

Explaining Racial Gaps in Property Assessment and Property Taxation

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Using property tax data from Florida, we find significant differences between black, Hispanic, and Asian homeowners relative to white homeowners at multiple stages of the property tax assessment process. All three minority groups have higher assessed value to price ratios, higher ratios after accounting for caps on the growth in assessments, and higher taxable value to price ratios, which account for various exemptions and determine a home's tax liability. We study a wide range of factors that may account for these racial disparities. We find differential take-up of the homestead exemption and transferred tax savings from previous homes contribute to the measured gaps. Errors made by county property appraisers in estimating the value of the home also play a role. Appeals differ by group but are inconsequential.

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I. Introduction

Accurately measuring racial disparities and analyzing potential policies to achieve racial equity is a perennial endeavor in social science research. Detailed datasets and modern empirical techniques have made it possible for researchers to investigate and quantify injustices in numerous settings. The principle that individuals should be treated equally and fairly by government inevitably leads to questions of fairness in taxation. To this point, economists consider the concept of horizontal equity, the idea that individuals with equal incomes and assets be taxed equally. Race and ethnicity, among other individual characteristics (e.g., gender), should be irrelevant if horizontal equity is to be achieved. The goal of this paper is to quantify to what degree horizontal equity is achieved through the property tax system and investigate possible causes of any deviations from that ideal.

Although there is extensive research on racial differences in other areas of economics (e.g., Arnold, Dobbie, & Yang, 2018; Card & Rothstein, 2007), there is relatively little work focused on how various elements of property taxation vary by race or ethnicity. The evidence that does exist points to disparities unfavorable to minorities, however. Recent work by Avenancio-León & Howard (2020) and Berry (2021) find that, relative to white homeowners living nearby, black and Hispanic homeowners face higher property tax bills as a consequence of receiving higher property assessments. As we discuss in our review of the literature, it is possible that this pattern is due to assessor bias or preferential treatment for white homeowners in the appeals process, though it may also be related to the commonly identified problem of assessing the value of homes at either end of the distribution (Hodge et al., 2017). A better understanding of the magnitude of the gaps and, perhaps more importantly, why they exist is necessary in order to generate policy prescriptions.

Our contribution to the literature centers on our ability to measure racial/ethnic gaps at multiple stages of the property tax process. Using data from Florida that links property details to the race/ethnicity of the owner, we observe not only the assessor's initial estimate of the value of a home, but also how policies such as homestead exemptions and caps on assessment growth affect a homeowner's property tax bill. If racial/ethnic groups differentially benefit from these policies, then the initial assessment gaps may not reflect actual property tax disparities. Because we observe enrollment and benefits for these programs at the homeowner level, we are able to quantify their specific impacts on property tax gaps. Furthermore, our data allow us to proxy for interior quality (i.e., remodel status) that is observable to the buyer but not to the assessor, a variable which strongly correlates with the race/ethnicity of the homeowner and may lead to assessor error that varies by group. Finally, our data also permit us to explore counterfactual policies and how they might affect measured property tax gaps.

Beyond the data linking homeowner race/ethnicity to house characteristics and tax roll information, Florida is a desirable setting to investigate racial differences in property taxation for multiple reasons. First, being the fourth most populated state, it offers ample observations to make precise estimation tractable. Second, Florida is in the middle of the distribution when considering reliance on property taxation for state and local government revenue (Appendix Figure 1). Third, it is a diverse state which resembles the average demographics of the United States.¹ In addition to supporting claims of external validity, the state's diversity represents important variation on which our analysis is based.

¹ Florida's population is 17 percent black, 26 percent Hispanic, and 3 percent Asian. Our sample is 12 percent black, 20 percent Hispanic, and 3.0 percent Asian. The United States is 13 percent black, 19 percent Hispanic, and 6 percent Asian (Census, 2019).

We find significant differences between black, Hispanic, and Asian homeowners relative to white homeowners at multiple stages of the property tax assessment process. These gaps are sensitive to specification choice, specifically to the inclusion and level of location fixed effects. Using the most granular fixed effect (Census block group), all three groups of minority homeowners have higher assessed value to price ratios relative to white homeowners living in the same neighborhood, with effects ranging from 0.5 – 1.3 percentage points (pp). These gaps grow once we account for caps on the growth in assessments, including tax savings from previous homes which can be transferred to new residences (1.5 – 2.9 pp). The most important gaps from the homeowner’s perspective are in the higher taxable value to price ratios (0.8 – 5.9 pp), which account for various exemptions and determine a home’s tax liability.² Although how these gaps affect property taxes depends on the level of fixed effects, our central estimates indicate that, relative to white homeowners, black, Hispanic, and Asian homeowners pay an additional \$60, \$30, and \$230, respectively. While modest on an annual basis, the total loss in income may not be trivial (e.g., \$1100 for blacks and \$4000 for Asians at an interest rate of 5% over the median homeowner tenure period of 13 years) and could exacerbate preexisting racial/ethnic wealth gaps (Blau & Graham, 1990; Altonji & Doraszelski, 2005).

We study a wide range of factors that may account for these racial disparities, including assessment errors, racial differences in homestead exemption take-up rates, transfers of tax savings from previous homes, and property tax appeals. We provide evidence that initial assessment gaps are due to assessor error that is correlated with house and neighborhood characteristics. Although we cannot rule out bias, Florida’s methods of assessment suggest that

² Florida is a full assessment state, meaning that assessments are statutorily required to approximate as closely as possible the true market value of the property. All properties, regardless of use (for example, residential versus commercial) are assessed at market value. Unlike many states, in Florida there is no assessment lag. All properties are reassessed annually.

this is an unlikely contributor to assessment gaps. We find that minorities are less likely to successfully appeal an assessment but that this does not explain the measured gaps. In addition to the important racial/ethnic group differences in locations resulting from sorting, we identify the take-up rate of the homestead exemption and transfers of tax savings to be significant factors explaining gaps in property tax liability. Finally, our counterfactual policy analysis indicates that a combination of improved assessment practices, increased take-up of the homestead exemption by minority homeowners, and limiting the transfer of tax savings would significantly reduce the property tax gaps, in some cases eliminating them entirely.

II. Literature Review

The most recent study directly related to ours is Avenancio-León & Howard (2020), who combine nationwide data on home sales and assessments from CoreLogic with the Home Mortgage Disclosure Act (HMDA) data in order to measure assessment gaps across racial groups. Using detailed location fixed effects, they find that black homeowners, on average, receive assessment to price ratios around 10 percent higher than white homeowners in comparable homes and locations. One explanation supported by the authors for the assessment gaps is that assessors do not accurately account for positive local amenities of white homeowners. They also present evidence that property tax appeals disproportionately favor white homeowners using data from Cook County, IL. Our findings are generally consistent with theirs despite using different data and we view the two papers as complementary. Although we do not have national data, our Florida data allow us to dig deeper into potential contributors to the measured gaps.

Berry (2021) also uses CoreLogic data to regress the assessment ratio of individual homeowners against Census tract descriptors, including race and ethnicity. His primary finding is

that property tax assessment is regressive: lower-priced houses are over-assessed relative to their sale price when compared to more expensive houses. He also finds that the percent of the Census tract that is black is positively correlated with assessment regressivity, but finds no significant relationship with the percentage of Hispanics. Since blacks live in less expensive homes than whites, these assessment gaps will generate higher property tax burdens for black homeowners.³ Atuahene (2017) and Atuahene & Berry (2019) are two related studies which use data from Wayne County, MI, to provide evidence that areas with more black homeowners received higher assessments than comparable white homeowners, in this case leading to higher property tax bills and significant increases in foreclosures. An important distinction between our work and these earlier studies is that, in addition to offering new evidence on racial differences in assessed values, we focus on the taxable values that determine the homeowner's tax liability. Differences between assessed and taxable value arise from caps and exemptions. Differences in taxable values are more consequential than the initial assessment gaps and may exacerbate the wealth gap between whites and minorities.

While not primarily about racial comparisons, there are other studies relevant to the present inquiry. As introduced above, a stylized fact from the assessment literature, despite some methodological debate (see Carter, 2016), is that assessment rates tend to be lower for higher-priced homes. Hodge et al. (2017) summarizes prior work on this subject and there are numerous recent studies which document similar patterns using improved methodologies and data (McMillen & Singh, 2020a, 2020b; Berry, 2021; Ihlanfeldt & Rodgers, 2021). In comparison to whites, minorities tend to live in lower-priced homes; hence, regressivity in assessment practices may result in racial disparities. The relationship between race and housing price may also play a role in

³ As noted below, assessment regressivity is a common finding within the property tax literature.

differential appeal outcomes if homeowners of higher priced homes are more successful appealing their initial assessments (McMillen & Weber, 2010).

There are also studies showing that blacks pay more for homes, which is relevant to property taxation as an ad valorem tax. Bayer, Ferreira, & McMillen (2017) use a repeated sale framework in four cities to find that minority homebuyers overpay by 2 percent. Interestingly, this premium is present regardless of the race of the seller, suggesting that racial prejudice is not the cause of the price difference. Ihlanfeldt & Mayock (2009) explore the sensitivity of estimates of racially-motivated price discrimination using data from Florida and conclude that whites and Hispanics discriminate when selling to black or Asian homebuyers but that this pattern is weaker in more racially diverse and more educated neighborhoods. Myers (2004), using data from the American Housing Survey, finds that black homeowners pay a 10 percent premium and that housing prices fall as the percentage of black residents increases.⁴

III. Background

An overview of Florida's property tax system is necessary before we describe the specifics of our empirical analysis. The property tax is an ad valorem tax and the first step in applying the tax is determining the market value of the property. Each year county property tax assessors estimate the market value as of January 1, which the Florida Department of Revenue (FDOR) labels the "just value" of the property. Assessors estimate the just value using various methods, including recent sales of comparable homes, replacement cost, and mass appraisals.⁵

An assessor performs a physical inspection of the exterior of the house upon sale, after an

⁴ Historical redlining (e.g., Aaronson, Hartley, & Mazumder, *forthcoming*) is another related area of study.

⁵ See Title XIV, Chapter 193 for more on assessment practices in Florida. Section 11 lists eight factors (location, size, condition, etc.) that appraisers should use in generating a just valuation, although appraisers have discretion as to how much weight they place on each of these factors.

improvement requiring a building permit, and at least once every five years thereafter.

Homeowners may appeal to the assessor's office if they feel the just value is inaccurate.

