OFFICE OF THE CONTROLLER

Mark Pinsley, MBA   Nanton John, CFE

COUNTY CONTROLLER   DEPUTY CONTROLLER

Corey A. Cieslak, Director of Real Estate
Lehigh County Assessment Office
17 South Seventh St.
Allentown, PA 18101-2400

Executive Summary

The Controller's Office requested Urban3 (see: https://www.urbanthree.com/) evaluate the fairness of the County of Lehigh property assessments. Attached is their report starting with their Executive Summary followed by their supporting analysis. The Urban3 report was prepared independent of the Controller's Office and their work does not represent any work product of the Controller's Office. We did not verify any of their data nor did we participate in their external analysis. We requested this independent analysis to determine whether the County of Lehigh analysis would indicate any required change in the County of Lehigh assessment process.

Overall Urban3 concluded the current status of assessed values of property tax is mostly fair. There are some small areas for improvement, but the report finds an overall fairness in assessed values. Over the period evaluated, according to Urban 3's analysis, market conditions of home prices have seemed to self-correct toward a more fair property assessment.

Background

Property taxes are a crucial revenue source for the county, funding essential public services such as the courts, jail, infrastructure, emergency services and more. Outside of state grants, property taxes are the main way the county funds these services. The goal of property assessments is to ensure that each property owner pays their fair share based on the value of their property. When assessments are not fair, it can lead to some homeowners paying too much while others pay too little. This report looks at the history and current state of property assessments in Lehigh County, focusing on whether these assessments are fair across different property values and demographics.

The report uses a method of analysis called "deciles." This method divides properties into ten equal groups based on the number of homes and their assessed values, then compares these to their actual sale values. This helps analyze how fair the assessments are across different property values. Overall, homeowners are seeing more savings in their property taxes, but this varies by property value. Initially, lower-priced homes were overtaxed, but this has improved

over time. The least expensive homes experienced the highest tax rates initially, but these rates have decreased, making the tax system fairer. Specific areas like Allentown have seen significant improvements, especially for lower and moderately priced homes, indicating that efforts to balance the tax burden have become fairer overtime. This was not a deliberate effort but rather market forces caused less expensive homes to rise in value faster than more expensive homes.

In the report, the term "savings" refers to the difference between the market value of a property (the price it actually sells for) and its assessed value (the value used to calculate property taxes). A property's assessed value is almost always lower than its market value. The homeowner pays taxes on a smaller amount than the property's full worth (at sale). This difference results in lower property taxes, referred to as "savings." In simple terms, homeowners benefit from paying less in taxes than they would if their property were assessed at its full market value. Ideally, these "savings" should be fair for all homeowners. For example, if your home could sell for $100,000 and you're paying taxes on $90,000, you have a 10% savings. Similarly, if your home could sell for $500,000 and you're paying taxes on $450,000, you also have a 10% savings. Historically, however, we've seen that more expensive homes tend to receive a larger percentage of savings compared to lower-valued homes, which creates an imbalance in the fairness of property tax assessments.

Counties across Pennsylvania assess the values of properties as a way to determine how much property owners have to pay in property taxes. That includes taxes levied by the county, local municipalities and school districts. Each of those entities sets its own property tax rate, which is then applied to the assessed value of a property to calculate tax bills. According to the state constitution, that has to be done uniformly.

To achieve uniformity, counties use what is called a "base year assessment." That is a year when the county goes out and officially assesses the value of all properties. The last time that was done in Lehigh County was 2012, which means tax calculations are done based on property values in that year.

Takeaways

Per the Urban3 report, in Lehigh County over time, the fairness of assessments between different property value groups has improved. This means that property taxes are more balanced now, but there is still room for improvement. Fairness has also improved across

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Lehigh County Government Center. 17 South Seventh Street. Allentown. PA 18101-2400

(610) 782-3082
FAX: (610) 871-2897
http://controller.lehighcounty.org

different municipalities and school districts within the county. For instance, lower-priced homes have seen more savings in recent years, which indicates a move towards fairer assessments. This pattern highlights the complex dynamics of property assessments and shows that while market forces can correct some disparities over time, it is still beneficial to regularly review and update property assessments to ensure ongoing fairness and accuracy.

The key findings of the report reveal significant trends and improvements in property assessments. All property values in Lehigh County are assessed based on their market value in 2012. When building a new property in Lehigh County in 2024, the property value will initially be assessed based on the market value as of 2012. This means that despite the current construction and market conditions of 2024, the assessed value used for property tax purposes will reflect what similar properties were valued at twelve years ago. This method describes the "base year assessment" model.

For properties that have been developed since 2012 – or those whose owners challenge the assessment through the county boards of assessment appeals – a calculation is made to equate today's home values to those from 2012. That calculation is done using a ratio called the *Common Level Ratio* (CLR) that is compiled state-wide by the State Tax Equalization Board (STEB). In Lehigh County, the CLR as of July 2024 is 1.88, which means that property values are assumed to be about 53% higher now than in 2012. The Lehigh County Assessment Office completes a cumulative sales ratio study each month for all properties as a whole that includes the CLR, PRD (Price Related Differential), and COD (Coefficient of Dispersion).

If a countywide reassessment is done, it resets the base year and all properties get an up-to-date assessment. While the process is expensive and labor intensive, it can lead to a more fair distribution of the tax burden by accounting for appreciation and depreciation of properties that has occurred since the previous base year. In Pennsylvania, however, there is no rule for when reassessments must happen or oversight as to whether those assessments are outdated and unfair.

July 5, 2024
Allentown, Pennsylvania

Final Distribution:
Philips Armstrong, County Executive
Edward Hozza, Jr., Director of Administration
Board of Commissioners
Timothy Reeves, Chief Fiscal Officer

Lehigh County Government Center. 17 South Seventh Street. Allentown. PA 18101-2400

(610) 782-3082
FAX: (610) 871-2897
http://controller.lehighcounty.org

Property Assessment Equity

Lehigh County, Pennsylvania Report Card

April 2024

URBAN**3**

Executive Summary

By considering state law and practice, in the context of historical property assessment, in Lehigh County, past progress and potential improvement is revealed. This analysis expands on industry standard by going into finer grain detail of price and spatial submarkets while holding up multiple years in a row for consideration. The following tables and graphics paint a picture of improved fairness in the county as a whole. However the improvement seems driven by market fluctuations instead of intentional changes, leaving room to improve. Especially because of the constraints in law on the assessors practice, if this information exposes patterns that are not desirable, those will need to be considered at the policy level. If the funding of government services through property tax were a sport, the assessor is more like the referee, meaning they only enforce the rules. It is up to the electorate and the jurisdictions if there needs to be a rule change.

Promoting equity in property tax assessment helps ensure that each property owner contributes to public services and infrastructure based on their property's assessed value relative to others. This means that those with higher-valued properties pay a relatively higher tax bill, while those with lower property values pay proportionately less. Such a system is more reflective of the individual circumstances and promotes a fair distribution of property taxes. By scrutinizing the disparities between assessed values and actual sale prices, we gain valuable insights into potential discrepancies and can address any systemic biases, thereby contributing to a more just and fair property tax assessment process.
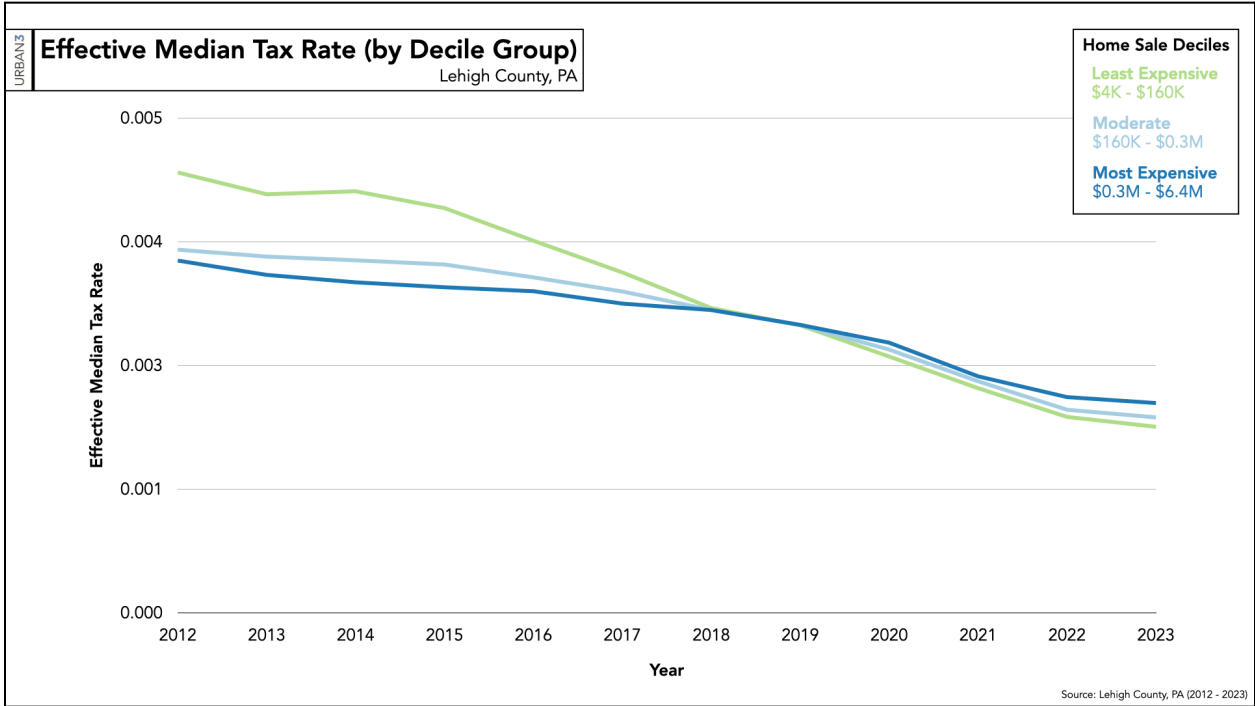
Findings

- Assessed values have fallen behind market values as should be expected in a place exercising the legal option to tie assessment to a base year.
- The historical starting point of 2012 was unfair by overtaxing the lowest deciles and under taxing the highest, consistent with common nationwide patterns.
- Fairness in assessment, and so taxation, between deciles has improved. This results in statistical tests falling within IAAO normal ranges.
- Fairness between cities and school districts is generally balanced between high, moderate, and low price homes over time. While total savings by price group indicate more savings for the lowest priced homes in recent years, per household savings are higher for higher value homes.
- Over the studied time frame, demographic concentrations of minority, low income, or younger residents, show historical overtaxing of those demographic groups converting in recent years to slight under taxing.
- Historical regressivity in value and effective tax rate, or overtaxing of the lower price homes, has lessened since 2012.

Further Observations

- Given the nature of assessing systems, it is difficult to ascribe improvement to anything other than movement in market prices for homes.
- Given the historical regressivity and lack of control over future market movements, further action to remediate past regressivity and prevent return to regressivity may be warranted.
- A reassessment with detailed statistics is a major undertaking that can reset valuations and fairness.

- The effective tax rate takes into account the way unfairness in valuation can spread an equal tax rate unequally across homes. The chart below shows the trend of effective median tax rate for each year across all sale decile categories (sale price categories) over time and sets the basis for a potential adjustment to home values to balance tax burden across the county.
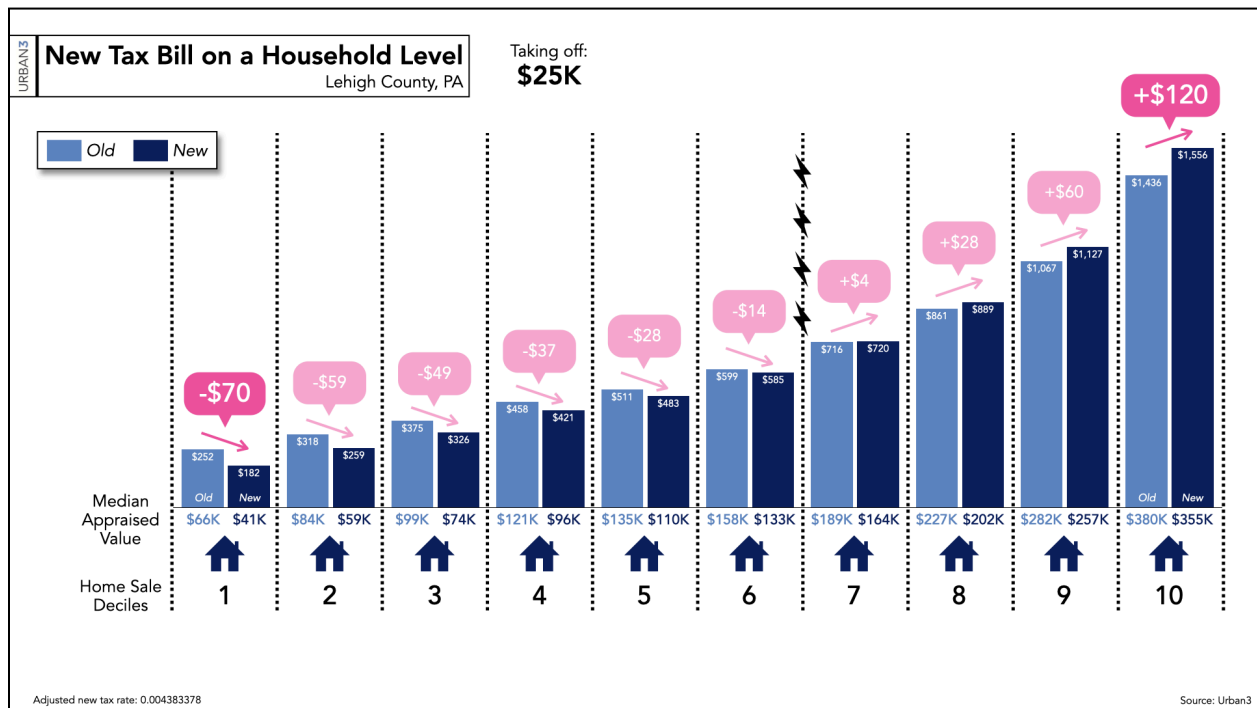

Effective Median Tax Rate (by Decile Group)
Lehigh County, PA

Home Sale Deciles
Least Expensive
$4K - $160K
Moderate
$160K - $0.3M
Most Expensive
$0.3M - $6.4M

Source: Lehigh County, PA (2012 - 2023)

- Because reassessment is expensive and takes time to execute, an intermediate step of a flat abatement to all properties could redress historical regressivity until reassessment is deemed appropriate.
- Given the historical pattern and of over assessing the lowest value homes, a stop gap measure of a flat reduction of $25k from every assessed value is tested below. Because lowering assessed values requires changing the tax rate to continue providing funding to schools and cities, this approach overviews how a flat reduction would impact the average taxable value and tax bill of households in different price brackets. The table below shows the range of sale prices and the number of single family homes in each decile for the year 2023.

