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An Evaluation of Property Tax Regressivity in Miami-Dade County (2002 – 2016)

INTRODUCTION

KEY FINDINGS
- Property assessments in the city of Miami and surrounding Miami-Dade County are within industry-acceptable limits, and in recent years have demonstrate negligible levels of regressivity.
- While on average, assessments in Miami-Dade County have demonstrated modest regressivity, more recent years have produced no consistent pattern, with homes in the first and third quartiles receiving relative assessments above properties in the second and fourth quartile.
- On average, Miami-Dade's lowest-valued (bottom 10%) and highest-valued (top 10%) properties receive assessments equal to 87% and 93% of their respective property values.
- As a result of inaccurate assessments, more than $616 million in recently sold property value goes untaxed every year, singularly from the community's top 10%

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 local own-source general revenue, nationwide.[1] Whether residents rent or own, property taxes directly or indirectly impact almost everyone.

In many cities, however, property taxes 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. The Center for

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[1] *U.S. Census Bureau, 2016 Annual Surveys of State and Local Government Finances.*
https://www.census.gov/data/datasets/2016/econ/local/public-use-datasets.html.

Municipal Finance at the University of Chicago has evaluated the regressivity of property assessment in 14 of America's largest cities and counties. The following report highlights the system in Miami-Dade County, between 2002 and 2016 where property taxes account for roughly one third of the all own-source revenue county-wide.[2]

Our review of Miami-Dade County property tax assessments reveals a modest level of regressivity compared to similar communities. While the average difference in effective tax rates between the lowest- (bottom 10%) and highest-valued properties (top 10%) is relatively small, 93% and 87% respectively, this spread has decreased significantly in recent years, reaching a 0.5 percentage point difference by 2016. Nevertheless, continuing assessment inaccuracy results In Miami-Dade County leaving more than $616 million in recently sold property value untaxed every year. In spite of this modest regressivity, all three of the most common models for evaluating regressivity fall within recommended levels.

In Miami-Dade County, like most communities, assessments are conducted at the county level. As such, our evaluation focuses on properties throughout the county as a whole. The report at hand relies on data provided by the Miami-Dade County Assessor and covers all "arms-length" property transactions within the city between 2002 and 2016. The analyses that follow use only "arms-length" transactions, generally meaning only traditional, market-rate sales involving buyers and sellers with no previous relationship (rather than, for example, sales between relatives or foreclosure auctions). For these analyses, we use the local assessor's classification of arms-length transactions.[3]

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[2] *Annual Survey of State and Local Government Finances*, United States Senate (last accessed October 2017), https://census.gov/programs-surveys/gov-finances.html.
[3] For an explanation and example of how the measures used in this paper may vary depending on local versus IAAO definitions of "arms-length" see the Center's previous work regarding St. Louis and St. Louis County assessments, which can be found at www.propertytaxproject.uchicago.edu/papers.

The standard approach for evaluating the quality and fairness of assessments is through a sales ratio study.[4] The *sales ratio* is defined as the assessed value of a property divided by its sale price. A sales ratio study evaluates the extent of regressivity in a jurisdiction, along with other aspects of assessment performance, by studying sales ratios for properties that sold within a specific time period. A system in which less expensive homes are systematically assessed at higher sales ratios than more expensive homes is *regressive*.

This report presents a basic sales ratio study for the Miami-Dade County based on data provided by the local assessor's office. Following a conceptual review of regressivity, our findings are broken into three categories: 1) the results of our sales-ratio study, 2) the application of industry standard measures of regressivity, and 3) the tax implications of local regressivity and inaccuracy.

Understanding Assessment Regressivity and Its Consequences

The property tax is, in principle, an *ad valorem* tax, meaning that the tax is proportional to the value of the property. Most textbook discussions of the property tax proceed as though a property's value is well known. But this is seldom the case. For a property that has sold recently, the sale price is usually a reasonable approximation of its market value. But only a small proportion of properties change hands in any given year— roughly 3-9% of all homes each year according to our data. For the vast majority of properties, which have not sold recently, the value must somehow be estimated. This is the job of local assessors.

In most large jurisdictions, assessors rely on statistical models to assess residential property. This procedure is, essentially, as follows:

- The local assessor compiles a list of all of the properties which have sold recently and identifies important characteristics of each property such as square footage, the number of bedrooms, the size of the yard, the age of the property, etc.

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[4] *See* International Association of Assessing Officers. 2013. *Standard on Ratio Studies.* https://www.iaao.org/media/standards/Standard_on_Ratio_Studies.pdf.

- The assessor estimates the relationship between a property's features and its' market value, using data from the sample of recently sold properties. For instance, each additional square foot of building space adds some amount to the sale price, an additional bathroom adds a certain amount of value, and so on. A statistical model, such as a regression, is created to estimate the relationships between all potentially relevant property features and the sale price.

- This statistical model is used to estimate the values of all similarly situated homes that haven't sold, based on their features. That is, the assessor assumes that the relationship between property features and prices for the sold properties would have been the same for the unsold properties. For example, if, among properties that sold, the average price for a 2,000 square foot, 3-bedroom home was $100,000, the assessor assumes that other 2,000 square foot, 3-bedroom homes that weren't sold are worth $100,000. In principle, these comparisons should be limited to homes within the same neighborhood, since the price of similar homes can vary significantly across locations, particularly in larger communities.

- The assessed value from this process becomes the basis on which property taxes are levied. Various exemptions and deductions may be applied at this stage.

- These assessments may be adjusted after the fact as the result of appeals by property owners.