Next, limitations are applied to the just value to generate a Florida property's "assessed value." The most notable limitation since its introduction in 1995 is the Save Our Homes (SOH) cap, which limits the annual growth in assessed value to 3 percent or the change in the Consumer Price Index, whichever is smaller. This benefit is similar to growth caps in other states in that it can compound over time. Less common is the option for homeowners to transfer accrued benefits from one house to another, a feature labeled as "portability." The definition of assessed value in Florida differs from what is commonly referred to in the literature, so it is important to focus on the just value when considering the specific impact of assessors. The SOH cap applies only to homeowners who claim the homestead exemption. In the absence of the cap, the assessed value is identical to the just value.

Lastly, exemptions are applied to the current assessed value to produce the "taxable value" of a house. The most significant exemption is that of the homestead exemption, which was first introduced during the Great Depression in response to concerns that homeowners would lose their houses due to failure to pay their property taxes. To qualify for the homestead exemption, a homeowner must provide documentation that the home is their primary residence. The homestead exemption allows homeowners to exempt up to \$50,000 from the assessed value of their house in determining the taxable value.⁶ Importantly, claiming the homestead exemption automatically enrolls the homeowner in the SOH program; the two programs are effectively bundled together. Additional exemptions are granted to specific groups, most commonly

⁶ Specifically, an exemption of \$25,000 is applied to the first \$50,000 of a house's just value and includes all taxes and a second exemption of \$25,000 is applied to the value of a house between \$50,000 and \$75,000 which excludes school district taxes. The most recent expansion of the program was in 2008.

disabled, veterans, and low-income senior residents, though these are much less common and are typically much smaller in size. A homeowner's annual property tax bill is simply the taxable value multiplied by the millage rate. School districts are synonymous with counties in Florida so school-specific taxes are constant within a county. For residents living in the unincorporated portion of the county the millage rate is the county rate. For residents in cities the total millage rate is the sum of the county and the city rate, with city rates roughly 20 percent the size of the county rates on average. Roughly half of Florida's population reside in unincorporated areas.

IV. Methodology

As described below, our data include the race/ethnicity of the homeowner, along with variables influential in determining the property taxes owed on the residence. We exploit these data to identify racial gaps at various stages of the property tax process based on a simple regression framework. The main OLS specification is intended to capture the relative difference in outcomes for black, Hispanic, and Asian homeowners as compared to white homeowners:

$$y_{i,c,t} = \beta_1 black_i + \beta_2 Hispanic_i + \beta_3 Asian_i + \phi_c + \tau_t + \epsilon_{i,c,t} \quad (1)$$

The main outcome variables (y) we analyze are the three measures of value (just, assessed, and taxable) expressed as a proportion of the recent sales price of the property for a homeowner i living in location c in year t . Each group variable is a binary variable equal to one if the homeowner is part of the racial/ethnic group, zero otherwise. We estimate Equation (1) with multiple levels of location fixed effects (ϕ), as well as omitting them entirely, in order to assess the sensitivity of the results to changing comparison groups, an issue of particular interest given the existence of ethnic/racial sorting. Our location fixed effects account for level differences in

jurisdictions (i.e., counties and municipalities) and Census block groups.⁷ We include year fixed effects (τ) in all regressions to address the possibility that sales or assessment patterns vary by racial group.⁸ In addition to the primary value ratios of interest, we also explore how other outcome variables may vary by race/ethnicity, including successful assessment appeals, homestead exemption status, and the amount of SOH benefits transferred from a previous homestead. We present robust standard errors although our main conclusions are unaltered when we use clustered standard errors.⁹

Our alternative models are based on our interest in the sensitivity of racial/ethnic comparisons to specification, namely the level of location fixed effect. Residential sorting by race (e.g., Ananat, 2011; Bayer et al., 2014) implies that comparisons across highly-sorted areas may generate different estimates than comparisons within neighborhoods. If the interest is in the impact that property taxation has on average racial/ethnic gaps in wealth, location fixed effects are unnecessary. Racial/ethnic groups tend to live in different places where ratios are uniformly high or low due to unobservable factors correlated with either assessed values, prices, or both. It is therefore important to allow jurisdictional sorting to determine its contribution to racial/ethnic gaps. However, while studying the wealth/property tax nexus is clearly important, a location fixed effect is necessary to compare homeowners living in areas with similar public services and amenities, as well as more comparable unobservables. Our strategy of using multiple

⁷ Census block groups are not unlike neighborhoods: they are contiguous clusters of blocks containing roughly 600 to 3000 people.

⁸ Temporal patterns unrelated to racial bias in the property tax system could emerge due to cyclical patterns of home buying, changes to assessment personnel or modeling practices, etc.

⁹ Our analysis, based on our reading of Abadie et al. (2017), does not necessitate the use of clustering. The authors argue that there are two reasons for clustering standard errors: 1) data are sampled from a population using clustered sampling, and 2) the assignment mechanism for some causal treatment of interest is clustered. Neither of these reasons apply here. Clustering at the jurisdiction level produces wider confidence intervals, although the gaps of the fixed effects specifications remain significant.

specifications and numerous outcome variables is intended to explore the sensitivity of the results are to changing comparison groups in order to better understand the causes of any measured gaps across racial/ethnic groups.

V. Data

Our two primary datasets come from the FDOR and the Florida Department of State's Division of Elections (DOE). All counties are required to submit their property tax rolls annually to the FDOR. We limit our study to the 20 largest counties in the state, which we list in Table 1. These counties represent over 80 percent of the population of Florida (Census, 2019) and 77 percent of the single-family homes in the state. There are a total of 246 jurisdictions represented in our sample, 20 unincorporated county areas and 226 cities. The DOE collects data on registered voters which includes race, name, and home address. Using the name and address information in the 2019 voter rolls, we merge the race variable to the property tax rolls from the FDOR. These tax rolls include extensive information about every house in the state of Florida, including specific property tax exemptions granted; the just, assessed, and taxable value; most recent sales price, and the Census block group location. Furthermore, we are able to identify owners who failed to claim the homestead exemption benefit despite being eligible.¹⁰ If the physical address of the home and the homeowners mailing address match and there is no homestead exemption on the property, the homeowner is considered a non-claimant.¹¹

¹⁰ According to Florida Statute 196.031, this exemption is available to “[a] person who, on January 1st, has the legal title or beneficial title to real property in [Florida] and who in good faith makes the property his or her permanent residence or the permanent residence of another or others legally or naturally dependent upon him or her.”

¹¹ See Ihlanfeldt (2021) and Ihlanfeldt and Rodgers (2021) for related work. The latter explains that alternative explanations for mismatched addresses which could generate false non-claimants are unlikely.

For our analysis, we focus on owner-occupied, single-family homes which successfully matched to a voter name and address in the 2019 voter rolls.¹² The average match rate across the 20 counties in our sample equaled 85 percent, with a range of 72 to 90 percent.¹³ Once flagged as owner-occupied in 2019, we restrict the sample to those houses purchased in 2017 or 2018 in order to generate our ratios of just value, assessed value, and taxable value to sales price.¹⁴ We update the sale prices by month and year using Zillow’s zip code price indices so that they correspond to the January 1, 2019 assessment date. We restrict the sample to homes where the sale is “qualified” by the county tax assessor as arm’s length.¹⁵

Table 1 presents the summary statistics of the data used in this analysis. Our sample of over 244,000 observations is comprised of 9.9 percent black homeowners, 18.2 percent Hispanic homeowners and 2.9 percent Asian homeowners, reflecting the diversity of the fourth most populated state in the United States. Differences by group at this level of aggregation are informative and serve as motivation for the more detailed analysis to follow. The numbers in Table 1 show that the taxable value to price ratio (TV/P), our central interest, is higher for all three minority groups in comparison to whites. White homeowners also have a higher probability of receiving a reduction in their just value from an appeal, have a higher take-up rate of the homestead exemption, and transfer more tax savings from a previous homestead when purchasing a home.

¹² An alternative and popular strategy for obtaining the race/ethnicity of homeowners is to match mortgage information contained within a homeowner record and Home Mortgage Disclosure Act (HMDA) data. Our match rates compare favorably to these studies (e.g., Bayer et al., 2017). The HMDA matches may also result in a less representative sample because only recent mortgage holders can be matched.

¹³ Less than 100 percent match rates are achieved because not all homeowners are registered to vote, race is sometimes not reported on the voter roll, and names/addresses are sometimes stated differently between the tax and voter rolls.

¹⁴ We drop observations where the homeowner qualified as fully exempt from property taxation, often due to disability status or living in a home which is also used for specific purposes (e.g., religious or charitable functions).

¹⁵ The FDOR excludes a wide range of transactions where the reported sales price may be an unreliable estimate of the true market value of the property. Buyers and sellers act independently in an arm’s length sale.

Table 1 - Summary Statistics - Means and (Standard Deviations)

	JV/P	AV/P	TV/P	Successful appeal (yes=1)	Portable transfer amount (\$1000)	Homestead exemption claimant (yes=1)	Observations
White	0.813 (0.09)	0.768 (0.11)	0.616 (0.16)	0.007 (0.08)	7.49 (28.2)	0.838 (0.37)	168,868
Black	0.821 (0.09)	0.790 (0.10)	0.621 (0.16)	0.004 (0.06)	2.93 (14.8)	0.806 (0.40)	24,177
Hispanic	0.810 (0.09)	0.774 (0.10)	0.619 (0.15)	0.004 (0.07)	5.17 (23.2)	0.819 (0.39)	44,572
Asian	0.828 (0.08)	0.795 (0.09)	0.665 (0.14)	0.005 (0.07)	5.21 (21.7)	0.797 (0.40)	7,139

Notes: FDOR and FDOE data on single-family owner-occupied homes covering 20 most populated counties in Florida: Brevard, Broward, Collier, Miami-Dade, Duval, Escambia, Hillsborough, Lake, Lee, Manatee, Marion, Orange, Osceola, Palm Beach, Pasco, Pinellas, Polk, Sarasota, Seminole, Volusia. Total N = 244,756. JV = just value, AV = assessed value, TV = taxable value, P = price. Successful JV appeals reduce the just value of the house. Homeowners can transfer accrued assessment growth cap value under the SOH program.

