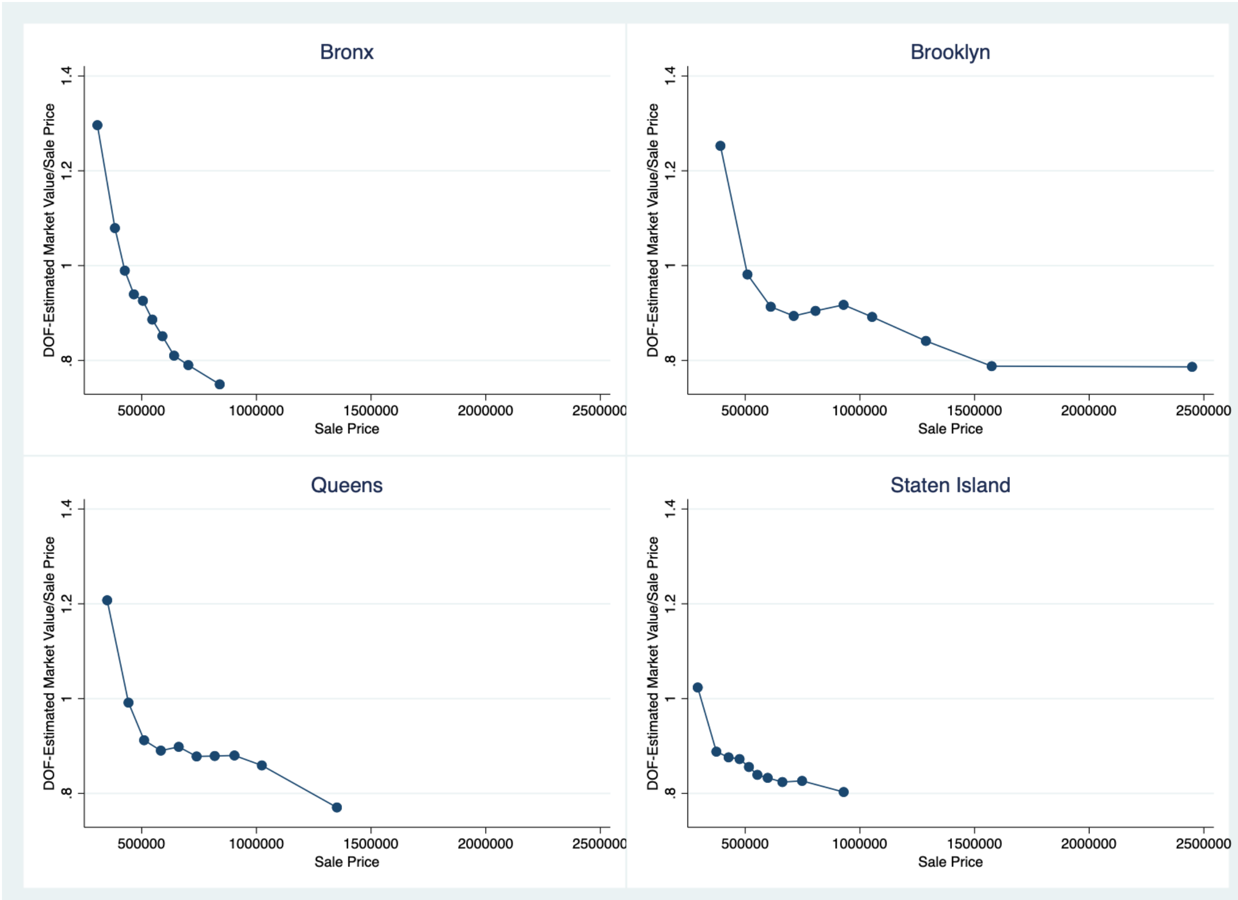

Figure 6: DOF-estimated market value ratio by sale price decile, by Borough, Class 1

Notes: Properties are sorted into deciles of sale price separately within each borough. Each dot represents the median sale price and median market value ratio in the decile. The market value ratio for an individual property is the property's DOF-estimated market value divided by its sale price. Manhattan is excluded because it has relatively few Class 1 property sales.