Decile	Sale Year	Number of homes	Sale price Range	Median Assessed Value	Median Reduced Assessed Value
1	2023	219	$18,500 - $150,000	$66,600	$41,600
2	2023	218	$150,000 - $186,000	$84,000	$59,000
3	2023	218	$186,000 - $216,000	$99,300	$74,300
4	2023	218	$216,000 - $250,000	$121,100	$96,100
5	2023	218	$250,000 - $285,000	$135,100	$110,100

6	2023	218	$286,000 - $322,500	$158,400	$133,400
7	2023	218	$324,000 - $371,000	$189,300	$164,300
8	2023	218	$372,000 - $436,000	$227,600	$202,600
9	2023	218	$437,000 - $575,000	$282,200	$257,200
10	2023	218	$575,000 - $3,400,000	$380,000	$355,000

- The chart below shows the adjusted annual tax bill for a home reflecting the median of a sale decile. Meaning, the tax bill adjustment would vary for each house, but looking at the median home value provides an idea of how tax adjustment would affect each decile. The new tax rate is calculated in a way that the total amount of property tax revenue from all residential single family homes in 2023 remains the same at the new tax rate.

New Tax Bill on a Household Level
Lehigh County, PA

Taking off: $25K

Old   New

-$70   -$59   -$49   -$37   -$28   -$14   +$4   +$28   +$60   +$120

	Decile 1	Decile 2	Decile 3	Decile 4	Decile 5	Decile 6	Decile 7	Decile 8	Decile 9	Decile 10
Old	$252	$318	$375	$458	$511	$599	$716	$861	$1,067	$1,436
New	$182	$259	$326	$421	$483	$585	$720	$889	$1,127	$1,556

Median Appraised Value: $66K $41K | $84K $59K | $99K $74K | $121K $96K | $135K $110K | $158K $133K | $189K $164K | $227K $202K | $282K $257K | $380K $355K

Home Sale Deciles: 1 2 3 4 5 6 7 8 9 10

Adjusted new tax rate: 0.004383378

Source: Urban3

- Historical trends reveal over-assessment in census tracts with higher racial diversity, lower median incomes, higher poverty rates, lower high school education rates, and lower senior populations, contrasting with fairer property assessments in areas characterized by lower racial diversity, higher median incomes, lower poverty rates, and higher high school education rates, underscoring the disproportionate burden of property taxes on individuals with limited resources.

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Introduction

This report summarizes the results from the property assessment equity analysis for Lehigh County, PA. The quality of property assessment is vital in gauging the fairness and accuracy of the assessment process, ensuring equitable treatment across different groups. It's essential to recall that the property tax bill, a key outcome for property owners, is computed by considering the appraised value of the property, accounting for exemptions, and then multiplying the result by the applicable tax rate. In evaluating the property tax system, a comparison between the assessed values assigned by Lehigh County and the actual sale prices of properties becomes instrumental. This comparative analysis serves as a crucial metric for assessing both the fairness and accuracy of the property tax system.

Key Concepts

Sale Ratio

The sale ratio, a pivotal metric in this analysis, is derived by dividing the assessed value of a property by its corresponding sale price. This fundamental calculation enables the evaluation of property assessments in relation to actual market transactions. Overassessment, leading to an increased tax burden, occurs when the assessed value exceeds the property's actual sales price. In such cases, the sale ratio surpasses 1. Conversely, underassessment, resulting in a reduced tax burden, occurs when the assessed value falls below the actual sales price, leading to a sale ratio below 1. By law the goal of the assessment process is to match market values to assessed values that determines how much each property owner must contribute to paying for services. Lehigh has opted to match all values to the market value in the last year of full assessment 2012.

A perfectly accurate assessment is achieved when the assessed value aligns precisely with the sale price, resulting in a sale ratio of 1. It is important to note that this analysis exclusively considers properties that were sold during the studied time period, as the sale ratio relies on actual property sales data for its computation. By dividing homes into ten equally sized groups of similar values, or deciles, the analysis of sales ratio can be improved to provide more insight into fairness than a county wide statistic.

Given below are some contextual examples of homes and their appraised and sale prices which established a visual framework for evaluating the sale ratio in terms of fair, over, or under taxing based on assessment.
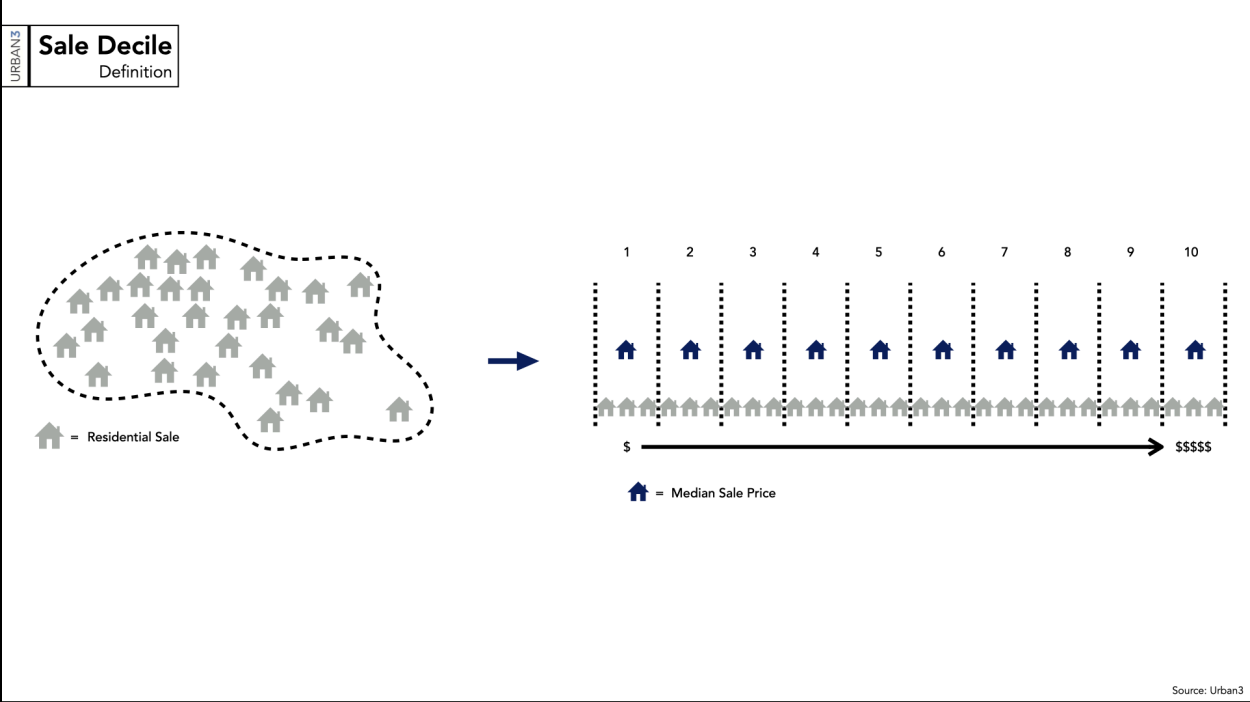
Appraised Value:	$190,800
Selling Price:	$150,000
Sales Ratio	**1.27**

Appraised Value:	$351,400
Selling Price:	$350,000
Sales Ratio	**1.00**

Appraised Value:	$1,278,100
Selling Price:	$2,450,000
Sales Ratio	**0.52**

Sales Ratio URBAN3
Definition

Sales Ratio

1.27 — Over Appraised = Over Taxed

1.00 — Accurately Appraised = Fairly Taxed

0.52 — Under Appraised = Under Taxed

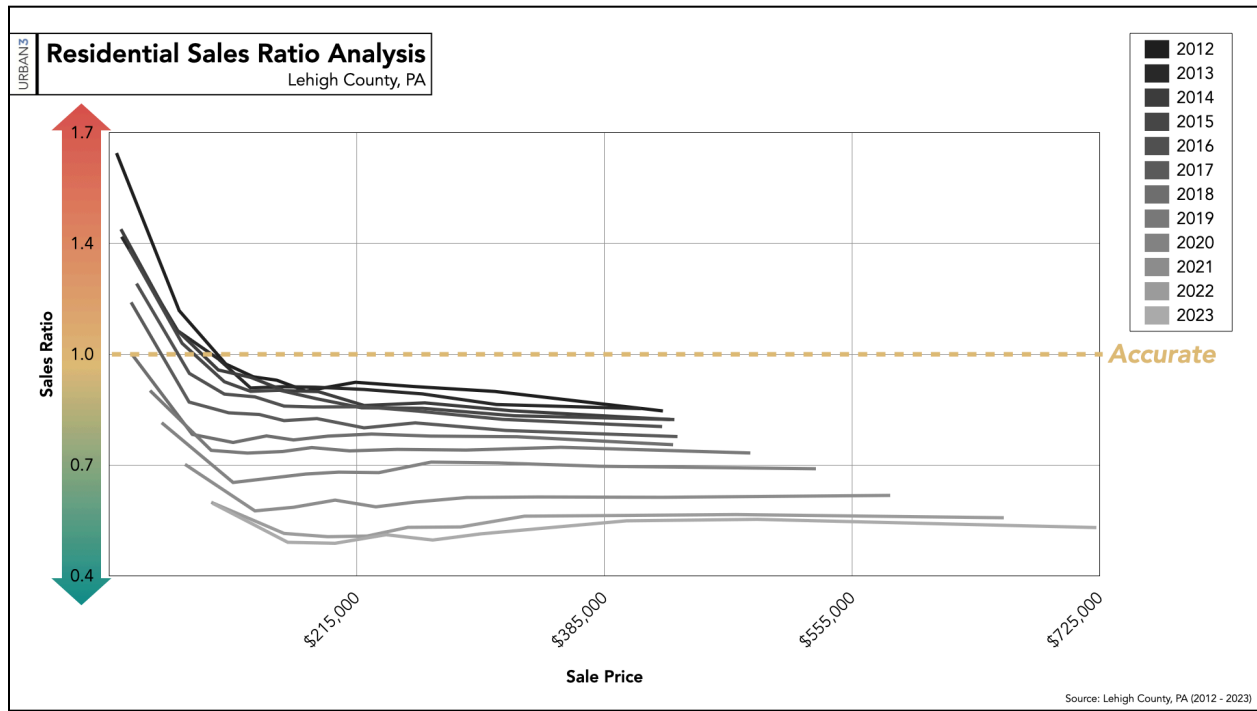Source: Buncombe County, NC; Urban3

Sale Deciles

When evaluating the effectiveness of property assessment, identifying issues related to fairness and accuracy can be challenging when applying statistical tests to the entire sample of properties sold in a given year. Consequently, it becomes essential to disaggregate the dataset into smaller segments to assess the fairness and accuracy of different groups in comparison to one another.

Sale deciles are computed by dividing the total number of property sales in a given year into equal buckets, or deciles based on the range of property sale prices. This process allows for a systematic categorization of sales, creating ten distinct groups that represent different segments of the market. Typically, the lower and middle deciles encompass a larger number of sales, while the higher deciles comprise a smaller number of transactions. This stratification enables a nuanced analysis of the market, shedding light on patterns and trends across different segments of the property landscape. Dividing the sales into deciles forms the base for a comprehensive understanding of the sales ratio concept and its

implications for property assessments. A visual framework for dividing the housing stock into deciles is given below.

Assessment Accuracy

Residential Sales Ratio Analysis
Lehigh County, PA

Legend: 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023

Y-axis: Sales Ratio (0.4, 0.7, 1.0, 1.4, 1.7)
X-axis: Sale Price ($215,000, $385,000, $555,000, $725,000)
Accurate (dashed line at 1.0)

Source: Lehigh County, PA (2012 - 2023)

The above chart shows the sales ratio in each year since 2012. Because the law in Pennsylvania and policy in Lehigh puts all news sales into terms of the last assessment, all values for tax purposes are in 2012 terms. This means that naturally market values will inflate to beyond assessed values creating the effect of the curve on the chart "sinking" over time. This makes the key consideration how balanced the drift from 2012 values is across each price bracket, or decile, of homes. Because the rules of assessment leave little room for the assessor to adjust fairness, changes are largely an expression of market forces moving some deciles further from the 2012 assessment than others and resulting in changing sales ratios or fairness. It appears that every home is after 2017, however, this sinking effect can be attributed to the increasing sale prices of homes while the assessed values remain the same. The chart below depicts the sinking effect of homes on the chart over time.

Residential Sales Ratio Analysis
Lehigh County, PA

Source: Lehigh County, PA (2012 - 2023)
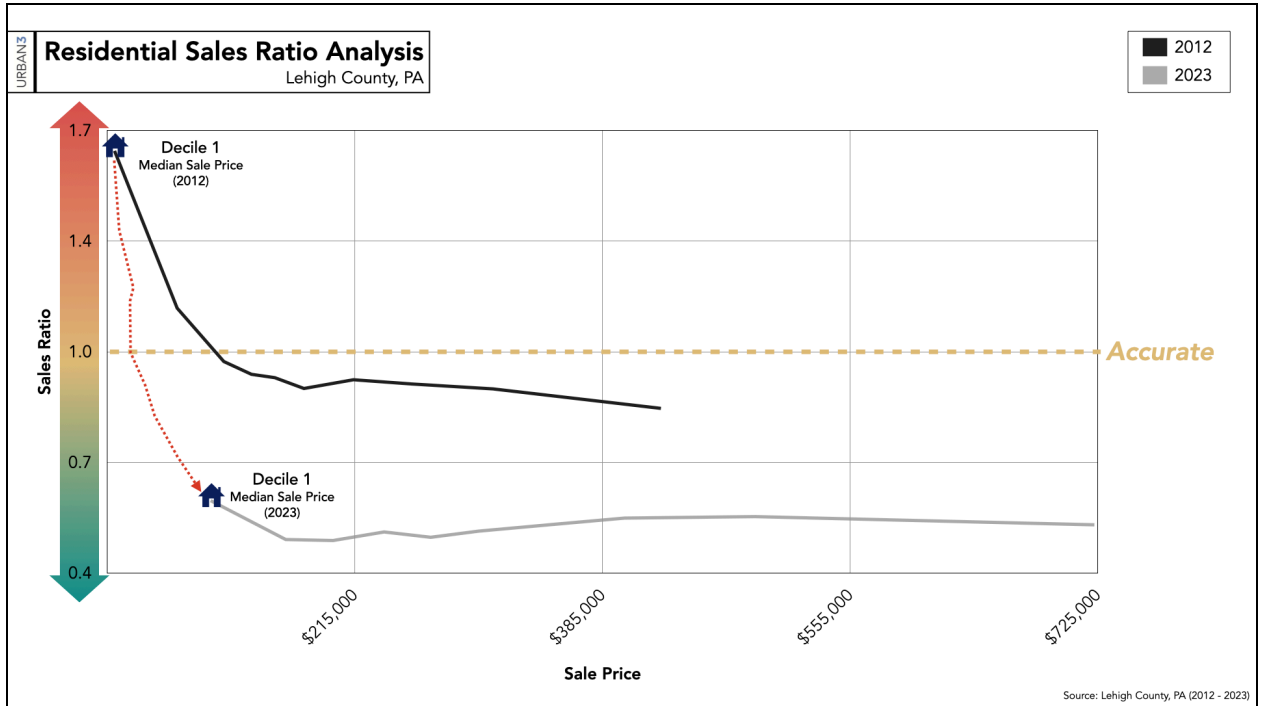
The next section on assessment fairness provides a deeper insight into how using the median adjusted sale ratio can give a more accurate overview of the degree of over or under assessment affecting property tax equity in the county.