VI. Main results

In Table 2, we report results from regressing the just, assessed, and taxable value ratios on the race/ethnicity variables as shown in Equation (1). Because the ratio is in logs, the estimated coefficient registers the percentage difference in the ratio between the racial/ethnic group and whites. The first column, which does not include location fixed effects, indicates that black and Asian homeowners have just value to price ratios (JV/P) that are 1 and 2 percentage points (pp) higher than white homeowners, respectively. The JV/P ratios of Hispanic homeowners are 0.3 pp lower than those of white homeowners. Once we include either jurisdiction or block group location fixed effects, however, positive and statistically significant gaps for all three groups emerge. The largest differences are in Column (3), which includes block group fixed effects. These contrasting results indicate that differences in the locations of the groups related to racial/ethnic sorting impact racial disparities in the JV/P ratio.

Table 2 - Main results

	ln(JV/price)			ln(AV/price)			ln(TV/price)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Black	0.010** (0.0007)	0.004** (0.0007)	0.011** (0.0007)	0.032** (0.0009)	0.026** (0.0009)	0.029** (0.0010)	0.013** (0.0020)	0.003 (0.0021)	0.044** (0.0021)
Hispanic	-0.003** (0.0006)	0.002** (0.0006)	0.005** (0.0006)	0.010** (0.0008)	0.015** (0.0009)	0.014** (0.0009)	0.009** (0.0016)	-0.016** (0.0018)	0.008** (0.0018)
Asian	0.020** (0.0011)	0.013** (0.0011)	0.014** (0.0011)	0.040** (0.0015)	0.033** (0.0015)	0.029** (0.0015)	0.091** (0.0030)	0.067** (0.0029)	0.059** (0.0028)
Jurisdiction FE		X			X			X	
Block group FE			X			X			X

Notes: N = 244,756 for each regression. Estimates are relative to baseline group of white homeowners. Each regression includes sale year fixed effects. Jurisdiction fixed effects (FE) account for level differences across the 246 different counties and municipalities. Robust standard errors: † p < 0.1, * p < 0.05, ** p < 0.01.

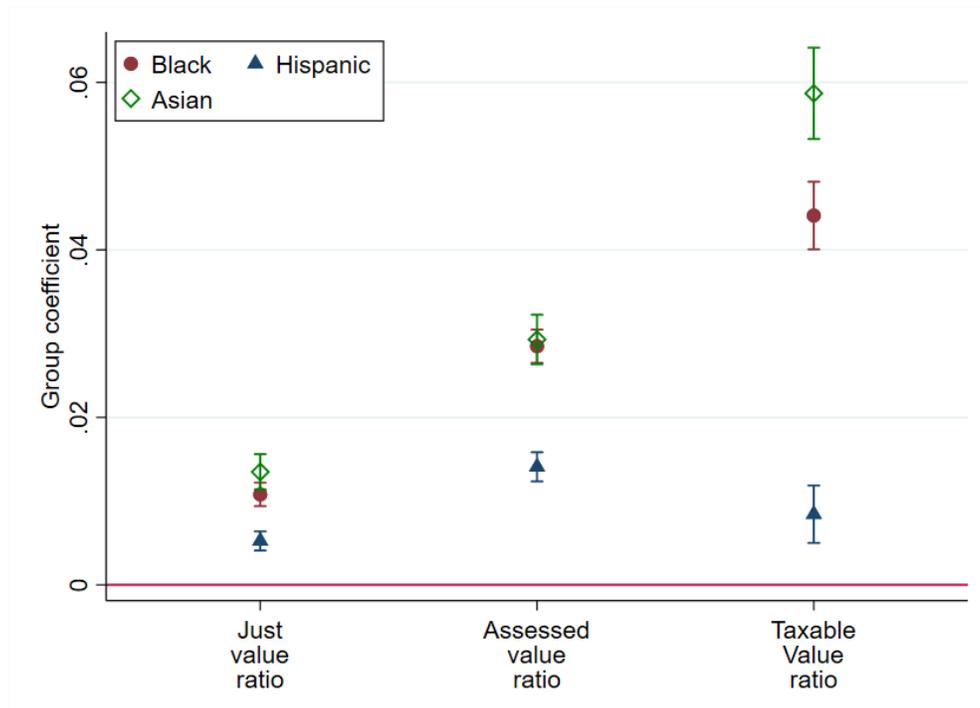
The assessed value to price ratio (AV/P) models in Columns 4 – 6 show that the ratio is higher for all three minority groups, with group differences highly significant. The ratios are roughly 1 to 4 pp larger for minorities than for whites. Recall that the assessed value in Florida is calculated by applying assessment growth caps (e.g., Save Our Homes) to the just value. The coefficients increase substantially when moving from the JV/P to the AV/P results, indicating that differences related to the SOH growth cap are a meaningful contributor to racial gaps. Notably, the choice of location fixed makes little difference to the estimated coefficients.

As previously mentioned, the ratio of most interest is TV/P, because its value, when multiplied by the millage rate, determines how much a homeowner owes in property taxes. Because the taxable value is the assessed value minus exemptions, most notably the homestead exemption, differences between the coefficients in the second and third panels of Table 2 are due to exemptions. The results for this ratio are dependent on the choice of location fixed effect. Allowing for sorting across jurisdictions (Column 7) shows that the TV/P ratios are all larger for the minority groups, especially for Asians, whose ratio is 9.1 percentage points larger than for whites. However, when we move from Column 7 to Column 8 (jurisdiction fixed effects) the

estimated ratios for blacks and Hispanics become statistically indistinguishable or even lower than those of whites. Adding the most granular location fixed effects reverses this pattern: relative to white homeowners living in the same block group, the TV/P ratios are 4.4 pp higher for black homeowners and 0.8 pp higher for Hispanic homeowners. Asians have by far the largest TV/P ratios, with ratios between 5.9 and 9.1 pp higher than whites.

Using the coefficients from the block group FE specification, Figure 1 illustrates how the racial/ethnics gaps change as we use different value ratios. The relatively modest gaps at the initial assessment stage (just value) are amplified for all groups once we account for assessment growth caps in the AV/P ratios. Once we account for exemptions in the TV/P ratios, the gaps increase for both black and Asian homeowners but fall for the Hispanic group.

Figure 1 – Racial differences at three stages



Notes: Coefficients on each group variable presented with 95 percent confidence intervals when using value to price ratios as the dependent variable in Equation (1) and controlling for block group fixed effects.

Quantifying the financial significance of these gaps depends on millage rates and taxable values. To roughly gauge the economic impact of our estimated racial/ethnic gaps, we calculate the additional annual property tax payments of minority homeowners in comparison to white homeowners based on the TV/P gaps reported in Table 2. We present our calculations for homeowners at the 25th, 50th, and 75th percentiles of the taxable value distribution in Appendix Table 1. Each calculation uses the population-weighted millage rate for our sample (1.7 percent). Additional payments are less than \$100 for black and Hispanic homeowners based on the gaps obtained from the models without fixed effects and with jurisdictional fixed effects (in the latter case, Hispanics pay less). When the fixed effects are at the block group level, blacks pay more than \$100 (\$213 at the 75th taxable value percentile). Across all model specifications and percentiles, Asians pay more than \$100, with the maximum additional amount being \$440 at the 75th percentile based on the model excluding fixed effects. While these amounts are not large on an annual basis, the homeowner must pay these larger tax bills every year they are in the same home. In many cases, the total amount lost from paying the higher property taxes over time is not trivial in magnitude. For example, based on the model including block group fixed effects, the \$213 additional amount in property taxes paid by black homeowners in comparison to white homeowners at the 75th percentile of taxable value, results in a total loss over the course of the median tenure length (13 years) of more than \$3700, assuming an interest rate of 5%. If we focus on the central estimates, the total additional payments are approximately \$1100, \$500, and \$4000 for blacks, Hispanics, and Asians, respectively.

Our results are robust to numerous checks common in the literature, none of which is as consequential as the inclusion/exclusion of the location fixed effects and their level.¹⁶ We

¹⁶ The results are similar when we trim the top and bottom percentiles of any value ratio or similarly trim by the number of sales in a block group.

reiterate that the choice of fixed effects changes the comparison groups, which when combined with ethnic/racial sorting, can meaningfully affect our conclusions regarding the roles played by individual factors in explaining the race/ethnicity gaps. For example, Appendix Figure 2 shows that exemptions eliminate the gaps for both black and Hispanic homeowners when using the jurisdiction FE results from Table 2 (Columns 2, 5, and 7). As another illustration of this point, we include Appendix Table 2 that shows that the gaps appear to shrink as the percentage of minorities in a block group increases. The sensitivity of the TV/P results in particular provides additional motivation to investigate root causes for the measured gaps.

VII. Explaining the gaps

The presence of racial/ethnic gaps in the property tax system naturally leads to questions about their origins. The combination of our data and setting make it possible to provide evidence on which factors contribute to the measured racial/ethnic gaps at each stage of the property tax process. We consider the JV/P, AV/P, and TV/P gaps in turn.

VII.A. JV/P gaps: assessor bias, assessor error, and appeals

In this section we provide additional evidence in support of what we view as the most common explanations of the measured racial gaps in property assessment. A central question in the literature is whether racial prejudice is the cause of inequity in property tax liability. One explanation is that assessors assign higher (lower) just values for minority (white) homeowners entirely due to their race. After the sale of a house, a staff member from the county property appraiser's office will visit the house to gather information for estimating the just value. The inspection, which is only from the outside of the house, requires the member to announce his presence on the property to anyone who may be home at the time of the inspection. At this point, it is possible to learn the race of the homeowner, yet this information is not officially recorded,

making overt discrimination extremely unlikely. Furthermore, the assessment proceeds regardless if anyone answers the door.

Another explanation for the lower JV/P ratios of white homeowners is that they are more likely to successfully reduce their just value through the appeal process. Avenancio-León & Howard (2021) use data from Cook County, IL and find evidence that black homeowners are less likely to appeal their assessment, less likely to win an appeal, and receive smaller reduction amounts than white homeowners. Although the appeals process varies across the United States, we investigate whether or not similar patterns are present in the Florida data. To do so, we replaced the outcome variable of Equation (1) with a binary variable equal to one if an appeal led to a successful reduction in the just value, zero otherwise. We should point out that this outcome combines any differential appeals behavior, specifically the likelihood of a homeowner filing an appeal as well as the approval rate of appeals. As we show in Appendix Table 3, the probability of a JV reduction is smaller for all racial/ethnic groups relative to white homeowners. Remarkably, when we restrict the sample to homeowners who did not receive a successful appeal, effectively removing any direct influence of this process from the remaining observations, the group coefficients are unaffected.¹⁷ Thus, while it is clear that the groups have different levels of success with the appeals process, it is unlikely that this is the primary reason for differences in the JV/P ratios.

