Racial Rent Differences in U.S. Housing Markets

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Abstract

This paper exploits an unusually rich data set to estimate racial differences in the rents paid for identical housing in the same neighborhood in U.S. housing markets and how they vary with neighborhood racial composition. It overcomes the shortcomings of the data used in previous studies. It is large (over 400,000 observations), covers all parts of the country, and contains detailed information about the housing units and their immediate neighborhoods and the census block group of each unit. Importantly, due to the sample size, there are many blacks living in predominantly white neighborhoods and many whites in predominantly black neighborhoods. Results suggest that households led by blacks pay more for identical housing in identical neighborhoods than their white counterparts and that this rent gap increases with the fraction of the neighborhood white. In neighborhoods with the smallest fraction white, the premium is about 0.6 percent. In neighborhoods with the largest fraction white, it is about 2.4 percent. This pattern holds across different types of areas, namely the 50 largest metro areas, all other metro areas, non-metro areas, and areas with the highest and lowest levels of racial segregation in housing.

Keywords: Racial discrimination, housing discrimination, racial rent differences, racial price differences

JEL Codes: R2, R3, J15, K25

1. Introduction

Racial discrimination and segregation have been important aspects of housing markets in the United States over its entire history. For many years, housing discrimination against blacks and other minorities was legal, open, and common. Racial covenants, openly advertising for white tenants, government policies restricting access to credit for minorities, and threats of violence greatly restricted the housing choices available to minority owners and renters. Although the Supreme Court declared the most egregious practices unconstitutional many years ago – racially restrictive zoning in 1917 and racial covenants in 1948, racial attitudes still play a major role in housing market outcomes.

That said, racial attitudes and policies have changed dramatically over the last 50 years. People express a much greater willingness to live in neighborhoods with members of other races (Bobo 2001; Schuman et al. 1998). In recent years, only a small minority of whites and blacks express a preference for living in a racially homogeneous neighborhood (Charles 2001). With respect to public policy, the Fair Housing Act of 1968 prohibited many types of housing discrimination and the 1988 amendments facilitated its enforcement, the 1974 Home Mortgage Disclosure Act and the 1977 Community Reinvestment Act led to the demise of redlining in mortgage lending, and local housing authorities have demolished many of the largest public housing projects occupied almost exclusively by black households and provided their occupants with housing vouchers that offer the opportunity to live in more racially diverse neighborhoods.

These changes in attitudes and policies have led to shifts in the racial composition of neighborhoods across all parts of the U.S. Glaeser and Vigdor (2012) document a steady decrease in standard measures of racial segregation that started around 1970 and a dramatic decline in the number of all-white neighborhoods since then. In 1970, nearly 20 percent of all census tracts contained no black residents. By 2010, less than one-quarter of one percent were still all-white.

In addition to resulting in racial segregation, racial attitudes about dealing with, and living near, people of other races can lead to racial differences in the rents paid for identical housing in the same neighborhood and differences in racial premia across neighborhoods with different racial composition. For example, since search is costly, identical units in the same neighborhood will not have the same rent. Blacks might reasonably search less where they expect to face the most hostility from landlords and neighbors, and those who rent in these areas will typically end up in overpriced units. In equilibrium, the aversion of some landlords to dealing with black tenants and the aversion of some white tenants to black neighbors should lead

to a sorting of landlords and tenants. Landlords with little or no aversion to dealing with blacks should work in predominantly black areas and landlords with the greatest aversion in predominantly white areas. A similar sorting across neighborhoods will occur for white tenants. As a result, the black rent premium is likely to be greatest in heavily white neighborhoods. Racial rent differences might also reflect differences in the revenue that landlords expect to receive from people of different races and expected differences in the cost of serving them (Ewers, Tomlin, and Wang 2014). These expectations might be based on prejudice or experience.

Changes in attitudes and policies have led to reductions in the scope and incidence of non-price racial discrimination in housing in recent years (Choi, Ondrich, and Yinger 2005; Zhao, Ondrich, and Yinger 2006). They might reasonably be expected to have led to reductions in the magnitude of racial rent differences as well.

Recent studies have established convincingly that blacks pay slightly higher sales prices for identical units in the same neighborhood (Ihlanfeldt and Mayock 2009; Bayer et al. 2017). Understanding racial rent differences is arguably even more importance since nearly 60 percent of black households are renters (U.S. Census Bureau 2017). While many of the same reasons underline racial differences in rents and sales prices, there is no reason to believe that the magnitude of the racial gaps in rents would be identical to the gaps in sales prices because the interactions between people in the two sectors are different. For example, since most sales transactions are handled through brokers, sellers of owner occupied houses usually have minimal dealings with potential buyers, and the interactions between white realtors and potential black buyers differs from the interactions between white landlords and minority tenants in their nature and duration.

Racial differences in rents as well as sales prices are important for understanding other significant outcomes. For example, Bayer et al. (2017) argue that the premium charged blacks and Hispanics in the owner occupied market will alter their choice whether to own or rent, possibly explaining some of the low ownership rates for blacks and Hispanics. If the same premium is found in the rental sector, racial premia will have no substitution effect on homeownership. They will operate entirely through an income effect. Unfortunately, the best evidence on racial rent differences (Myers 2004) leaves much more uncertainty about the current situation in rental markets.

The purpose of this paper is to estimate the difference in the rents that minorities and whites pay for identical housing in identical neighborhoods and how racial differences in rents

vary with neighborhood racial composition. Our data set overcomes shortcomings of the data used in previous studies. It is large, containing over 400,000 observations. It covers all parts of the United States. It contains detailed information about the housing units and their immediate neighborhoods. For example, we have 44 regressors representing 25 underlying neighborhood characteristics compared with Myers's (2004) six characteristics. Importantly, our data include the census block group of each unit, and due to the large sample size, there are many blacks living in predominantly white neighborhoods and whites in predominantly black neighborhoods. Most studies that include the racial composition of the neighborhood divide all neighborhoods into three broad categories (black ghetto, boundary, white interior) defined a priori. Our abundant data allow us to estimate racial premia with considerable precision for more narrowly defined categories. Finally, our data refer to a more recent time period and hence give a better idea of the current situation.

Our main results are simply stated. In regressions without census tract fixed effects that assume that the black premium (expressed as a percentage) is the same in all neighborhoods, we find that blacks pay about 2.5 percent more than whites for similar housing in census block groups (CBG) with similar characteristics. In similar regressions that allow the percentage black premium to vary linearly with the racial composition of the CBG, we find that blacks pay about 0.5 percent more in all-black neighborhoods and the gap increases by 0.3 percent for each 10 percent increase in the percent white. In regressions that include dummy variables to represent ventiles of the racial composition of the CBG, the black premium is about 0.5 percent for neighborhoods that are less than 20 percent white and rises to about 3 percent for neighborhoods at least 60 percent white with a few modest blips. When household income is added to the hedonic regression to account for unobserved housing and neighborhood characteristics, none of the estimated coefficients of the racial variables is perceptibly affected. When census tract dummies are included to account for these unobserved characteristics, the fit is much better and the general pattern is the same. As before, the premium is negligible in heavily black areas and about 2.4 percent in areas with the highest fraction white. Finally, the patterns of racial rent premia are very similar in areas with the highest and lowest levels of racial segregation in housing.

Section 2 reviews the literature on racial rental price differences, Section 3 presents our data and empirical methods, Section 4 reports our results, and Section 5 summarizes the paper.

2. Empirical literature

The most common approach to estimating racial price differences has been to use cross-sectional data to estimate a hedonic equation that explains the logarithm of gross rent or sales price as a function a dwelling unit's housing and neighborhood characteristics, the race of the head of the household, and perhaps other household characteristics. The results of empirical studies using this approach (King and Mieszkowski 1973, Yinger 1978, Schafer 1979, Follain and Malpezzi 1981, Chambers 1992, Kiel and Zabel 1996, Myers 2004) are mixed. Some find that blacks pay a premium; others find that they receive a discount; and still others find no statistically significant difference.

The reasons for the mixed results are almost surely that the data underlying the studies are deficient in different respects. Almost all include a modest set of housing or neighborhood characteristics in their hedonic equations. Correlation between different omitted characteristics and the race of the occupant conditional on observed characteristics leads to different degrees of bias in different studies. Some studies are based on extremely small samples that lead to imprecision in estimating the premium, especially how it varies with the racial composition of the neighborhood. The best early papers were based on less than 270 observations. Many are based on data for a single locality raising questions about whether the results are nationally representative. Most are based on data from the 1960s and 1970s when racial attitudes and policies were quite different. Few studies are based primarily on data for the past 25 years.

Using different approaches to overcome these shortcomings, Ihlanfeldt and Mayock (2009) and Bayer et al. (2017) establish convincingly that blacks pay higher sales prices, roughly 1 to 3 percent, for identical units in the same neighborhood. Appendix A provides details on these studies.

The evidence on racial premia in rental housing leaves much more uncertainty about the current situation. Almost all of the studies are based on data for the 1960s and 1970s, and they all have some of the shortcomings mentioned earlier. Myers (2004) is the only study based on more recent data, specifically, a panel from the national American Housing Survey (AHS) for 1985, 1989, and 1993. A unique feature of these data sets is that they contained a supplementary sample of the ten nearest neighbors to about 700 units in the regular AHS sample. Her rental results are based on about 2,800 rental units in these clusters, and her hedonic equation includes selected characteristics of the unit, its neighborhood, and occupants, broad location (census region and whether it is in a central city), time dummies, and a few other variables. She provides

random effects estimates that account for correlation between the error terms associated with particular units in different years and fixed effects estimates that include housing unit dummies.