Assessment Fairness

Median Adjusted Sales Ratios
Lehigh County, PA

URBAN3
Source: Lehigh County, PA (2012 - 2023)
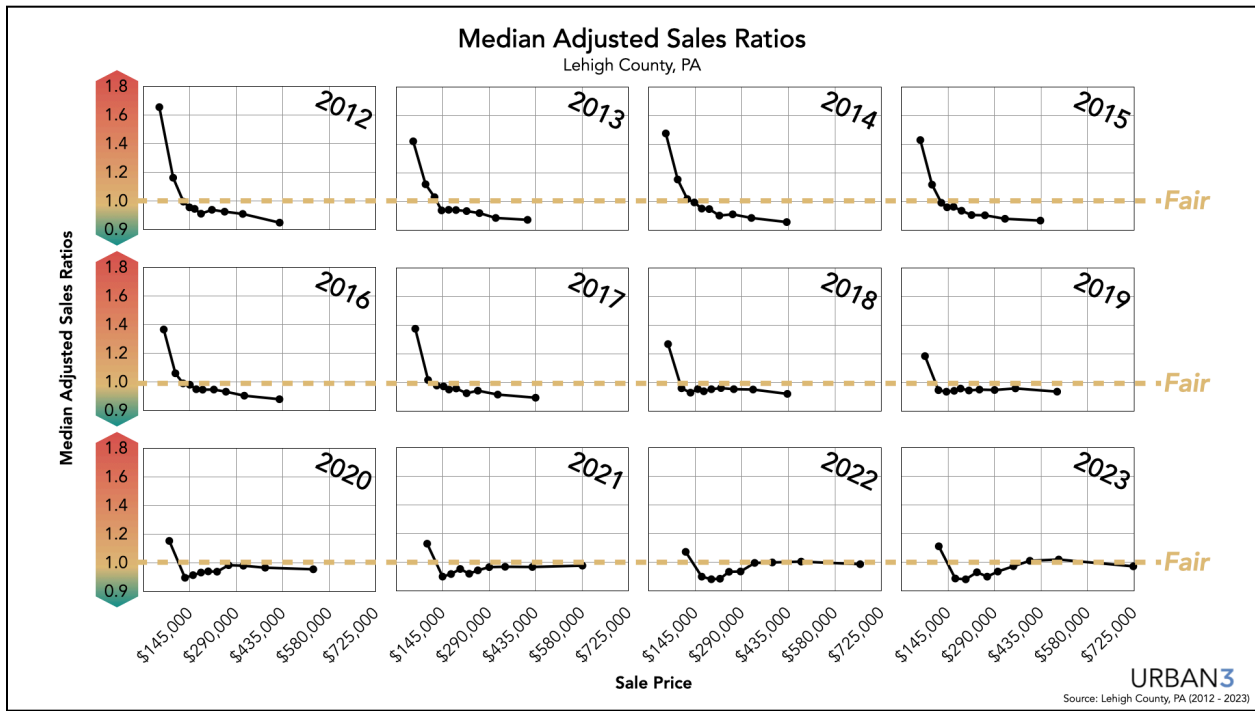
The above chart shows the variability in residential property assessments for each year individually from 2012-2023. The y-axis represents the median adjusted sale ratio which helps to determine the degree of fairness of property assessment. A ratio close to 1 indicates a more equitable and fair assessment. Because the property tax system in Pennsylvania uses assessed values to determine what share of local budgets each property will pay, this median adjustment allows us to focus on fairness measured by how far from the median any decile of property values is. For Lehigh County, the lower decile homes (least expensive) tend to be overassessed during all years, however the degree of over assessment has dropped significantly over the years from a high of 1.6 times the median to under 1.2 times the median.

There is a consistent pattern of underassessment for the middle and higher decile homes from 2012-2019 but this shifts in the later years where the higher deciles (most expensive) continue to be almost fairly assessed however the middle deciles were being underassessed. This can be attributed to the increasing demand for these types of homes, coupled with a scarcity of housing stock in this category, leading to considerable price pressure in the market. Consequently, the prices of middle and higher decile homes have risen substantially. This trend has influenced the assessment landscape, with higher decile homes now being almost fairly assessed, while middle deciles continue to be underassessed. Despite the flattening curve over time, there remains a degree of unfairness in property assessments, particularly evident in the lower and middle deciles.
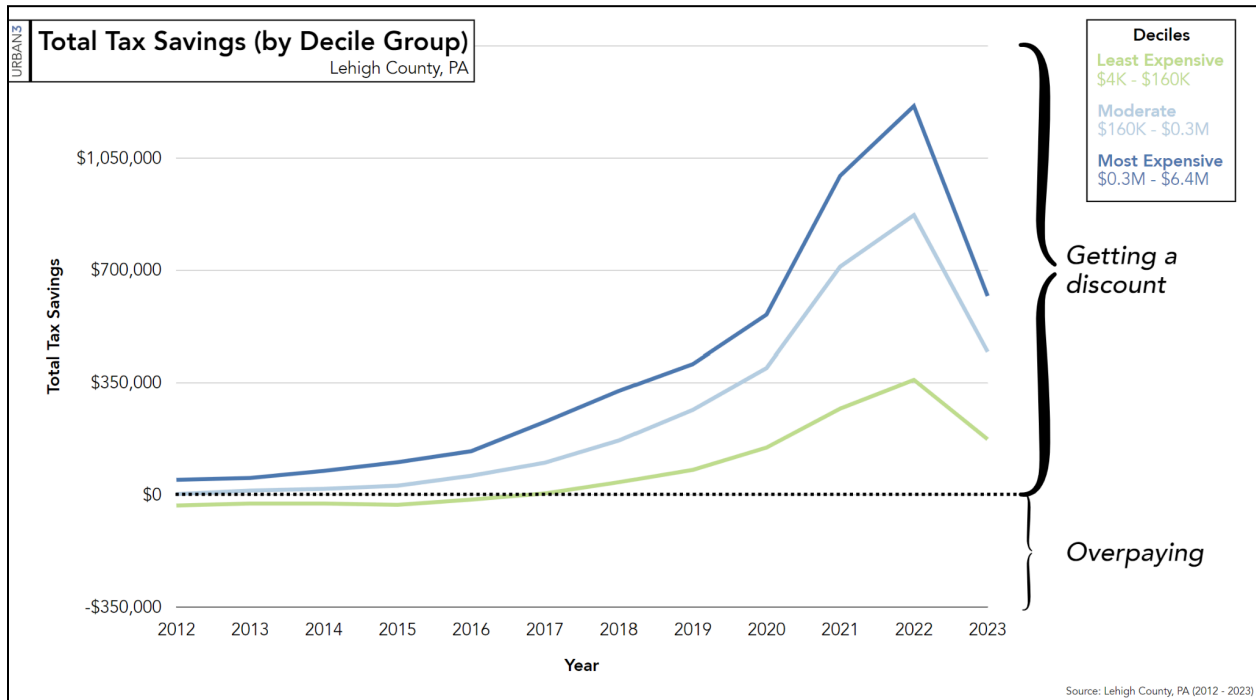
This chart presents the same annual median adjusted sales ratios for each year in a combined format for comparison.
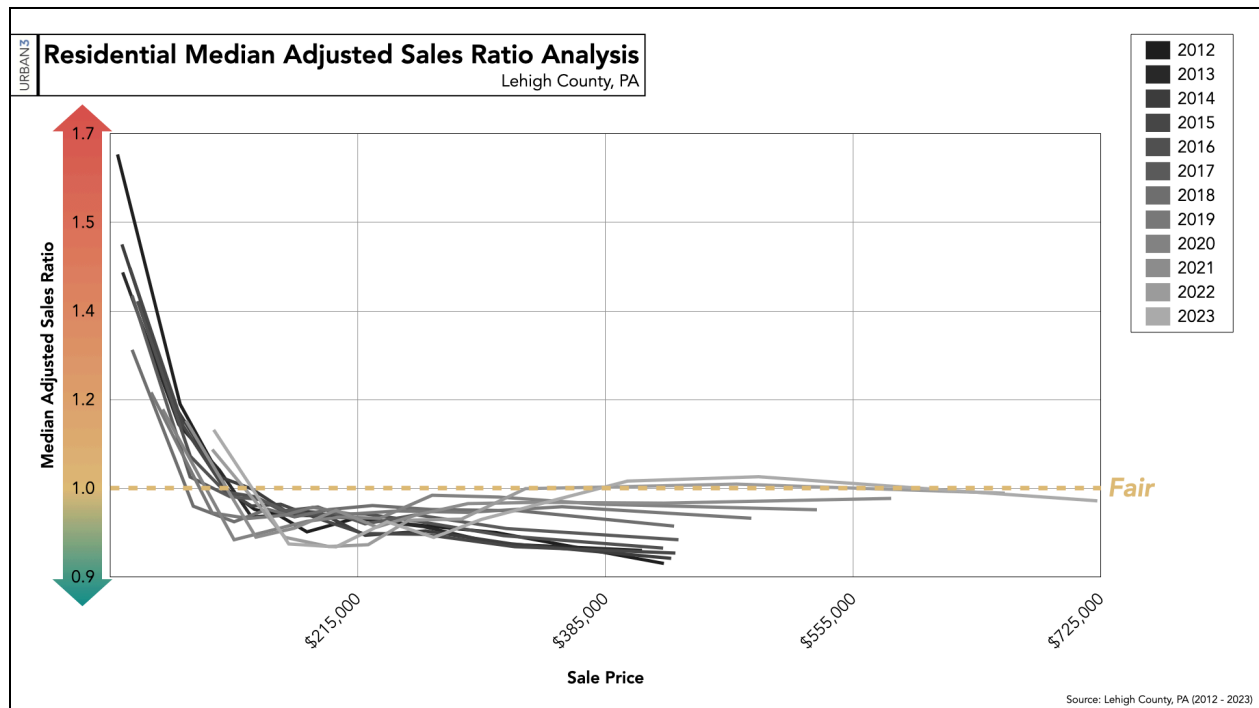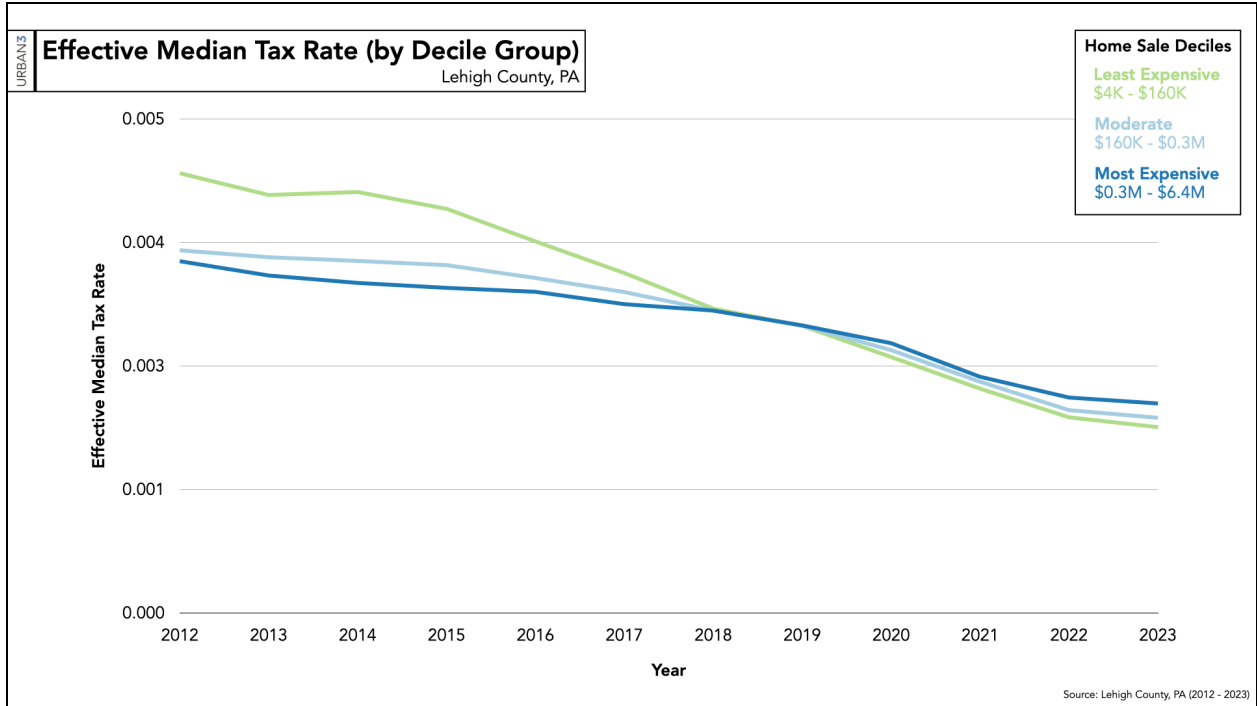
Analysis by Sale Decile Groups

County Wide Analysis

This chart shows the total savings in property taxes from the perspective of a homeowner in three home price brackets. A positive total savings value implies that homeowners are receiving a discount, indicating an underpayment in property taxes. Conversely, a negative total savings suggests that homeowners are overpaying in taxes. The deciles in the chart are categorized into three groups: least expensive ($4K-$160K), moderate ($160K-$0.3M), and most expensive ($0.3M-$6.4M).

Notably, there has been an increase in total savings across the board, signifying that homeowners in each decile group are receiving some level of discount in property taxes. However, during the period from 2012 to 2016, the least expensive decile group experienced negative total savings, indicating that homeowners were overpaying in property taxes during those years. Subsequently, there has been a consistent upward trajectory in savings for all decile groups, with the most significant increase observed in the most expensive decile group. It is important to note that this chart is an aggregation of all the sales in the county and might not present a very accurate picture of the actual discount/overpayment per household.

Effective Median Tax Rate (by Decile Group)
Lehigh County, PA

Home Sale Deciles
Least Expensive
$4K - $160K
Moderate
$160K - $0.3M
Most Expensive
$0.3M - $6.4M

Source: Lehigh County, PA (2012 - 2023)

This chart shows the effective median tax rate for three decile groups. Effective tax rate is defined as the property tax bill as a percentage of the sale price of the property. In this chart, the median of the effective tax rates for each decile group are plotted for each year. There is a discernible downward trend for all three deciles; however, a significant shift occurs after 2018. Before 2012, a consistent pattern was observed: the least expensive decile had the highest effective tax rate, while the most expensive decile had the lowest effective tax rate. This trend undergoes a noteworthy reversal after 2018, where the most expensive decile experiences the highest effective tax rate, while the least expensive decile sees a decrease, resulting in the lowest effective tax rate.