If overt discrimination is unlikely and appeals do not explain the measured gaps in JV/P ratios, it is possible that errors in the assessor's estimate of just value are correlated with race. Compared to prospective homebuyers, assessors have extremely limited information to use when

¹⁷ It is possible that there are spillover effects if white homeowners benefit from their white neighbors' successful appeals, but the fact that the results are so stable across sample restrictions would imply a very strong spillover effect.

performing valuations. Where the assessor is confined largely to external indications of quality and easily quantifiable characteristics such as square footage and the year of construction, abundant property details are readily available to inform pricing bids. For example, we find that minority homeowners are significantly less likely to live in a house which has been remodeled. If remodeled interiors raise the sale price of a home but are not reflected in just value estimations, this could partially explain the gaps.¹⁸ Unfortunately for the researcher, the use of very granular location fixed effects does not eliminate this problem.

To further study the possible role played by assessor error in explaining the JV/P ratio gaps, we estimated simple Oaxaca (1973) decomposition, designed to reveal the factors accounting for differences in the locational unrestricted racial/ethnic gaps reported in Column (1) of Table 2. The idea is to identify neighborhood and house characteristics where there is an assessor evaluation error. Neighborhood characteristics that influence market value may be under or over assessed by property tax assessors and due to sorting these errors may correlate with the race/ethnicity of the homeowner. Similarly, features of the house may be inaccurately assessed and these features on average may vary across race/ethnicity groups due to differences in income or preferences. We decompose the gaps into three sets of grouped variables. The jurisdictional fixed effects, a neighborhood group, and a house group. The neighborhood group includes eight neighborhood characteristics, where we define the neighborhood as the census block group. The data source is the 2018 American Community Survey 5-year Estimates. The house group includes five variables recorded in the tax roll property record that describe the house's characteristics. We describe the neighborhood and house characteristics at the bottom of Table 3. The decomposition quantifies how much of the differential gap in the mean log JV/P ratio

¹⁸ Controlling for remodel status reduces estimated coefficients slightly (under 5 percent relative to baseline). The coefficient on remodel status is negative and similar in magnitude to the largest (Asian) gaps.

between whites and one of the three minority groups is due to group differences in their values and how much of the gap is due to differences in their estimated effects.¹⁹

We summarize the JV/P decomposition in Table 3. We show the contribution of each group toward explaining the gap, and identify the key characteristic and coefficient difference for groups that diminishes the gap. The first column decomposes the black/white gap which is 0.010. The significant positive coefficient on jurisdictions (0.007) supports the theory that differential sorting across jurisdictions plays an important role in explaining the gap. Differences in the estimated coefficients of the house group (0.017) are also key in explaining the higher JV/P ratio of black homeowners. The house characteristic within this group that largely accounts for its effect is the square feet of interior living space (“LA” adds 0.027 to the gap). Put another way, larger homes are overvalued for both blacks and whites, but more so for blacks than for whites. Interestingly, an important contribution to the Asian/white gap of 0.020 is again the house group (0.002) and the size of the home within this factor (0.003), but in this case it is the difference in the amount of space rather than the difference in its effect. Assessors overvalue interior living space and Asians tend to live in larger homes than whites, 2,421 vs. 2,196 median square feet, respectively. Jurisdictional sorting also plays a role in explaining the white/Asian difference in the JV/P ratio (0.006).

In contrast to blacks and Asians, the JV/P gap favors Hispanics in comparison to whites. The gap in the mean log JV/P ratio is -0.003. In comparison to whites, the results show that Hispanics more frequently reside in jurisdictions with lower average JV/P ratios. In addition, the neighborhood factor coefficient differences reduce the gap (-0.019), and within this factor the key characteristic is the neighborhood percentage of homeowners (-0.009). Assessors overvalue

¹⁹ We describe the Oaxaca decomposition as applied here in the appendix.

neighborhoods with a higher percentage of homeowners, but only in those neighborhoods where whites reside.

Table 3 - Oaxaca Decompositions of the Just Value/Price Ratios

	Blacks/Whites	Hispanics/Whites	Asians/Whites
Gap	0.010** (0.001)	-0.003** (0.001)	0.020** (0.001)
Group values			
Jurisdiction	0.007** (0.001)	-0.006** (0.001)	0.006** (0.0005)
Neighborhood	-0.004** (0.001)	-0.0005 (0.001)	0.0004 (0.0003)
House	-0.002** (0.0001)	-0.002** (0.0001)	0.002** [LA 0.003**] (0.0002) (0.0002)
Appeal	-0.000004 (0.000004)	-0.000002 (0.000003)	-0.000001 (0.000002)
Group coefficients			
Jurisdiction	-0.035* (0.015)	-0.032** (0.011)	-0.006 (0.027)
Neighborhood	0.005 (0.008)	-0.019** [PH -0.009**] (0.006) (0.001)	-0.003 (0.012)
House	0.017** [LA 0.027**] (0.005) (0.003)	0.026** (0.004)	0.005 (0.007)
Appeal	0.00001 (0.001)	-0.00006* (0.00002)	-0.0001 (0.0001)
Observations	193,045	213,440	176,007

Notes: The neighborhood group variables are the average age of adults, the unemployment rate, the percentage of housing units owner occupied (PH), the percentage of the population receiving food stamps, median income, and the percentages of residents who are black, Hispanic, and Asians. The house group variables are the assessor's estimate of the condition of the home using a five-point scale, the interior living space in square feet (LA), lot size in square feet, house age in years, and whether the house had been remodeled. Robust standard errors are in parentheses. In brackets is the key variable accounting for the group effect. Robust standard errors: † p < 0.1, * p < 0.05, ** p < 0.01.

In summary, the gaps between racial/ethnic groups at the initial assessment stage appear to result from jurisdictional sorting and the over- and under-assessment of individual house and neighborhood characteristics. The contribution to the gaps from sorting may result from whites and Hispanics more frequently residing in places where homes have value-enhancing interior features that are unobservable to assessors or in places where community amenities are under-assessed (Avenancio-León and Howard,2021). Alternatively, homeowners in these jurisdictions may have political power that lowers their assessed values on average (DiPasquale & Glaeser,

1999). In Florida, county property tax assessors are elected positions and our data show that in comparison to the minority groups, whites are more likely to reside in places with a higher percentage of homeowners, who have higher than average incomes. A promising area for future research is evaluating how this public choice channel compares to the assessor error in generating initial assessment gaps.

VII.B. Gaps in AV/P ratios

As shown in Figure 1, the small racial/ethnic gaps in the first stage of assessment substantially increase for all three groups once we account for the SOH assessment growth cap. These differences could be related to differential property value appreciation which interacts with racial/ethnic sorting. We view the consistency of the AV/P results across each FE specification evidence against this explanation. If segregated neighborhoods with different growth patterns were driving the AV/P gaps then we would expect lower levels of fixed effects to alter the estimated group coefficients.

Another potentially important factor in Florida is the ability to transfer previously accrued assessment benefits to a new house. The assessed value of a house which benefitted from the SOH cap will be lower than the assessed value of an otherwise similar house. Concerns that these accrued benefits were reducing sales and relocation in Florida motivated the policy change which made these benefits transferable to a new homestead (Ihlanfeldt, 2011). Thus, it is possible that two homeowners buying identical homes and both claiming the homestead exemption may have different assessed values due entirely to their previous assessment history. Assessed value differs from just value not only by SOH benefits accrued at the current house but also by the amount of SOH savings that are transferred from the previous home at the time of purchase. It is possible that transferred SOH benefits that differ across racial/ethnic groups

contribute to these measured gaps in AV/P. Once again using Equation (1), we replaced the dependent variable with the dollar amount of the portable transfer. The results, which we report in Appendix Table 3, confirms differential SOH transfer amounts contribute to the AV/P gaps. Relative to whites, minority homeowners transfer between \$1400 and \$4500 less in SOH benefits from previous homes. Even when normalized by the price of the home the minority transfers are 3 – 9 pp smaller than the reference group. These differences beg the question: why do the transfer amounts differ by group? There are a number of racial/ethnic differences that may account for white homeowners' larger mean SOH transfer: a higher prior homeownership rate, a longer duration of stay in their previous home under the SOH cap, a higher probability of the prior homesteaded home being located in Florida, and a higher take up of the homestead exemption from prior ownership. A promising direction for future research is to explore the origins of these differences and how they affect the incidence of SOH benefits.²⁰

VII.C. Gaps in TV/P ratios

While racial and ethnic disparities in the JV/P and AV/P ratios point to horizontal inequities in property taxation, the higher TV/P ratios found for minorities warrant greater concern because taxable value determines a homeowner's actual tax bill. In part, differences in taxable value are derived from differences in just and assessed values, though they also account for exemptions. TV/P ratios may be higher for minorities than whites because whites may have a higher take-up rate of the homestead exemption, which as described above, provides significant tax savings. To explore this possibility, we replace the dependent variable in Equation (1) with a

²⁰ Lending practices, among other factors (Dawkins, 2005), may make early home ownership more difficult for minorities. Differences may also exist if minorities in our sample tend to be younger or more recent movers from other states than whites. Interestingly, if assessors tend to over-assess minorities then this should make the SOH more valuable to minorities, all else equal. When we control directly for the transfer the racial gaps in AV/P decrease by around 30 percent.

binary variable indicating whether or not the homeowner claimed the homestead exemption (yes=1, no=0). The homeowners in our sample are all eligible to receive the exemption to the extent that we are successful in identifying the home as the owner's primary residence.²¹ As we report in Appendix Table 3, all three minority groups have a lower take-up of the exemption than whites, with each difference significant at the one percent level. Relative to white homeowners, Asians have the lowest take-up of the homestead exemption, followed by blacks, and then by Hispanics. These results mesh with the differences between the AV/P and TV/P ratio gaps for each minority group shown in Figure 1. In particular, the low take-up of the exemption by Asians helps explain why their AV/P ratio is 2.9 pp higher than whites, while their TV/P ratio is 5.9 pp higher.²² The low take-up by Asian homeowners might at first pass be attributed to a lack of U.S. citizenship, which is a requirement for the exemption. However, recall that all of the homeowners in our sample are registered voters, who also must be citizens. Another possibility is that English may not always be an Asian homeowner's first language, presenting an additional barrier to making an application that is not present for English-speaking homeowners or even Spanish-speakers in Florida.