Using the AHS has significant advantages for estimating racial premia, though she did not take advantage of all of them. The AHS contains by far the most detailed information about the characteristics of dwelling units of any regularly produced public use data set, and it contains the respondent's views about many aspects of their neighborhood and the enumerator's views about a few. The data in the neighbors sample allowed Myers to add several additional neighborhood variables, namely, median income and years of education of residents of each cluster, and it allowed her to include the average views about the neighborhood of respondents and enumerators within the cluster. However, limiting the estimation to the neighborhood subsample available in only three years also has substantial disadvantages. It led to a substantial reduction in the sample size and a small number of changes in the key racial variables within housing units (see her Table 3). This is important for precise estimation of their coefficients.

Her estimates of the black rent premium are similar to Ihlanfeldt and Mayock's (2009) and Bayer et al.'s (2017) results for home sales, but these coefficients are not estimated with much precision.[1] Her preferred random effect estimate of the black premium is 1.2 percent. However, a Hausman test rejects the null hypothesis that the error term in this regression is uncorrelated with its explanatory variables. This is not surprising because Myers did not include many of the AHS variables that describe the condition of the dwelling unit and its location in her hedonic equation. More subtly, she did not account for the extent to which utilities are included in contract rent. Unlike most previous studies her dependent variable was the logarithm of contract rather than gross rent. Utilities might be included in rent to different extents for blacks and whites. Her preferred fixed effect estimate is 2.4 percent which suggests that the correlation between the race of the occupant and omitted housing and neighborhood characteristics in the random effects estimation led to a modest downward bias in the estimator of the black premium. Unfortunately, the results of the fixed effect estimation leave considerable doubt about the magnitude of the black premium. The 90 percent confidence interval is -3.7 percent to 8.6 percent. In her reported regressions, Myers's specification does not allow the premium to depend on the racial composition of the neighborhood, but she says that in unreported regressions the coefficients on the interactions between occupant race and neighborhood type based on the broad racial composition of neighborhood were statistically insignificant.

[1] Myers's results for home sales are quite different from Ihlanfeldt and Mayock's and Bayer et al.'s results.

3. Data and Statistical Model

Data Overview

The primary data used in this study is from the US Department of Housing and Urban Development's (HUD) Customer Satisfaction Survey (CSS) supplemented by administrative data from HUD's housing voucher and certificate programs. The CSS is a mail-back survey of voucher and certificate recipients that collected data across three years – 2000, 2001, and 2002. In each of those years, the CSS was mailed to more than 250,000 families in HUD's voucher program and the response rate was roughly 52% (Gray et al., 2009). This allowed for an initial sample size of more than 450,000 rental housing units.

In addition to the sample size, the detailed information collected from tenants is another substantial benefit these data have over any other data source used to detect housing discrimination. The CSS asks tenants 75 questions related to the condition of their housing unit and their neighborhood with a level of detail similar to the American Housing Survey. A pilot study indicated a very high agreement between residents and trained inspectors in answering the questions (Building Research Council, 1998). From their administrative data, HUD added the gross rent of the unit (that is, the sum of the tenant's and government's payment to the landlord plus an allowance for tenant-paid utilities), the number of persons in the unit, the race and ethnicity of the head of the household, and the location of the unit at the census block group level.

To further control for neighborhood attributes, neighborhood data at the block group level from the 2000 Decennial Census is appended to each household's record. All previous studies use data that either have a more limited geographic coverage, a more limited set of unit characteristics to control for housing quality, or are unable to control for neighborhood characteristics at the level of the block group. Indeed, most previous studies use data that suffer from more than one of these limitations. As previous studies have shown, controlling well for neighborhood quality is critical to determine the effect of race and ethnicity on the rent paid for identical housing in the same neighborhood. In addition to variables from the Decennial Census, proxies for school quality are also included in the hedonic regressions.

Because the households involved in the analysis participate in the Section 8 Housing Choice Voucher Program and several earlier variants, the results literally apply only to differences in rents that voucher recipients pay for identical housing in identical neighborhoods. Whether these results should be interpreted to apply to the entire unsubsidized rental housing market is a matter of judgment. Since voucher recipients are free to use their subsidy to occupy

any unit that meets the program's standards, we see no good reason that they would not apply generally. Competition between landlords for tenants should be expected to lead to rents for units occupied voucher recipients that are close to the rents of unsubsidized units with the same characteristics, and previous research supports this expectation (Wallace et al., 1981; Weinberg, 1982; Leger and Kennedy, 1990; ORC/Macro, 2001; Chapter V, Desmond and Perkins, 2016). With respect to the type of housing involved, the restrictions and incentives in the housing voucher programs have induced the average recipient to occupy rental housing of about average quality (Carrillo, Early, and Olsen 2014), though the variance in housing quality among voucher recipients is smaller than in the unsubsidized market due to the program's minimum housing standards and ceiling rents. To allow readers to form an independent judgment about the generalizability of our results, Appendix B provides more information about the voucher and certificate programs.

Statistical Model

The statistical models underlying our estimates of racial premia are hedonic equations that explain the logarithm of gross rent as functions of structural characteristics (STRUCT), neighborhood characteristics (NEIGH), and contract conditions (CONTRACT). Dummy variables (YEAR) are included in each hedonic to control for the year of the survey (2000, 2001, 2002). To control for the variation in the price of rental housing service across areas, dummies indicating the metropolitan area or nonmetropolitan area of each state (AREA) are included. In total, 380 distinct metropolitan areas or the nonmetropolitan parts of states are identified. To capture the variety of racial and ethnic compositions of a household, each household is classified into one of six race/ethnicity categories: non-Hispanic white, non-Hispanic black (NONH-BLACK), non-Hispanic other (NONH-OTHER), Hispanic white (HISP-WHITE), Hispanic black (HISP-BLACK), and Hispanic other (HISP-OTHER). A dummy variable indicating the sex of the head of the household is also included.

The variables most critical to the analysis, race, ethnicity, and gender were extracted from administrative data and are available for all observations in the sample. However, as with other self-administered surveys, some questions in the CSS were either not answered or contain an invalid response. A common method for handling missing data is to restrict the data to observations with complete data, normally referred to as complete case analysis (CCA.) Although few variables had missing information for more than 5 percent of the observations, roughly 50 percent of observations had missing data for at least one variable. Since CCA would

have required the omission of a substantial fraction of the sample, omitted variable indicators were constructed and hedonics are run on the full sample. For each variable with missing values, a new variable was constructed (MX_{xn}) that is coded 0 if the data exists, and 1 otherwise and the value of missing variables is coded as 0.[2] The small number of observations (roughly 3 percent) with more than 20 variables with missing data are omitted from the hedonic regression.

In addition, observations with unrealistic rents (less than $200 a month) are not included in the hedonic regression. With these omissions, just over 417,000 observations remain (about 93 percent of the original sample).

Hence, the basic hedonic specification is:

$$\ln(RENT_i) = \alpha_0 + STRUCT_i \times \alpha_1 + NEIGH_i \times \alpha_2 + CONTRACT_i \times \alpha_3 + YEAR_i \times \alpha_4 + AREA_i \times \alpha_5 + \gamma_1 MX_{1i} + ... + \gamma_n MX_{ni} + \alpha_6 NONH\text{-}BLACK_i + \alpha_7 NONH\text{-}OTHER_i + \alpha_8 HISP\text{-}WHITE_i + \alpha_9 HISP\text{-}BLACK_i + \alpha_{10} HISP\text{-}OTHER + \alpha_{11} FEMALE + v_i \quad (1)$$

This equation is the starting point for determining how much, if at all, rents vary across races and ethnicities among units with the same characteristics in the same neighborhood. We use variants of this simple model to explore in more detail racial and gender differences in rents, including how racial rent premia vary with the racial composition of the neighborhood.

Data Details

Table 1 gives the definitions and summary statistics for the variables used in the hedonic regressions. The summary statistics on the 380 area dummies ($AREA_i$) are not reported. Explanatory variables include unit and structural characteristics (number of bedrooms, existence of working kitchen appliances, adequate heat in the unit, etc.), neighborhood characteristics (problems with crime, vacant buildings, fraction of the neighborhood black, measures of school quality, etc.), contract conditions (whether the unit has been rented for more than one year, number of persons per bedroom), and dummy variables capturing the year of the survey (2000, 2001, 2002).

Most of the variables in Table 1 need no discussion. Of note is that nearly all of the neighborhood measures are for census block groups (600 – 3000 persons), which is arguably a better measure of a neighborhood than the more commonly used census tract (1,200 – 8,000

[2] Alternative methods for dealing with missing values discussed later yield virtually identical results.

persons). We also include neighborhood variables often omitted from hedonics designed to capture differences in rents across race and ethnicity, most notably measures of the quality of local schools. In their review of the research on housing prices and school quality, Nguyen-Hoang and Yinger (2011) report mixed effects of school inputs on house prices, but a consistent positive effect of test scores. To account for variations in school quality, we use data from the elementary school closest to the population centroid of the census block group of the unit. The average fraction of students within the school who pass the states proficiency test for reading and math is used as a proxy for school output. Since the tests used to measure proficiency and the definitions of proficiency vary across states, these scores are normalized to have a mean of zero and standard deviation of one for each state. Also included is a measure of school inputs, the student teacher ratio of the neighborhood elementary school. Appendix C provides further details on the construction of the measures of school quality.

The contract conditions differ from the other characteristics of the unit since they capture attributes of tenants. Length of tenure is included to capture discounts usually available to long term tenants, possibly reflecting the gradual deterioration of their units and the landlord's desire to retain the best tenants. Since housing units depreciate faster as the number of persons in a unit increases, landlords might reasonably charge more for additional persons being added to the lease. To control for the level of crowding within a unit in hedonic regressions, it is common to include the number of persons per room. However, since total number of rooms is not available in the CSS, the number of persons per the number of bedrooms plus one is used instead.