When assessment is conducted accurately, the resulting property taxes indeed constitute an *ad valorem* tax. However, when property assessment is inaccurate, the resulting property taxes will also be inaccurate. Over-assessed properties will be over-taxed, while under-assessed properties will be under-taxed. Although no assessment system is perfectly accurate, we are especially concerned with a particular type of inaccuracy known as *regressivity*. Assessments are regressive when low-value homes are assessed at a higher percentage of their true market value than are high-value homes.
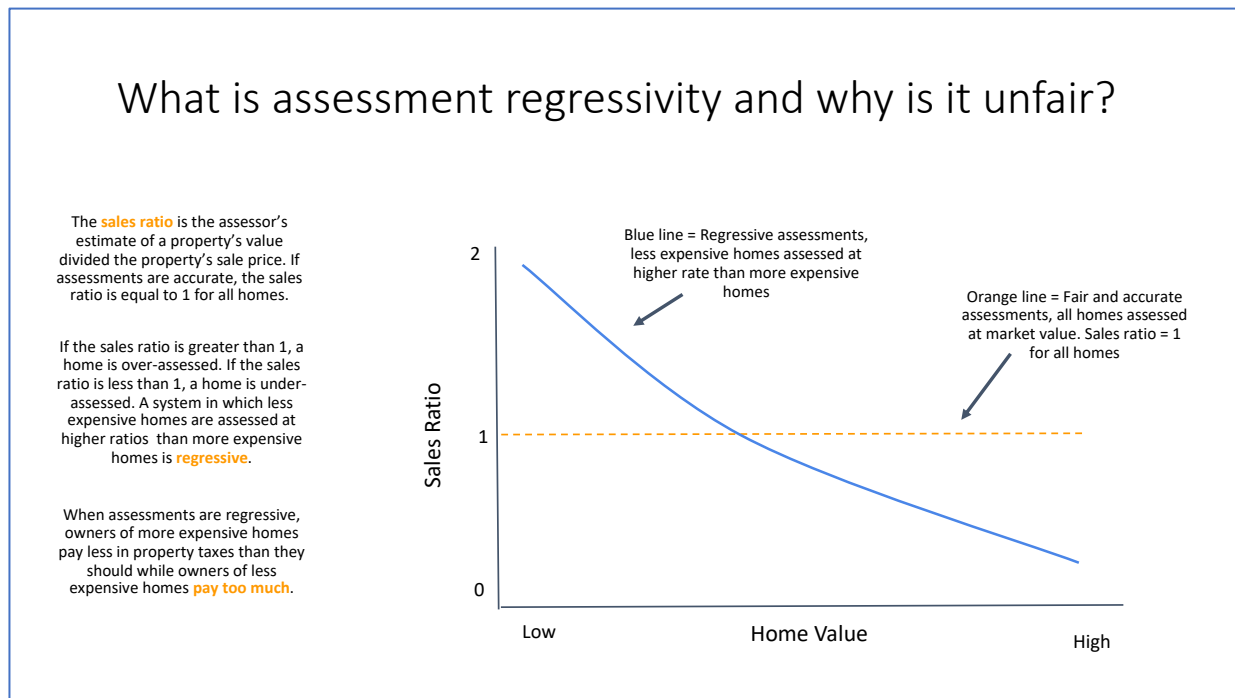
To understand regressive assessment and its consequences, it is useful to contrast it with fair assessment. A common way of diagnosing regressivity is to compare the *sales ratio* for homes with different sale prices.[5]

Figure 1 shows what the average sales ratio should look like in a properly functioning assessment system, as well as what can go wrong when assessments are regressive. If assessments were perfectly accurate, every home would be valued at exactly 100% of its value, meaning that the sales ratio would be 1 for every property, as depicted by the dashed orange line. Of course, no assessment system if perfect. But if the average sales ratio is equal across the spectrum of prices, even an imperfect system will be unbiased with respect to price, meaning that owners of both more and less expensive property will pay their fair share of taxes on average. However, when the average sales ratio is higher for low-priced homes than for high-priced homes, as depicted by the solid blue line, assessments are regressive. Regressive assessments lead to regressive taxation, in which owners of low-value property pay too much in taxes while owners of high-value properties pay too little.

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[5] Because accurate sale prices are only known for properties that have recently sold, the sales ratio can only be computed for properties that have recently sold.

Figure 1: Understanding Assessment Regressivity

What is assessment regressivity and why is it unfair?

The **sales ratio** is the assessor's estimate of a property's value divided the property's sale price. If assessments are accurate, the sales ratio is equal to 1 for all homes.

If the sales ratio is greater than 1, a home is over-assessed. If the sales ratio is less than 1, a home is under-assessed. A system in which less expensive homes are assessed at higher ratios than more expensive homes is **regressive**.

When assessments are regressive, owners of more expensive homes pay less in property taxes than they should while owners of less expensive homes **pay too much**.

Blue line = Regressive assessments, less expensive homes assessed at higher rate than more expensive homes

Orange line = Fair and accurate assessments, all homes assessed at market value. Sales ratio = 1 for all homes

Sales Ratio

Low   Home Value   High

A simple numerical example illustrates the consequences of assessment regressivity. Suppose the average home that sold for $100,000 is actually assessed at $120,000. Meanwhile, the average home that sold for $1 million is assessed at $800,000. Suppose, the statutory tax rate is 1% of assessed value. In this scenario, the $100,000 home pays $1,200 in taxes each year, for an effective tax rate of 1.2 percent. The $1 million home pays $8,000 in taxes, for an effective tax rate 0.8 percent. The result is that the low-priced home has a 50% higher tax rate than the high-priced home (1.2/0.8 = 1.5).