In addition to the homestead exemption, counties and municipalities across the state offer tax exemptions to residents over the age of 65 who qualify as low-income. When we replace the dependent variable of Equation (1) with a binary variable indicating that the homeowner received a low-income senior exemption, we find that blacks are less likely while Hispanics are more likely to claim such an exemption. The data do not permit us to see if these differences are

²¹ To the extent that we misattribute second homes or rentals as being non-claimants, if white homeowners tend to own these properties then this would bias our estimated group differences to finding higher take-up rates of minority homeowners.

²² Our homestead take-up rates are consistent with those found by Ihlanfeldt (2021). He estimated mean take-up rates for neighborhoods in Florida and found they are lower in majority black and Hispanic neighborhoods in comparison to majority white neighborhoods. He did not include Asians in his analysis.

due to differential take-up or differential eligibility, but the small racial and ethnic differences in the probability of receipt of the exemption (and their relatively small amounts) suggest they are not driving the TV/P gaps.²³

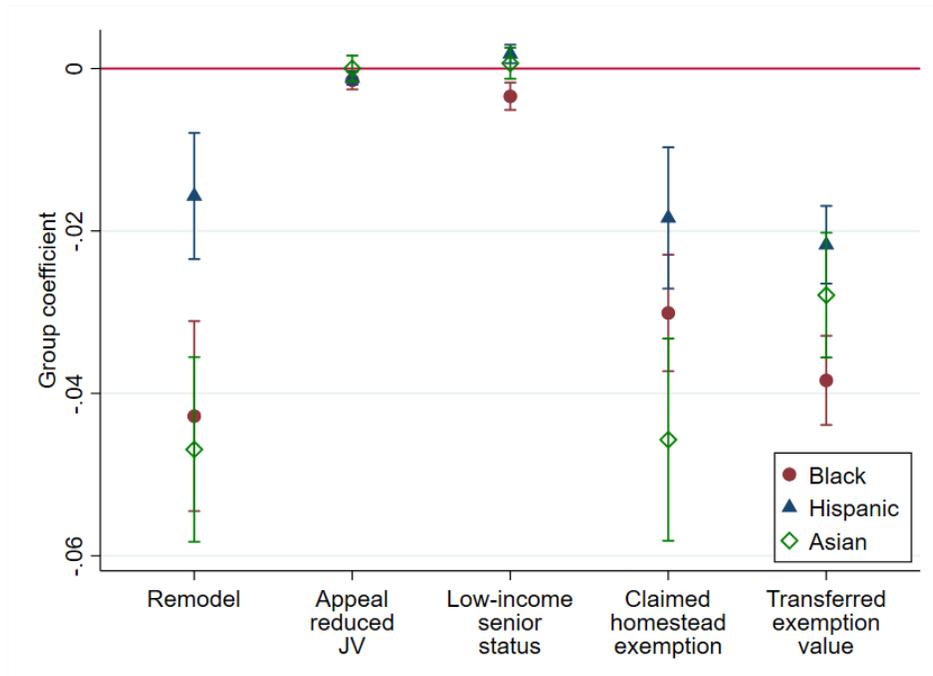
Because TV is derived from JV and AV, factors influencing the other gaps will impact the TV gaps. It is of interest to explore the importance of these variables, in addition to those that pertain strictly to TV. Therefore, we performed additional Oaxaca decompositions of the TV/P gaps including the full set of variables, the details of which we include in Appendix C. The common factors explaining the higher TV/P ratios for minorities are sorting into jurisdictions with lower average ratios, the take-up rate of the homestead exemption, and transferred SOH savings, all of which are greater for white homeowners in comparison to minority homeowners. Also important in explaining the higher mean taxable value to price ratios of blacks and Hispanics are racial/ethnic differences in the effects of home size. Assessors overvalue the size of the home for all groups, but this is especially true for houses occupied by blacks and Hispanics. Confirming our previous results, although there are differences in appeals behavior and low-income senior exemptions, they do not appear to be central causes of the observed gaps.

To summarize, there are multiple stages of the property tax system in which group differences can emerge, the combination of which is captured in differences in taxable values. We present Figure 2 as a concise way to assess the relative importance of multiple factors that lead to gaps in TV/P. As discussed above, we consider large differences in remodel status as a proxy for how the availability of information on house characteristics may differ between buyers and assessors. These differences, along with an overreliance on observable characteristics such as house size, could contribute to assessor error which differs by racial/ethnic group. Putting

²³ The estimates are very similar to the main results when we restrict to homeowners who do not claim the senior exemptions or directly control for low-income senior exemption status.

aside assessor prejudice which should only affect the initial JV/P gaps, our evidence suggests that jurisdictional sorting, assessor errors, portability transfers, and homestead exemption take-up all contribute to group differences that are unfavorable to minorities.

Figure 2 – Racial gaps in other outcomes



Notes: Coefficients on the group variables from the block group FE specification presented with 95 percent confidence intervals. The outcome variables were a dummy indicating a home remodel, a dummy indicating that the JV was successfully lowered due to an assessment appeal, a dummy indicating that a homeowner claimed an exemption reserved for low-income senior residents, a dummy indicating that an eligible homeowner claimed the homestead exemption, and a dummy indicating that the homeowner transferred SOH benefits as the dependent variable in Equation (1).

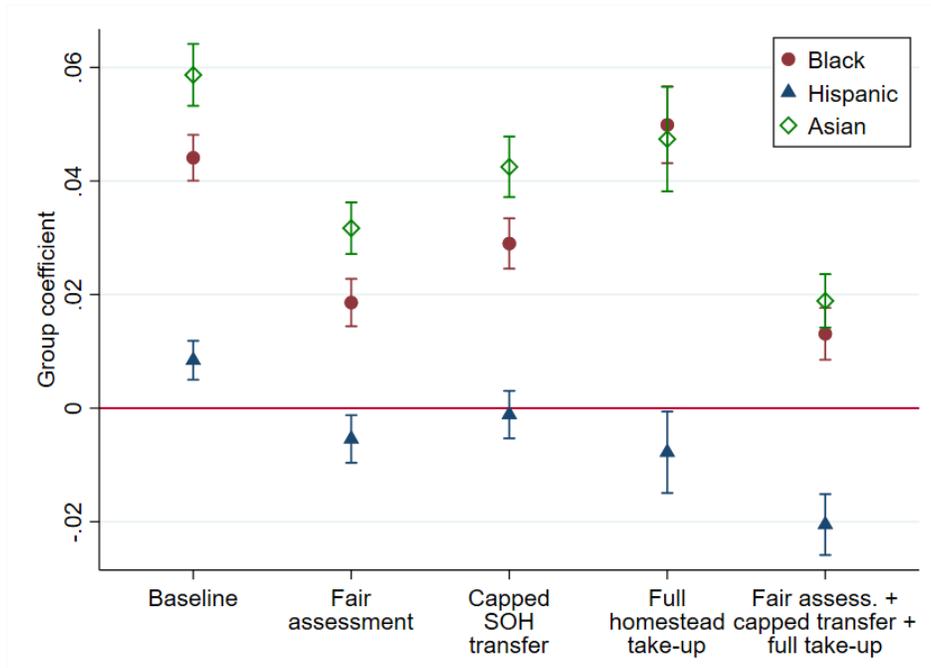
VIII. Counterfactual Policy Simulations

We now explore how various reforms to property taxation could affect the estimated racial gaps in the taxable value to price ratios. The following results may be useful to policymakers seeking ideas on how to move closer to the goal of horizontal equity. Figure 3 compares the baseline racial/ethnic gaps from Column 9 of Table 2 to estimates using simulated taxable value ratios under counterfactual policies. Fair assessment is the impact of assigning the median just value ratio to every homeowner, effectively eliminating any influence at the assessor

level. The gap for black and Asian homeowners is cut in half while the gap for Hispanic homeowners actually becomes negative. Figure 1 showed that SOH transfer value increased the gap between the groups, so capping the value of that transfer may limit its effects. This appears to be the case when the transfer is capped at \$50,000, with the gap shrinking for all groups; eliminating portability altogether produces a stronger effect. Another factor which contributes to differences in taxable value ratios is the differential group take-up of the homestead exemption, as show in Figure 2. By assuming full take-up, that is adjusting the taxable value of a home to reflect the eligible exemption amount of a non-claimant, we can estimate the relative importance of this factor. Interestingly, full take-up eliminates the gap between Hispanic and white homeowners but does not meaningfully affect the gaps between the other groups. The latter may be the result of how racial sorting and differential take-up interact within a particular block group.²⁴ The last set of results show that the combination of these adjustments could significantly reduce the gaps relative to the baseline. Notably, gaps remain even in this final simulation. The goal of horizontal equity may prove particularly difficult to achieve in light of sorting and imprecise assessment practices.

²⁴ When evaluated with jurisdiction rather than block group fixed effects, each of these adjustments amplifies the negative gap between both black and Hispanic homeowners relative to white homeowners.

Figure 3 - Racial gaps in taxable value ratios under alternative policies



Notes: Coefficients on the group variables presented with 95 percent confidence intervals. From left to right starting with the baseline results (block group FE), these estimates were obtained by calculating counterfactual taxable value ratios based on identical just value ratios, capping the SOH transfer at \$50,000, assuming full take-up of the homestead exemption, and the combination of these three modifications.

IX. Discussion and Conclusion

Economic research continues to shed light on important differences between racial and ethnic groups. One area, however, that has received comparatively scant attention is the property tax. A unique feature of this paper is that we have matched the race/ethnicity of a large percentage of the single-family homeowners in Florida with detailed data on their property taxes. We find significant differences unfavorable to minority homeowners relative to white homeowners at various stages of the property tax assessment process. Referring to the block group fixed effect results, black, Hispanic, and Asian homeowners experience higher gaps in JV/P ratios immediately upon receiving a county assessor’s initial assessment (1.1, 0.5, and 1.4

pp, respectively), are amplified due to transferrable exemption benefits (2.9, 1.4, and 2.9 pp), and increase or decrease once we account for exemptions (4.4, 0.8, and 5.9 pp).

Residential racial/ethnic segregation continues to be a major social problem within America's metropolitan areas. Segregation has been linked to a whole host of inequalities, including access to jobs (Weinberg, 2000), schooling and single parenthood (Cutler & Glaeser, 1997), and future earnings (Chetty et al., 2014; Chetty & Hendren, 2018). Our results suggest that it also contributes to property tax disparities that are unfavorable to minorities. In comparison to black and Asian homeowners, white homeowners reside in jurisdictions where, on average, assessed values are lower relative to market values. Even when holding the local area constant via block group fixed effects, all three minority groups are disadvantaged because they have lower take-up of the homestead exemption despite being eligible, transfer less portable tax savings when purchasing a home, and face larger errors in assessments.