4. Results

An analysis of the CSS data linked to neighborhood characteristics at the census block group level indicates differences in rents across races, ethnicities, and sexes. The first column of Table 2 provides the results of the hedonic specification given in equation (1). Since our focus is on the differences in rents across races and ethnicities, the estimates of the coefficients on unit characteristics, contract terms, the missing value indicators, area dummies, and most neighborhood measures are omitted. The fit of the hedonic is very good with an adjusted-R squared of roughly 0.81. The results suggest that non-Hispanic blacks pay about 2.5 percent more than non-Hispanic whites for similar housing in similar neighborhoods and that this difference is statistically significant at the 1 percent level. Given an average monthly gross rent of roughly $600 in the 2000-2002 timeframe, this suggests that the average difference in the rents of units occupied by non-Hispanic blacks and non-Hispanic whites was about $15 per

month. The coefficient estimates on the remaining race/ethnicity categories suggest much smaller, less than one percent, differences in the rents of those groups and non-Hispanic whites. Households headed by women were found to pay roughly 2 percent more than men, on average, for similar housing in similar neighborhoods. This is consistent with Harding, Rosenthal, and Sirmans's (2003) finding of a difference in bargaining power between men and women. Men and women may also differ in how they perceive the quality of identical units. For example, if women are more likely than men to indicate safety or sanitation concerns when faced with the same situation, it will appear that women are occupying lower quality units, but pay the same rent as men. This suggests a positive bias in the estimate of the coefficient on whether the head of the household is female.

As the results reported in column 1 suggest, although some differences were noted between non-Hispanic whites and other groups, the largest difference is between non-Hispanic whites and non-Hispanic blacks. Therefore, the remainder of this study concentrates on these two groups by restricting the data to them. Table 1 reports the summary statistics for this subset of the data.

Before introducing further controls, an interaction term between FEMALE and BLACK is added to the hedonic specification given in equation (1) to allow for the possibility that the black premium is different for men and women. The results are reported in column 2. Restricting the sample to these two groups and adding this variable has little effect on the estimated racial coefficients. The estimated coefficient of the interaction term is very small and not statistically significant at standard levels. The estimated mean difference in rents for similar units in similar neighborhoods is roughly 2.7 percent between non-Hispanic whites and non-Hispanic blacks and roughly 2.1 percent between women and men.

To explore how the racial premium varies with the racial mix of the neighborhood, we estimate regressions using continuous and discrete measures of racial composition. The continuous measure is the fraction of the census block group white times the dummy indicating a non-Hispanic black headed household and the discrete measures of the neighborhood racial mix indicate whether the fraction of the block group is majority white (50 to 80 percent white) or mostly white (greater than 80 percent white) also interacted with whether the household head is black. The results in column (3) based on the continuous variable indicate almost no black premium in block groups with few whites and a premium of about 3 percent in areas with few blacks. Estimates using the discrete measures of the racial composition of the neighborhood, shown in column (4), suggests similar differences. Moving from neighborhoods that are less than

50 percent white to majority or mostly white would increase the rent premium to blacks by just over 1 percentage point. An F-test of the hypothesis of no difference in the rent premium across block groups with different racial compositions was rejected, further suggesting statistically significant, though small, differences in premiums across these types of neighborhoods.

To check for robustness across different methods for controlling for missing values, the hedonic regressions presented in Table 2 are also estimated under alternative methods of handling missing values, namely complete case analysis and by imputing missing values. The imputation methods used are replacement of missing values with the mean of the observed values for that variable and predictions of the probability of the condition being present based on logit regressions that include all variables that are reported for all observations. All variables with missing values are dummies indicating the presence of a condition. The logit regression used to impute missing values contained 416 explanatory variables including variables capturing race, ethnicity, gender, unit size, household composition, neighborhood quality, and the area dummies. These results are presented in Appendix Table A. The estimates under CCA and the imputation methods used to estimate values for missing values are virtually the same as those presented in Table 2.

One substantial advantage of our large data set is that it contains large numbers of black and white households in neighborhoods with each racial mix (see Table 3) and hence allows us to estimate how the racial premium varies with neighborhood racial composition without strong assumptions about the functional form of the relationship. A hedonic that replaced the preceding interaction terms with interactions between black and 20 discrete measures of the fraction of the census block group white (0–5 percent, 5-10 percent, etc.) yielded the results depicted in Figure 1. The black premium is about 0.5 percent for neighborhoods with less than 25 percent white, rises to about 3 percent as the fraction white increases to about 60 percent, and remains at that level for higher white concentrations.

Although our hedonic equations contain an unusually large number of housing and neighborhood characteristics, they are not exhaustive. This leads to the possibility that correlations between omitted characteristics and the race of the household head conditional on included explanatory variables will bias estimates of the racial premium. To account for omitted housing and neighborhood characteristics, we added household income to the explanatory variables in the regressions reported in Table 2. While the results indicate that the units occupied by households with higher incomes are better in unobserved respects, the inclusion of income

has virtually no effect on the estimated racial coefficients. These results are presented in Appendix Table B.

Additional controls for omitted characteristics

The preceding results contain one anomaly. Rents are lower for whites and blacks in heavily white neighborhoods even after controlling for an unusually large number of housing and neighborhood characteristics. This is true not only in the hedonic regressions reported in Table 2, but also in unreported regressions estimated separately for blacks and whites. The obvious explanation is that heavily white areas are worse with respect to omitted characteristics, and the most obvious candidate is proximity to places to which people want to travel regularly. To account for these omitted variables, Table 4 presents estimates that add census tract dummy variables to the hedonic regression model underlying the results in Table 2 column (3). [3] For comparison, the first column repeats the results from that table.

Contrary to the results without the census tract dummies, the results with them, shown in column (2), suggest that whites pay roughly the same for housing regardless of the racial composition of the neighborhood. Adding the fixed effects also reduces the coefficient on the interaction between nonHispanic black and the fraction of the neighborhood white. This lowers the estimate of the premium to blacks living in neighborhoods that are 80 percent white from roughly 3 percent without fixed effects to 2 percent with their inclusion. The adjusted R^2 is also higher in the regression containing the census tract dummies, suggesting they capture important omitted variables.

Results across geographic areas

To see whether the results vary by population size of the area, Table 4 also reports results for the 50 largest metro areas, all other metro areas, and all non-metro areas for the non-Hispanic white and black households in the sample. Results with and without census tract dummies for the three subsets of the sample are presented in columns (3) through (8). Across the subsamples of metropolitan areas, the results with census tract fixed effects indicate that whites either pay somewhat more for housing in heavily white areas (largest 50 MSA) or about the same rent (smaller MSA or non-metro areas). With and without census tract dummies, the results indicate minimal difference in rents paid by blacks and whites in heavily black areas and that blacks pay a premium in heavily white areas. However, the estimated premium is less for each subsample

[3] Recall that the neighborhood variables in this specification are at the census block group level.

when census tract dummies are included, ranging from 1.5 percent to 2.3 percent. The estimated premium paid by women is about the same in regressions with and without census tract dummies but smaller in the largest MSA than other places.

Another interesting question is whether patterns of racial rent premia are different in areas with the highest and lowest levels of racial segregation. Table 5 reports results based on the dissimilarity indices produced by Glaeser and Vigdor (2001). Two thirds of our sample live in areas covered by their indices. Dissimilarity indices in excess of .6 are considered high for this analysis. In our sample, it varied from .21 to .84 with an interquartile range of .47 to .65. The results indicate that all of the relevant coefficients are about the same in areas with high and low racial segregation in housing and that adding the census tract dummies to the regression model has about the same effect on these coefficients.

Differences in rent premia across metropolitan areas

Many studies of racial premia have been based on samples of modest sizes for one or a few metro areas. An open question is whether the results are typical of the situation throughout the country. In this section, we consider the extent to which the pattern of rent premia paid by black households differs across the largest 50 metropolitan areas and the precision with which the pattern can be estimated with samples of sizes often used. To do so, the hedonic regression including the interaction of the percent of the neighborhood white and the race of the head of the household (identical specification to column (3) in Table 2) with and without census tract dummy variables is estimated separately for each metropolitan area.

Restricting the regressions to individual metropolitan areas led to small sample sizes in some cases. The sample sizes ranged from 322 to 7,463 observations, 7 of 50 had less than 1,000, and the median was about 1,900. Much larger samples for each area would surely lead to a narrower range of parameter estimates.

The first row under each variable in Table 6 summarizes the results from regressions without census tract fixed effects and the second row from regressions with them. Each row contains the mean of the estimated coefficients across metro areas, their standard deviation, minimum, and maximum, the number of coefficients that were positive and statistically significant at the 10 percent level, and number of coefficients that were negative and statistically significant at this level.[4] Broadly speaking, the means of the estimated coefficients across areas are similar to the coefficients reported in the third and fourth columns of Table 4 based on the

[4] Results for each of the 50 areas are available from the authors.

combined sample from these areas. However, the variation in the estimated coefficients across areas as judged by their range and their standard deviation relative to their mean is enormous, and most are not statistically significant at the 10 percent level. In our view, the small sample sizes have led to estimated differences across areas much greater than the real differences. Bayer et al.'s (2017) enormous samples surely accounts for the modest range of estimated black price premia across their four metro areas ranging from 1.6 percent in Los Angeles to 3.4 percent in Chicago. They were able to estimate the premia with considerable precision in each area.

5. Conclusion

This paper exploits an unusually rich data set covering all areas in the U.S. to estimate how racial differences in the rents paid for identical housing in the same neighborhood vary with neighborhood racial composition. Besides rents and demographic characteristics of the renter, the data contain detailed information about the features of the housing unit and its neighborhood, including the census block group of each unit. This data set is particularly well suited to revisiting an issue that has been studied for more than fifty years. It yields the first highly credible evidence on patterns of racial rent differences in recent times.