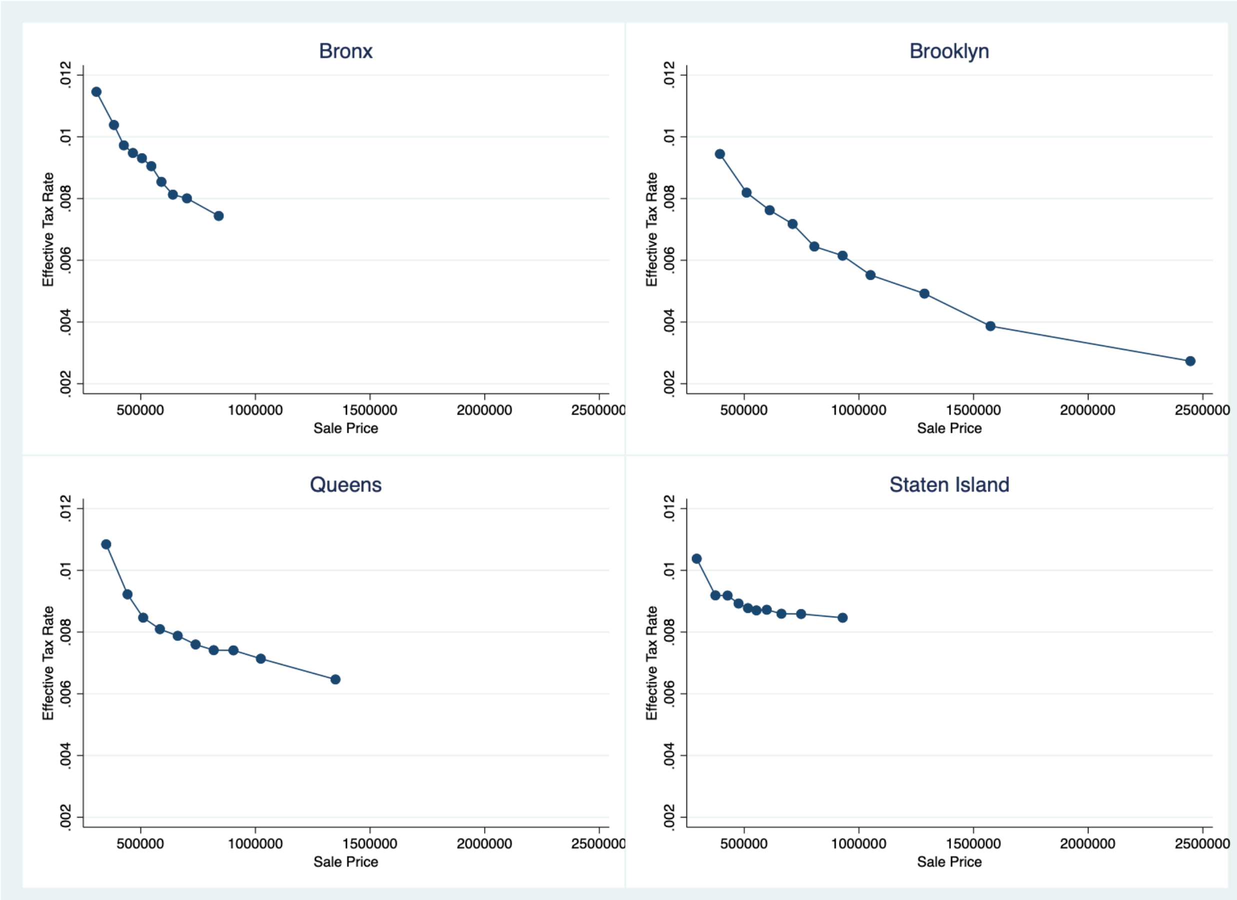

Figure 7: Effective tax rate by sale price decile, by Borough, Class 1

Notes: Properties are sorted into deciles of sale price separately by borough. Each dot represents the median sale price and median effective tax rate in the decile. The effective tax rate for an individual property is the property's tax bill (after exemptions and abatements) divided by its sale price. Manhattan is excluded because it has relatively few Class 1 property sales.

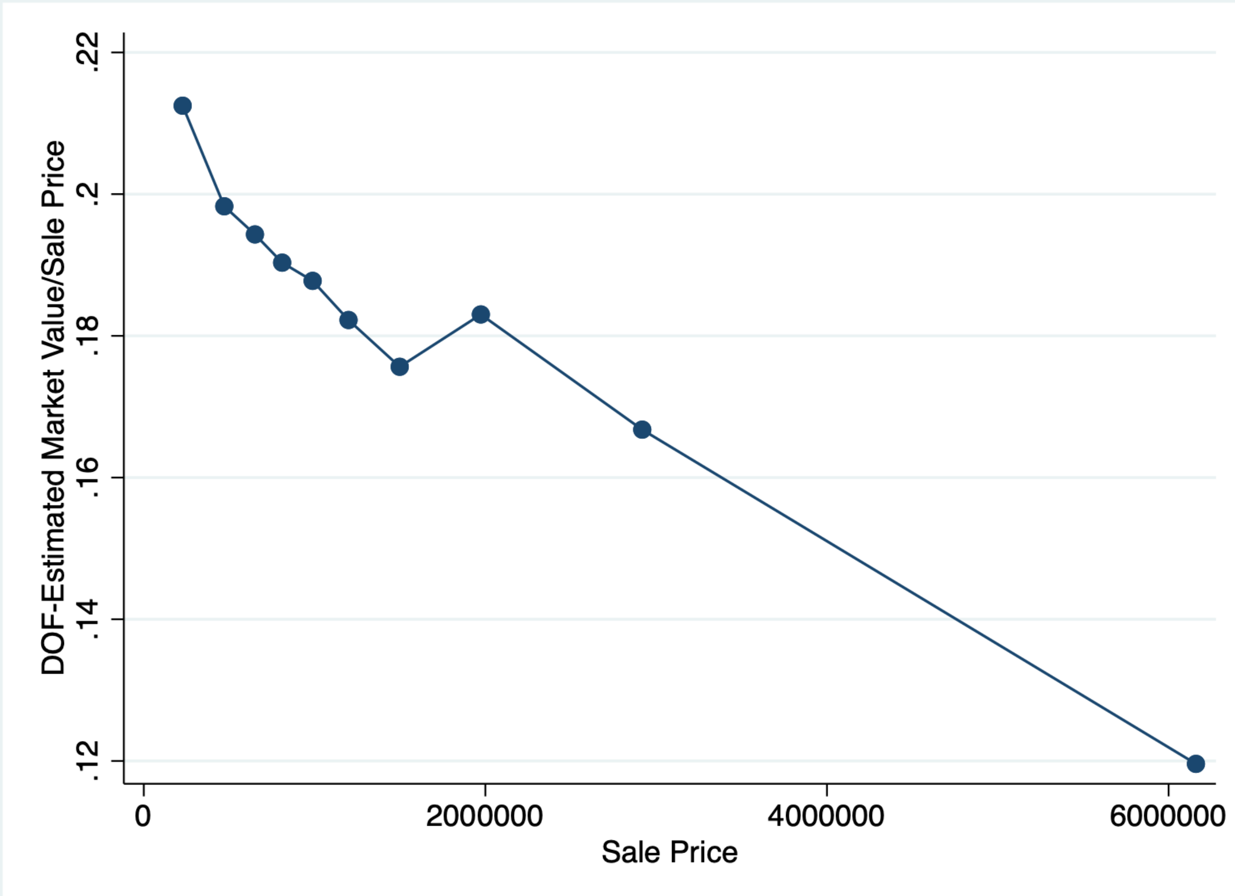

Figure 8: DOF-estimated market value ratio by sale price decile, Condominiums

Notes: Properties are sorted into deciles of sale price. Each dot represents the median sale price and median market value ratio in the decile. The market value ratio for an individual property is the property's DOF-estimated market value divided by its sale price.