Our analysis points to policies which may reduce group disparities even as integration remains an elusive goal. Property assessors in every county of Florida rely on the size of a house to generate assessment estimates. Our results show that for all racial/ethnic groups assessors are overvaluing size, especially for blacks and Hispanics. We offered some evidence in the appendix that an insufficient number of comparable sales may be a factor. Without knowing the details underlying the assessment evaluation models used by assessors, which are proprietary, it is difficult to determine the source of these and other assessor errors. Although we find it unlikely that explicit bias is a major factor in our setting, we cannot rule it out. We found that white homeowners tend to live in remodeled houses where improvements are likely to be observable to the buyer but not to the assessor. Where there are too few sales to obtain reliable

comps, contracting with a professional appraisal company might be advisable. Our simulations suggest that improving the assessment process could cut the measured racial/ethnic gaps in half.

Group differences in tax relief programs, which has hitherto received little attention, are equally if not more important than initial assessment gaps to overall property tax disparities. Ihlanfeldt (2021) shows that the lower take-up rate of the homestead exemption among minorities can be addressed by publicizing the exemption and reducing the digital divide.²⁵ For example, the state could require that realtors and closing attorneys inform home buyers of the exemption and how to apply. Another option which would reach all homeowners regardless of their interaction with such intermediaries would be to include an informational flyer in the property tax bill. Not only are minority homeowners less likely to claim the homestead exemption, but they subsequently miss out on benefits from the bundled cap on assessment growth that compound over time and are transferrable across properties. To the extent that less portability is from minority purchasers' failing to own a prior homestead in Florida, the differential transfer reflects gaps in the homeownership rate between whites and minorities. While recognized as a major contributor to differences in household wealth, the homeownership gap may contribute to minorities paying higher property taxes via this unintended interaction. Despite the tax relief and mobility-related origins of the program, Florida's cap has been criticized because evidence indicates it worsens property tax inequities (Moore, 2008). These findings, along with our own findings, suggest that measuring the social benefit/cost ratios of caps and portability may be a worthwhile undertaking.

Although we have made the case that Florida provides an appropriate setting for studying racial and ethnic disparities in the property tax, future research is necessary to better understand

²⁵ Most Florida counties now allow applications online, which lowers the transaction costs from filing an application. Therein lies the importance of improving access to the internet among minority homeowners.

how racial gaps vary across the United States and how particular aspects of other property tax systems contribute to or ameliorate such gaps. In addition to continued refinement of the measurement of any racial/ethnic gaps via improved data and techniques, we look forward to studies which also quantify the relative importance of the factors affecting the gaps. Such work is necessary in order for policymakers to identify the most effective way of achieving progress towards horizontal equity in property taxation.

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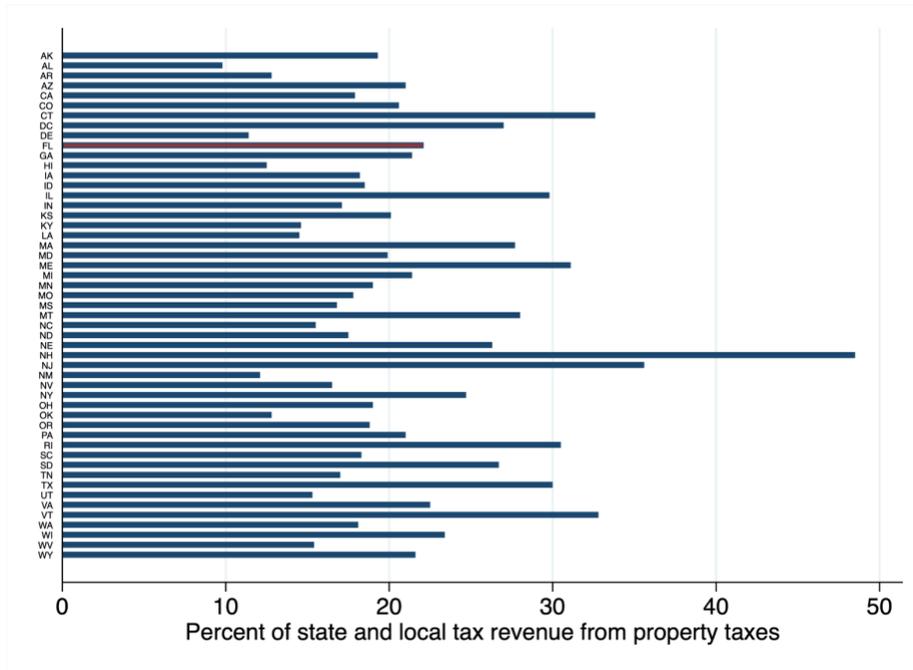
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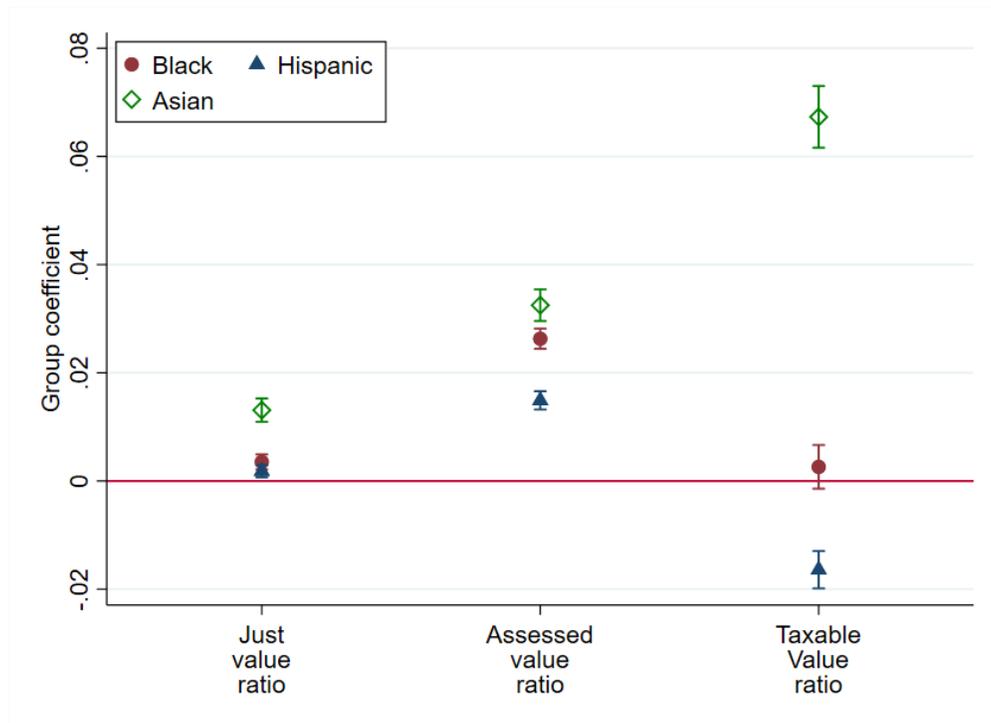
Appendix Material

Appendix Figure 1 – Property tax revenue percentage by state



Notes: The mean is 21.2 and the median is 19.3. The percent of state and local tax revenue from property taxes in Florida is 22.1. Data from the 2017 Survey of State and Local Government Finances (Census, 2017).

Appendix Figure 2 – Group coefficients using jurisdiction fixed effects



Notes: Coefficients on each group variable presented with 95 percent confidence intervals when using value to price ratios as the dependent variable in Equation (1) and controlling for block group fixed effects.

Appendix Table 1 – Annual Difference in Property Tax Payments in Comparison to White Homeowners

<i>Percentile</i>	No fixed effects			Jurisdiction fixed effects			Block group fixed effects		
	25	50	75	25	50	75	25	50	75
Black	32	44	63	7	10	15	107	150	213
Hispanic	22	31	44	-39	-54	-77	20	27	39
Asian	222	310	440	163	228	324	144	201	285

Notes: Additional annual property tax payments in dollars of minority homeowners compared to white homeowners. We calculated the payments using the estimated TV/P gaps from Table 2. We made the calculations at the 25th, 50th, and 75th percentiles of the taxable value distribution, based on a population-weighted millage rate of 1.7 percent.

Appendix Table 2 – Results conditional on minority presence

	Baseline (1)	>25% minority homeowners (2)	>50% minority homeowners (3)
<u>Panel A: $y = \ln(JV/P)$</u>			
Black	0.011** (0.001)	0.010** (0.001)	0.009** (0.001)
Hispanic	0.005** (0.001)	0.004** (0.001)	0.002** (0.001)
Asian	0.014** (0.001)	0.012** (0.001)	0.011** (0.002)
<u>Panel B: $y = \ln(AV/P)$</u>			
Black	0.029** (0.001)	0.022** (0.002)	0.016** (0.002)
Hispanic	0.014** (0.001)	0.011** (0.001)	0.009** (0.002)
Asian	0.029** (0.002)	0.025** (0.002)	0.018** (0.003)
<u>Panel C: $y = \ln(TV/P)$</u>			
Black	0.044** (0.002)	0.042** (0.003)	0.037** (0.004)
Hispanic	0.008** (0.002)	0.007** (0.002)	0.008** (0.003)
Asian	0.059** (0.003)	0.055** (0.003)	0.049** (0.006)
Notes: The reference group for every regression are white homeowners. Each panel replaces the dependent variable of Equation (1) with the outcome variable indicated. Every regression includes block group fixed effects and year fixed effects. The baseline results with the full sample are reproduced in Column 1 (N = 264,180). Column 2 restricts the sample to block groups where at least 25 percent of homeowners in our data are black, Hispanic, or Asian (N = 129,020), The third column increases the restriction to 50 percent minority (N = 60,546). Robust standard errors: † p < 0.1, * p < 0.05, ** p < 0.01.			