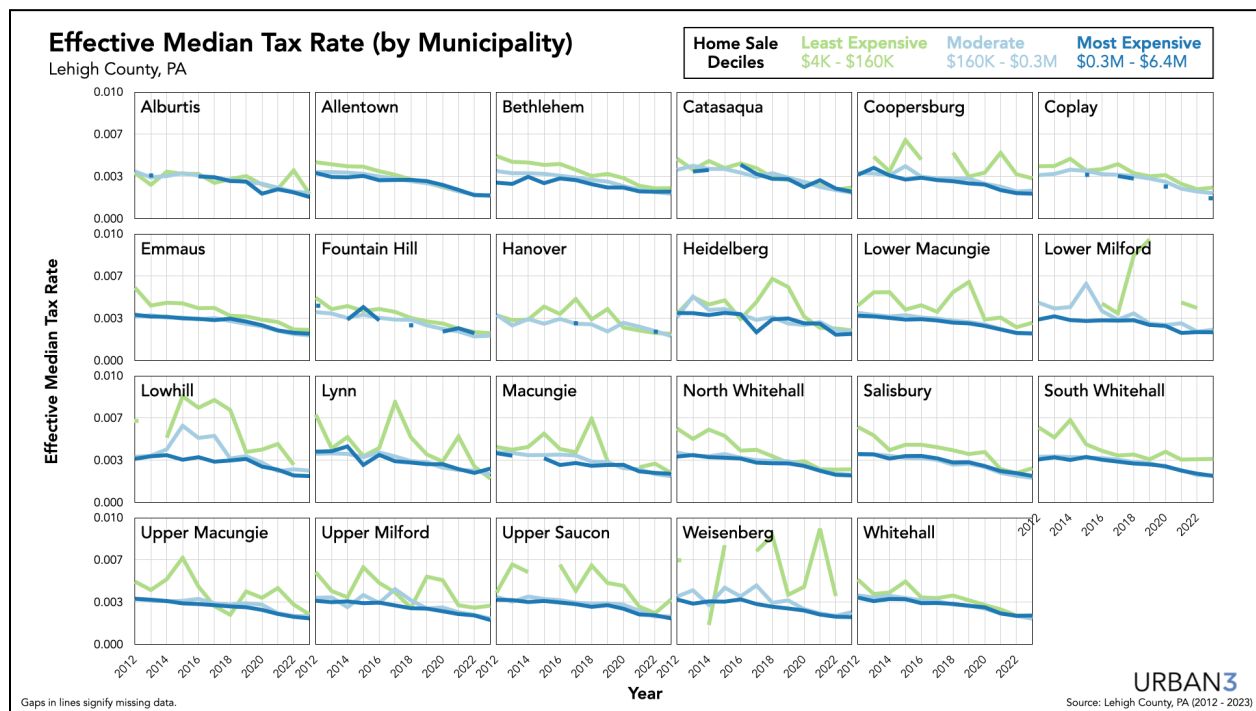# Municipality Specific Property Tax Analysis
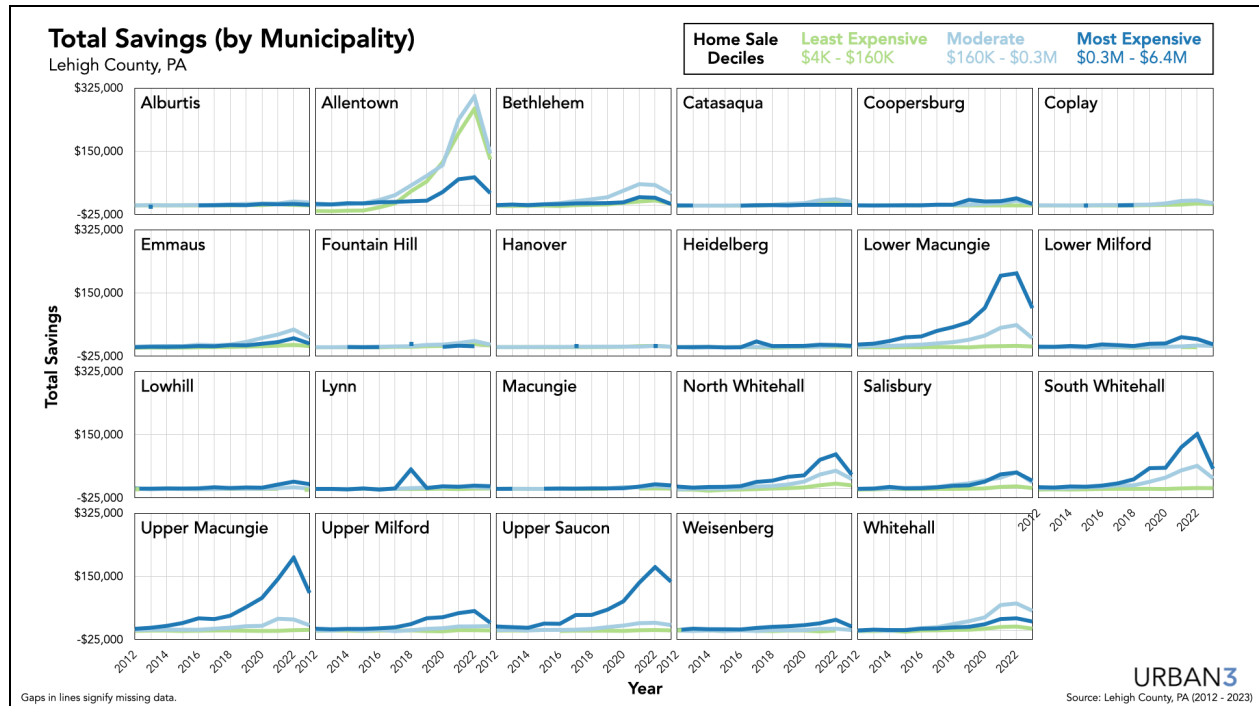
This chart illustrates the total savings by decile group but for each municipality within Lehigh County. It is interesting to note that Allentown had a noticeable increase in total savings for the least expensive and moderate decile over the years, even greater than the most expensive deciles which is a typical trend
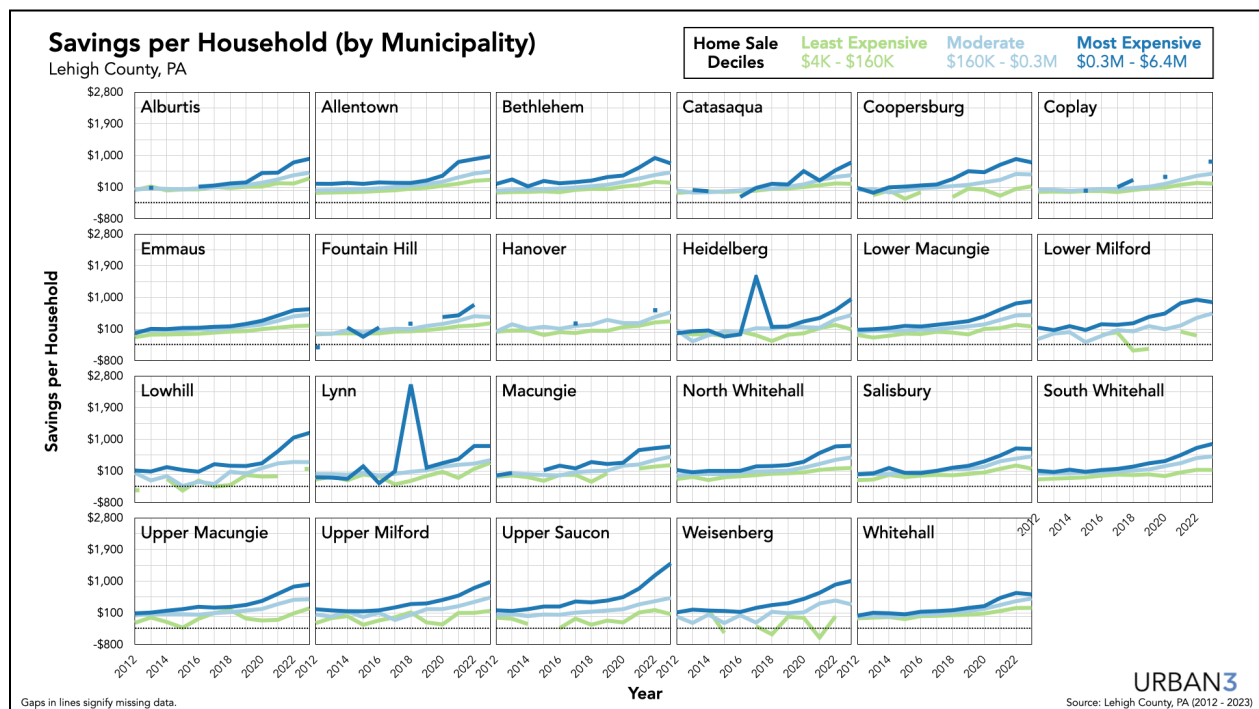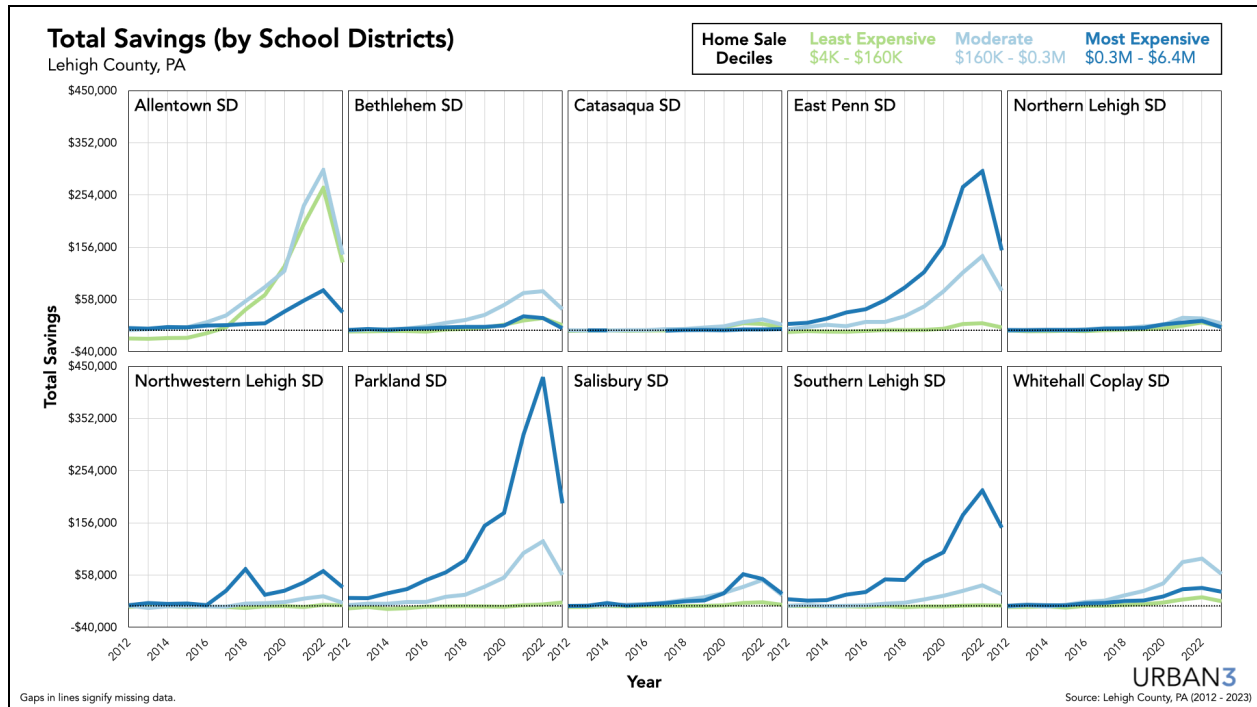
across several municipalities and the county as a whole. This can be attributed to the higher number of lower and moderately priced properties in Allentown.
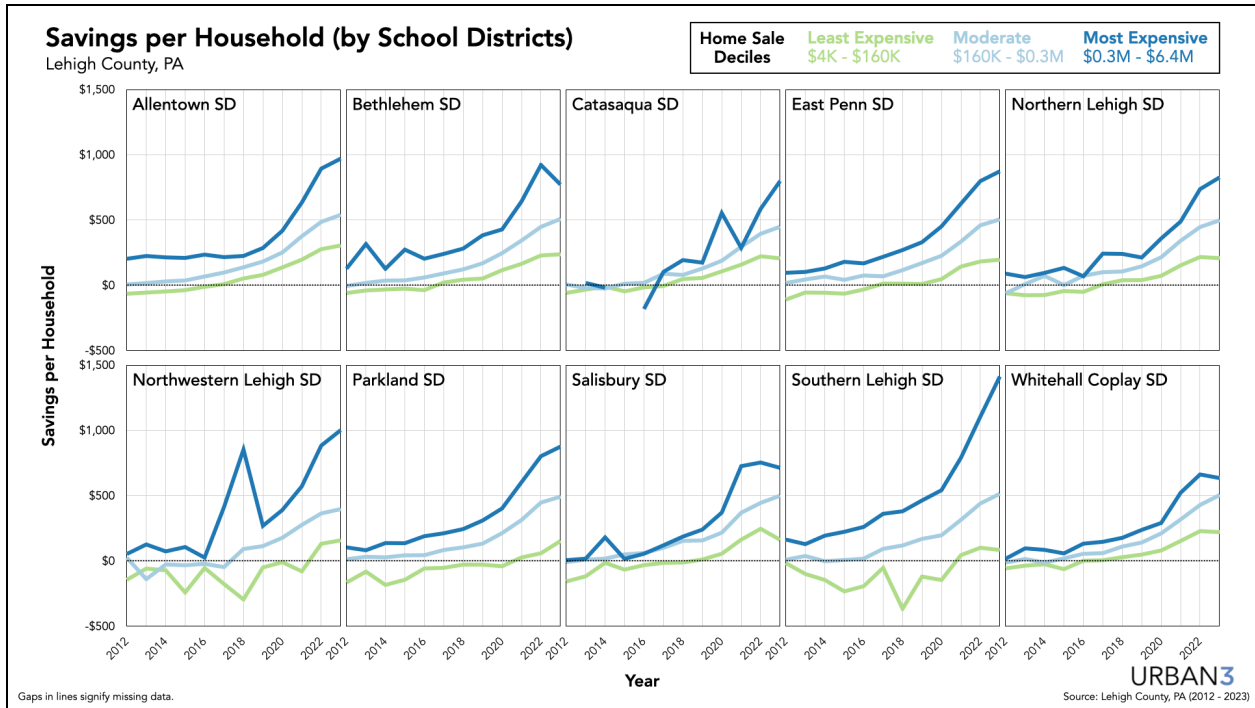
The second chart shows the same statistics but on a per household basis, meaning the average savings per household for each decile group over the years. This was calculated by dividing the total savings in a decile group by the number of properties in that decile group. It is important to note that this is the average total savings per household and not the accurate number. Here it is interesting to note that the most expensive decile group is still getting the most discount as compared to the other two deciles in all municipalities. In the previous chart where the savings were aggregated for each decile group, Allentown exhibits the most savings in the least expensive and moderate decile groups, however when we look at the savings from a per household perspective, the trend flips and the most expensive decile group is still saving the most tax dollars.