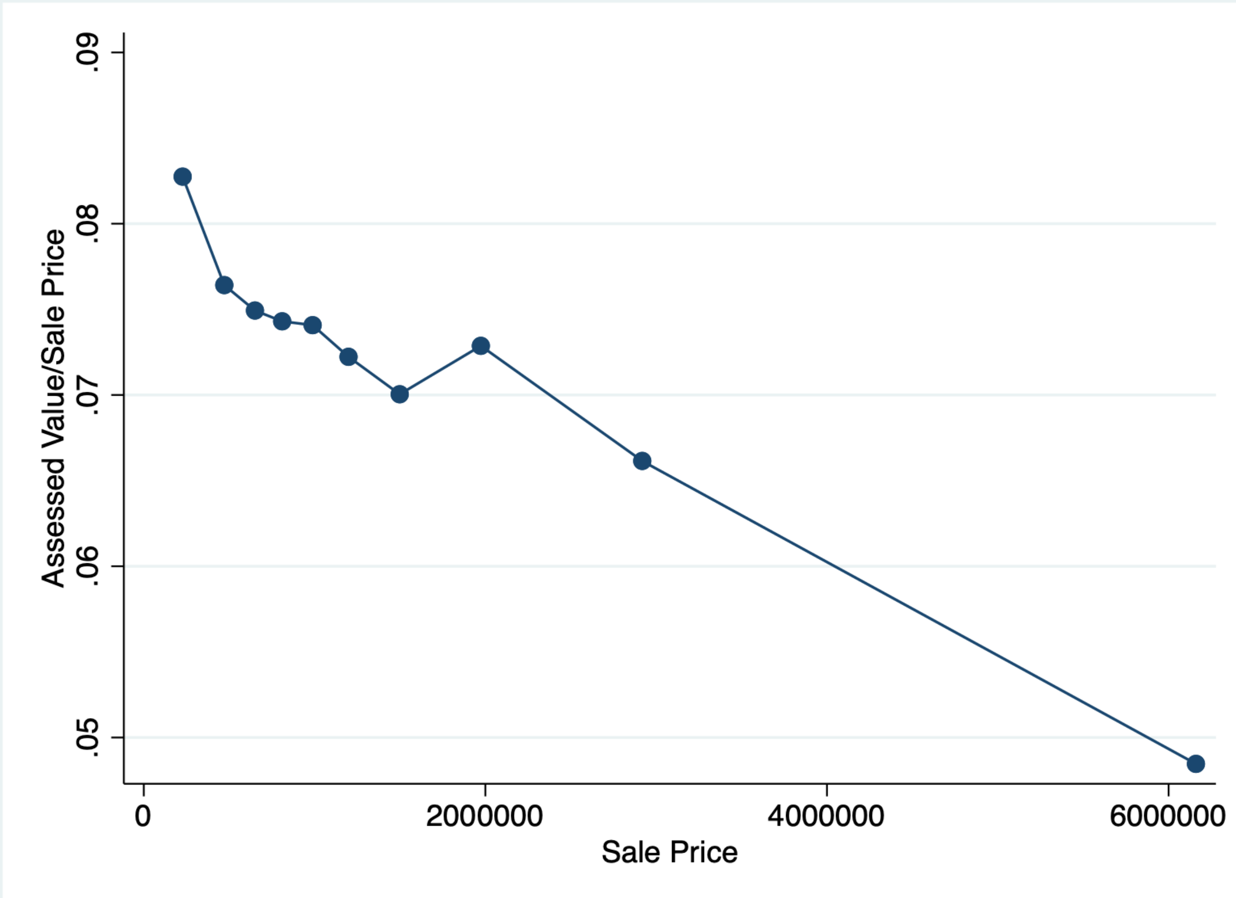

Figure 9: Assessment ratio by sale price decile, Condominiums

Notes: Properties are sorted into deciles of sale price. Each dot represents the median sale price and median assessment ratio in the decile. The assessment ratio for an individual property is the property's assessed value (prior to exemptions) divided by its sale price.