Graphs such as the one shown in Figure 1 are a useful way to visually detect assessment regressivity. For more formal evaluations, the industry has developed several statistical tests for assessment regressivity. As discussed below, the measures most commonly used by professional assessors are the coefficient of dispersion (COD), price-related differential (PRD) and the coefficient of price-related bias (PRB). In addition, academic researchers have

developed several more sophisticated statistical tests for assessment regressivity.[6] While none of these tests is perfect, collectively they can be used to evaluate the likely extent of assessment regressivity in a given jurisdiction.

SUMMARY OF FINDINGS

Of the 14 cities and counties evaluated for this series, Miami-Dade County had one of the least regressive property assessment schemes, and has been improving further in recent years.[7] When averaged over a 14-year period, the lowest-valued properties in the county received assessments equal to approximately 93% of the property's actual sale-price; while, the county's highest-value homes were assessed at only 87% of their sale price. Using industry-standard measures of assessment regressivity and accuracy produce similar results. More recent years, though, suggest that there is little to no regressivity in the county's assessments, though, importantly, these assessments remain inaccurate and lack uniformity.
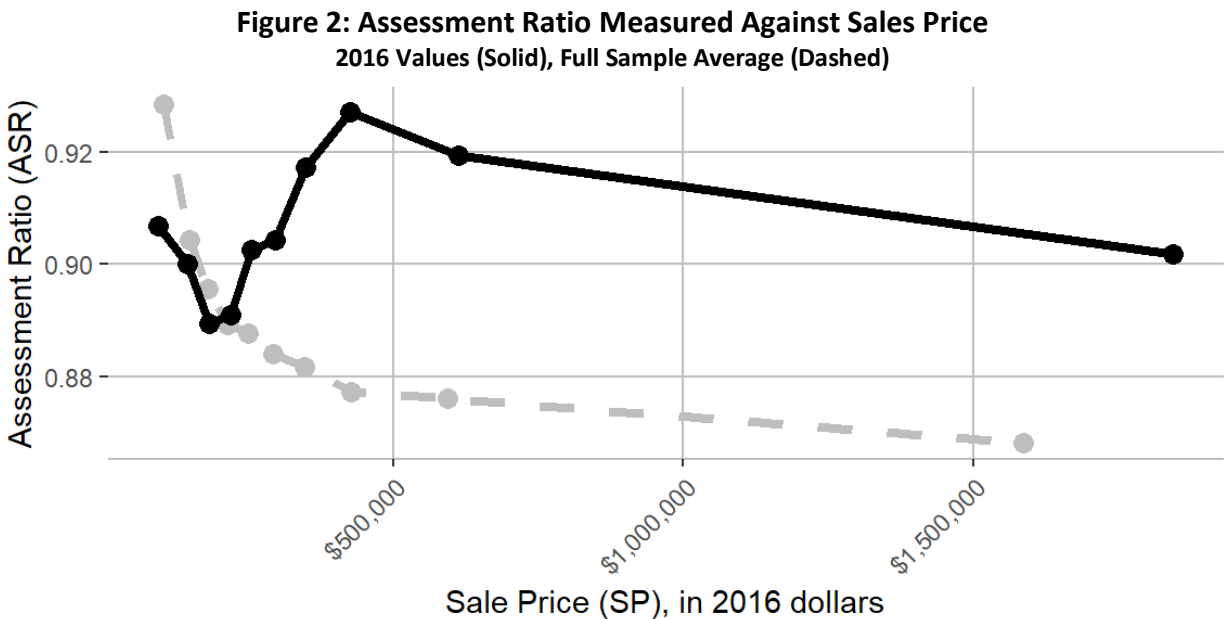
Sales Ratio Evaluation

The relationship between assessments and sale prices is regressive if less-valuable homes are assessed at higher rates (relative to the value of the home) than more valuable homes. Figure 2 below demonstrates the relationship between assessment ratios and sale prices in Miami-Dade County. For Figure 2, property sales have been sorted into deciles (10 bins of equal size based on sale price), each representing 10% of all properties sold in the county. Each dot represents the average sale price and average sales ratio for each respective decile of properties sold. Figure 2 also compares the most recent values for 2016 (solid line) with the average values across all years of observation, 2002 through 2016 (dashed line). All values were adjusted for inflation to 2016 dollars to facilitate comparisons. If sale prices are a fair indication of market value and assessments are fair and accurate, Figure 2 would be a flat line with a constant sales

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[6] *For a review, see,* Horizontal and Vertical Inequity in Real Property Taxation Author(s): G. Stacy Sirmans, Dean H. Gatzlaff and David A. Macpherson Source: Journal of Real Estate Literature, Vol. 16, No. 2 (2008), pp. 167-180, https://www.jstor.org/stable/44105042.

[7] *For a comparison of all 14 jurisdictions see* Appendix E.

ratio, meaning that the value of is unrelated to the accuracy of its assessments. A downward sloping line indicates that less expensive homes are over-assessed compared to more expensive homes and is evidence of regressivity.

Figure 2: Assessment Ratio Measured Against Sales Price
2016 Values (Solid), Full Sample Average (Dashed)

For 2016, the highest ten percent of sales were assessed at 99.4% of the rate of assessment applied to the lowest ten percent of sales. Top decile rate: 90.2%. Bottom decile rate: 90.7%.