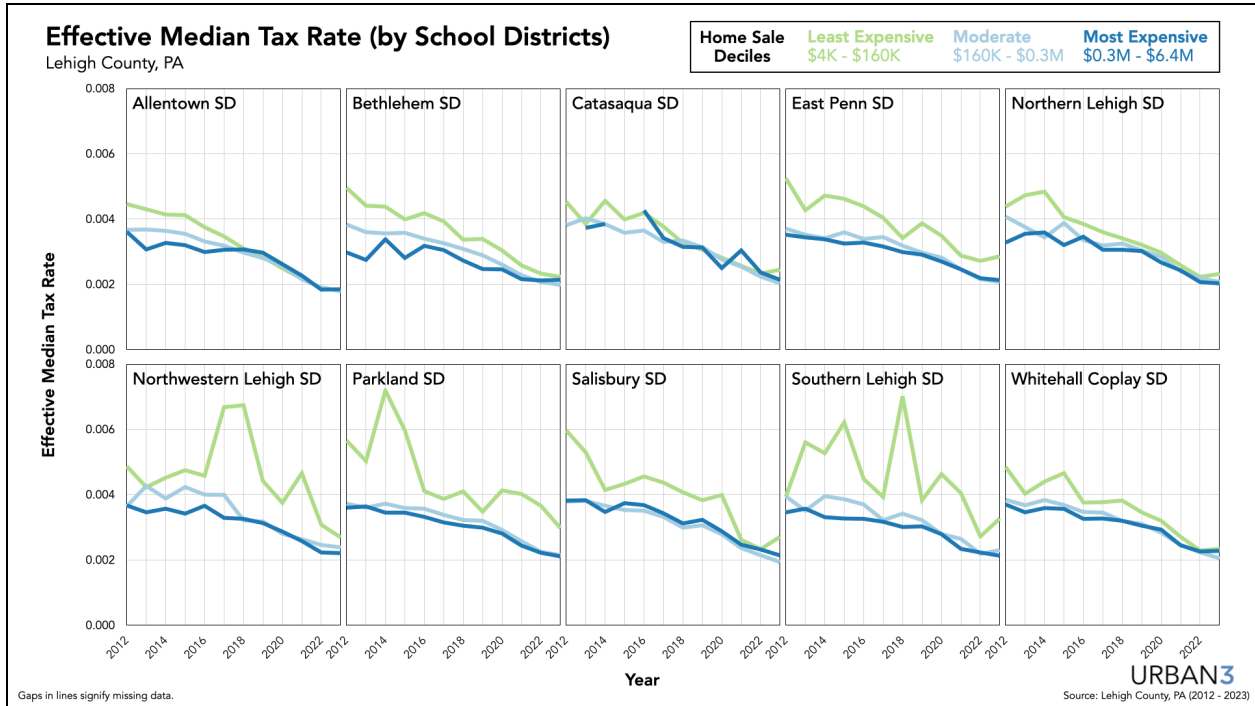Effective Median Tax Rate (by Municipality) — Lehigh County, PA

Home Sale Deciles: Least Expensive $4K - $160K; Moderate $160K - $0.3M; Most Expensive $0.3M - $6.4M

Gaps in lines signify missing data.

Source: Lehigh County, PA (2012 - 2023)

URBAN3

School District Specific Property Tax Analysis

Total Savings (by School Districts)
Lehigh County, PA

| Home Sale Deciles | Least Expensive $4K - $160K | Moderate $160K - $0.3M | Most Expensive $0.3M - $6.4M |

Allentown SD, Bethlehem SD, Catasaqua SD, East Penn SD, Northern Lehigh SD, Northwestern Lehigh SD, Parkland SD, Salisbury SD, Southern Lehigh SD, Whitehall Coplay SD

Gaps in lines signify missing data.

Source: Lehigh County, PA (2012 - 2023)

URBAN3

This chart illustrates the total savings by decile group but for each school district within Lehigh County. Here also, Allentown had a noticeable increase in total savings for the least expensive and moderate decile over the years, even greater than the most expensive deciles which is a typical trend across several school districts and the county as a whole. This can be attributed to the higher number of lower and moderately priced properties in the Allentown school district. It is interesting to note that East Penn and Parkland school districts have considerably higher savings in the most expensive deciles. This could be attributed to the higher prevalence of expensive homes leading to higher discounts in these areas.

Savings per Household (by School Districts)
Lehigh County, PA

| Home Sale Deciles | Least Expensive $4K - $160K | Moderate $160K - $0.3M | Most Expensive $0.3M - $6.4M |

Gaps in lines signify missing data.

Source: Lehigh County, PA (2012 - 2023)

URBAN3

The above chart shows the same statistics but on a per household basis in each school district, meaning the average savings per household for each decile group over the years. A similar pattern is observable here as well that the most expensive decile group is still getting the most discount as compared to the other two deciles in all municipalities. Despite Allentown's dominance in savings within the lower deciles due to its higher number of houses in those brackets, the trend flips when viewed from a per household perspective. Here, the most expensive decile group consistently emerges as the one saving the most on tax dollars, including Allentown. This shift suggests that while Allentown may exhibit significant savings in the lower deciles due to its larger housing stock, the wealthiest households still benefit the most when it comes to tax savings per individual household, aligning with a typical county-wide pattern.

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Effective Median Tax Rate (by School Districts)
Lehigh County, PA

| Home Sale Deciles | Least Expensive $4K - $160K | Moderate $160K - $0.3M | Most Expensive $0.3M - $6.4M |

Allentown SD | Bethlehem SD | Catasaqua SD | East Penn SD | Northern Lehigh SD

Northwestern Lehigh SD | Parkland SD | Salisbury SD | Southern Lehigh SD | Whitehall Coplay SD

Year

Effective Median Tax Rate

Gaps in lines signify missing data.

URBAN3

Source: Lehigh County, PA (2012 - 2023)

The above chart shows the effective median tax rate in each school district, meaning the way assessment accuracy changes the function amount of taxes homes in different price ranges pay. Volatility in some years and some districts may be due to smaller samples or anomalies in actual market transactions. In most districts the historically higher effective tax rate of lower price homes has moved closer to matching the other price brackets in recent years.

Demographic Analysis

This section examines the relationship between property assessment fairness and key census variables in Lehigh County. Through trendline charts plotting median adjusted sale ratios against factors such as racial diversity, high school education, senior population, poverty, owner occupancy and household income in census tracts, we uncover insights into how property values are influenced by demographic characteristics. Ultimately, this analysis serves as a critical tool for identifying systemic inequities in property tax assessment and advocating for policies that promote fairness for all residents, irrespective of their socioeconomic status or demographic characteristics.

The chart below shows all the census tracts as points and where they are located on the sale ratio spectrum. However, the following charts depict census tracts as trendlines (drawing a trendline through the points) for each year making it easy to compare demographic characteristics and sale ratios over time.
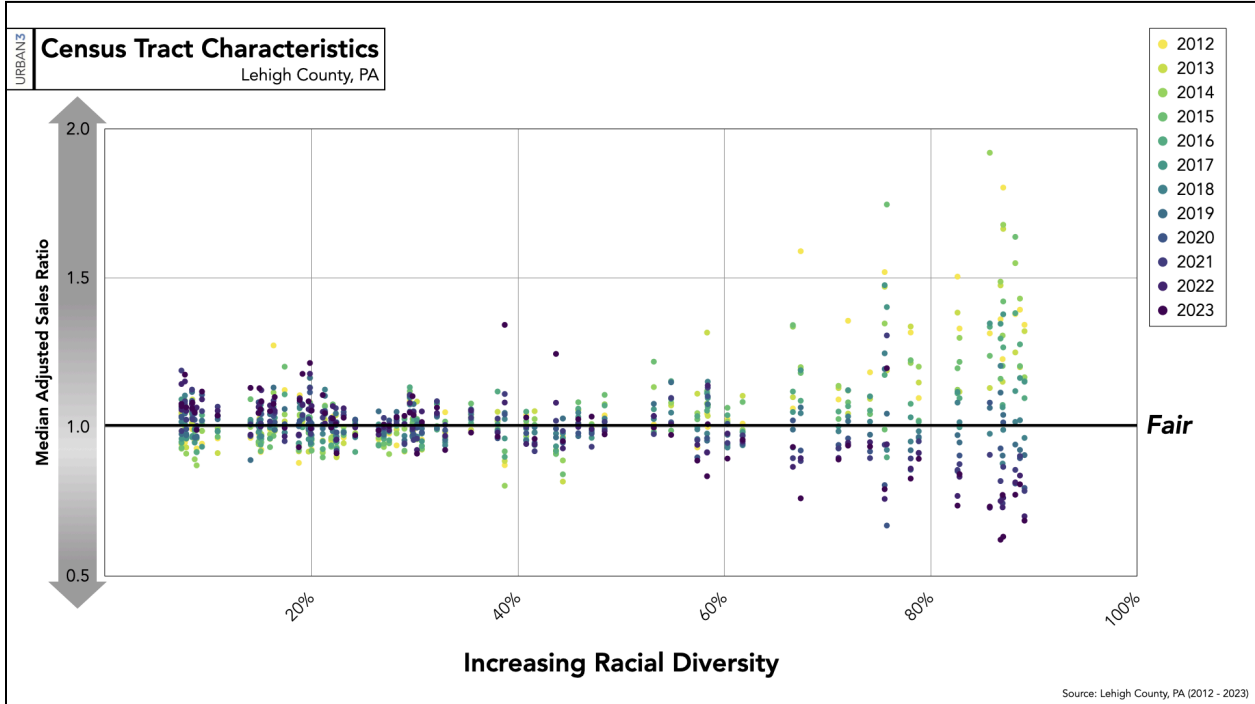

Observations

- Historical trends indicate that census tracts characterized by higher racial diversity, lower median incomes, higher poverty rates, lower high school education rates, and lower senior populations have experienced over-assessment in property tax valuation.
- Conversely, census tracts with lower racial diversity, higher median incomes, lower poverty rates, and higher high school education rates have tended to experience fairer property assessments.
- This analysis underscores the disproportionate burden of property taxes on individuals with limited resources, as highlighted by the over-assessment in communities facing socioeconomic challenges.

- Reassessment is crucial to rectify biases in property assessments and ensure fairness across all demographic groups.
- Trendlines approaching sale ratio closer to 1 in areas with higher median incomes, senior populations, and owner occupancy highlight the existing bias in assessment practices, emphasizing the need for reform to distribute the tax burden more equitably.

Racial Diversity
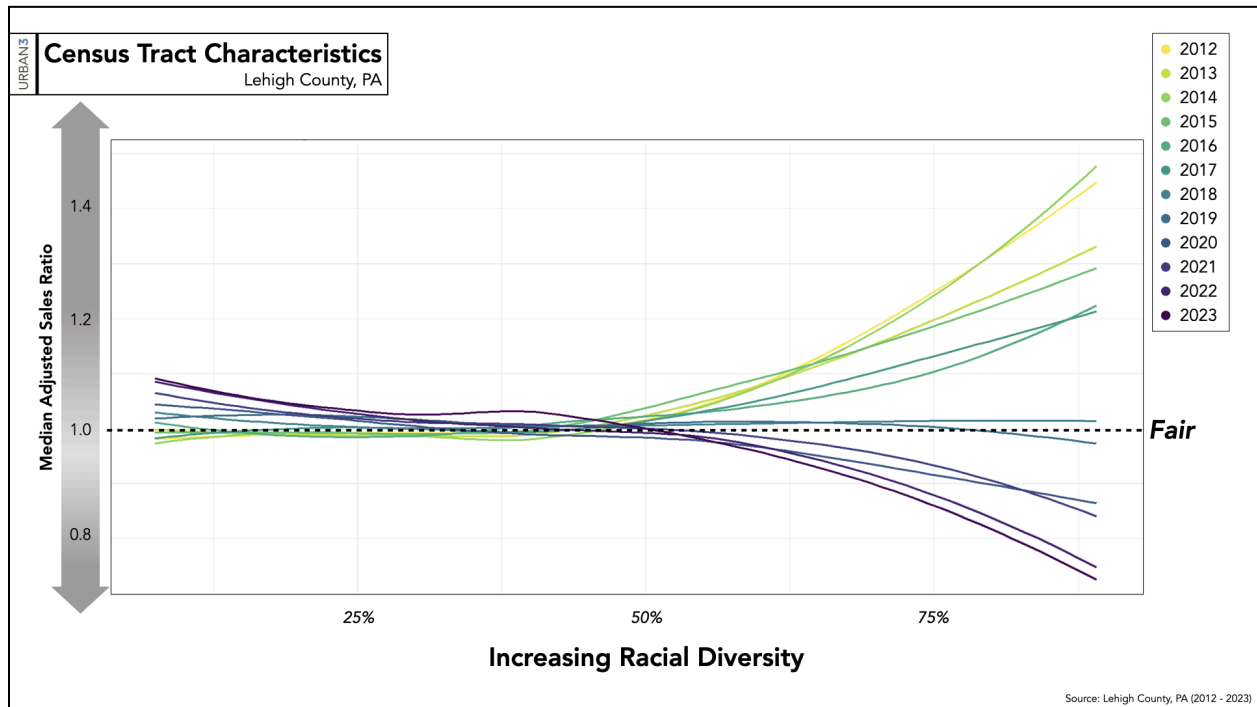
This chart compares assessment fairness depicted by the median adjusted sale ratio to percent of non-white population within the census tracts. The upward trend of 2012 trendlines (in yellow) suggests that in that year, census tracts with higher racial diversity tended to have higher median adjusted sale ratios. However, over the years the trendlines shift downward indicating underassessment in census tracts with higher racial diversity. The declining trendlines indicate a greater equity in property assessment in racially diverse neighborhoods, however, the high divergence of the trend lines from 1 in the later years (dark purples) might indicate that the assessed values of properties in more diverse neighborhoods have not kept up with the market values.
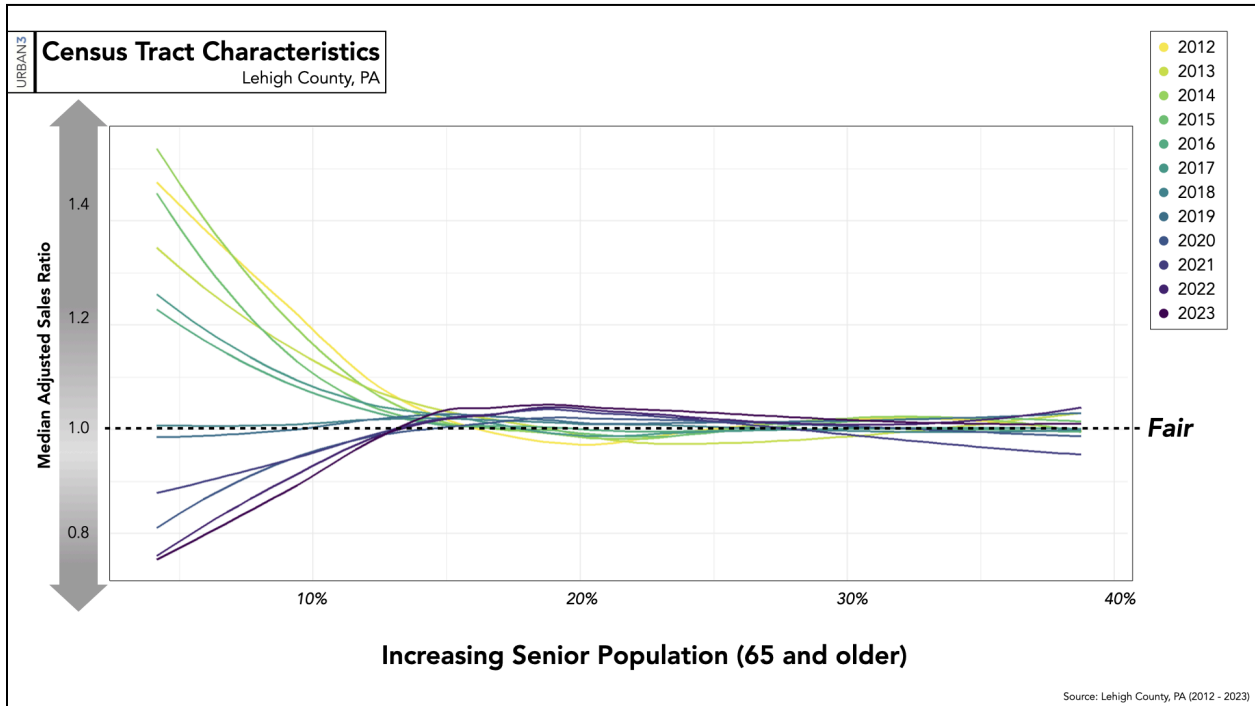
High School Education
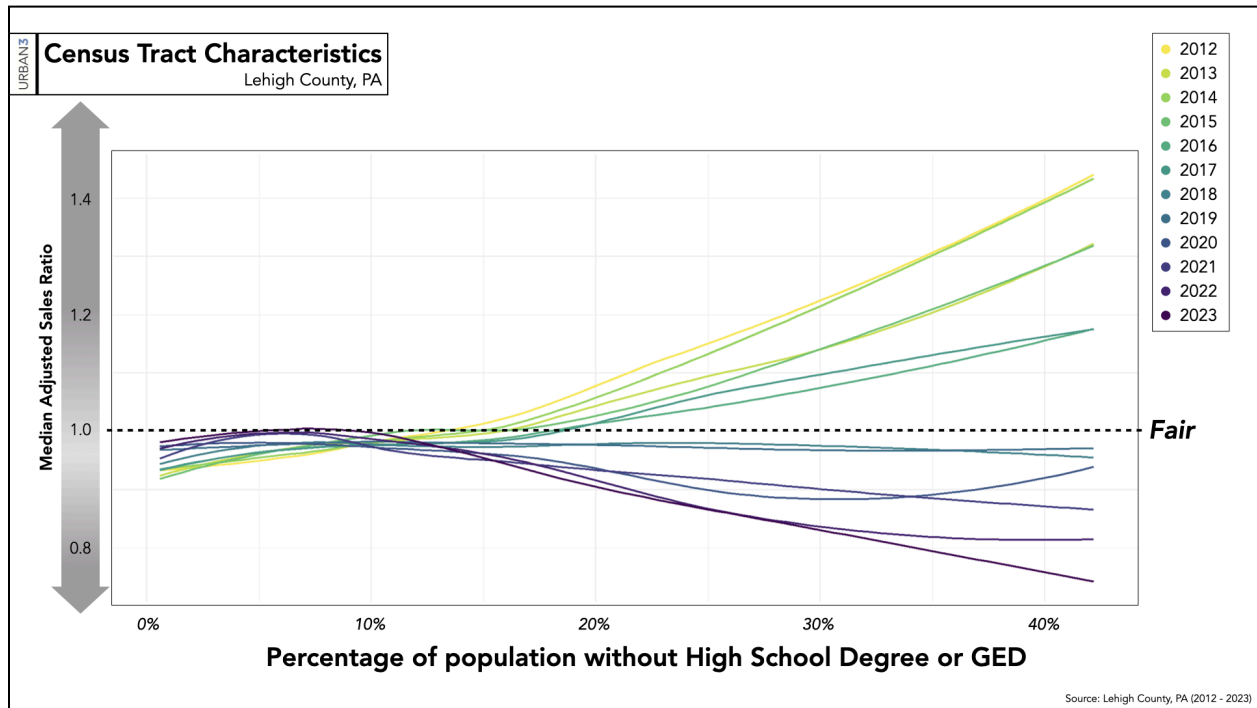
A similar pattern is observed with the percentage of the population without a high school degree and assessment fairness. As the percentage of the population without a high school degree rises within a census tract in 2012 (in yellow), the median adjusted sale ratio initially starts close to 1 and then trends upward, indicating potentially inflated property valuations within these areas. However, over the years, these trendlines exhibit a downward trajectory.