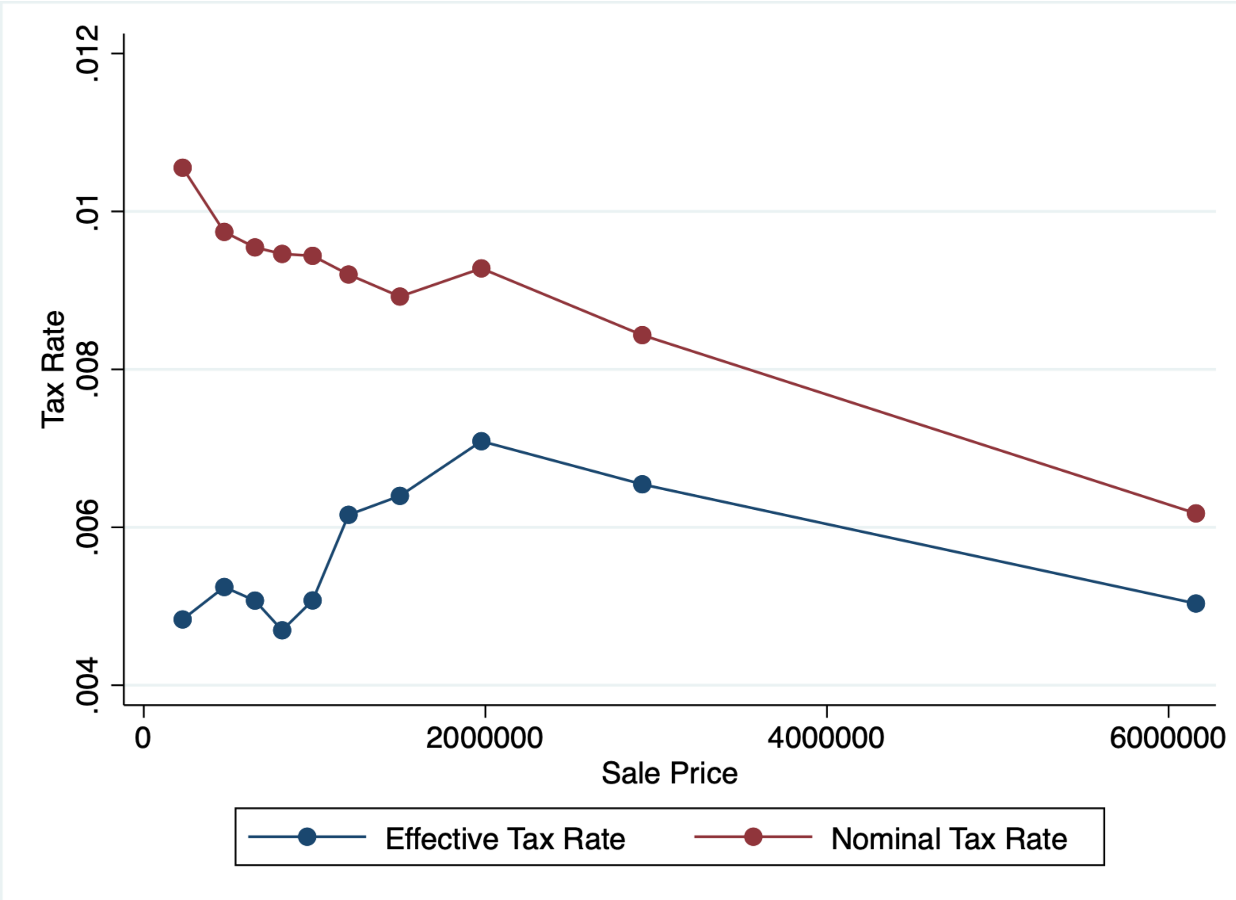

Figure 10: Nominal and effective tax rate, by sale price decile, Condominiums

Notes: Properties are sorted into deciles of sale price. Each dot on the blue line represents the median sale price and median effective tax rate in the decile. Each dot on the red line represents the median sale price and median nominal tax rate in the decile. The effective tax rate for an individual property is the property's tax bill (after exemptions and abatements) divided by its sale price. The nominal tax rate for an individual property is the property's tax bill (before exemptions and abatements) divided by its sale price.

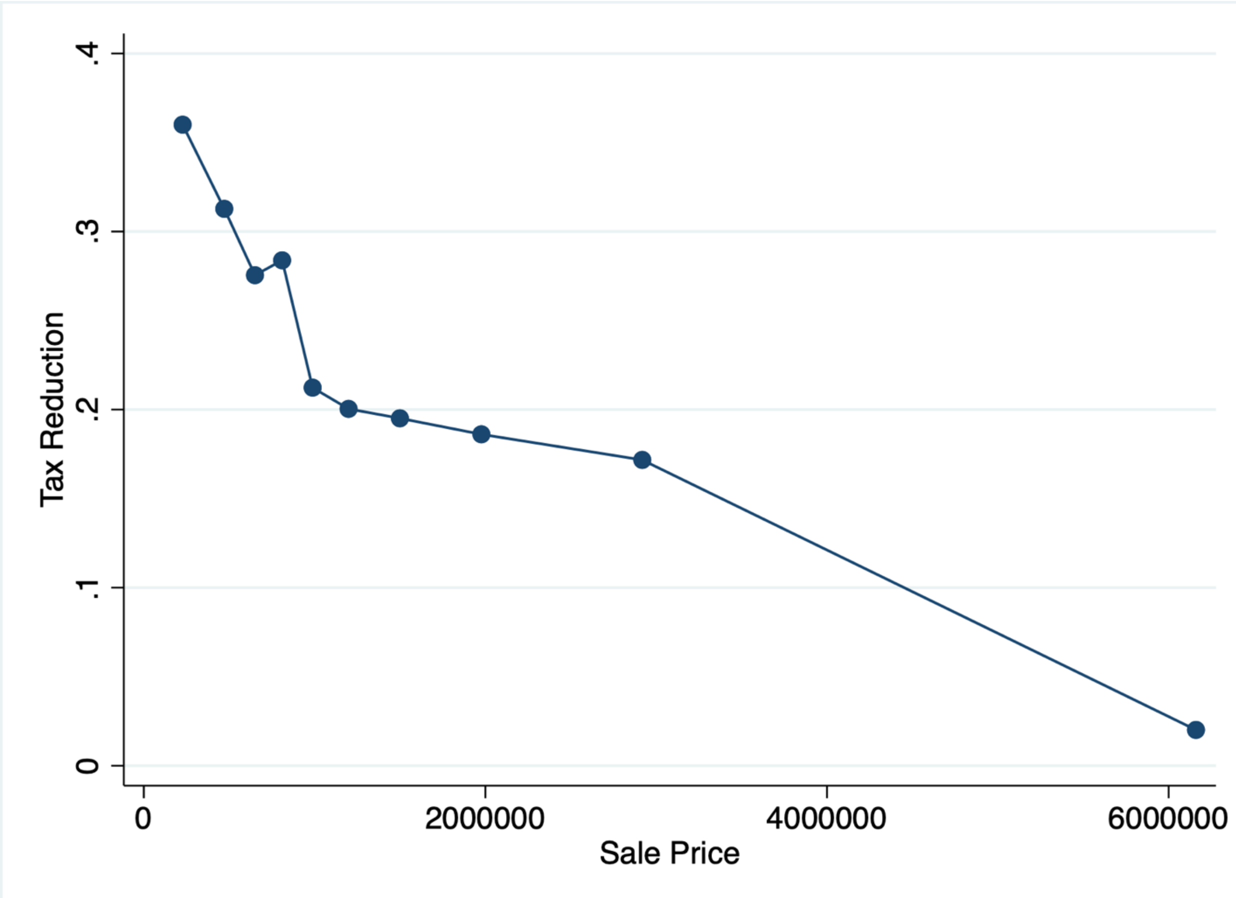

Figure 11: Share of nominal tax liability eliminated by abatements and exemptions, by sale price decile, Condominiums

Notes: Properties are sorted into deciles of sale price. Each dot represents the median sale price and median tax reduction due to exemptions and abatements in the decile.