As Figure 2 demonstrates, when averaged over all 14 years, the assessment rate applied to Miami-Dade's lowest-valued homes (bottom 10%) was equal to 97% of a property's sale price, while for the county's highest-valued properties (top 10%) the rate was only 83% of sale price. In more recent years, even this modest regressivity appears to have declined, with these same values reaching only 90.7% and 90.2% of sale price, respectively.

Importantly, the trend line displayed in Figure 2 cannot be described as regressive, as the curve here is instead bimodal. In a truly regressive system, the lowest-valued homes would be assessed at the highest ratios, while the highest-valued properties would receive the lowest assessment ratios. In Miami-Dade, however, it is the mid-valued properties, particularly the third and fourth deciles, that enjoy the lowest assessment ratios, and properties in the seventh

through ninth deciles which received the highest assessment ratios. By 2016, the true lowest- and highest-valued properties, the first and tenth deciles, had comparable ratios: 90.7% and 90.2%, respectively. This particular pattern was not present in any of the other 13 communities studied for this evaluation.

Figure 3 below demonstrates the relative proportion of each decile which was over- or under-assessed. In Miami-Dade County, assessed values are supposed to be equal to 85% of the property's actual sale price; to that end, properties are considered "over-assessed" when their assessed value exceeds 85% of sale price, while properties are considered "under-assessed" when their assessed value is less than 85% of sale price.

As Figure 3 shows, some homes in each decile were both over- and under-assessed in any given year. However, the relative proportion of homes that are over- or under-assessed varies significantly based on the value of the property in question. While more than 80% of Marion County's lowest-priced homes received overassessments, less than 20% of similarly priced homes benefited from underassessment. Conversely, nearly 60% of Marion County's highest-priced homes enjoyed underassessments while only approximately 45% of similarly priced homes received overassessments.

Figure 3: Percent of Property Over-/ Under-Assessed by Decile
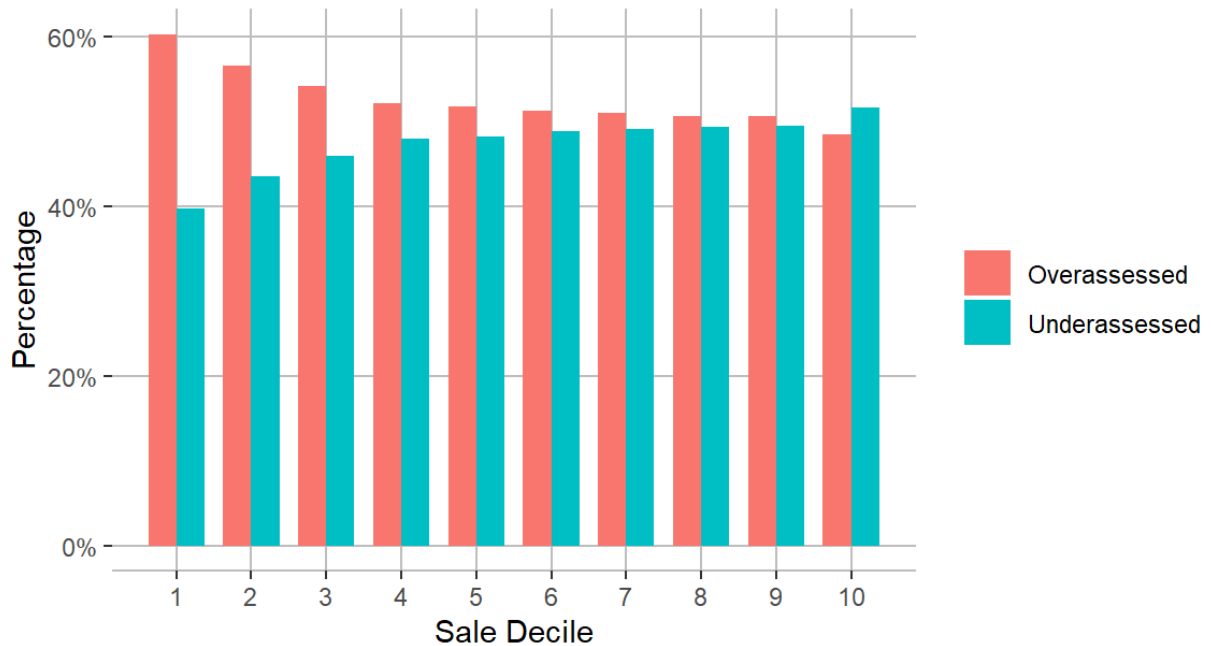
Industry Standards

The preceding section provides graphical evidence of regressivity in property assessments but it does not provide a statistical evaluation. In this section, we report several standard statistics used in the evaluation of assessment quality.

The International Association of Assessing Officers (IAAO) provides standards for assessments including standards for uniformity and regressivity (*aka* vertical equity). *Uniformity* refers to the overall level of variability in sales ratios across properties. Regressivity refers to the correlation between sales ratios and sale prices. The three main standards are[8]:

- Coefficient of Dispersion (COD) is a measure of uniformity based on the average percentage deviation of the ratios from the median, expressed as a percentage of the median. For example, given a COD of 15%, a property worth $100,000 has a 50% chance

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[8] International Association of Assessing Officers. 2013. *Standard on Ratio Studies*. https://www.iaao.org/media/standards/Standard_on_Ratio_Studies.pdf.

to be assessed between $85,000 and $115,000. Higher values of COD indicate less uniformity in assessments.