To estimate the racial rent gap, we use simple hedonic models. The results of regressions without census tract dummy variables indicate that blacks pay almost no premium in heavily black areas and the premium rises to about 3.6 percent in heavily white areas. When census tract dummy variables are included to account for unobserved neighborhood and housing characteristics, the fit is much better but the general pattern is the same. As before, the premium is negligible in heavily black areas and about 2.4 percent in areas with the highest fraction white. Finally, the patterns of racial rent premia are very similar in large metro areas, other metro areas, and non-metro areas and in areas with the highest and lowest levels of racial segregation in housing.

Our results for racial rent premia are remarkably similar to Ihlanfeldt and Mayock's (2009) and Bayer et al.'s (2017) highly credible evidence on racial sales price premia. Bayer et al. argue that the premium in sales prices paid for houses by blacks will reduce their home ownership rate and affect their locational choice. Our finding of a similar premium in the rental housing market implies blacks do not have the incentive to move into the rental sector to avoid the racial premium in the owner occupied market. We show that blacks face roughly the same premium in the rental housing market. Hence, the overrepresentation of blacks in rental housing

is not expected to be driven by substitution effects. Instead, those differences will operate mainly through income effects.

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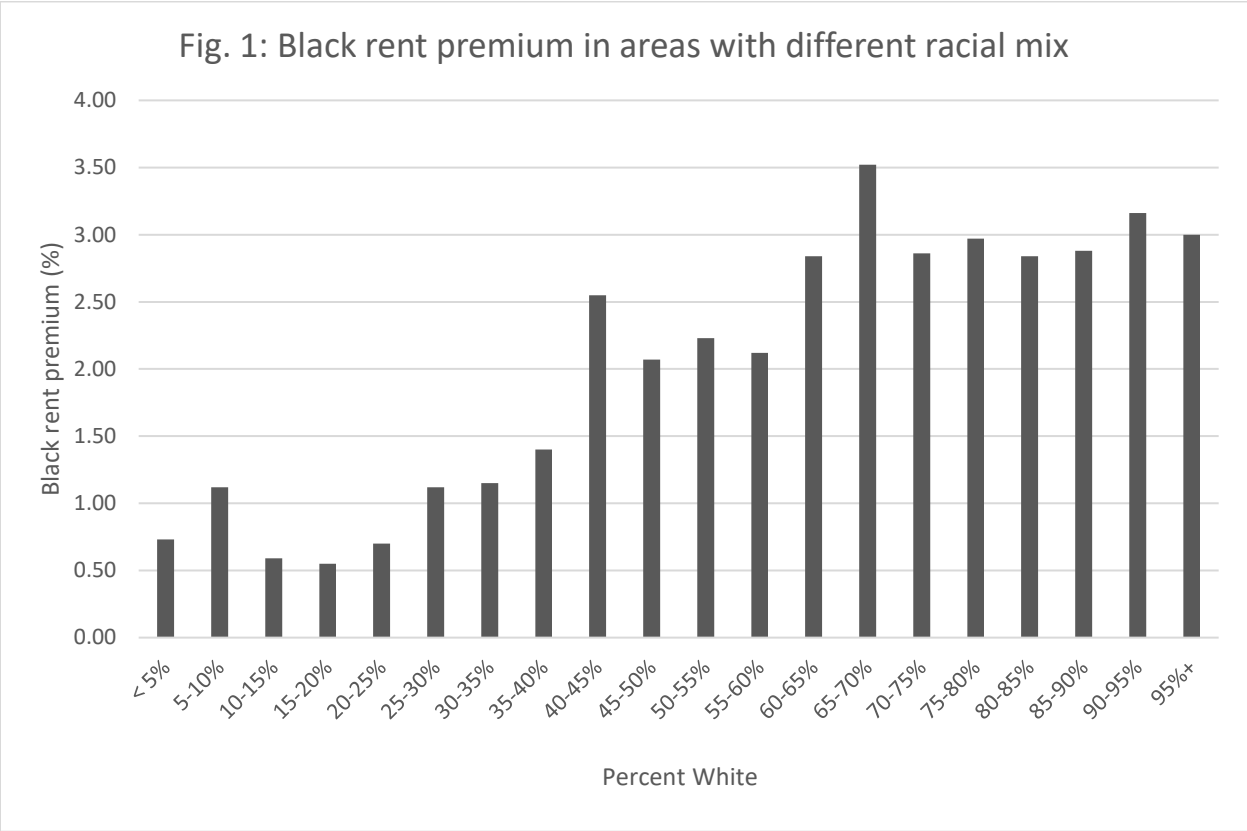
Fig. 1: Black rent premium in areas with different racial mix
Black rent premium (%)
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
<5%
5-10%
10-15%
15-20%
20-25%
25-30%
30-35%
35-40%
40-45%
45-50%
50-55%
55-60%
60-65%
65-70%
70-75%
75-80%
80-85%
85-90%
90-95%
95%+
Percent White

Appendix A. Recent Evidence on Racial Premia in Sales Prices

Recent studies have established convincingly that blacks pay slightly higher sales prices for identical units in the same neighborhood.

Ihlanfeldt and Mayock (2009) use two approaches to estimate racial premia based on almost 200,000 home sales in Florida metro areas between 2003 and 2006. Their initial analysis used the traditional approach with a modest set of important housing and neighborhood characteristics supplemented by two additional explanatory variables to account for unobserved characteristics, namely, the unit's assessed value and its census block group. Without the supplementary variables, the hedonic results indicated that blacks paid 6.2 to 12.1 percent less for similar housing in neighborhoods with various racial mixes. Adding assessed value to the hedonic regression greatly improved its fit and reduced the estimated black discount to low levels (0.8 percent in areas with few blacks, 1.0 percent in mixed areas, and 2.5 percent in areas with many blacks). Their preferred specification that included assessed value and replaced neighborhood characteristics and metro dummy variables with dummy variables for census block groups yielded about the same fit but smaller black discounts (0.5 percent, 0.8 percent, 2.0 percent). These results provide strong evidence that previous estimates of the black premium were biased downwards by the omission of housing and neighborhood characteristics. Because the racial premia are estimated with considerable precision, these results suggest that the difference in the sales prices paid by blacks and whites for identical housing in the same neighborhood is almost surely small in neighborhoods with any racial mix.

The implausibility of the estimated black discounts led Ihlanfeldt and Mayock (2009) to use a second approach developed by Harding, Rosenthal, and Sirmans (2003). This approach adds the characteristics of buyers and sellers to the hedonic equation to help capture the unobserved characteristics of the housing and its neighborhood. Its effectiveness depends on the importance of the observed household characteristics in explaining unobserved housing and neighborhood characteristics and the number of interracial sales. In their own study, Harding, Rosenthal, and Sirmans (2003) had excellent data on household characteristics but too few observations on interracial sales to estimate the racial price difference with much precision. Although Ihlanfeldt and Mayock (2009) had few household characteristics (specifically, age and marital status of the household head and whether the head is a single woman), these together with many more interracial sales and the same explanatory variables that explained so much of the variation in sales price in the preceding analysis enabled them to produce more precise estimates of racial premia. Their preferred results indicate that blacks pay about 1 percent more

than whites for identical housing in the same neighborhood. When they allow the black premium to be different in different types of neighborhood, they find (with minor exceptions) that blacks pay a premium in all neighborhoods, it is small in all cases, and it is smallest in heavily black areas.

More recently, Bayer et al. (2017) assembled a data set that is particularly well suited to estimating racial premia in home sales. It covered about two million sales of houses that sold at least twice in four of the largest areas in the U.S.– the Chicago metro area and the Maryland counties in the Washington and Baltimore metro areas (1997-2007) and the Los Angeles and San Francisco metro areas (1990-2007). To construct it, the authors merged proprietary data on housing transactions from DataQuick with demographic and economic data in the public-use Home Mortgage Disclosure Act (HMDA) data. The merged data set enables them to estimate racial premia without the inclusion of any specific housing characteristics. They use housing unit and neighborhood-by-time fixed effects to control for the characteristics of the dwelling unit and its neighborhood and changes in the relative desirability of different locations within a metro area over time. Beyond the first sale of a house, they know the characteristics of the seller as well as the buyer. Estimation of racial premia is based on changes in the race of the owner of specific dwelling units. With roughly two million observations, their data contain many transactions where the race of the owner changed. This enables them to estimate how the sales price depends on the race of the seller as well as the buyer and hence test whether the initial owner's aversion to dealing with people of other races plays a role in the premia paid by people of particular races.

Bayer et al. (2017) find that black buyers pay sales prices about 2 percent more for equally good houses in the same location. The differences across areas are modest ranging from 1.6 percent in Los Angeles to 3.4 percent in Chicago. In specifications that allow the premium to vary with the racial composition of the census tract, they find that the black premium is greater in heavily white areas – 2.9 percent in census tracts where the percentage white exceeds 80 percent. Contrary to the view that the higher sales prices paid by blacks reflect the aversion of white sellers (though not necessarily white brokers) to deal with them, they find that the premium paid by black buyers is greater when the seller is black than when the seller is white.

Appendix B. Housing Voucher Programs

This appendix describes the main features of the tenant-based housing voucher programs in operation at the time of our data. Units occupied by voucher recipients had to meet certain minimum standards, and most voucher recipients participated in programs that had a ceiling on the rent paid to the landlord and hence an upper limit on the desirability of the housing that could be occupied under the program. Most families in the housing voucher programs paid 30 percent of their adjusted income toward rent if they occupied units with rents at or below a payment standard set by the local public housing authority (PHA). As a result, except for search cost, these recipients had every incentive to occupy units renting for at least the payment standard. Program rules allow the PHA to set the payment standard at between 90 and 110 percent of the applicable HUD Fair Market Rent (FMR) in the locality. Separate FMRs are established for units with each number of bedrooms in each metropolitan area and each non-metro county. In most metro areas, they were estimates of the fortieth percentile of gross rents of newly occupied units with a particular number of bedrooms that were not new (at least three years old) and met certain minimum standards. Under the primary program in operation at the time of our data, participants had the option of occupying units that rented for more than the payment standard, but had to pay any amount above the payment standard from their own resources. However, the tenant's contribution could not exceed 40 percent of adjusted income. This effectively limited voucher recipients to units renting for less than the applicable payment standard plus 10 percent of their adjusted income. These limits precluded most units in the upper half of the rent distribution.