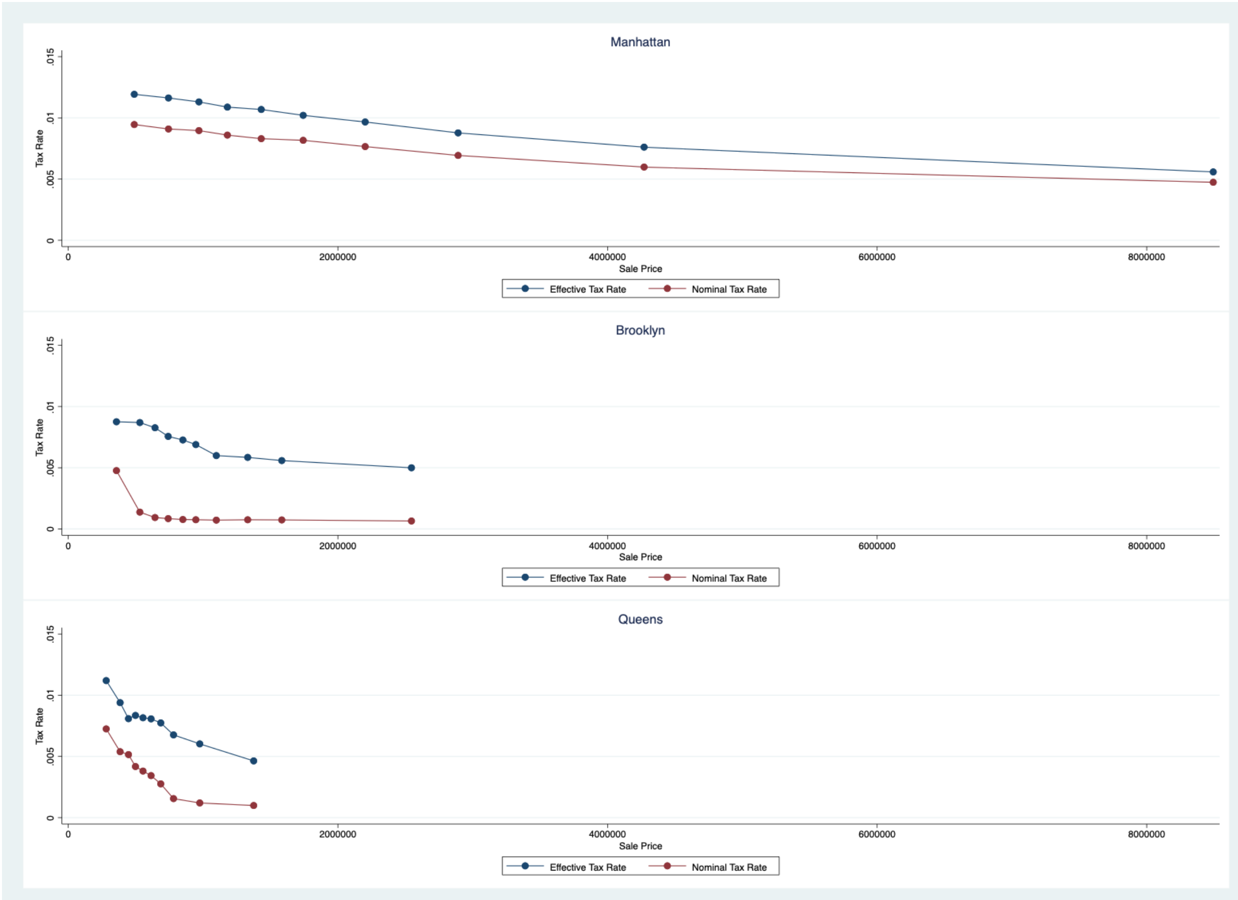

Figure 12: Nominal and effective tax rates, by sale price decile, by borough, Condominiums

Notes: Properties are sorted into deciles of sale price separately by borough. Each dot on the blue line represents the median sale price and median effective tax rate in the decile. Each dot on the red line represents the median sale price and median nominal tax rate in the decile. The effective tax rate for an individual property is the property's tax bill (after exemptions and abatements) divided by its sale price. The nominal tax rate for an individual property is the property's tax bill (before exemptions and abatements) divided by its sale price. Staten Island and the Bronx are excluded because they have relatively few condominium sales.

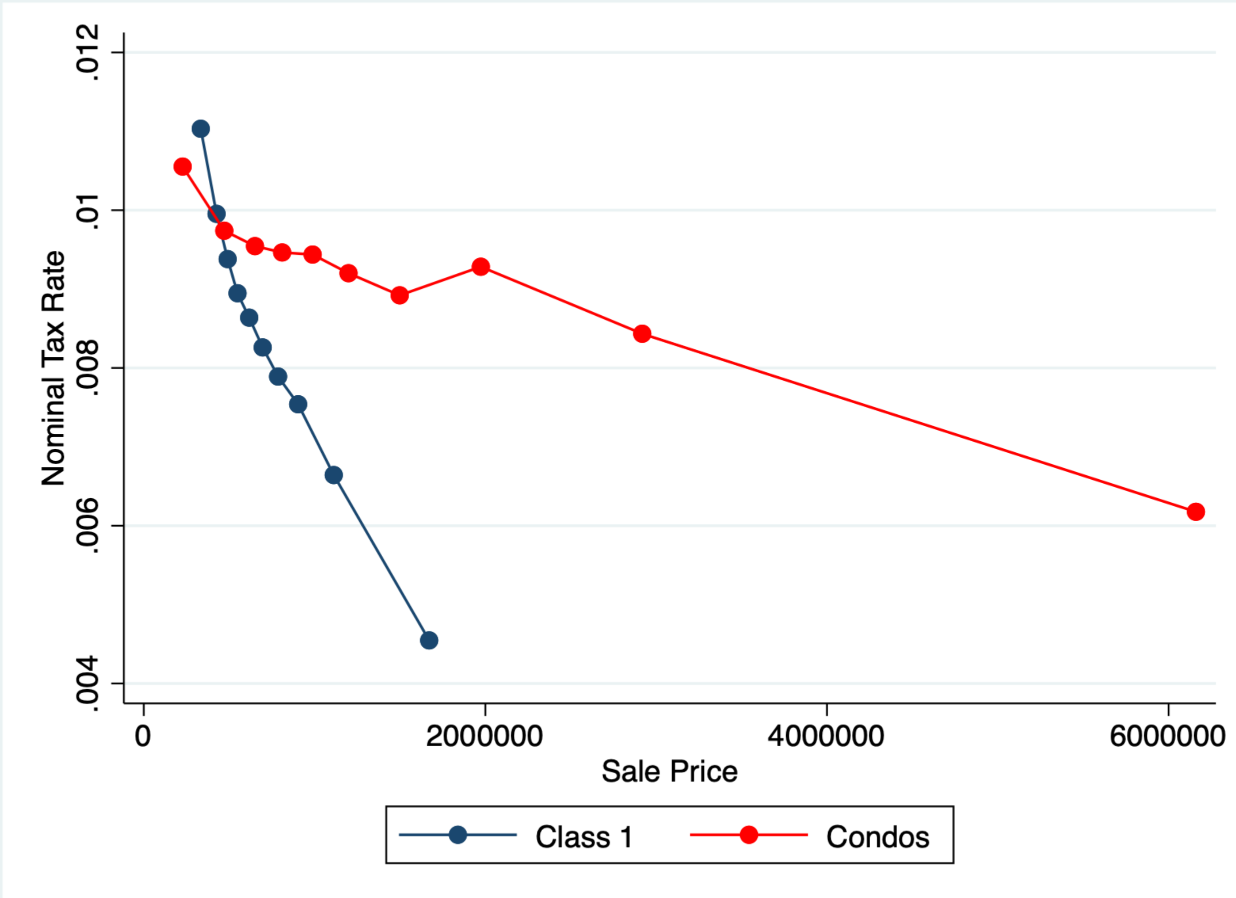

Figure 13: Class 1 vs Condo nominal tax rates, by sale price decile

Notes: Properties are sorted into deciles of sale price. Each dot represents the median sale price and median effective tax rate in the decile. The nominal tax rate for an individual property is the property's tax bill (before exemptions and abatements) divided by its sale price. The blue line represents data for Class 1 properties. The red line represents data for condominiums.