- Price-Related Differential (PRD) is a measure of vertical equity calculated by dividing the mean sales ratio by the weighted mean ratio, where the weight is the sale price. For example, assume a jurisdiction contains two homes, one worth $100,000 assessed at 12% and one worth $1,000,000 assessed at 8% of the fair market value. The mean ratio would be 10% (12% + 8% divided by 2) while the weighted mean ratio would be 8.4% (12% * 100,000 + 8% * 1,000,000 divided by 1,100,000). The resulting PRD (10% divided by 8.4%) would be 1.20. Higher values of PRD indicate greater regressivity.

- Coefficient of Price-Related Bias (PRB) is a regression-based measure that estimates the relationship between the sales ratio and a given proxy for actual property value determined by giving equal weight to market value and assessed value. In other words, PRB predicts the change in assessment ratio that can be expected to result from a 100% change in this value proxy. For example, a PRB of 0.031 indicates that assessment ratios increase by 3.1% when the home value increases by 100%. Higher values of PRB indicate greater regressivity.

Table 1: IAAO Standards

Parameter	Acceptable Minimum	Acceptable Maximum
COD	5.00	15.00
PRD	0.98	1.03
PRD	-0.05	0.05

While no jurisdiction can achieve perfect assessments, remaining within industry-acceptable limits, particularly with regard to COD, PRD, and PRB measures, is an important tool in evaluating equity and uniformity. Table 2 below shows the most recent levels in Miami-Dade County for all three of these measures, compared with industry recommendations.

Table 3: Miami-Dade County's COD, PRD, and PRB Levels (2016)

Measure	Miami Rate	Recommended Limit(s)
Coefficient of Dispersion	10.80	</= 15
Price-Related Differential	1.003	0.98 to 1.03
Price-Related Bias	.013	-0.05 to 0.05

Miami-Dade's COD of 10.8 is well within acceptable levels, indicating that while property assessments in the area are not perfectly uniform (an unattainable goal, for practical purposes), the remaining disparities are within normal levels. Both industry measures of regressivity, the PRD and PRB, are also within industry thresholds, again indicating that while the system is still not perfect, it remains within industry-acceptable levels.

Figures 4 through 6 demonstrate trends over time in industry measures of regressivity and uniformity since 2008. Like many other communities, Miami-Dade County experience a sharp spike in regressivity during and immediately following the 2008 financial crisis. Unlike many communities, though, the city has since rectified these spikes and brought all three industry-standards within acceptable levels.

Figure 4: Miami-Dade County's Coefficient of Distribution
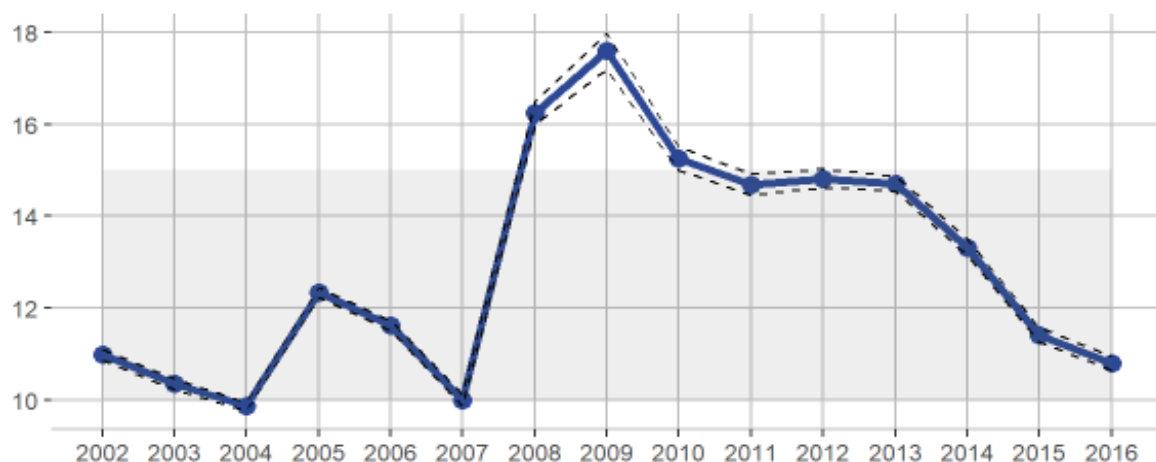
Dotted lines represent 95% Confidence Interval.
In 2016, the Coefficient of Dispersion was 10.8 which does meet the IAAO standard for uniformity.
With this value, a property worth $100,000 has a 50% chance to be assessed between $89200 and $110800.