The restrictions preventing households in the program from occupying low quality housing or from occupying units renting for substantially more than the area median, result in the average unit occupied by a voucher recipient being similar to the average unsubsidized rental unit in terms of its overall desirability. On average, voucher units rent for amounts about equal to the program's applicable Fair Market Rent (FMR) (Leger and Kennedy, 1990, p. 28), the average two-bedroom FMR in April 2000 was $625 a month, and the median gross rent of all two-bedroom rental units in this year was $620 a month. Mast (2009, Exhibit 7) reports that the mean values of the answers to two broad questions about the desirability of the housing and its neighborhood are virtually identical for voucher recipients and other renters in the 2001 National AHS. The mean values of Mast's two measures for rental units are 25 and 35% of one standard deviation below the means of these measures for all units (U.S. Census Bureau, 2002, Tables 2–7 and 2–8). Voucher recipients are also widely dispersed. More than 80% of all census tracts in the 50 largest metropolitan areas have at least one voucher recipient (Devine et al., 2003, p. 10).

Appendix C. School Quality Measures

The quality of local schools is of importance to parents with school aged children. Hence, access to better quality schools should be a positive attribute of a rental unit that increases its value. In most jurisdictions, the location of the rental unit determines the school available to residents of the unit. Unfortunately, the CSS data do not contain enough information to perfectly identify the school occupants can attend. Ellen and Horn (2011), in their work proposing a metric of school quality, conclude that the nearest elementary school is a reasonable estimate of the school residents are assigned and the quality of the nearest elementary school is the proxy used for education quality in this study. Since the CSS does not identify the exact address, the lowest level of geography reported (census block group) is used to identify the closest school. The US Census Bureau provides the population centroid of each block group[5] and the nearest elementary school to the population center is used as a proxy for the school assigned to each unit in the block group.

The Common Core of Data (CCD), collected by the U.S. Department of Education's National Center for Education Statistics, provides the Latitude and Longitude for each school as well as the racial and ethnic composition of the school, fraction of students eligible for free or reduced lunches, and the pupil to teacher ratio. These data are linked to each block group by determining the closest elementary school, defined as a school with a grade between kindergarten and sixth grade, in the CCD that was located in the same state as the rental unit.[6] The CCD also provides a code that uniquely identifies each school. That code is used to link 2003 and 2004 data from No Child Left Behind (NCLB) state level assessments.

In the NCLB data, states report information on assessment of student's knowledge of mathematics and reading.[7] However, states are not consistent in the tests administered, what determines proficiency, or what grade levels are assessed. If reported for the entire school, the average of the percent of students who scored at a proficient level or above on an assessment of their abilities in mathematics and at a proficient level or above in reading is used. When information on the entire school is not reported, the average level of proficiency across all

[5] The Latitude and Longitude of the population center of each block group are reported on the Census website: http://www.census.gov/geo/reference/centersofpop2000.html.

[6] For the population of each block group, the closest 20 schools were identified and the closest within the state was found. If none of the 20 schools were in the same state as the rental unit, no school information was recorded for that observation. Missing data are handled using a missing value indicator as described in equation 1.

[7] Some states reported no data in 2003 or in 2004. For 2003, no data are available for AL, AR, CO, ME, NE, NH, and WV. For 2004, only AL, NE, and NH do not report assessment results. In both years, VT provides values for the percent of students who meet their proficiency standards that exceed 100 percent for all schools and are considered missing. Missing data are handled using a missing value indicator as described in equation 1.

elementary grades reported is used as a proxy for the entire school. Because of the variation across states, state dummies are included and the level of proficiency in each state is normed to have a mean of zero and standard deviation of 1. The normalizations of these measures are calculated using means and standard deviations across all elementary schools in the state that reported those data.

Table 1. Variables used in the hedonic regressions, their definitions, and summary statistics

Variable	Definition	All races/ethnicities		Non-Hispanic Whites and African Americans	
		Mean	Std. Dev.	Mean	Std. Dev.
Dependent Variable [1]					
Gross Rent	Gross rent (contract rent to owner + utility allowance)	606.17	239.25	591.15	228.07
LNRENT	Log of gross rent (contract rent to owner + utility allowance)	6.34	0.36	6.32	0.35
Racial and ethnic composition of the household [1]					
NONH-BLACK	Household head is non-Hispanic, African American	0.30	0.46	0.34	0.47
NONH-OTHER	Household head is non-Hispanic, not African American & not white	0.02	0.15	0.00	0.00
HISP-WHITE	Household head is Hispanic and white	0.10	0.29	0.00	0.00
HISP-BLACK	Household head is Hispanic and African American	0.00	0.07	0.00	0.00
HISP-OTHER	Household head is non-Hispanic, not African American & not white	0.00	0.04	0.00	0.00
FEMALE	Female headed household	0.83	0.38	0.83	0.37
NONH-BLACK*FEMALE	Interaction of NONH-BLACK and FEMALE	0.27	0.45	0.31	0.46
Racial composition of the neighborhood and interaction terms					
FRAC-WHITE	Fraction of the neighborhood White	0.70	0.29	0.71	0.30
FRAC-WHITE*BLACK	Fraction of the neighborhood white*BLACK	0.13	0.26	0.15	0.27
MAJORITY-WHITE	Fraction of the neighborhood white > .50 & < .80	0.25	0.43	0.23	0.42
MOSTLY-WHITE	Fraction of the neighborhood white > .80	0.51	0.50	0.55	0.50
MAJORITY-WH*BLACK	MAJORITY-WHITE*BLACK	0.09	0.28	0.10	0.30
MOSTLY-WH*BLACK	MOSTLY-WHITE*BLACK	0.05	0.21	0.05	0.22
Unit Characteristics					
Bedrooms [1]					
BDRMS1	unit has 1 bedroom	0.28	0.45	0.29	0.46
BDRMS2	unit has 2 bedrooms	0.40	0.49	0.40	0.49
BDRMS3	unit has 3 or more bedrooms	0.30	0.46	0.29	0.45
BDRMS4P	number of bedrooms - 3, if number of bedrooms > 3	0.04	0.23	0.04	0.23
Units in the structure					
UNITS1	single-family detached housing unit	0.36	0.48	0.36	0.48
UNITS4-8	four to eight units in building	0.13	0.34	0.13	0.34
UNITS8P	eight or more units in building	0.25	0.43	0.24	0.43
Length of time in the unit					
LT1YR	lived in the unit less than 1 year	0.27	0.44	0.27	0.44
Kitchens and bathrooms					
STOVE	all stove burners work	0.97	0.17	0.97	0.17
OVEN	working oven	0.93	0.26	0.93	0.26
REFRIG	refrigerator keeps food cold enough that food does not spoil	0.96	0.20	0.96	0.20
WATER1	tap water has a problem with color or odor	0.10	0.30	0.10	0.30
WATER2	tap water sometimes has a problem with color or odor	0.09	0.29	0.09	0.29
KLIGHT	kitchen has a working light fixture	0.96	0.19	0.97	0.17
KOUT1	one working outlet in the kitchen	0.06	0.23	0.05	0.22
KOUT2	two or more working outlets in the kitchen	0.92	0.28	0.92	0.27
HOTCOLD	hot and cold running water in kitchen and bathroom, tub, shower, and sink	0.98	0.15	0.98	0.15
WLEAK	water is leaking from any kitchen or bathroom sink, pipe, or drain	0.15	0.35	0.15	0.35
CLOG1	any kitchen or bathroom sink, pipe, or drain is clogged	0.04	0.19	0.03	0.18
CLOG2	any kitchen or bathroom sink, pipe, or drain is slow	0.35	0.48	0.35	0.48
BATHVENT	bathroom has either a window that opens or a ventilation system that works	0.91	0.28	0.91	0.28
TOILETS	all toilets are working	0.97	0.17	0.97	0.17
BADTOILET13	in the last three months, toilets did not work for more than 6 hours at least once, but fewer than 4 times	0.09	0.28	0.09	0.28
BADTOILET4P	in the last three months, toilets did not work for more than 6 hours more than 3 times	0.02	0.15	0.02	0.15
WETFLOOR	bathroom floor was covered by water due to plumbing problem	0.13	0.33	0.13	0.34

Table 1. Variables used in the hedonic regressions, their definitions, and summary statistics