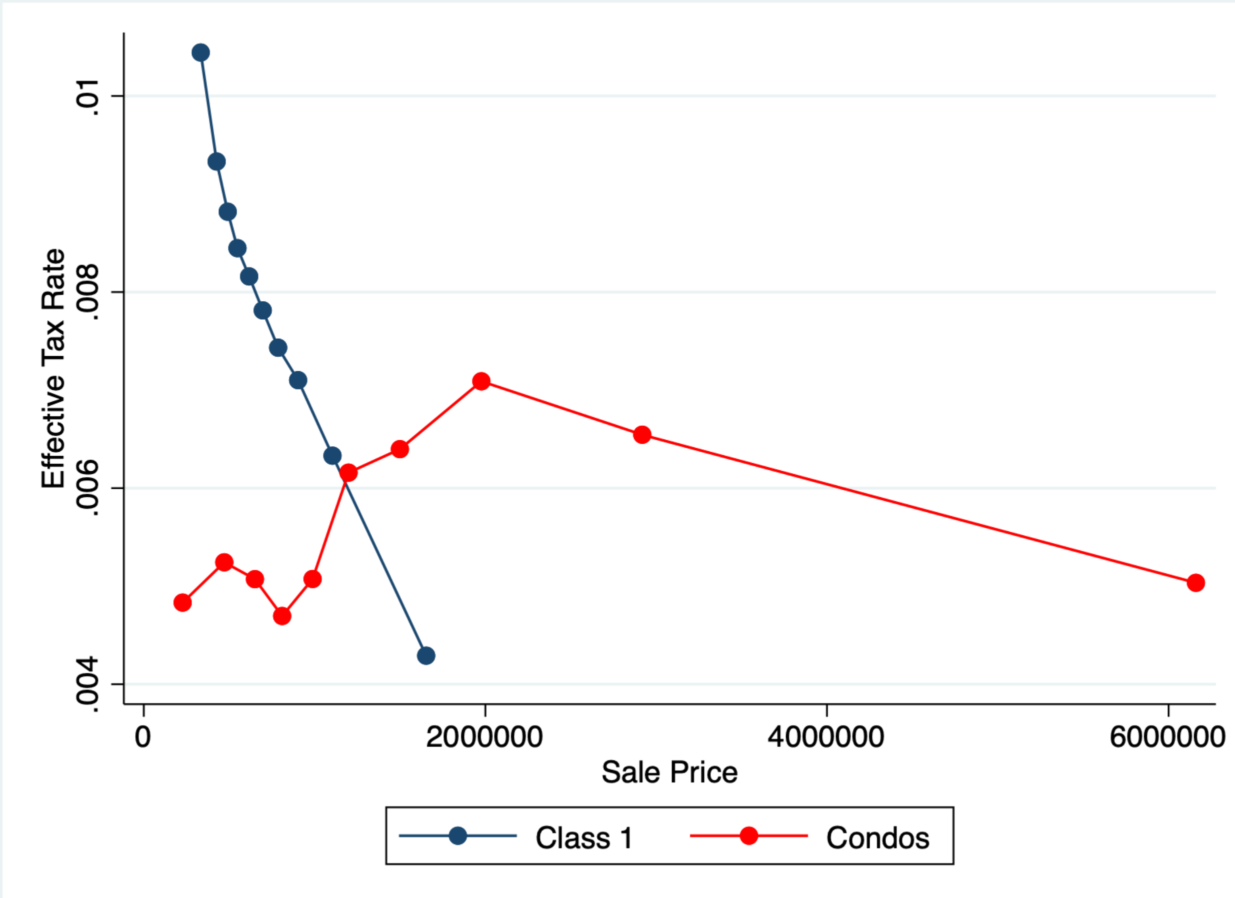

Figure 14: Class 1 vs Condo effective tax rates, by sale price decile

Notes: Properties are sorted into deciles of sale price. Each dot represents the median sale price and median effective tax rate in the decile. The effective tax rate for an individual property is the property's tax bill (after exemptions and abatements) divided by its sale price. The blue line represents data for Class 1 properties. The red line represents data for condominiums.