Appendix Table 3 - Differences in related outcomes

	(1)	(2)	(3)
<u>Panel A: Successful JV appeal</u>			
Black	-0.002** (0.0005)	-0.003** (0.0005)	-0.002** (0.0004)
Hispanic	-0.002** (0.0003)	-0.002** (0.0004)	-0.001** (0.0004)
Asian	-0.002** (0.0008)	-0.002** (0.0008)	0.00002 (0.0001)
<u>Panel B: Transferred SOH amount (\$)</u>			
Black	-4517** (117)	-4150** (127)	-2070** (135)
Hispanic	-2271** (127)	-2959** (141)	-1377** (146)
Asian	-2138** (261)	-2350** (262)	-1936** (265)
<u>Panel C: Homestead claimant</u>			
Black	-0.033** (0.003)	-0.041** (0.003)	-0.031** (0.003)
Hispanic	-0.020** (0.002)	-0.023** (0.002)	-0.020** (0.002)
Asian	-0.043** (0.005)	-0.047** (0.005)	-0.045** (0.005)
<u>Panel D: Low-income senior exemption</u>			
Black	-0.002** (0.0004)	-0.003** (0.0004)	-0.003** (0.0006)
Hispanic	0.002** (0.0004)	0.002** (0.0005)	0.002** (0.0006)
Asian	-0.001 (0.001)	-0.0001 (0.0001)	0.001 (0.001)
<p><i>Notes:</i> N = 244,756 for all regressions. The reference group for every regression are white homeowners. Each panel replaces the dependent variable of Equation (1) with an alternative outcome variable. Successful just value (JV) appeal indicates that the homeowner reduced their initial JV assessment through the appeal process. Homeowners may transfer Save Our Homes (SOH) benefits from previous homes upon relocating to a new homestead. All homeowners in our sample are eligible for the homestead exemption. A subset of jurisdictions offer exemptions to low-income senior residents. Column 2 includes jurisdiction fixed effects (FE), Column 3 includes block group FE, and Column 1 omits any location FE. Robust standard errors: † p < 0.1, * p < 0.05, ** p < 0.01.</p>			

Appendix B: Oaxaca Decompositions

To review the method as applied here, the mean difference in the black to white gap can be expressed as:

$$DTP_{B,W} = E(TP_B) - E(TP_w), \quad (1)$$

where $E(TP)$ denotes the expected value of the just value to price ratio and B and W identify blacks and whites. Based on the linear model estimated,

$$DTP_{B,W} = E(TP_B) - E(TP_w) = E(X_B)' \beta_B - E(X_w)' \beta_w, \quad (2)$$

where β are the estimated parameters and X is a vector containing the factors influencing the ratio. Equation (1) can be rearranged as follows:

$$\begin{aligned} DTP_{B,W} = [E(X_B) - E(X_w)]' \beta_w + E(X_w)' (\beta_B - \beta_w) + [E(X_B) \\ - E(X_w)]' (\beta_B - \beta_w). \end{aligned} \quad (3)$$

The first two components of equation (3) represent, in order, amounts of the differential gap in the mean ratio between blacks and whites that are due to group differences in the factors and their estimated effects. The last component is an interaction term accounting for the fact that differences in factors and coefficients exist simultaneously between the two racial groups. In the means decomposition described in (3), the expected change in the mean ratio of whites is obtained by giving whites the mean values of the factors of blacks.

Appendix C: Additional decompositions of the gaps in the TV/P ratios

We offered evidence on locational, neighborhood, house and policy variables that play a role in the minority disadvantage at the JV, AV, and TV stages in the administration of the tax. From a policy perspective, it is useful to explore the relative importance of each of these variables in explaining the higher TV/P ratios of minorities. We again rely on Oaxaca decompositions and identify the contributions made by single variables and groups of variables. In addition to the jurisdictional, neighborhood, and house groups previously described (see Table 3), we identify a homeowner group, which includes the homestead and other exemptions, transfers from portability, and appeals. Our interest is in those effects that help explain the higher TV/P ratios of the minority groups; specifically, where the effects are positive. There are also negative effects that favor the minority group that work to offset these positive effects. However, on net, the positive effects are dominate.

Appendix Table 4 reports the results from decomposing the black/white difference in the log mean of the taxable value to price ratio. We first focus on the group effects and then consider the role played by individual variables within each group in explaining the gap. The black/white difference (0.013) shows that the taxable value ratio is 1.3 percentage points higher for blacks and is statistically significant at the one percent level. The jurisdiction fixed effects strongly favor whites, contributing 0.035 to the gap. White homeowners reside in jurisdictions with lower TV/P ratios, because, as noted above, they sort into jurisdictions with lower JV/P ratios. The group homeowner variables also increase the gap by 2.9 percentage points. The variables that contribute the most to this result are the SOH transfer (0.016) and the homestead exemption (0.011) which lower the taxable value and are both larger for whites. The higher mean value of the homestead exemption for whites is due to their higher take up of the homestead exemption.

None of the group coefficient differences play an important role in explaining the lower TV/P ratios of whites. However, it is worth noting that there is a large effect in favor of whites (0.076) resulting from coefficients differences in the size of the home. Assessors overvalue interior living space, especially for blacks.

Appendix Table 5 reports the results from decomposing the Hispanic/white difference in the log mean of the taxable value to price ratio. The difference (0.009) shows that the taxable value ratio is 0.9 percentage points higher for Hispanics and is statistically significant at the one percent level. As is true for the black/white decomposition, the jurisdiction fixed effects strongly favor whites (0.035) and, to a lesser extent, so does the owner group (0.014).²⁶ Another similarity is that the variables that contribute the most to the latter result are the SOH transfer (0.009) and the homestead exemption (0.007), both of which are larger for whites than Hispanics. House group coefficient differences also play a role, increasing the gap by 2.6 percentage points. By a large margin the house characteristic that accounts for the group effect is the size of the home (0.043). For both whites and Hispanics assessors overvalue the size of the home, but this is especially true for houses occupied by Hispanics.

Among the TV/P disparities by far the largest is between whites and Asians. The TV/P ratio is 9.1 percentage point larger for Asians. Appendix Table 6 reports the decomposition findings of the Asian/white gap. While the jurisdiction fixed effects again show that whites reside in places that have lower average TV/P ratios, this makes less of a contribution to the Asian/white gap than for the other minority groups (0.025 for Asians versus 0.035 for blacks and Hispanics.) Differences in the values of both the house (0.026) and owner (0.025) groups

²⁶ Note that the jurisdictional fixed effects favored Hispanics over whites in the JV/P models, but the reverse is true in the TV/P models. The reason for this is that Hispanics reside in places with higher home values and, as noted above, this results in the homestead exemption causing a smaller percentage decline in the taxable value.

increase the gap. The key house characteristic is the size of the home (0.016). As noted, assessors overvalue size and Asians live in larger homes than whites (2,421 vs. 2,196 median square feet, respectively). The owner characteristic that is most important is the homestead exemption (0.013), which as noted in Section VII.C, is much less likely to be claimed by Asians than whites. Differences in the effects of the homestead exemption are even more important than its value differences in explaining the higher TV/P ratios of Asians. The coefficient differences raise the gap by 0.042, which is the largest contributing variable to the gap. Asians live in more expensive homes than whites (median prices of \$328,000 versus \$296,000). Because the exemption is a dollar amount and not a percentage of house value, the \$50,000 exemption results in a larger percentage decline in the TV/P ratio the smaller the home value.

The importance of racial/ethnic differences in the effects of home size in explaining the higher mean taxable value to price ratios of blacks and Hispanics motivates additional discussion. One possibility is that assessor errors may depend on the number of recent sales in the neighborhood. Estimates of the just value of homes are partially based on the prices of similar homes in the neighborhood that have recently been sold. Fewer sales may reduce the accuracy of assessments (McMillen and Weber, 2008). We reran the black and Hispanic decompositions limiting the samples to homes in block groups where there were 50 or more recent sales.²⁷ For blacks the contribution of the home size coefficient difference fell from 0.076 to 0.033, lending support to the sales explanation. The coefficient difference contribution also declined for Hispanics, but the magnitude of the decline was considerably smaller, from 0.0433 to 0.0419.

²⁷ We chose 50 sales because it approximated the median number of sales for the full sample of neighborhoods.

The issue remains why the coefficient differences necessarily favor white over minority homeowners in neighborhoods with fewer sales. One possibility is that even within block groups minorities and white homeowners may be spatially sorted, and there may be a larger number of sales in the white portion, resulting in estimates of just value for white homeowners that are closer to true market value.

As we noted above, our focus is on factors which contribute to the net positive gaps, yet some of the effects are negative and reduce the gap between the minority group and whites. Noteworthy are commonalities between blacks and Hispanics. Both groups tend to live in neighborhoods with higher percentages of SNAP recipients and both live in smaller homes. Because assessors undervalue homes in SNAP neighborhoods and overvalue larger homes, these effects benefit these minority groups in comparison to whites.

**Appendix Table 4 - Decomposing the Racial Gap in the Log Mean Taxable Value to Price Ratio
(Black and White Homeowners)**

	Black	White	Difference/Effect
Mean Log	-0.513	-0.526	0.013** (0.002)
Jurisdictional Fixed Effects Values			0.035** (0.001)
Jurisdictional Fixed Effects Coefficients			-0.002 (0.031)
Neighborhood Mean Values			
Average Adult Age	39	46	0.002** (0.0005)
Unemployment Rate	6.7	5.2	-0.001** (0.0002)
Percent Owner	70	77	-0.001** (0.0003)
Percent SNAP	15	8.0	-0.022** (0.0008)
Median Income (1000)	63	73	-0.003** (0.0003)
Percent Black	28	8.3	-0.017** (0.002)
Percent Hispanic	24	16	0.001* (0.0005)
Percent Asian	3.6	3.4	0.0001* (0.00003)
Neighborhood Group			-0.041** (0.001)
House Mean Values			
Quality Score	3.2	3.3	-0.004** (0.0002)
Interior Size (1000)	2.2	2.4	-0.018** (0.001)
Lot Size (1000)	8.9	14	-0.0004* (0.0002)
Remodeled	0.49	0.54	0.001** (0.0001)
House Age	20	18	-0.003** (0.0003)
House Group			-0.024** (0.001)
Owner Mean Values			
Homestead Exemption (1000)	40.1	41.8	0.011** (0.001)
Other Exemptions (1000)	0.3	0.4	0.001** (0.0004)
SOH Transfer Amount (over price)	0.009	0.019	0.016** (0.0005)
Appeal JV Down Amount (1000)	0.07	0.29	0.00001 (0.00002)
Owner Group			0.029** (0.001)