		All races/ethnicities		Non-Hispanic Whites and African Americans	
Variable	Definition	Mean	Std. Dev.	Mean	Std. Dev.
Electrical wiring					
ENCLOSED	all wiring enclosed in walls or metal coverings	0.94	0.24	0.94	0.23
COVERS	all outlets and switches have cover plates	0.94	0.25	0.94	0.24
OUTLETS	each room has at least one working outlet (excluding the bathroom)	0.98	0.15	0.98	0.14
FIXWORK	all ceiling and wall mounted light fixtures work	0.93	0.25	0.93	0.25
NOFIX	no ceiling or wall mounted light fixtures	0.01	0.10	0.01	0.10
BLOWN13	fuses blown or circuits tripped 1 to 3 times in last three months	0.15	0.36	0.16	0.36
BLOWN4P	fuses blown or circuits tripped 4 or more times in last three months	0.04	0.19	0.04	0.19
Heating and cooling					
HEATOK	heating system provides enough heat in every room	0.79	0.41	0.79	0.41
HEATDN	do not know whether heating system provides enough heat in every room	0.05	0.21	0.04	0.20
OVENHEAT1	use oven to heat the unit	0.09	0.28	0.09	0.28
OVENHEAT2	sometimes use oven to heat the unit	0.08	0.27	0.08	0.27
NOAC	no air conditioning	0.36	0.48	0.35	0.48
BADAC	air conditioning is not working	0.07	0.25	0.06	0.24
ADJHEAT1	can adjust heat when too hot or too cold	0.85	0.36	0.86	0.35
ADJHEAT2	can partially adjust heat when too hot or too cold	0.05	0.22	0.05	0.22
NOWINTER	did not live in the unit last winter	0.13	0.34	0.13	0.34
HEATOFF13	lived in the unit last winter and heating broke down for more than 6 hours at least once, but fewer than 4 times	0.09	0.28	0.09	0.28
HEATOFF4P	lived in the unit last winter and heating broke down for more than 6 hours	0.02	0.12	0.02	0.12
COLDHOME	lived in the unit last winter and unit was cold for more than 24 hours	0.11	0.31	0.11	0.31
Sanitation and safety					
RATS	observed rats in the building or outside around the grounds	0.08	0.27	0.07	0.26
ROACHES	observed many cockroaches in the unit this week	0.13	0.33	0.12	0.33
SMELL1	bad odor (sewer, natural gas, etc.) is present in the unit	0.04	0.20	0.04	0.20
SMELL2	bad odor (sewer, natural gas, etc.) is sometimes present in the unit	0.09	0.29	0.09	0.29
LOCKS	all doors have working locks	0.93	0.26	0.93	0.26
WINLOCK	all windows have locks that work	0.88	0.32	0.88	0.32
BWINDOW	all bedrooms have a window that can open	0.92	0.28	0.92	0.28
MAILGONE	mail has been stolen	0.06	0.25	0.06	0.25
DETECTOR	working smoke detector exists	0.93	0.25	0.94	0.24
DETECTORDK	do not know if a working smoke detector exists	0.02	0.14	0.02	0.14
EXITS	at least two exits out of the unit to be used in case of a fire	0.93	0.25	0.93	0.25
GARBAGE	weekly garbage pickup	0.94	0.23	0.94	0.23
DUMPSTER	covered dumpsters or cans for garbage and trash	0.87	0.34	0.87	0.34
Dwelling quality					
RAIN	holes or cracks allow outdoor air or rain to enter unit	0.12	0.33	0.13	0.33
CHIPPING	paint is easily chipped or peeled	0.17	0.37	0.17	0.37
PEELING	large areas of peeling paint or broken plaster	0.05	0.22	0.05	0.22
WALLSBAD	walls, ceilings, or floors with serious problems	0.13	0.34	0.13	0.34
MILDEW	mildew, mold, or water damage on any wall, floor, or ceiling	0.19	0.39	0.19	0.39
FLOORMISS	flooring material missing, curled, or loose	0.18	0.39	0.19	0.39
TRIP	floor problems can cause you to trip	0.07	0.26	0.07	0.26
BADRAILS	secure handrails are not present on all stairs and landings in the unit	0.08	0.27	0.08	0.26
BADRAILSNA	handrails in unit does not apply	0.32	0.47	0.31	0.46
BROKENW	any window with broken glass	0.05	0.21	0.05	0.21
BADPORCH	dangerous porch or balcony	0.06	0.24	0.06	0.25
BADPORCHNA	porch or balcony condition not applicable	0.18	0.38	0.17	0.38
BADSTEPS	unsafe handrails, steps, or stairs outside unit	0.08	0.27	0.08	0.28
BADSTEPSNA	condition of handrails, steps, or stairs outside unit not applicable	0.18	0.38	0.18	0.38
SIDEWALK	sidewalk, driveway, or parking lot damaged	0.11	0.31	0.11	0.31
NOLIGHT	not enough exterior light for safety	0.13	0.33	0.13	0.33

Table 1. Variables used in the hedonic regressions, their definitions, and summary statistics

		All races/ethnicities		Non-Hispanic Whites and African Americans	
Variable	Definition	Mean	Std. Dev.	Mean	Std. Dev.
BADFENCE	problems with the fences or gates in bad repair	0.07	0.25	0.07	0.25
NOFENCE	no fence	0.43	0.49	0.44	0.50
EXWALLS	exterior walls have serious problems	0.05	0.22	0.05	0.22
BADROOF	roof sagging, holes, or missing roofing	0.05	0.22	0.05	0.22
ROOFDK	cannot see roof	0.19	0.39	0.19	0.39
SAFEYARD	agree or strongly agree that yards, playgrounds, and off-street parking are safe	0.69	0.46	0.69	0.46
UNSAFEYARD	disagree or strongly disagree that yards, playgrounds, and off-street parking are safe	0.17	0.37	0.16	0.37
OUT-SAME	lived in unit for one year and condition of building same as a year ago	0.40	0.49	0.40	0.49
OUT-WORSE	lived in unit for one year and condition of building worse than a year ago	0.05	0.23	0.06	0.23
SUPER-SAME	lived in unit for one year and landlord's supervision of vacant units is the same as a year ago	0.46	0.50	0.46	0.50
SUPER-WORSE	lived in unit for one year and landlord's supervision of vacant units is worse than a year ago	0.02	0.15	0.02	0.15
REPAIR-SAME	lived in unit for one year and repair of problems the same as a year ago	0.44	0.50	0.44	0.50
REPAIR-WORSE	lived in unit for one year and repair of problems is worse than a year ago	0.06	0.23	0.06	0.23
Apartment complex amenities					
LAUNDRY1	live in an apartment complex with a laundry room in working condition	0.34	0.48	0.34	0.47
LAUNDRY2	live in an apartment complex with a non-working laundry room	0.01	0.10	0.01	0.09
PLAYAREA1	live in an apartment complex with a useable play area	0.28	0.45	0.28	0.45
PLAYAREA2	live in an apartment complex with a play area, but it is not usable	0.02	0.15	0.02	0.14
ELEVATOR1	live in an apartment complex with a working elevator	0.06	0.23	0.06	0.23
ELEVATOR2	live in an apartment complex with an elevator, but it is not in working	0.00	0.06	0.00	0.06
Neighborhood quality					
CRIMEOK	crime or drugs not a problem	0.51	0.50	0.51	0.50
CRIMEBAD	crime or drugs big problem	0.08	0.27	0.08	0.27
CRIMEDK	do not know whether crime is a problem	0.20	0.40	0.20	0.40
TRASHOK	trash or junk nearby not a problem	0.70	0.46	0.70	0.46
TRASHBAD	trash or junk nearby big problem	0.06	0.24	0.06	0.24
TRASHDK	do not know whether trash is a problem	0.05	0.22	0.05	0.21
VACANTOK	vacant or run-down homes or stores not a problem	0.76	0.43	0.76	0.43
VACANTBAD	vacant or run-down homes or stores big problem	0.03	0.16	0.03	0.16
VACANTDK	do not know whether vacant or run-down buildings are a problem	0.08	0.27	0.07	0.26
NBHDGRT	scale from 1-10 (10 being best) rated neighborhood 9 or 10	0.37	0.48	0.37	0.48
NBHDOK	scale from 1-10 (10 being best) rated neighborhood 6 - 8	0.40	0.49	0.40	0.49
General opinion of home (rental unit) as a place to live					
HOMEGRT	scale from 1-10 (10 being best) rated home as a place to live 9 or 10	0.43	0.49	0.43	0.49
HOMEOK	scale from 1-10 (10 being best) rated home as a place to live 6 - 8	0.35	0.48	0.36	0.48
Contract conditions					
CHILDREN	number of children in the unit	1.08	1.30	1.03	1.28
CROWDED[1]	number of persons in the unit divided by 1 + number of bedrooms	0.75	0.35	0.73	0.34

Table 1. Variables used in the hedonic regressions, their definitions, and summary statistics

Variable	Definition	All races/ethnicities		Non-Hispanic Whites and African Americans	
		Mean	Std. Dev.	Mean	Std. Dev.
Census variables - Block Group Level [2]					
BLT95_98	Structure built 1995 to 1998	0.05	0.08	0.05	0.08
BLT90_94	Structure built 1990 to 1994	0.05	0.06	0.05	0.06
BLT80_89	Structure built 1980 to 1989	0.12	0.12	0.12	0.11
BLT70_79	Structure built 1970 to 1979	0.18	0.13	0.18	0.13
BLT60_69	Structure built 1960 to 1969	0.14	0.10	0.14	0.10
BLT50_59	Structure built 1950 to 1959	0.13	0.11	0.13	0.11
BLT40_49	Structure built 1940 to 1949	0.09	0.08	0.09	0.08
BLT39	Structure built 1939 or earlier	0.22	0.22	0.22	0.23
TRAVELTIME	Average travel time to work (minutes)	22.51	6.85	22.37	6.83
POVRATE	Poverty rate in 1999	18.69	12.37	18.34	12.22
MEDINC	Median household income in 1999, 1000s	32.95	12.93	32.88	12.81
DENSITY	Population density, 1000s per square kilometer	2.10	3.49	1.83	2.80
VR_RENTAL	Vacancy rate, rental units	7.68	7.25	7.81	7.24
%HISP	Percent of the population Hispanic	12.26	19.93	8.45	14.12
%FORBORN	Percent of the population foreign born	9.17	12.57	7.49	10.63
%MIGRANT	Percent of the population that moved to MSA in last 5 years	17.56	11.52	17.33	11.56
%BAPLUS	Percent of the population with a BA degree or more	16.41	12.30	16.53	12.30
%MAPLUS	Percent of the population with more than a BA degree	5.66	5.75	5.70	5.77
UR_RATE	Unemployment rate	7.71	5.90	7.55	5.84
LFPR	Labor force participation rate	61.91	10.45	62.08	10.44
RURAL	Rural area	12.12	29.33	13.22	30.49
OWNEROCC	Percent of units owner occupied	52.59	22.66	53.42	22.37
FAMILIES	Percent of units occupied by families	63.87	13.93	63.30	13.70
Measures of school quality [3]					
STUDENTTEACHER	Student to teacher ratio	14.36	5.48	14.24	5.46
MATH_PROF	Percent of students in local school proficient or above in mathematics in 2003	58.96	22.56	59.52	22.48
READ_PROF	Percent of students in local school proficient or above in reading in 2003	61.44	21.84	62.20	21.36
AV_MATH_READ	Average of MATH_PROF and READ_PROF normalized to mean 0 and standard deviation = 1 for each state	-0.14	0.77	-0.13	0.76
Year Dummies					
YEAR2001	observation from 2001	0.36	0.48	0.36	0.48
YEAR2002	observation from 2002	0.26	0.44	0.27	0.44

Notes:

[1] From Form HUD-50058, Family Report

[2] From the 2000 Decennial Census.