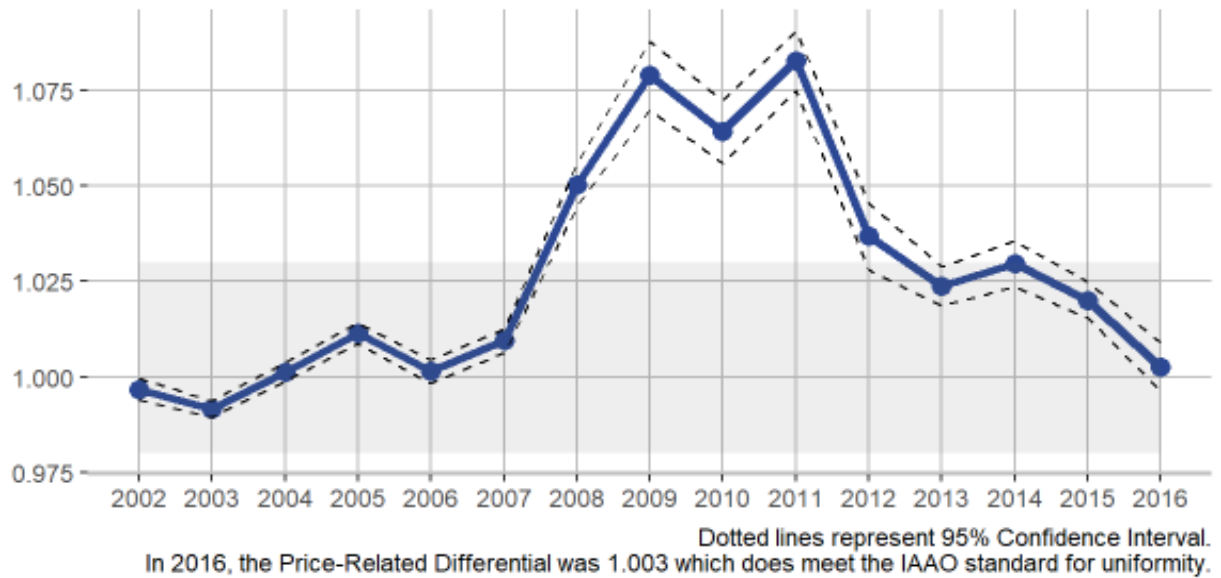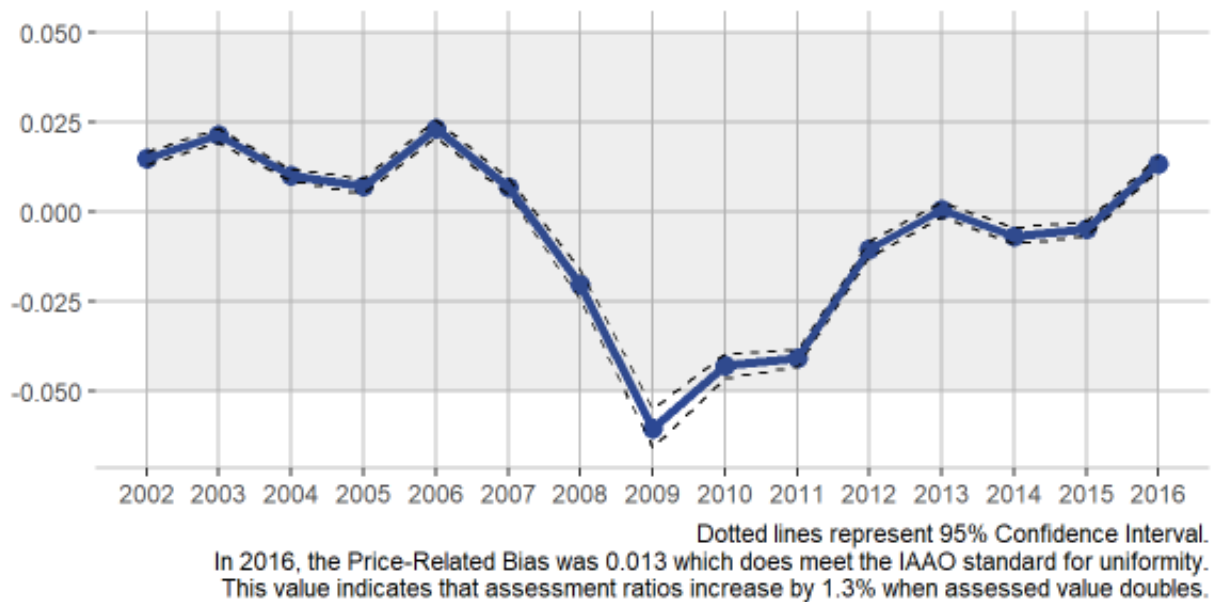## Figure 5: Miami-Dade County's Price-Related Differential

Dotted lines represent 95% Confidence Interval.
In 2016, the Price-Related Differential was 1.003 which does meet the IAAO standard for uniformity.

Figure 6: Miami's Price-Related Bias

Dotted lines represent 95% Confidence Interval.
In 2016, the Price-Related Bias was 0.013 which does meet the IAAO standard for uniformity.
This value indicates that assessment ratios increase by 1.3% when assessed value doubles.

Tax Implications

Community Implications

When assessments are regressive, low-value properties can expect to pay more than their fair share of property taxes, while higher-value properties will actually pay less. In other words, regressivity shifts a portion of the collective tax burden from high-value properties and onto lower-value properties. Table 3 provides average sales and assessment data within each decile, including both individual properties and aggregate impact. For example, Line 1 indicates that among the bottom 10% of homes in Miami-Dade County, local governments collectively under-assessed recently sold property by more than $31 million. By comparison, Line 10 shows that among the county's top 10% of homes, local governments collectively under-assessed recently sold homes by more than $640 million in property value. Table 3 supports the findings discussed earlier, namely, that inaccurate assessments in Miami-Dade County produce some degree of under-assessment, and thus under-taxation, among properties of all values; because of local regressivity, however, these "benefits" disproportionately favor higher-valued properties.

Table 3 only uses data from recently sold properties. Scaling the estimates up to all property in Miami-Dade County requires making some assumptions. Collectively, the under-assessment described in Table 3 amounted to nearly $1.5 billion in untaxed property value among recently sold residential properties alone. In an average year, however, only around 5% of homes in any given community actually sell. As such, the full value of untaxed property is likely many magnitudes greater.