This pattern suggests that historically, areas with higher concentrations of residents lacking a high school degree may have experienced overvaluation in property assessments. However, ongoing analysis and adjustments in assessment practices have resulted in a more equitable distribution of property values across diverse demographic profiles until 2018-2019. The downward shift in the later years could be attributed to increasing market prices of homes but static assessed values in census tracts with higher percentage of population without a high school degree, indicating a need for reassessment.

Senior Population

Census Tract Characteristics
Lehigh County, PA
URBAN3

Median Adjusted Sales Ratio

Fair

Increasing Senior Population (65 and older)

Source: Lehigh County, PA (2012 - 2023)

Initially, in 2012, we observed a divergence in trendlines, indicating potential disparities in property valuations based on the senior population within census tracts. Areas with lower senior populations may have experienced over assessment, reflected in higher median adjusted sale ratios. However, as the years progress, a convergence occurs in the trendlines. This suggests that properties in census tracts with higher senior population are more fairly assessed over the years.

Poverty
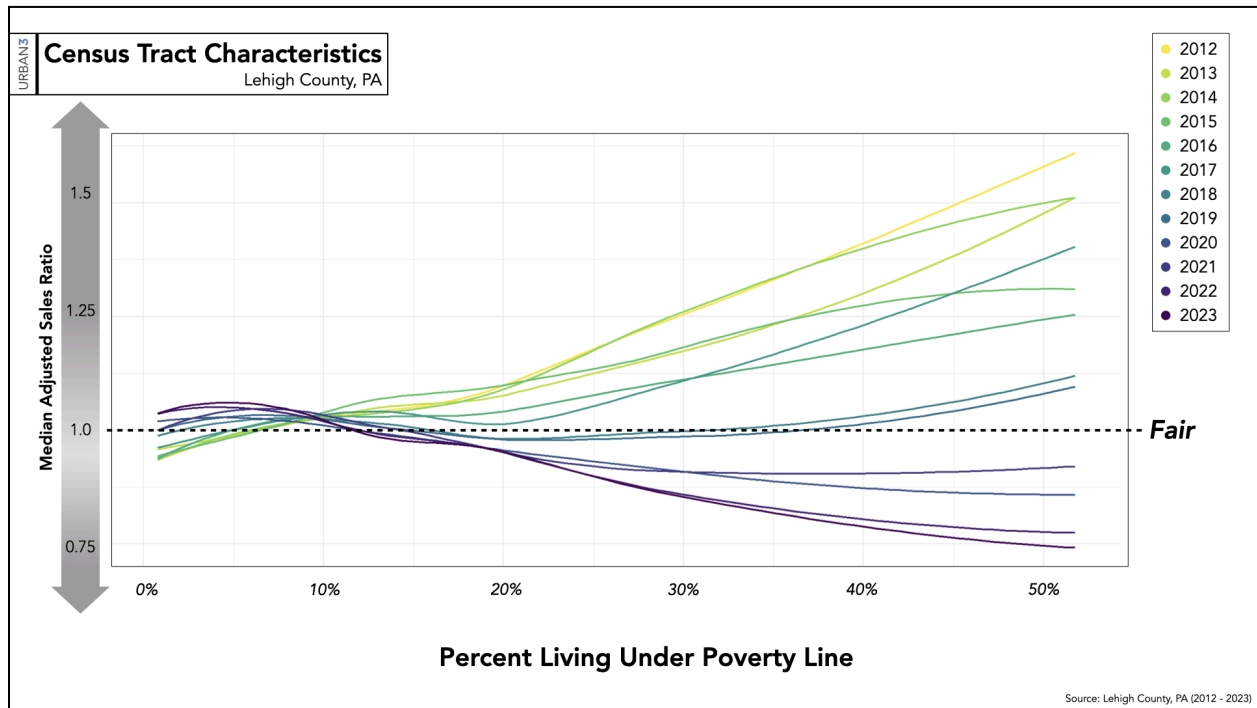
For all years we observe a pattern where census tracts with lower poverty rates tend to have median adjusted sale ratios closer to 1, suggesting a fairer assessment of property values. However, as poverty rates increase within census tracts in the earlier years, we see potential overassessment in these areas. This suggests that neighborhoods with higher poverty rates may have experienced inflated property valuations, possibly exacerbating financial burdens on disadvantaged residents. However, in the later years, the trendlines diverge showing a similar pattern as previous charts indicating a need for reassessment to bring the sale ratios closer to 1.
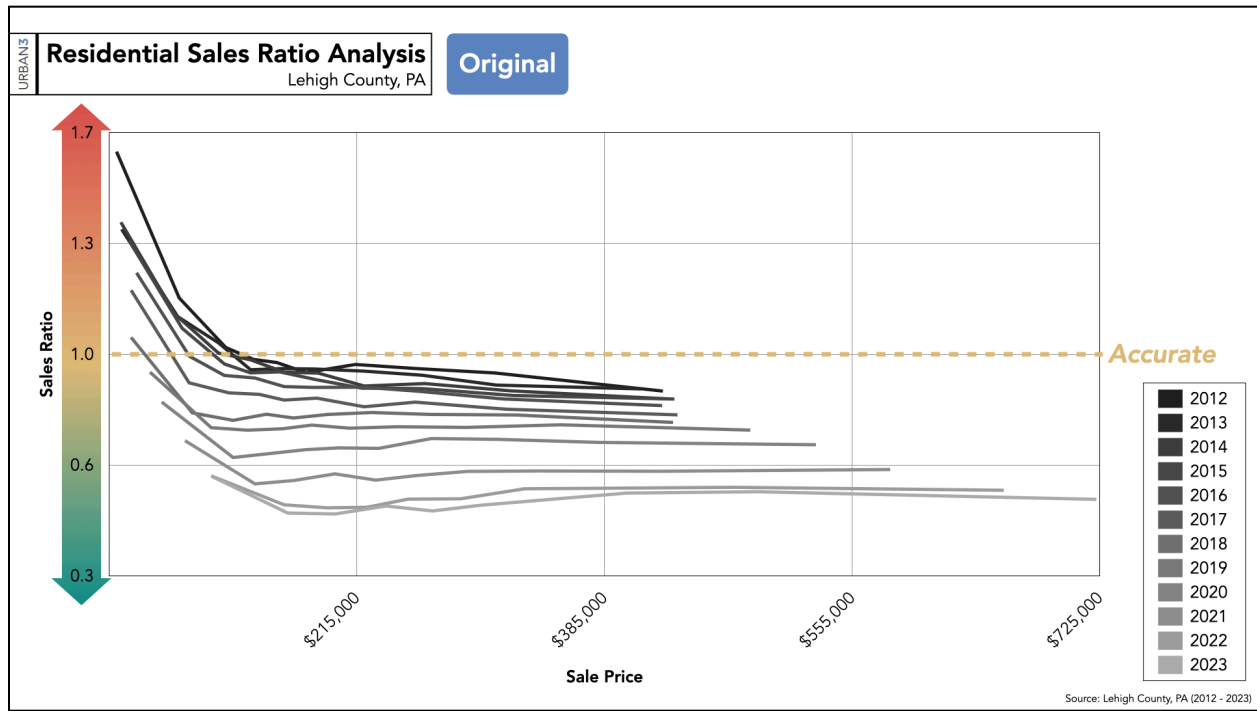
Owner Occupancy
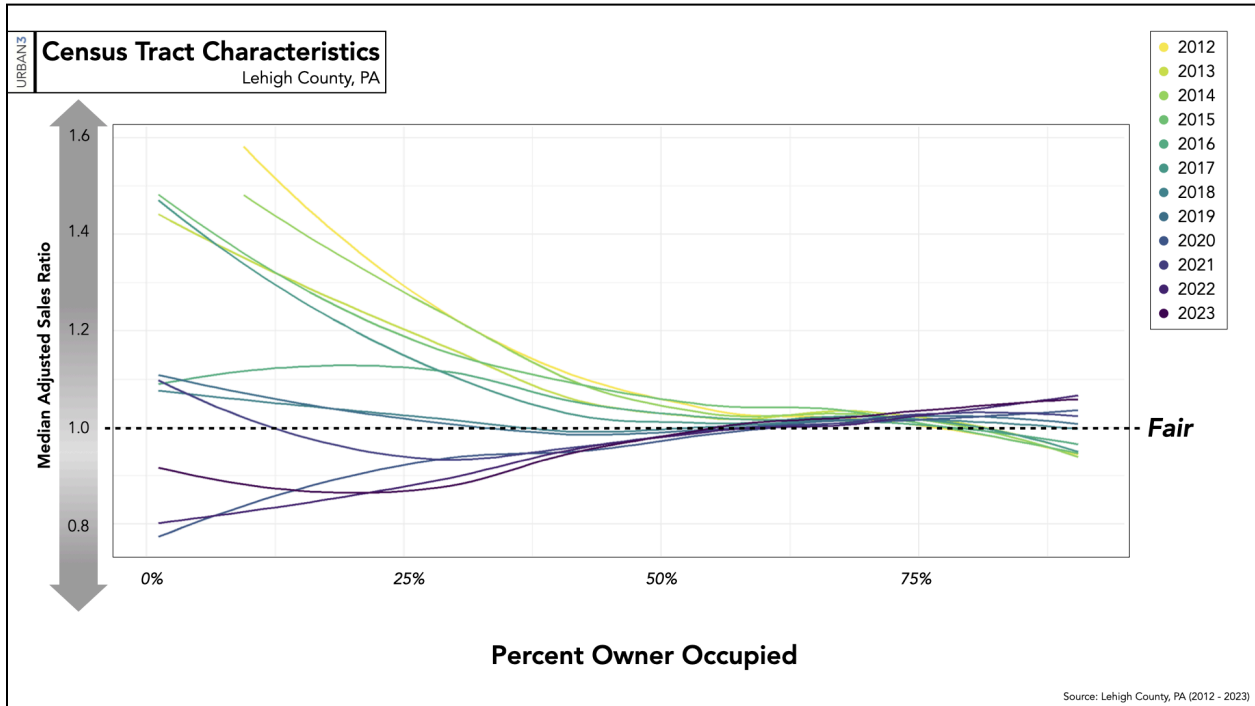
This chart depicts that census tracts with higher owner occupied properties have sale ratios closer to 1 indicating a more fair assessment. Historically, census tracts with lower percentage of owner occupied properties have experienced over-assessment. In more recent years, a transition is observed from under-assessment in census tracts with more renters to almost fair/slight over-assessment in census tracts with more owners than renters.