[3] From Common Core of Data or No Child Left Behind data

All other data from HUD Customer Satisfaction Survey "Tell us About Your Home."

Unless otherwise noted, all variables are coded 1 if the condition exists, 0 otherwise.

Table 2. Results from hedonic regressions

	(1)	(2)	(3)	(4)
	b/(se)	b/(se)	b/(se)	b/(se)
NONH-BLACK	0.0247***	0.0267***	0.0051	0.0171***
	(0.0008)	(0.0018)	(0.0027)	(0.0021)
NONH-OTHER	-0.0002			
	(0.0018)			
HISP-WHITE	0.0049***			
	(0.0011)			
HISP-BLACK	0.0091*			
	(0.0036)			
HISP-OTHER	0.0020			
	(0.0057)			
FEMALE	0.0201***	0.0207***	0.0207***	0.0207***
	(0.0007)	(0.0008)	(0.0008)	(0.0008)
FRAC-WHITE	-0.0362***	-0.0379***	-0.0591***	-0.0498***
	(0.0016)	(0.0017)	(0.0026)	(0.0022)
NONH-BLACK*FEMALE		-0.0025	-0.0022	-0.0023
		(0.0018)	(0.0018)	(0.0018)
FRAC-WHITE*BLACK			0.0308***	
			(0.0029)	
MAJORITY-WH*BLACK				0.0117***
				(0.0013)
MOSTLY-WH*BLACK				0.0121***
				(0.0018)
R^2	0.811	0.804	0.804	0.804
Adj-R^2	0.811	0.803	0.803	0.803
N	414,771	363,240	363,240	363,240

(1) All observations, all races and ethnicities included, no interaction terms.
(2) Restricted to nonHispanic whites and blacks, interaction between black and female.
(3) Restricted to nonHispanic whites and blacks, interactions between black and female and between fraction of neighborhood white and black.
(4) Restricted to nonHispanic whites and blacks, interactions between black and female and between discrete measure of fraction of neighborhood white and black.
***, **, and * indicate significance at the .01, .05, and .10 levels respectively.

Table 3. Distribution of sample by racial mix of census block group

Percent of households in census block group that are white	Number of observations	
	Non-Hispanic Black	Non-Hispanic White
0 - 10 percent	23,042	792
10 - 20 percent	11,836	1,052
20 - 30 percent	11,496	1,689
30 - 40 percent	11,832	3,364
40 - 50 percent	11,988	5,468
50 - 60 percent	11,842	8,577
60 - 70 percent	11,795	14,159
70 - 80 percent	12,249	23,923
80 - 90 percent	11,161	46,751
90 - 100 percent	7,241	132,983

Table 4. Results for all areas and by MSA population with and without census tract fixed effects

	All areas		Largest 50 MSA		Smaller MSA		Nonmetro areas	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Table 2(3)	Table 2(3) CT FE	No CT FE	CT FE	No CT FE	CT FE	No CT FE	CT FE
	b/(se)	b/(se)	b/(se)	b/(se)	b/(se)	b/(se)	b/(se)	b/(se)
NONH-BLACK	0.0051	0.0061*	-0.0069	0.0015	0.0087*	0.0093*	0.0053	0.0055
	(0.0027)	(0.0027)	(0.0046)	(0.0047)	(0.0040)	(0.0042)	(0.0060)	(0.0059)
FEMALE	0.0207***	0.0191***	0.0141***	0.0119***	0.0238***	0.0222***	0.0220***	0.0199***
	(0.0008)	(0.0007)	(0.0018)	(0.0016)	(0.0012)	(0.0012)	(0.0013)	(0.0011)
NONH-BLACK*FEMALE	-0.0022	-0.0025	0.0037	0.0021	-0.0009	-0.0026	-0.0166***	-0.0095**
	(0.0018)	(0.0016)	(0.0032)	(0.0029)	(0.0027)	(0.0025)	(0.0039)	(0.0034)
FRAC-WHITE*NONH-BLACK	0.0308***	0.0179***	0.0376***	0.0185**	0.0249***	0.0150**	0.0410***	0.0216***
	(0.0029)	(0.0032)	(0.0051)	(0.0058)	(0.0043)	(0.0048)	(0.0060)	(0.0065)
FRAC-WHITE	-0.0591***	0.0028	-0.0756***	0.0215**	-0.0398***	-0.0092	-0.0508***	0.0047
	(0.0026)	(0.0040)	(0.0046)	(0.0079)	(0.0040)	(0.0061)	(0.0052)	(0.0073)
Premium at 80 percent white	2.98%	2.04%	2.34%	1.54%	2.90%	2.10%	3.78%	2.36%
R^2	0.804	0.873	0.741	0.846	0.763	0.830	0.658	0.777
Adj-R^2	0.803	0.857	0.740	0.820	0.762	0.810	0.658	0.757
N	363,240	363,240	105,559	105,559	142,013	142,013	115,668	115,668

Notes: ***, **, and * indicate significance at the .01, .05, and .10 levels respectively.

(1) Results from Table 2, column (3). Included for comparison.

(2) Results from estimates of a regression identical to Table 2, column (3) with census tract fixed effects.

(3) Sample restricted to the 50 most populated MSAs, without census tract fixed effects.

(4) Sample restricted to the 50 most populated MSAs, with census tract fixed effects.

(5) Sample restricted to MSAs that are not one of the 50 most populated MSAs, without census tract fixed effects.

(6) Sample restricted to MSAs that are not one of the 50 most populated MSAs, with census tract fixed effects.

(7) Sample restricted to nonmetro areas, without census tract fixed effects.

(8) Sample restricted to nonmetro areas, with census tract fixed effects.

Premium at 80 percent white is the estimated premium in black rents in neighborhoods with 80 percent of the population white.

Table 5. Results for areas with different levels of racial segregation with and without census tract fixed effects

	All areas		Observations with segregation data		High levels of segregation		Low levels of segregation	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Table 2(3)	Table 2(3) CT FE	No CT FE	CT FE	No CT FE	CT FE	No CT FE	CT FE
	b/(se)	b/(se)	b/(se)	b/(se)	b/(se)	b/(se)	b/(se)	b/(se)
NONH-BLACK	0.0051	0.0061*	0.0021	0.0060	0.0038	0.0069	-0.0006	0.0049
	(0.0027)	(0.0027)	(0.0030)	(0.0031)	(0.0049)	(0.0049)	(0.0039)	(0.0040)
FEMALE	0.0207***	0.0191***	0.0200***	0.0185***	0.0189***	0.0163***	0.0208***	0.0196***
	(0.0008)	(0.0007)	(0.0011)	(0.0010)	(0.0017)	(0.0016)	(0.0013)	(0.0013)
NONH-BLACK*FEMALE	-0.0022	-0.0025	0.0010	-0.0011	-0.0028	-0.0008	0.0042	-0.0011
	(0.0018)	(0.0016)	(0.0021)	(0.0019)	(0.0033)	(0.0030)	(0.0026)	(0.0025)
FRAC-WHITE*NONH-BLACK	0.0308***	0.0179***	0.0309***	0.0174***	0.0314***	0.0144*	0.0310***	0.0186***
	(0.0029)	(0.0032)	(0.0033)	(0.0037)	(0.0051)	(0.0057)	(0.0043)	(0.0049)
FRAC-WHITE	-0.0591***	0.0028	-0.0612***	0.0011	-0.0531***	-0.0054	-0.0727***	0.0016
	(0.0026)	(0.0040)	(0.0030)	(0.0048)	(0.0047)	(0.0076)	(0.0041)	(0.0063)
Premium at 80 percent white	2.97%	2.04%	2.68%	1.99%	2.89%	1.84%	2.42%	1.98%
R^2	0.804	0.873	0.780	0.857	0.789	0.868	0.770	0.846
Adj-R^2	0.803	0.857	0.779	0.837	0.788	0.849	0.769	0.824
N	363,240	363,240	242,208	242,208	98,526	98,526	143,682	143,682

Notes: ***, **, and * indicate significance at the .01, .05, and .10 levels respectively.

The dissimilarity index, a measure of racial segregation, is produced at the MSA level and is reported in Glaeser and Vigdor (2001). Not available for all MSAs in our sample. These data are available at: http://web.archive.org/web/20030622134117/http://trinity.aas.duke.edu:80/~jvigdor/segregation/

(1) Results from Table 2, column (3). Included for comparison.

(2) Results from estimates of a regression identical to Table 2, column (3) with census tract fixed effects. Included for comparison.

(3) Sample restricted to MSAs with data on segregation, without census tract fixed effects.

(4) Sample restricted to MSAs with data on segregation, with census tract fixed effects.