Table 3: Average Sale Price and Total Property Value of Over/ Underassessment Among Recently Sold Homes

Sale Decile	Average Sale	Average Assessed Value	Sum of Sales	Sum of Assessed Values	Sum of Over/Under Assessments	% Over/Under Assessed
1	$102,803	$80,257	$136,723,300	$104,801,441	-$31,921,859	-30.5%
2	$147,762	$113,210	$208,017,050	$159,179,052	-$48,837,998	-30.7%
3	$180,180	$137,158	$263,515,200	$199,321,789	-$64,193,411	-32.2%
4	$214,106	$161,878	$317,477,339	$240,470,197	-$77,007,142	-32.0%
5	$250,097	$188,793	$369,184,023	$283,265,935	-$85,918,088	-30.3%
6	$292,598	$220,049	$427,562,800	$328,667,816	-$98,894,984	-30.1%
7	$347,061	$260,346	$502,281,590	$391,539,997	-$110,741,593	-28.3%
8	$426,827	$318,633	$615,302,352	$485,048,691	-$130,253,661	-26.9%
9	$594,199	$442,945	$885,526,850	$692,307,653	-$193,219,197	-27.9%
10	$1,586,527	$1,153,786	$2,664,295,950	$2,022,956,627	-$641,339,323	-31.7%

Impact on the Individual Homeowner

A natural question that emerges from our analysis is how much money is at stake for individual homeowners. This question does not have an easy answer because individual property tax burdens can vary even within a single city, as a result of overlapping jurisdictions with concurrent taxing authority. For example, many communities permit municipalities, counties, school districts, public utilities, development districts, and numerous other government entities to levy property taxes. As a result, different residents in the same city or county may be subject to different taxing authorities. For the purposes of the following illustration, we consider the average 2018 tax rate of 1.879 % calculated by the state of Florida, incorporating all various tax rates within the county.[9]

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[9] *Florida Ad Valorem Valuation and Tax Data Book*, Florida Department of Revenue (last accessed October 2019), https://floridarevenue.com/property/Pages/DataPortal_DataBook.aspx.

Table 4 below demonstrates the approximate tax implication for properties within the first, fifth, and tenth deciles of sale prices. Within each decile, we show the average sale price and the average assessed value. We compute the correct tax bill by multiplying the average value by the average tax rate of 1.879%, and we compare that with the average actual tax bill to arrive at the difference. The difference between the average correct tax bill and the average actual tax bill shows the extent to which the average property in each decile is over- or under-taxed. Consistent with our analysis, these values demonstrate that while the region's lowest-valued homes receive an inflated tax bill, middle- and high-valued homes enjoy increasingly substantial reductions. These estimates should be considered examples rather than definitive conclusions with respect to any individual property because, as noted above, there may be multiple tax rates within a jurisdiction due to different taxing jurisdictions. It should be noted that these figures do not include any exemptions; in reality, most homeowners receive a substantial homeowner exemption that reduces the taxable value of their home.

Table 4: Statutory and Effective Tax Bills Among Miami-Dade Property Owners[10]

Decile	Actual Value	Assessed Value	Statutory Tax Bill	Effective Tax Bill	Difference
Lowest Valued Homes	$94,618.00	$85,809.06	$1,777.87	$1,612.35	-9%
Median Home Price	$255,668.00	$230,740.37	$4,804.00	$4,335.61	-10%
Highest Valued Homes	$1,845,080.00	$1,663,893.14	$34,669.05	$31,264.55	-10%

CONCLUSION

While property assessments, when averaged over the last several years, are modestly regressive, the observed levels are far below many other similar communities. Moreover, assessments in the most recently observed year demonstrate little to no regressivity, with assessments among the lowest- and highest-valued properties receiving assessment ratios less than one percentage point apart. Even among all Miami-Dade properties, the total range of

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assessment ratios was less than 4%. Yet this modest regressivity still results in nearly $1.5 billion in recently-sold property-value going untaxed every year, suggesting remaining room for improvement.

APPENDIX A

Detailed Findings

A more detailed report including all relevant modeling and results can be found at
www.propertytaxproject.uchicago.edu.

APPENDIX B

Alternative Measures of Regressivity

While the PRD and PRB measures are the most commonly used metrics within the assessing industry, academic researchers have developed alternative methods with varying degrees of acceptance. Among these alternative models, the majority (5 of 8) produce results similar to those outlined thus far, as Table 5 below shows. See the detailed report in Appendix A for a detailed breakdown of these alternative methods and their results.

Table 5: Alternative Models of Regressivity

Model	Value	Test	T Statistic	Conclusion	Model Description
paglin72	1.5e+04	> 0	54.8	Regressive	AV ~ SP
cheng74	9.8e-01	< 1	2186.0	Regressive	ln(AV) ~ ln(SP)
IAAO78	-1.5e-08	< 0	-28.7	Regressive	RATIO ~ SP
kochin82	9.7e-01	< 1	2186.0	Regressive	ln(SP) ~ ln(AV)
bell84	1.6e+04	> 0	54.2	Progressive	AV ~ SP + SP^2
	3.1e-10	< 0	8.9	Progressive	AV ~ SP + SP^2
sunderman90	6.9e+03	> 0	3.5	Regressive	AV ~ SP + low + high + low * SP + high * SP
clapp90	1.0e+00	> 1	1778.0	Progressive	ln(SP) ~ ln(AV) -> ln(AV) ~ Z

APPENDIX C

Regressivity Due to Measurement Error

One limitation of sales ratio studies is that a property's sale price may be an imperfect indication of its true market value. Given inevitable random factors in the sale of any individual property, the final price may include some "noise." If so, this will introduce some measurement error into the analysis, which could lead to the appearance of regressivity when there is none. For instance, consider two hypothetical homes that are identical and each worth $100,000. If both homes went up for sale at the same time, one might fetch a price of $105,000, say if the seller is a particularly savvy negotiator, while the other home might garner only $95,000, say if the buyer is a particularly savvy negotiator. If the assessor appropriately assessed both homes at $100,000, a sales ratio analysis would indicate regressivity (the higher-priced home is under-assessed and the lower-priced home would be over-assessed). While there is no reliable correction for measurement error of this kind, as long as the extent of measurement error is small, relative to the price, the extent of bias will also be small.