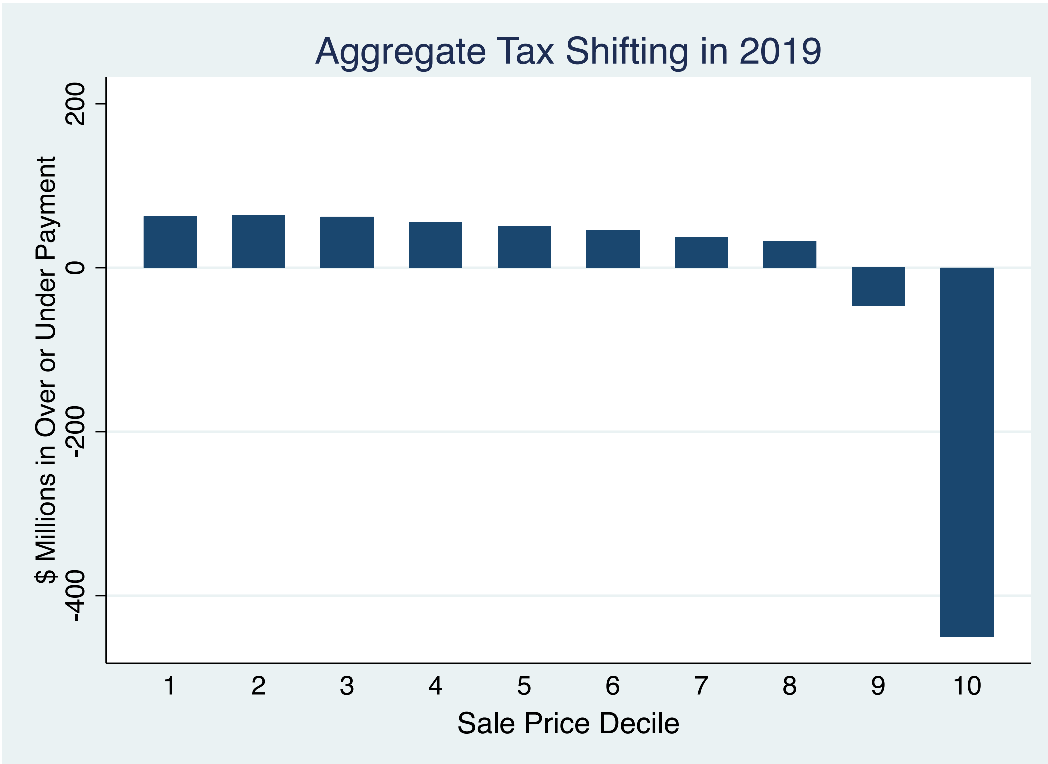

Figure 15: Aggregate Tax Shift by Price Decile in 2019, Class 1

Note: Each bar represents the total tax shift for properties within a price decile, estimated following the method described in the text.

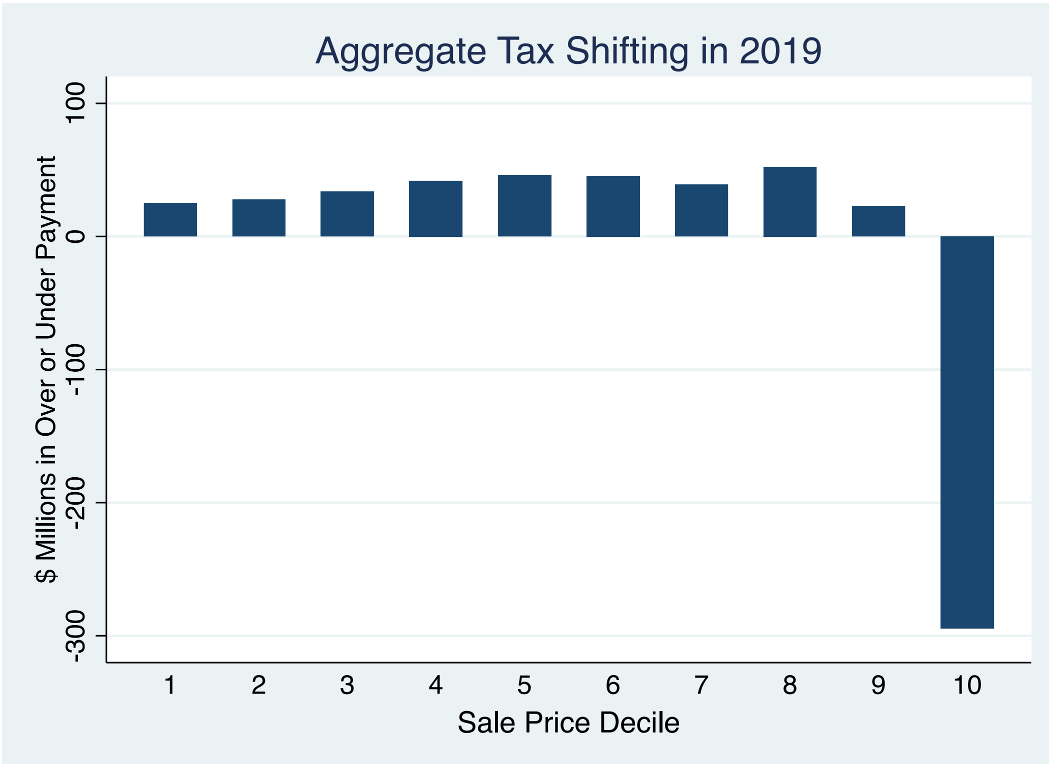

Figure 16: Aggregate Tax Shift by Price Decile in 2019, Condos

Note: Each bar represents the total tax shift for properties within a price decile, estimated following the method described in the text.

Table 1: Regressivity Metrics for Class 1 Sales

	(1)	(2)	(3)	(4)
	Market Value/Sale Price	Assessed Value/Sale Price	Nominal Tax Rate	Effective Tax Rate
A. Regression				
ln(sale price)	-0.174***	-0.455***	-0.455***	-0.440***
	(0.00201)	(0.00255)	(0.00255)	(0.00304)
Constant	2.235***	2.841***	1.253***	0.961***
	(0.0271)	(0.0343)	(0.0343)	(0.0409)
Observations	62,228	62,228	62,228	62,169
R-squared	0.112	0.340	0.339	0.252
B. Alternative Stats				
PRD	1.04	1.15	1.15	1.15
MKI	0.89	0.56	0.57	0.58
COD	20.2	25.1	25	27.6

Notes:

Panel A shows results of a regression in which the dependent variable is ln(column variable)-ln(sale price) and the independent variable is ln(sale price). All models include fixed effects for fiscal year. Standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Panel B shows the Price-related differential (PRD), the modified Kakwani index (MKI), and the coefficient of dispersion (COD) for each column variable.