Neighborhood Coefficients			
Average Adult Age	-0.001** (0.0002)	-0.0004** (0.0001)	-0.044** (0.012)
Unemployment Rate	-0.001** (0.0004)	-0.0004* (0.0001)	-0.003 (0.002)
Percent Owner	0.0006** (0.0001)	0.0002** (0.00004)	0.027** (0.008)
Percent SNAP	-0.001** (0.0001)	-0.0029** (0.0001)	0.015** (0.002)
Median Income	5.4e-08 (9.3e-08)	3.3e-07** (3.2e-08)	-0.020** (0.007)
Percent Black	-0.001** (0.0001)	-0.001** (0.00007)	0.003* (0.001)
Percent Hispanic	-0.0006** (0.0001)	0.0001* (0.00007)	-0.011** (0.002)
Percent Asian	-0.0004 (0.0003)	0.0003* (0.0001)	-0.003* (0.001)
Neighborhood Group			-0.041* (0.016)
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House Coefficients			
Quality Score	0.011** (0.002)	0.027** (0.001)	-0.052** (0.008)
Interior Size	0.00010** (0.000003)	0.00007** (1.8e-06)	0.076** (0.007)
Lot Size	2.9e-07* (1.2e-07)	7.3e-08* (3.5e-08)	0.0031 † (0.0018)
Remodeled	-0.039** (0.004)	-0.017** (0.001)	-0.012** (0.002)
House Age	-0.002** (0.0001)	-0.002** (0.0001)	-0.001 (0.003)
House Group			0.015 (0.012)
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Owner Coefficients			
Homestead Exemption Amount	-7.3e-06** (5.7e-08)	-6.6e-06** (2.5e-08)	-0.031** (0.002)
Other Exemptions Amount	-9.8e-06** (1.1e-06)	-0.00001** (4.0e-07)	0.001 (0.0004)
SOH Transfer Amount (over price)	-1.71** (0.049)	-1.65** (0.013)	-0.001 (0.001)
Appeal JV Down Amount	0.0017* (0.0008)	-0.00006 (0.00007)	0.001* (0.0002)
Owner Group			-0.031** (0.003)

Notes: There are 24,177 black homeowners and 168,868 white homeowners in the sample. The homestead exemption, other exemptions, appeal just value (JV) downward amount, median income, interior size square footage, and lot size are measured in thousands. Robust standard errors: † $p < 0.1$, * $p < 0.05$, ** $p < 0.01$.

**Appendix Table 5 - Decomposing the Racial Gap in the Log Mean Taxable Value to Price Ratio
(Hispanic and White Homeowners)**

	Hispanic	White	Difference/Effect
Mean Log	-0.520	-0.526	0.009** (0.002)
Jurisdictional Fixed Effects Values			0.035** (0.002)
Jurisdictional Fixed Effects Coefficients			-0.003 (0.018)
Neighborhood Mean Values			
Average Adult Age	40	46	0.002** (0.0005)
Unemployment Rate	5.8	5.2	-0.0003* (0.0001)
Percent Owner	72	76	-0.0009** (0.0002)
Percent SNAP	14	8.0	-0.018** (0.0001)
Median Income (1000)	69	73	-0.001** (0.0001)
Percent Black	14	8.3	-0.005** (0.0004)
Percent Hispanic	39	16	0.003* (0.001)
Percent Asian	3.5	3.4	0.00003* (0.00002)
Neighborhood Group			-0.019** (0.001)
House Mean Values			
Quality Score	3.3	3.3	-0.001** (0.0001)
Interior Size (1000)	2.1	2.4	-0.020** (0.001)
Lot Size (1000)	10	14	-0.0003* (0.0001)
Remodeled	0.49	0.54	0.0008** (0.0001)
House Age	22	18	-0.007** (0.0003)
House Group			-0.027** (0.001)
Owner Mean Values			
Homestead Exemption (1000)	40.7	41.8	0.007** (0.0001)
Other Exemptions (1000)	0.5	0.4	-0.001** (0.0004)
SOH Transfer Amount (over price)	0.013	0.019	0.009** (0.0004)
Appeal JV Down Amount	0.16	0.29	0.00001 (0.0001)
Owner Group			0.014** (0.001)

Neighborhood Coefficients			
Average Adult Age	-0.0001** (0.0002)	-0.0004** (0.0001)	-0.017 (0.009)
Unemployment Rate	-0.001** (0.0003)	-0.0004* (0.0001)	-0.005** (0.002)
Percent Owner	0.0002** (0.00008)	0.0002** (0.00004)	0.003 (0.007)
Percent SNAP	-0.001** (0.0001)	-0.0029** (0.0001)	0.013** (0.001)
Median Income	4.6e-08 (6.2e-08)	3.3e-07** (3.2e-08)	-0.021** (0.005)
Percent Black	-0.001** (0.0001)	-0.001** (0.00007)	-0.004** (0.001)
Percent Hispanic	-0.0004** (0.0001)	0.0001* (0.00007)	-0.008** (0.002)
Percent Asian	0.0004 (0.0003)	0.0003* (0.0001)	0.0002 (0.001)
Neighborhood Group			-0.035** (0.013)
House Coefficients			
Quality Score	0.020** (0.002)	0.027** (0.001)	-0.024** (0.008)
Interior Size	0.00008** (2.5e-06)	0.00007** (1.8e-06)	0.043** (0.007)
Lot Size	1.1e-07 (6.9e-08)	7.3e-08* (3.5e-08)	0.001 (0.001)
Remodeled	-0.036** (0.003)	-0.017** (0.001)	-0.010** (0.002)
House Age	0.001** (0.0001)	-0.002** (0.0001)	0.016** (0.002)
House Group			0.026** (0.010)
Owner Coefficients			
Homestead Exemption Amount	-6.6e-06** (4.3e-08)	-6.6e-06** (2.5e-08)	-0.003 (0.002)
Other Exemptions Amount	-0.00001** (7.0e-07)	-0.00001** (4.0e-07)	-0.0003 (0.0003)
SOH Transfer Amount (over price)	-1.76** (0.033)	-1.64** (0.013)	-0.0021** (0.0007)
Appeal JV Down Amount	-0.001** (0.0001)	-0.00006 (0.00007)	-0.0002** (0.00004)
Owner Group			-0.005* (0.002)

Notes: There are 44,572 Hispanic homeowners and 168,868 white homeowners in the sample. The homestead exemption, other exemptions, appeal just value (JV) downward amount, median income, interior size square footage, and lot size are measured in thousands. Robust standard errors: † p < 0.1, * p < 0.05, ** p < 0.01.

**Appendix Table 6 - Decomposing the Racial Gap in the Log Mean Taxable Value to Price Ratio
(Asian and White Homeowners)**

	Asian	White	Difference/Effect
Mean Log	-0.436	-0.526	0.091** (0.003)
Jurisdictional Fixed Effects Values			0.025** (0.001)
Jurisdictional Fixed Effects Coefficients			0.038 (0.031)
Neighborhood Mean Values			
Average Adult Age	41	46	0.002** (0.0004)
Unemployment Rate	5.1	5.2	0.00002 (0.00002)
Percent Owner	73	76	-0.001** (0.0002)
Percent SNAP	9.1	8.0	-0.003** (0.0003)
Median Income (1000)	78	73	0.001** (0.0002)
Percent Black	12	8.3	-0.003** (0.0003)
Percent Hispanic	23	16	0.0010* (0.0005)
Percent Asian	5.8	3.4	0.001* (0.0003)
Neighborhood Group			-0.0018* (0.0008)
House Mean Values			
Quality Score	3.3	3.3	-0.001 (0.0003)
Interior Size (1000)	2.7	2.4	0.016** (0.001)
Lot Size (1000)	11.3	14	-0.0002* (0.0001)
Remodeled	0.42	0.54	0.0019** (0.0002)
House Age	15	18	0.009** (0.0004)
House Group			0.026** (0.001)
Owner Mean Values			
Homestead Exemption (1000)	39.8	41.8	0.013** (0.002)
Other Exemptions (1000)	0.3	0.4	0.001 (0.001)
SOH Transfer Amount (over price)	0.012	0.019	0.011** (0.001)
Appeal JV Down Amount (1000)	0.22	0.29	5.0e-06 (7.7e-06)
Owner Group			0.025** (0.002)

Neighborhood Coefficients			
Average Adult Age	0.0004 (0.0004)	-0.0004** (0.0001)	0.034* (0.017)
Unemployment Rate	-0.0025** (0.0010)	-0.0004* (0.0001)	-0.011* (0.005)
Percent Owner	-0.0001 (0.0002)	0.0002** (0.00004)	-0.024 † (0.013)
Percent SNAP	-0.0022** (0.0004)	-0.0029** (0.0001)	0.006 † (0.003)
Median Income	2.3e-07 † (1.2e-07)	3.3e-07** (3.2e-08)	-0.007 (0.009)
Percent Black	-0.001** (0.0003)	-0.001** (0.00007)	0.0004 (0.002)
Percent Hispanic	-0.0001 (0.0002)	0.0001* (0.00007)	-0.004 (0.003)
Percent Asian	0.0003 (0.0004)	0.0003* (0.0001)	-0.002 (0.002)
Neighborhood Group			-0.008 (0.022)
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House Coefficients			
Quality Score	0.0115** (0.0031)	0.027** (0.001)	-0.051** (0.011)
Interior Size	0.00006** (2.8e-06)	0.00007** (1.8e-06)	-0.024** (0.008)
Lot Size	1.6e-07** (5.7e-08)	7.3e-08* (3.5e-08)	0.001 (0.001)
Remodeled	-0.028** (0.007)	-0.017** (0.001)	-0.006 (0.004)
House Age	-0.002** (0.0003)	-0.002** (0.0001)	0.004 (0.006)
House Group			-0.075** (0.014)
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Owner Coefficients			
Homestead Exemption Amount	-5.6e-06** (9.1e-08)	-6.6e-06** (2.5e-08)	0.042** (0.004)
Other Exemptions Amount	-0.00001** (1.7e-06)	-0.00001** (4.0e-07)	0.001 (0.001)
SOH Transfer Amount (over price)	-1.42*** (0.068)	-1.64** (0.013)	0.004** (0.001)
Appeal JV Down Amount	-0.0004 (0.0003)	-0.00006 (0.00007)	-0.0001 (0.0001)
Owner Group			0.047** (0.004)

Notes: There are 7,139 Asian homeowners and 168,868 white homeowners in the sample. The homestead exemption, other exemptions, appeal just value (JV) downward amount, median income, interior size square footage, and lot size are measured in thousands. Robust standard errors: † $p < 0.1$, * $p < 0.05$, ** $p < 0.01$.