(5) Sample restricted to MSAs with high levels of segregation (dissimilarity index > .6), without census tract fixed effects.

(6) Sample restricted to MSAs with high levels of segregation (dissimilarity index > .6), with census tract fixed effects.

(7) Sample restricted to MSAs with low levels of segregation (dissimilarity index < .6), without census tract fixed effects.

(8) Sample restricted to MSAs with low levels of segregation (dissimilarity index < .6), with census tract fixed effects.

Premium at 80 percent white is the estimated premium in black rents in neighborhoods with 80 percent of the population white.

Table 6. Summary of results for individual metro areas without and with census tract fixed effects

	Mean	SD	Min	Max	Pos & Sig	Neg & Sig
NONH-BLACK						
No CT FE	-0.006	0.069	-0.224	0.161	4	8
With CT FE	0.011	0.053	-0.154	0.152	4	1
FEMALE						
No CT FE	0.011	0.026	-0.102	0.073	11	0
With CT FE	0.013	0.018	-0.048	0.057	9	0
NONH-BLACK*FEMALE						
No CT FE	0.004	0.034	-0.062	0.075	5	2
With CT FE	0.000	0.038	-0.132	0.079	0	2
FRAC-WHITE*NONH-BLACK						
No CT FE	0.033	0.098	-0.251	0.264	12	4
With CT FE	0.007	0.080	-0.217	0.155	5	3
FRAC-WHITE						
No CT FE	-0.040	0.108	-0.404	0.148	2	12
With CT FE	0.033	0.153	-0.28	0.691	5	2

Notes: Results for No CT FE are from regression specification identical to Table 2, column (3). Results for With CT FE are from regression specification that adds census tract dummies. Mean is the mean of the coefficients across the 50 largest metropolitan areas based on population in 2000, SD is the standard deviation of the estimated coefficients, Min is the smallest coefficient, and Max is the largest. Significance is at the .10 level.

Appendix Table A. Results from hedonic regressions under alternative methods for handling missing values

	Model (1)				Model (2)			
	(1)	CCA	Mean	Logit	(2)	CCA	Mean	Logit
	b/(se)	b/(se)	b/se	b/se	b/(se)	b/(se)	b/se	b/se
NONH-BLACK	0.0247***	0.0244***	0.0247***	0.0247***	0.0267***	0.0268***	0.0266***	0.0268***
	(0.0008)	(0.0011)	(0.0008)	(0.0008)	(0.0018)	(0.0025)	(0.0018)	(0.0018)
NONH-OTHER	-0.0002	-0.0028	-0.0002	-0.0002				
	(0.0018)	(0.0025)	(0.0018)	(0.0018)				
HISP-WHITE	0.0049***	0.0047**	0.0048***	0.0048***				
	(0.0011)	(0.0015)	(0.0011)	(0.0011)				
HISP-BLACK	0.0091*	0.0052	0.0090*	0.0090*				
	(0.0036)	(0.0052)	(0.0036)	(0.0036)				
HISP-OTHER	0.0020	0.0071	0.0018	0.0020				
	(0.0057)	(0.0082)	(0.0057)	(0.0057)				
FEMALE	0.0201***	0.0204***	0.0201***	0.0201***	0.0207***	0.0210***	0.0206***	0.0206***
	(0.0007)	(0.0009)	(0.0007)	(0.0007)	(0.0008)	(0.0011)	(0.0008)	(0.0008)
FRAC-WHITE	-0.0362***	-0.0389***	-0.0363***	-0.0359***	-0.0379***	-0.0406***	-0.0380***	-0.0377***
	(0.0016)	(0.0023)	(0.0016)	(0.0016)	(0.0017)	(0.0024)	(0.0017)	(0.0017)
NONH-BLACK*FEMALE					-0.0025	-0.0034	-0.0023	-0.0025
					(0.0018)	(0.0025)	(0.0018)	(0.0018)
R^2	0.811	0.810	0.811	0.811	0.804	0.803	0.803	0.803
Adj-R^2	0.811	0.810	0.810	0.810	0.803	0.803	0.803	0.803
N	414,771	209,775	414,771	414,771	363,240	183,935	363,240	363,240

	Model (3)				Model (4)			
	(3)	CCA	Mean	Logit	(4)	CCA	Mean	Logit
	b/(se)	b/(se)	b/se	b/se	b/(se)	b/(se)	b/se	b/se
NONH-BLACK	0.0051	0.0045	0.0049	0.0051	0.0171***	0.0148***	0.0170***	0.0172***
	(0.0027)	(0.0038)	(0.0027)	(0.0027)	(0.0021)	(0.0030)	(0.0021)	(0.0021)
FEMALE	0.0207***	0.0210***	0.0206***	0.0207***	0.0207***	0.0210***	0.0206***	0.0207***
	(0.0008)	(0.0011)	(0.0008)	(0.0008)	(0.0008)	(0.0011)	(0.0008)	(0.0008)
FRAC-WHITE	-0.0591***	-0.0620***	-0.0592***	-0.0589***	-0.0498***	-0.0551***	-0.0498***	-0.0495***
	(0.0026)	(0.0036)	(0.0026)	(0.0026)	(0.0022)	(0.0031)	(0.0022)	(0.0022)
NONH-BLACK*FEMALE	-0.0022	-0.0030	-0.0020	-0.0022	-0.0023	-0.0031	-0.0022	-0.0024
	(0.0018)	(0.0025)	(0.0018)	(0.0018)	(0.0018)	(0.0025)	(0.0018)	(0.0018)
FRAC-WHITE*BLACK	0.0308***	0.0318***	0.0309***	0.0309***				
	(0.0029)	(0.0040)	(0.0029)	(0.0029)				
MAJORITY-WH*BLACK					0.0117***	0.0138***	0.0116***	0.0116***
					(0.0013)	(0.0019)	(0.0013)	(0.0013)
MOSTLY-WH*BLACK					0.0121***	0.0158***	0.0120***	0.0120***
					(0.0018)	(0.0025)	(0.0018)	(0.0018)
R^2	0.804	0.803	0.803	0.804	0.804	0.803	0.803	0.804
Adj-R^2	0.803	0.803	0.803	0.803	0.803	0.803	0.803	0.803
N	363,240	183,935	363,240	363,240	363,240	183,935	363,240	363,240

Model (1): All observations, all races and ethnicities included, no interaction terms.
Model (2): Restricted to nonHispanic whites and blacks, interaction between black and female.
Model (3): Restricted to nonHispanic whites and blacks, interactions between black and female and between fraction of neighborhood white and black.
Model (4): Restricted to nonHispanic whites and blacks, interactions between black and female and between discrete measure of fraction of neighborhood white and black.
To compare to the initial results, the first column within each model is from the corresponding model as presented in Table 2.
CCA: Complete Case Analysis, sample restricted to observations with no missing values.
Mean: Missing values replaced with sample means.
Logit: Logit regressions used to impute missing values. Missing replaced with predicted value. List of explanatory variables include all variables with no missing values.
***, **, and * indicate significance at the .01, .05, and .10 levels respectively.

Appendix Table B. Results from national hedonic inlcuding household income as explanatory variable in hedonic regression

	All races, ethnicities		Blacks and whites, no interactions		Blacks and whites, black interacted with fraction white		Blacks and whites, black interacted with majority white and mostly white	
	Includes income	Income not included	Includes income	Income not included	Includes income	Income not included	Includes income	Income not included
	b/(se)	b/(se)	b/(se)	b/(se)	b/(se)	b/(se)	b/(se)	b/(se)
NONH-BLACK	0.0242***	0.0247***	0.0262***	0.0267***	0.0047	0.0051	0.0166***	0.0171***
	(0.0008)	(0.0008)	(0.0018)	(0.0018)	(0.0027)	(0.0027)	(0.0021)	(0.0021)
NONH-OTHER	0.0002	-0.0002						
	(0.0019)	(0.0018)						
HISP-WHITE	0.0049***	0.0049***						
	(0.0011)	(0.0011)						
HISP-BLACK	0.0070	0.0091*						
	(0.0037)	(0.0036)						
HISP-OTHER	0.0006	0.002						
	(0.0058)	(0.0057)						
FEMALE	0.0212***	0.0201***	0.0215***	0.0207***	0.0216***	0.0207***	0.0215***	0.0207***
	(0.0007)	(0.0007)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0008)
FRAC-WHITE	-0.0354***	-0.0362***	-0.0371***	-0.0379***	-0.0581***	-0.0591***	-0.0490***	-0.0498***
	(0.0016)	(0.0016)	(0.0017)	(0.0017)	(0.0026)	(0.0026)	(0.0022)	(0.0022)
NONH-BLACK*FEMALE			-0.0026	-0.0025	-0.0023	-0.0022	-0.0024	-0.0023
			(0.0018)	(0.0018)	(0.0018)	(0.0018)	(0.0018)	(0.0018)
FRAC-WHITE*NONH-BLACK					0.0307***	0.0308***		
					(0.0029)	(0.0029)		
MAJORITY-WH*NONH-BLACK							0.0118***	0.0117***
							(0.0014)	(0.0013)
MOSTLY-WH*NONH-BLACK							0.0121***	0.0121***
							(0.0018)	(0.0018)
HOUSEHOLD INCOME (1000s)	0.0026***		0.0027***		0.0027***		0.0027***	
	(0.0000)		(0.0001)		(0.0001)		(0.0001)	
R^2	0.813	0.811	0.806	0.804	0.806	0.804	0.806	0.804
Adj-R^2	0.813	0.810	0.805	0.803	0.805	0.803	0.805	0.803
N	399,062	414,771	349,128	363,240	349,128	363,240	349,128	363,240

Notes: The results not including income as a regressor are idential to those reported in Table 2. ***, **, and * indicate significance at the .01, .05, and .10 levels respectively.