Table 2: 2016-2019 Median Values by Borough, Class 1

	Sale price	DOF-estimated market value/ sale price	Assessed value/ sale price	ETR before exemptions & abatements	ETR after exemptions & abatements
BRONX	$ 520,980	90.6%	4.6%	0.95%	0.89%
BROOKLYN	$ 868,000	90.2%	3.2%	0.65%	0.60%
MANHATTAN	$ 5,050,000	102.3%	2.3%	0.47%	0.46%
QUEENS	$ 700,000	90.0%	4.1%	0.83%	0.79%
STATEN ISLAND	$ 535,000	85.7%	4.6%	0.95%	0.89%

Table 3: Regression with Borough Fixed Effects, Class 1

	(1)	(2)	(3)	(4)
	Market Value/Sale Price	Assessed Value/Sale Price	Nominal Tax Rate	Effective Tax Rate
ln(sale price)	-0.271***	-0.412***	-0.412***	-0.400***
	(0.00222)	(0.00283)	(0.00283)	(0.00343)
Bronx	-0.715***	-0.285***	-0.285***	-0.317***
	(0.0124)	(0.0158)	(0.0158)	(0.0192)
Brooklyn	-0.562***	-0.484***	-0.484***	-0.509***
	(0.0117)	(0.0150)	(0.0150)	(0.0182)
Queens	-0.652***	-0.246***	-0.246***	-0.271***
	(0.0119)	(0.0152)	(0.0152)	(0.0184)
Staten Island	-0.794***	-0.244***	-0.244***	-0.275***
	(0.0122)	(0.0156)	(0.0156)	(0.0189)
Constant	4.193***	2.572***	0.983***	0.769***
	(0.0359)	(0.0458)	(0.0458)	(0.0555)
Observations	62,228	62,228	62,228	62,169
R-squared	0.209	0.405	0.404	0.303

Notes:

Table shows results of a regression in which the dependent variable is ln(column variable)-ln(sale price) and the independent variable is ln(sale price). All regressions include fixed effects for boroughs; Manhattan is the omitted category. All models include fixed effects for fiscal year. Standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 4: Regressivity Metrics for Condominiums

	(1)	(2)	(3)	(4)
	Market Value/Sale Price	Assessed Value/Sale Price	Tax/Sale Price (before exemptions and abatements)	Tax/Sale Price (after exemptions and abatements)
A. Regression				
ln(sale price)	-0.190***	-0.177***	-0.177***	0.127***
	(0.00398)	(0.00400)	(0.00400)	(0.01000)
Constant	0.846***	-0.269***	-2.329***	-7.461***
	(0.0557)	(0.0560)	(0.0560)	(0.140)
Observations	22,728	22,728	22,728	21,879
R-squared	0.104	0.090	0.087	0.011
B. Alternative Stats				
PRD	1.25	1.24	1.24	1.06
MKI	0.79	0.81	0.81	0.95
COD	36.8	36.7	36.7	68.2

Notes:

Panel A shows results of a regression in which the dependent variable is ln(column variable)-ln(sale price) and the independent variable is ln(sale price). All models include fixed effects for fiscal year. Standard errors are in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Panel B shows the Price-related differential (PRD), the modified Kakwani index (MKI), and the coefficient of dispersion (COD) for each column variable.

Table 5: 2017-2019 Median Values by Borough, Condominiums

	Sale price	DOF-estimated market value/ sale price	Assessed value/ sale price	ETR before exemptions & abatements	ETR after exemptions & abatements
BRONX	$ 170,000	25.5%	10.5%	1.33%	0.24%
BROOKLYN	$ 895,000	14.4%	5.4%	0.69%	0.07%
MANHATTAN	$ 1,550,000	19.5%	7.7%	0.98%	0.77%
QUEENS	$ 568,000	15.9%	6.2%	0.79%	0.31%
STATEN ISLAND	$ 260,000	18.1%	7.3%	0.93%	0.68%

Table 6: Regression with Borough Fixed Effects, Class 2

	(1)	(2)	(3)	(4)
	Market Value/Sale Price	Assessed Value/Sale Price	Tax/Sale Price (before exemptions and abatements)	Tax/Sale Price (after exemptions and abatements)
ln(sale price)	-0.338***	-0.338***	-0.321***	-0.327***
	(0.00459)	(0.00459)	(0.00460)	(0.0103)
Bronx	-0.414***	-0.414***	-0.349***	-1.868***
	(0.0207)	(0.0207)	(0.0207)	(0.0465)
Brooklyn	-0.531***	-0.531***	-0.557***	-2.127***
	(0.00906)	(0.00906)	(0.00907)	(0.0204)
Queens	-0.598***	-0.598***	-0.584***	-1.495***
	(0.0112)	(0.0112)	(0.0112)	(0.0249)
Staten Island	-0.634***	-0.634***	-0.628***	-0.629***
	(0.0246)	(0.0246)	(0.0247)	(0.0544)
Constant	3.148***	2.350***	1.964***	-0.352**
	(0.0662)	(0.0662)	(0.0663)	(0.149)
Observations	22,728	22,728	22,728	21,879
R-squared	0.260	0.260	0.254	0.357

Notes:

Table shows results of a regression in which the dependent variable is ln(column variable)-ln(sale price) and the independent variable is ln(sale price). All regressions include fixed effects for boroughs; Manhattan is the omitted category. All models include fixed effects for fiscal year. Standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 7: Class 1 Tax Shift by Decile, 2019

	Average within Sales Sample			Scaled Up Tax Shift	
Price Decile	Fair Tax	Actual Tax (before abatements and exemptions)	Tax Shift	Simple Weights	Strata Weights
1	2,516	3,744	1,228	78,200,000	62,600,000
2	3,309	4,469	1,160	74,100,000	63,700,000
3	3,807	4,842	1,035	67,700,000	62,200,000
4	4,256	5,195	939	58,300,000	55,800,000
5	4,741	5,533	792	50,400,000	50,700,000
6	5,290	5,971	681	42,900,000	45,900,000
7	5,936	6,420	484	31,000,000	37,200,000
8	6,773	7,139	366	23,900,000	32,300,000
9	8,455	7,767	(688)	(43,100,000)	(46,500,000)
10	19,024	12,873	(6,151)	(383,000,000)	(450,000,000)

Table 8: Condominium Tax Shift by Decile, 2019

	Average within Sales Sample			Scaled Up Tax Shift	
Price Decile	Fair Tax	Actual Tax (before abatements and exemptions)	Tax Shift	Simple Weights	Strata Weights
1	2,046	3,010	964	18,400,000	25,100,000
2	3,984	5,441	1,457	25,600,000	27,700,000
3	5,170	6,980	1,809	31,600,000	33,800,000
4	6,302	8,614	2,312	39,600,000	41,800,000
5	7,534	10,057	2,523	44,800,000	46,200,000
6	9,416	11,945	2,528	46,600,000	45,500,000
7	11,849	14,266	2,417	42,200,000	38,900,000
8	15,878	19,721	3,843	69,500,000	52,300,000
9	24,409	27,212	2,803	50,600,000	22,700,000
10	72,154	51,968	(20,185)	(369,000,000)	(295,000,000)