Household Income
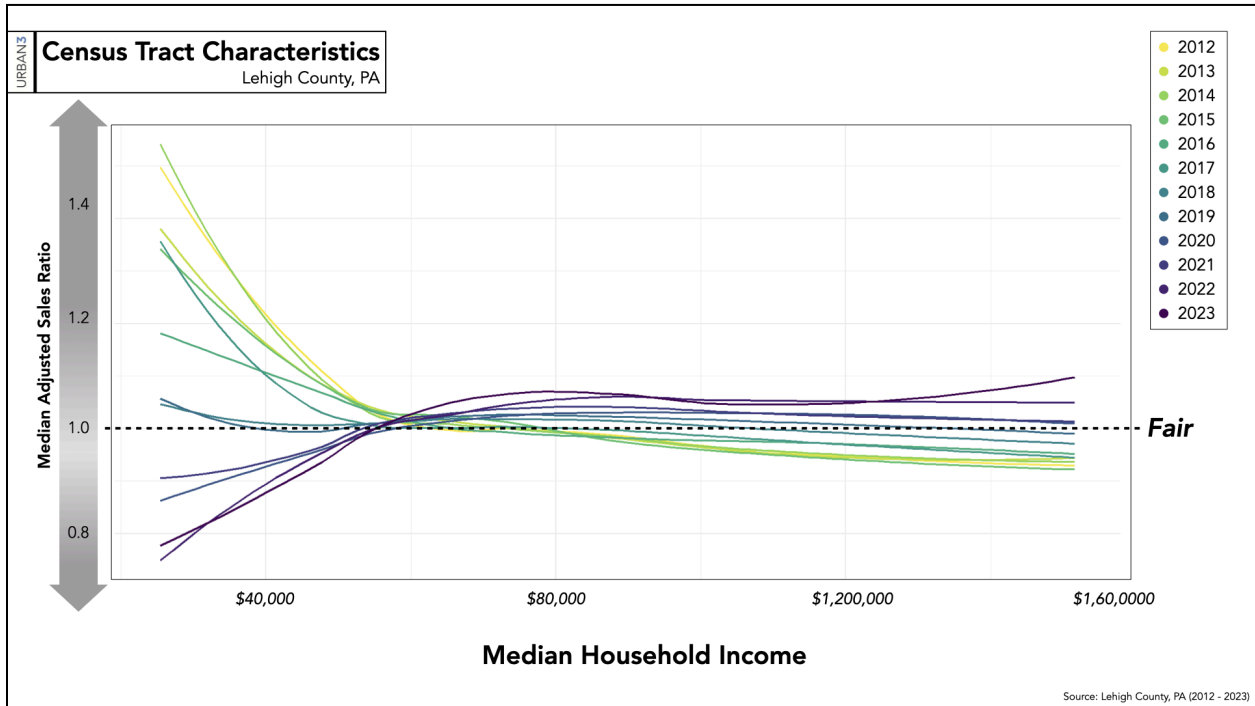
This chart compares assessment fairness to the median income in census tract. Historically, lower median income has indicated over-assessment and higher median income indicated fair - slight under-assessment in census tracts. In more recent years, a transition is observed from under-assessment in census tracts with lower median income to almost fair/slight over-assessment in census tracts with higher median income.

Balancing Tax Burden

Residential Sales Ratio Analysis
Lehigh County, PA — **Original**

Source: Lehigh County, PA (2012 - 2023)

Lehigh County exemplifies a typical trend in property assessment where the least expensive homes tend to be overassessed and the most expensive homes tend to be underassessed. This creates an imbalance, disproportionately burdening homeowners with the least expensive homes. With no pending property revaluation, a potential solution to address this imbalance is to uniformly reduce the assessed value across all properties, thereby distributing the tax burden more equitably throughout the county.
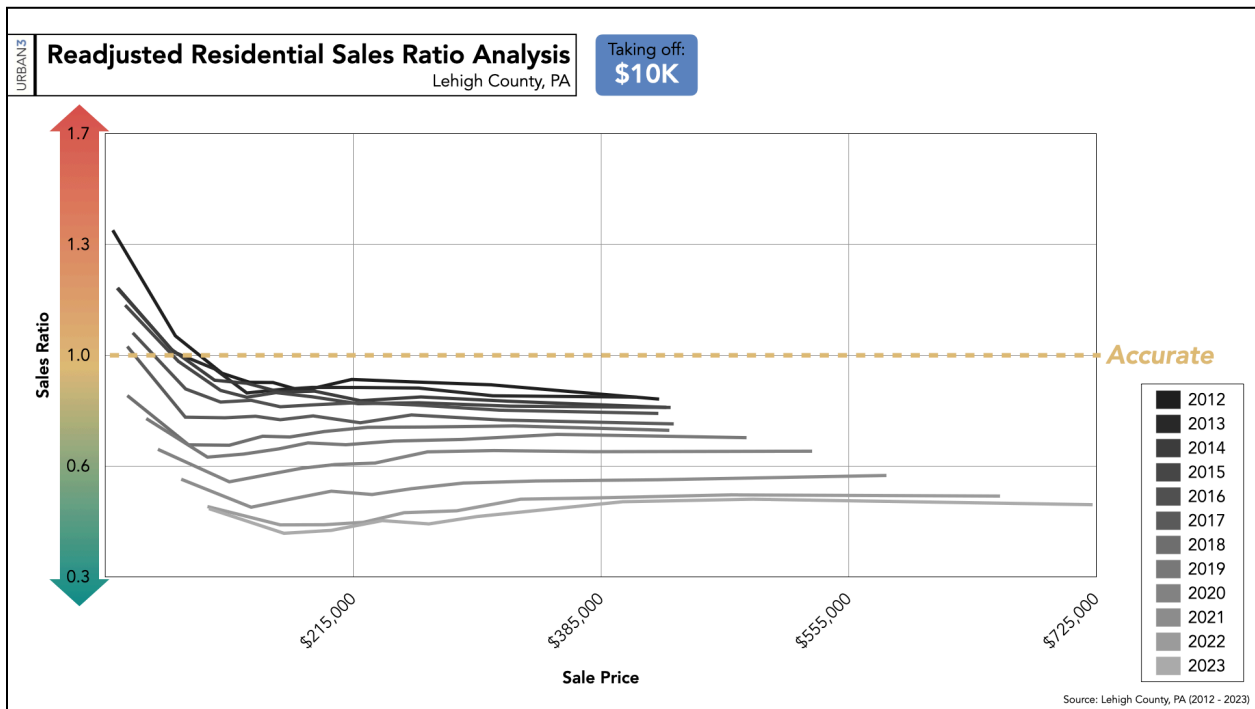
Abatement on Property Value

The images below illustrate four scenarios, each depicting different levels of abatements towards the assessed value of properties.

a. All properties receiving an abatement of $10,000 on their assessed value
b. All properties receiving an abatement of $15,000 on their assessed value
c. All properties receiving an abatement of $20,000 on their assessed value
d. All properties receiving an abatement of $25,000 on their assessed value

It is evident from the charts that as the abatement increases, the curve begins to flatten, particularly in the initial years. However with continued increase in abatement, the curve undergoes an interesting transformation, almost flipping. In the latter scenario, the bottom deciles, or the least expensive homes receive a discount, while the top deciles experience an increase in property taxes. This method serves as an approach to determine the appropriate abatement amount to address the inequities in property taxes, offering insights into potential solutions for a more balanced tax distribution.
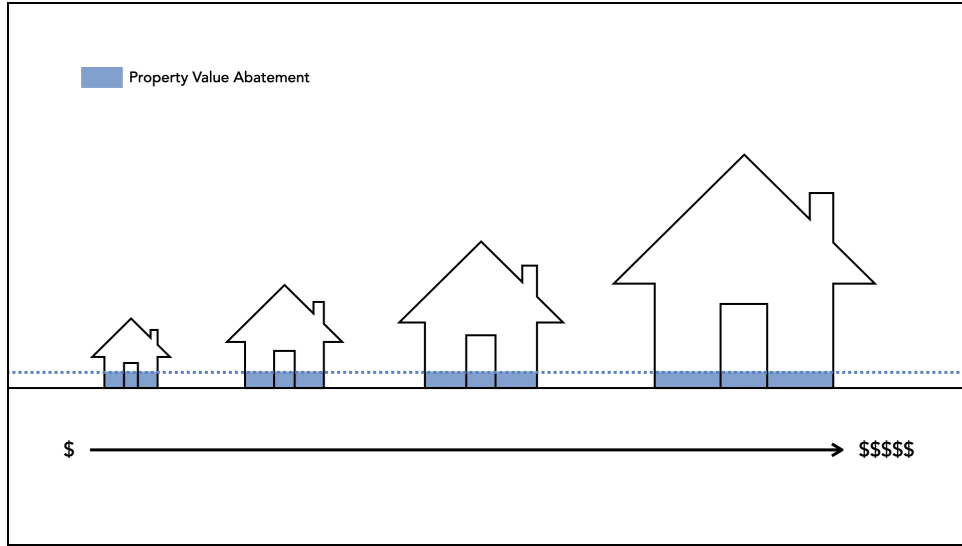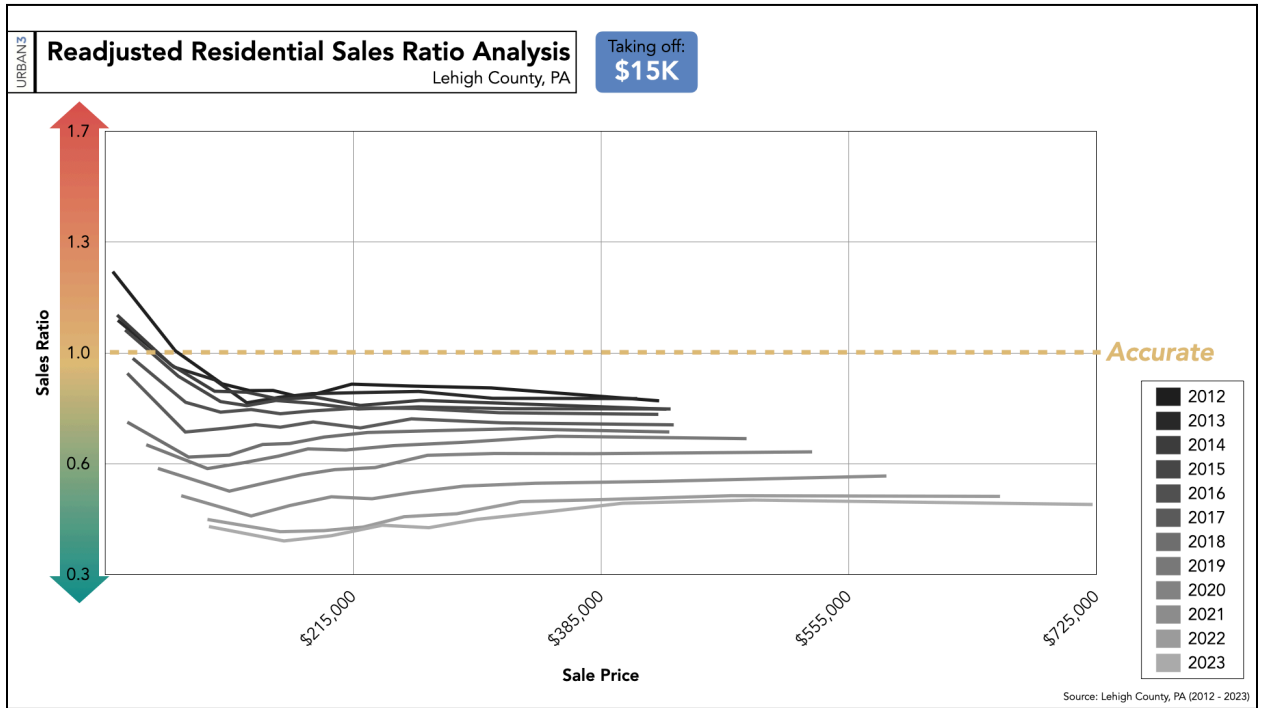
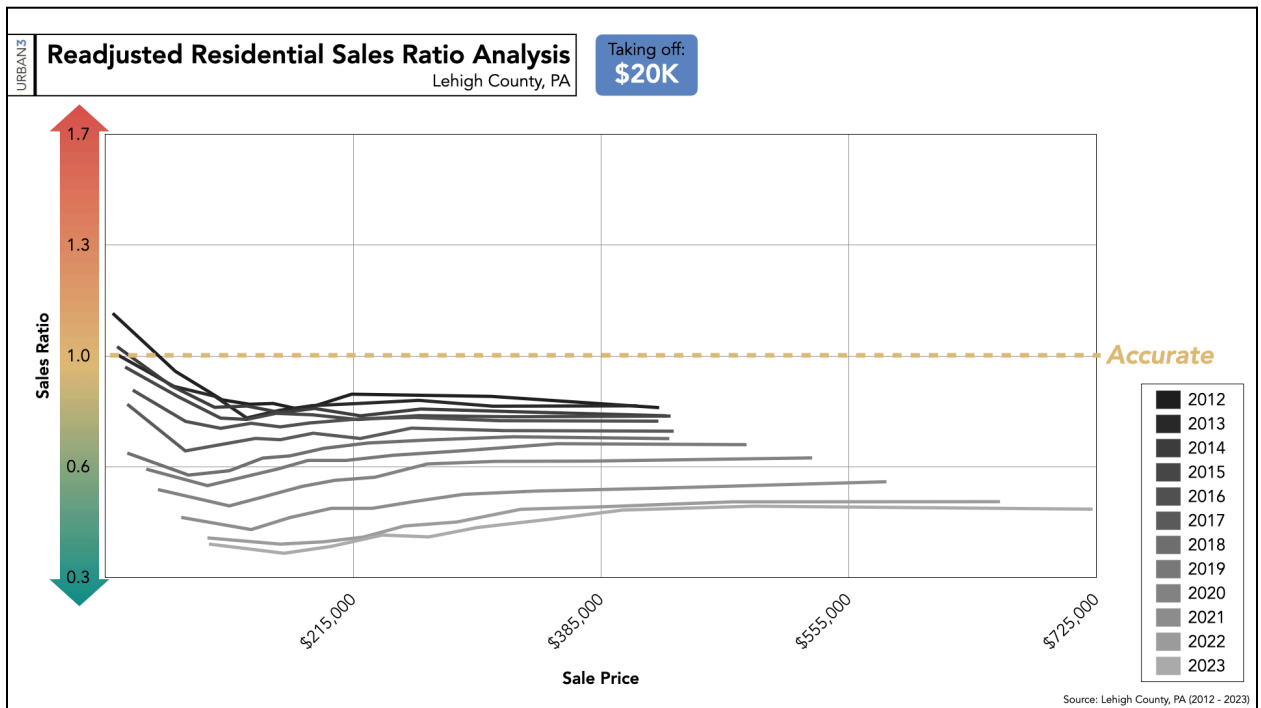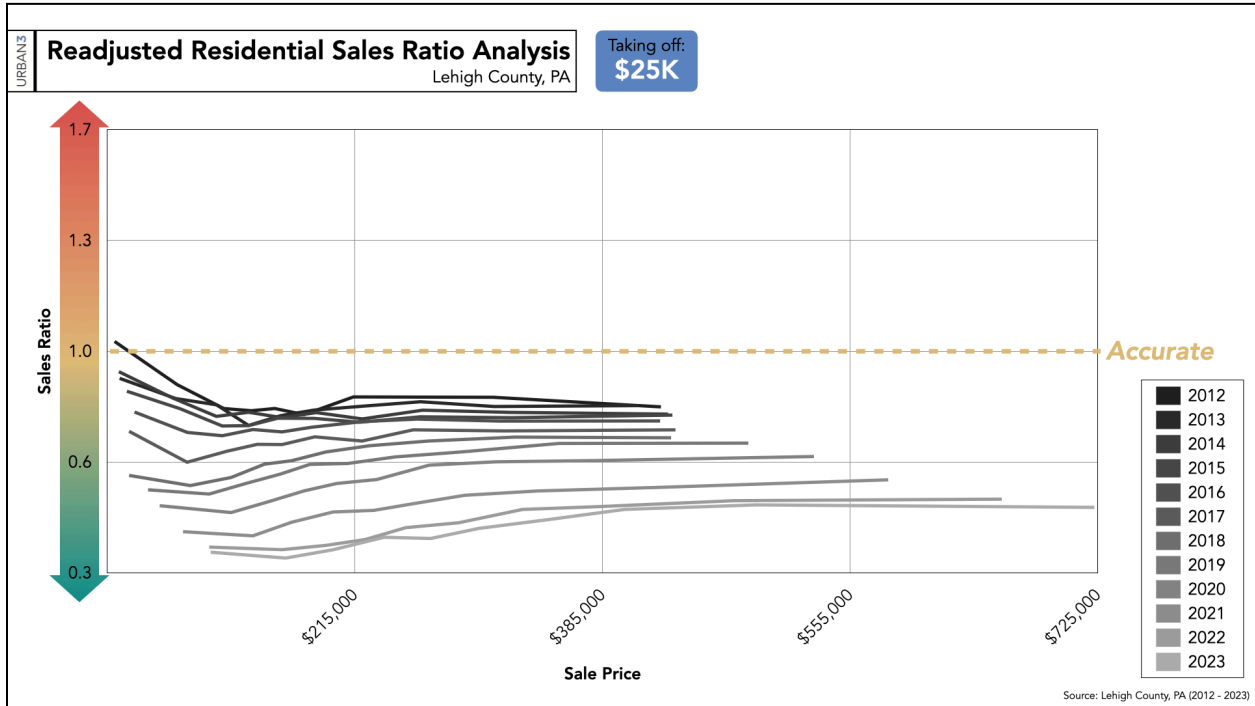a. All properties receiving an abatement of $10,000 on their assessed value

b. All properties receiving an abatement of $15,000 on their assessed value

c. All properties receiving an abatement of $20,000 on their assessed value

d. All properties receiving an abatement of $25,000 on their assessed value

Readjusted Residential Sales Ratio Analysis
Lehigh County, PA

Taking off: **$25K**

Source: Lehigh County, PA (2012 - 2023)

