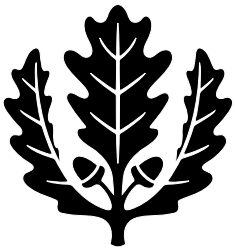

University of Connecticut

Department of Economics Working Paper Series

Now You See it, Now You Don't: Why Do Real Estate Agents Withhold Available Houses from Black Customers?

Jan Ondrich
Syracuse University

Stephen Ross
University of Connecticut

John Yinger
Syracuse University

Working Paper 2001-01

August 2001

341 Mansfield Road, Unit 1063
Storrs, CT 06269–1063
Phone: (860) 486–3022
Fax: (860) 486–4463
http://www.econ.uconn.edu/

Abstract

Potential home buyers may initiate contact with a real estate agent by asking to see a particular advertised house. This paper asks whether an agent's response to such a request depends on the race of the potential buyer or on whether the house is located in an integrated neighborhood. We build on previous research about the causes of discrimination in housing by using data from fair housing audits, a matched-pair technique for comparing the treatment of equllay qualified black and white home buyers. However, we shift the focus from differences in the treatment of paired buyers to agent decisions concerning an individual housing unit using a sample of all houses seen during he 1989 Housing Discrimination study. We estimate a random effect, multinomial logit model to explain a real estate agent's joint decisions concerning whether to show each unit to a black auditor and to a white auditor. We find evidence that agents withhold houses in suburban, integrated neighborhoods from all customers (redlining), that agents' decisions to show houses in integrated neighborhoods are not the same for black and white customers (steering), and that the houses agents show are more likely to deviate from the initial request when the customeris black than when the customer is white. These deviations are consistent with the possibility that agents act upon the belief that some types of transactions are relatively unlikely for black customers (statistical discrimination).

Journal of Economic Literature Classification: D1, D4, J7, R3

Introduction

Many market interactions involving search begin with a complicated request from a customer to an agent. The agent's interpretation of this request may influence his subsequent behavior and hence influence the outcomes of the interaction. Moreover, this interpretation and the resulting behavior may depend on characteristics of the customer, such as race or ethnicity, or on the nature of the request itself. This paper uses data from fair housing audits to study the way real estate agents respond to a customer's initial request for housing, with a focus on the extent to which an agent's responses to a given request depend on the customers' race or on the racial composition of the neighborhood in which the housing is located.

This approach sheds light on both the complexity of housing search and on the form and causes of racial discrimination by real estate agents. We find, not surprisingly, that a customer's initial housing request has a major impact on an agent's subsequent behavior. In addition, we find evidence that requests for housing in integrated areas are not treated the same as those in white areas. We also find that agents do not respond the same way to black and white customers, even when they make identical housing requests. This result is consistent with hypothesis that real estate agents practice statistical discrimination. This entirely new picture of housing market discrimination is uncovered through the use of a new methodology, in which an individual house, not an audit, is the unit of observation.

A fair housing audit compares the treatment of an African-American or Hispanic home seeker with the treatment of an equally qualified white home seeker.[1] Discrimination is defined as unfavorable treatment based solely on a person's membership in a particular group; in a sample of audits, discrimination is systematic unfavorable treatment of minority auditors. Audits conducted as part of the 1989 Housing Discrimination Study (HDS) were based on advertisements randomly selected from a newspaper. In the sales audits, audit teammates began

their visits to a real estate agent by asking about the availability of a house in one of these advertisements. As a result, audit teammates made exactly the same initial request, and it is possible to determine whether agent responses to that request differ by the race or ethnicity of the customer or by the characteristics of the neighborhood in which the advertised unit is located.

This research builds on a large literature concerning the causes of discrimination in housing. Most of this literature uses audit data to study minority-white differences in the number of housing units shown or recommended to an auditor (Page 1995; Roychoudhury and Goodman 1992, 1996; Yinger 1986, 1995) or on discrete agent choices during an audit (Ondrich, Stricker, and Yinger, 1998, 1999). In regressions to test hypotheses about the causes of discrimination, therefore, the dependent variable might be the number of units recommended or shown and the explanatory variables include average characteristics, such as neighborhood racial composition, over the set of available units. These studies therefore test hypotheses related to the characteristics of the advertised unit or to average characteristics of all units seen by either auditor.