We use Monte Carlo simulations to estimate the extent of measurement error that would need to exist for any of our tests to falsely show regressivity due to measurement error or unrelated noise in the data. These tests compare our results with thousands of hypothetical scenarios to determine the likelihood that our same results would be reproduced in the market absent regressivity. As Table 6 shows, these tests demonstrate that for 5 of the 6 measures of regressivity used in our evaluation, home prices would need to vary by more than 10% among similar homes to produce the same level of regressivity currently observed in Miami-Dade County, and by more than 25% under two alternative measures.

Table 6: Monte Carlo Results

Metric	Shock Percentage	Metric	Shock Percentage
COD	16%	Paglin 72	>25%
PRD	12.9%	Cheng 74	11.2%
PRB	>25%	IAAO 78	11.1%

APPENDIX E

Comparison with other Jurisdictions

Table 7: Summary of Communities Included in This Review

Population Rank	Major Metro	Jurisdiction Evaluated	Jurisdiction Population	Revenue from Prop. Tax.	COD	PRD	PRB
1	Los Angeles	Los Angeles County, CA	10,105,518	28.85%	38.75	2.67	0.003
2	Chicago	Cook County, IL	5,180,493	46.26%	16.32	1.04	-0.01
4	Phoenix	Maricopa Count, AZ	4,410,824	28.08%	27.14	0.97	0.21
7	Miami	Miami-Dade County, FL	2,761,581	33.77%	10.8	1	0.01
9	New York*	New York City, NY	8,398,748**	26.27%	58.21	1.07	0.03
12	Seattle	King County, WA	2,233,163	24.26%	10.49	1.01	0.004
13	Las Vegas	Clark County, NV	2,231,647	28.64%	28.35	1.04	0.09
19	Detroit	Detroit, MI	1,753,893	35.99%	70.03	1.71	-0.42
23	Philadelphia	Philadelphia Combined City-County, PA	1,584,138	13.95%	13.41	1.04	-0.05
31	Columbus	Franklin County, OH	1,310,300	34.76%	18.4	1.04	-0.002
32	Minneapolis***	Hennepin County, MN	1,259,428	46.71%	12.91	1.01	0.01
46	St. Louis***	St. Louis & St. Louis County, MO†	996,945	55.37%	17.49	1.08	-0.07
51	Indianapolis***	Marion County, IN	954,670	n/a	22.3	1.06	-0.05
78	Boston***	Boston, MA	807,252††	71.30%	13.15	1.004	0.02

* New York City is coterminous with five counties (New York, Kings, Queens, Bronx, and Richmond) which are all among the nation's most populous. For purposes of this evaluation, these counties were evaluated collectively and are represented in this list by New York.
** This population represents all five counties of New York City, Kings County (Brooklyn) is the actual 9th most-populous county in America with a population of 2,582,830.
*** Though not in the top twenty metros, several other communities were included for various reasons.
†St. Louis and the surrounding county utilize an unusual assessment system between the municipal and county levels, as such both county and city were evaluated. The numbers listed here reflect the entire county.
†† Unlike most large metros which are located near the center of the surrounding county, Boston sits on the border of two counties. As such, this population is unusually small relative to Boston's regional population. When combined with nearby Middlesex County, the regional population is 2,421,966.

APPENDIX F

Glossary

- **Ad Valorem Tax** – A tax applied as a percentage of the value of the item being taxed.

- **Arms-Length Sale** - A sale in the open market between two unrelated parties, each of whom is reasonably knowledgeable of market conditions and under no undue pressure to buy or sell.[11] This generally excludes transfers between family or other close parties, transactions made in a distressed nature, such as through foreclosure or tax sale, and transfers made for substantially little value.

- **Assessment percentage**: The percentage of a property's market value that should be reflected in its assessed value.

- **Coefficient of Dispersion (COD)** - A measure of uniformity based on the average percentage deviation of the ratios from the median, expressed as a percentage of the median. [12]

- **Coefficient of Price-Related Bias** – A regression-based measure that estimates the relationship between the sales ratio and a given proxy for actual property value determined by giving equal weight to market value and assessed value.[13]

- **Price-Related Differential** - A measure of vertical equity calculated by dividing the mean sales ratio by the weighted mean ratio, where the weight is the sale price.[14]

- **Regressivity** – To be characterized as providing an increasing benefit in correlation with an increasing base. When referring to public policies, particularly fiscal policies, this usually reflects a program in which the financial burdens on a given individual decrease as their income or wealth increases.

- **Sales Ratio** – The dollar-for-dollar ratio between a property's assessed value and sale price, where sale price is used as a proxy for market value.[15]

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[11] International Association (2013).
[12] *Id.*
[13] *Id.*
[14] *Id.*
[15] *Id.*