New Tax Rate

It is important to note that in the process of uniformly reducing the assessed values of properties, the tax revenue for the county also experiences a reduction, assuming the tax rate remains unchanged. So in order to maintain the total tax revenue, a corresponding adjustment of the tax rate becomes necessary. *Note that this is just an approximate value based on 2023 assessment values and does not reflect an accurate applicable tax rate for each property in the county. For this analysis, only single family valid home sales were taken into consideration, so the total revenue from property taxes is different from the county number (~$140 million).*

The total old tax revenue from single family homes (valid home sales) for 2023 is $1,497,293 and the new tax revenue is $1,612,370 using the average new tax rate. The correct tax rate to apply to all properties in order to maintain the original 2023 total tax revenue from all properties is calculated as follows,

$$New\ Tax\ Rate\ =\ \frac{Total\ Old\ Tax\ Revenue\ (2023)}{Sum\ of\ Reduced\ Appraised\ Values\ (2023)}$$

Upon doing this calculation, the New Tax Rate comes out to be 0.004383378. Multiplying this tax rate to all the reduced appraised values will give the new tax bill for each property. The table below depicts the new and old tax revenues for the median appraised value in each decile for the year 2023 with a $25,000

abatement. The last two columns depict how the total tax bill (sum of all tax bills) in each decile changes with the new tax rate.

Decile	Sale Year	Number of homes	Sale price Range	Median Assessed Value	Median Reduced Assessed Value	Old Tax Revenue	New Tax Revenue	Old Tax Revenue by Decile (sum of all tax bills in a decile)	New Tax Revenue by Decile (sum of all tax bills in a decile)
1	2023	219	$18,500 - $150,000	$66,600	$41,600	$251.75	$182.34	$59,368	$44,955
2	2023	218	$150,000 - $186,000	$84,000	$59,000	$317.52	$258.62	$75,791	$63,890
3	2023	218	$186,000 - $216,000	$99,300	$74,300	$375.25	$325.68	$87,040	$77,044
4	2023	218	$216,000 - $250,000	$121,100	$96,100	$457.76	$421.24	$102,404	$94,860
5	2023	218	$250,000 - $285,000	$135,100	$110,100	$510.68	$482.68	$113,467	$107,690
6	2023	218	$286,000 - $322,500	$158,400	$133,400	$598.75	$584.74	$130,747	$127,728
7	2023	218	$324,000 - $371,000	$189,300	$164,300	$715.55	$720.19	$156,012	$157,025
8	2023	218	$372,000 - $436,000	$227,600	$202,600	$861.08	$888.94	$189,293	$195,620
9	2023	218	$437,000 - $575,000	$282,200	$257,200	$1066.72	$1127.40	$230,965	$243,943
10	2023	218	$575,000 - $3,400,000	$380,000	$355,000	$1436.40	$1556.09	$352,207	$384,538

The image below illustrates the rebalancing of tax burden across all deciles when the average new tax rate is used for 2023. In accordance with the desired outcome, the first six deciles receive a discount on their property tax bill while the remaining deciles experience an increase in their property tax bills, thereby balancing the tax burden equitably.
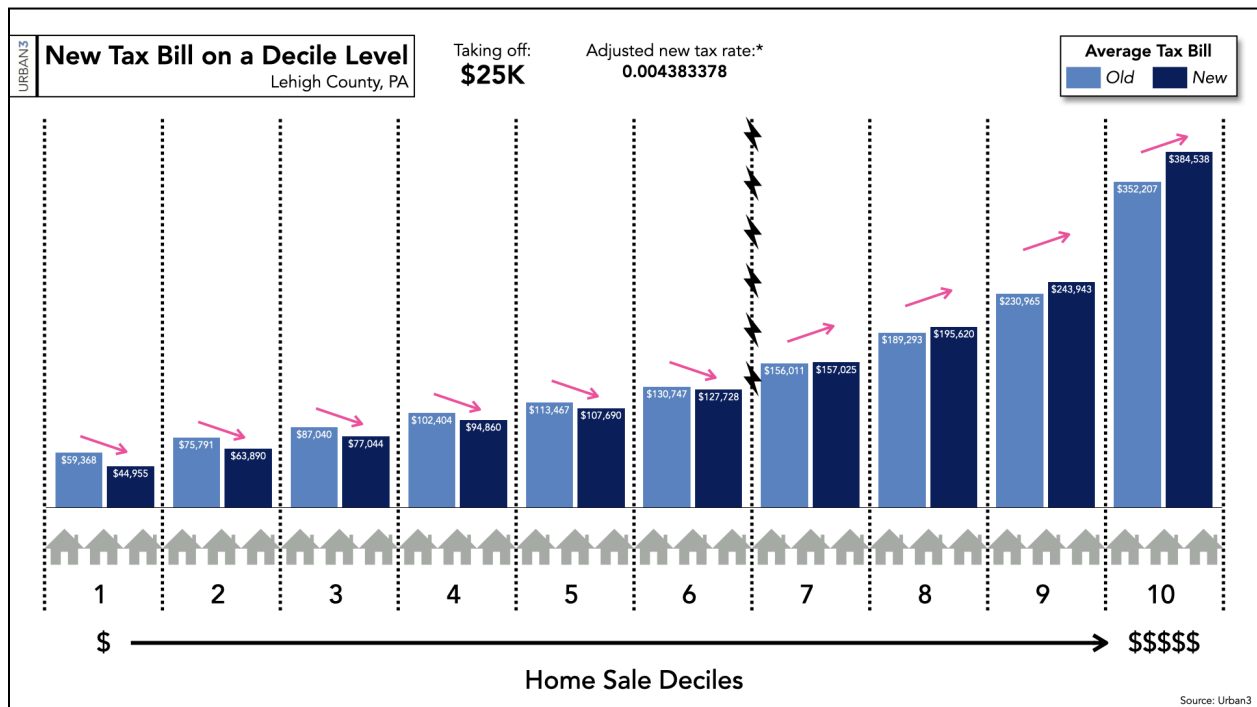
To break it down even further, the second chart shows the old and new tax bill when $25,000 is taken off from each property. The median home value in the first six deciles receive a discount as shown in pink annotations with a negative (-) sign. This is consistent with the desired rebalancing of tax burden across the spectrum. The last four deciles receive an increased tax bill to shoulder some of the property tax burden off from the least expensive homes.
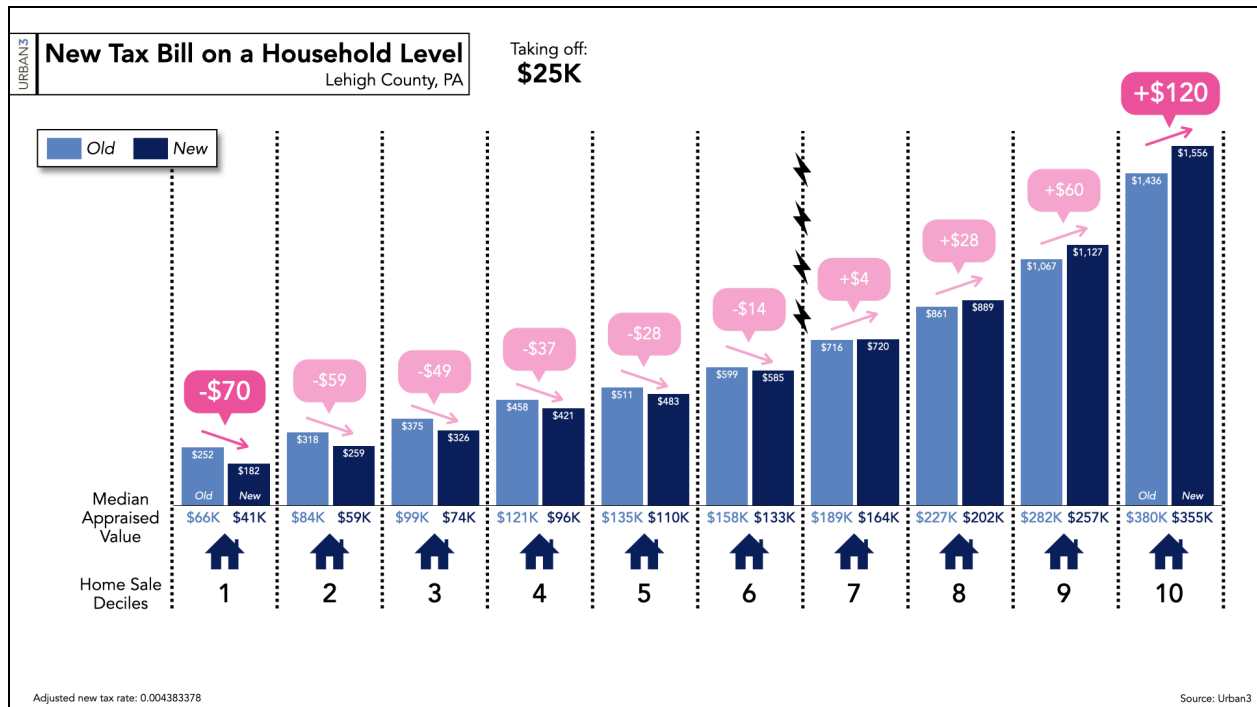
This approach can be used to arrive at an abatement value and a new tax rate to address property tax inequities in the county given that no property reassessment is conducted. It is important to note that not all properties in the first few deciles will receive a reduction in their bills as it is dependent upon the degree of overassessment. If the degree is overassessment is too high, then it is very likely that the property will get a reduced bill with this new approach

Statistical Appendix

The statistical appendix provided here offers additional analysis beyond the scope of the final report on property tax assessment equity. While these tests offer valuable insights into property assessment practices, it's important to note that they may be challenging for the average reader to fully comprehend. These analyses are based on standard statistical tests outlined by the International Association of Assessing Officers (IAAO), specifically focusing on measures such as the Coefficient of Dispersion (COD), Price Related Differential, and Price Related Bias. These tests provide insights into the variability, regressivity or progressivity, and vertical equity of property assessments within Lehigh County, PA, over the span of 2012 to 2023.

Link to IAAO Standards on Ratio Studies

https://www.iaao.org/media/standards/Standard_on_Ratio_Studies.pdf

Coefficient of Dispersion

Sale Year	Coefficient of Dispersion (COD)	COD as Percent
2012	0.1928	19.28%
2013	0.1753	17.53%
2014	0.1814	18.14%
2015	0.1725	17.25%
2016	0.1497	14.97%
2017	0.1451	14.51%
2018	0.1308	13.08%
2019	0.1256	12.56%
2020	0.1209	12.09%
2021	0.1130	11.30%
2022	0.1030	10.30%
2023	0.1093	10.93%

The most generally useful measure of variability or uniformity is the COD. The COD measures the average percentage deviation of the ratios from the median ratio.

The most generally useful measure of variability or uniformity is the COD. The COD measures the average percentage deviation of the ratios from the median ratio. Observing the span of 2012 to 2023 the county has seen improvement reflected in the COD cut nearly in half. This raises the question of what, other than reassessment, the county can do to further reduce the COD.

Price Related Differential

The mean ratio divided by the weighted mean ratio. Price-related differentials above 1.03 tend to indicate assessment regressivity; price-related differentials below 0.98 tend to indicate assessment progressivity. Similar to COD, the price-related differential shows improvement over time, but remaining space to improve.

Sale Year	Price-Related Differential	Trend
2012	1.088780	regressive
2013	1.068936	regressive
2014	1.076815	regressive
2015	1.068940	regressive
2016	1.051206	regressive
2017	1.060761	regressive
2018	1.051399	regressive
2019	1.028648	uniform
2020	1.017547	uniform
2021	1.019474	uniform
2022	1.012050	uniform
2023	1.018894	uniform

The mean ratio divided by the weighted mean ratio. Price-related differentials above 1.03 tend to indicate assessment regressivity; price-related differentials below 0.98 tend to indicate assessment progressivity.

Price Related Bias

The coefficient of price-related bias (PRB) is an index of vertical equity that quantifies the relationship between assessment-sales ratios (ASR) and value in percentage terms. A PRB of 0.043 indicates that, on average, assessment ratios increase by 4.3 percent whenever values increase by 100 percent (e.g., double or double again). The PRB has several technical advantages, including being less sensitive to outliers than the PRD, and also quantifies the statistical significance of observed relationships.

Regression Formula: Pct_Diff = b0 + b1 × Ln_Value

Pct_Diff = Sales Ratio - Median Sales Ratio / Median Sales Ratio

Ln_Value = ln(value)/0.693 Where "value" is a value proxy, calculated as 50% of sale price + 50% of assessed values. Dividing by .693 (the natural log of 2) allows a change in the increment of 1 to be interpreted as a change of 100 percent

B0 = Axis Intercept

B1 = Because each increment of 1 in the independent variable represents a 100 percent change in value, the regression coefficient, b1, represents the corresponding percentage change in assessment ratios.

	Estimate	Std. Error	T value	Pr(>|t|)	
(Intercept)	0.856978	0.032250	26.57	<2e-16 ***	
ln_value	-0.045476	0.001821	-24.98	<2e-16 ***	
Signif. Codes:	0 '***'	0.001 '**'	0.01 '*'	0.05 '.'	0.1 ' ' 1

The T and P value test indicate the estimated values create a line that is statistically accurate in describing the observed data.

Residuals: These statistics describe the distribution of the residuals, which are the differences between the observed values of the dependent variable (pct_dif) and the values predicted by the model.

Minimum: -0.8527

1st Quartile (25th percentile): -0.1524

Median (50th percentile): -0.0450

3rd Quartile (75th percentile): 0.0868

Maximum: 9.3948

Ratios decline by 4.5% when value doubles, and increase by 4.5% when the value halves at the median. However, considering lower selling homes from the median towards the 1st quartile or minimum, the sales ratio declines in larger steps when the value halves. In the other direction considering the 3rd quartile to the maximum home values, the sales ratio increases in larger steps as the value doubles.