The information collected for HDS makes it possible to shift the unit of analysis from an audit to a housing unit. In particular, HDS indicates on the address of every house inspected by each auditor. This information makes it possible to determine which houses are inspected by both auditors, which are inspected only by the white auditor, and which are inspected only by the black or Hispanic auditor, and therefore results in a sample of inspected houses.

This shift in the unit of analysis has three key advantages.[2] First, this shift makes it possible to determine whether a real estate agent's decision to withhold a house from a minority customer depends on the characteristics of that particular house and thereby adds new information for testing existing hypotheses about the causes of discrimination. This information includes whether the house is the one that was advertised in the newspaper and was the basis for

the audit; the physical characteristics of the house, such as the number of bedrooms it contains; and the characteristics of that house's neighborhood, such as its racial composition.

Second, this shift makes it possible to determine whether a real estate agent's response to an initial housing request is different for minority and white customers. The houses in the sample include not only the units initially requested, provided they were shown to at least one auditor, but also other, similar units shown to one or both auditors by the agent. Consequently, we can observe whether housing agents show the same types of additional units to audit teammates, who make exactly the same initial request. In other words, we can discover whether agents' responses to a given initial request depend on the race or ethnicity of the customer.

Third, the shift to a unit-based analysis sheds light on the extent to which real estate agents' tendency to show a house to any customer, black or white, depends on the characteristics of the house or its neighborhood. As a result, we are able to explore hypotheses about real estate agents' marketing behavior, such as whether they practice redlining, defined as withholding from all customers houses located in integrated neighborhoods. No previous study has examined this type of behavior.

This paper is organized as follows. The first two sections describe the Housing Discrimination Study and explain our new approach to studying discrimination in general terms. The third section outlines hypotheses about the causes of discrimination and demonstrates how to test them with audit data. The fourth through sixth sections present our econometric procedure, our data, and our estimation results. The final section summarizes our key findings.

The Housing Discrimination Study

In the Housing Discrimination Study, each audit was conducted by two teammates, a white person and a member of a minority group.[3] To ensure equal qualifications, teammates were matched according to sex and age, given the same training, assigned similar socioeconomic characteristics for the purposes of the audit, and sent to the same real estate agency within a short time of each other. After visiting an agency to inquire about the same advertised unit as well as similar available housing, teammates independently recorded what they were told and how they were treated.

The HDS audits were conducted in 25 metropolitan areas, selected to allow valid estimates of unfavorable treatment in the United States. Black-white audits were conducted in 20 areas and Hispanic-white audits were conducted in 13 areas (with both types of audits in 8 areas) during May through August 1989. Both sales and rental audits were conducted. Each audit was based on audit teammates' inquiries about the availability of a housing unit mentioned in an advertisement randomly selected from the major metropolitan newspaper. Audit teammates were assigned incomes and family characteristics that made them qualified for this advertised unit. This paper is based on 1,081 black-white sales audits. For more details on HDS, see Yinger (1995).

New federal anti-discrimination enforcement activities authorized by the 1988 Fair Housing Amendments Act have been implemented since the HDS data were collected, so these data may overstate the incidence of discrimination today. The available evidence does not support this possibility (see Yinger 1998). Even if discrimination has declined since 1989, however, there is no reason to believe that recent developments have altered the factors that lead housing agents to discriminate, which are the focus on this study. Moreover, no other data set

comes close to HDS in terms of providing the information needed to test hypotheses about the causes of discrimination—particularly the information for a unit-based approach.

Structure of the Data Set

Our objective in this paper is to test behavioral hypotheses about the determinants of real estate agents' marketing behavior and about the causes of discrimination by real estate agents. Our investigation into the causes of discrimination draws on a large literature, discussed below, but many of our tests have different forms than do the tests in previous studies. These forms are related to the nature of our unit-based data set. In this section we describe this data set, focusing on the structure of the explanatory variables, and explain the various forms for our hypothesis tests. In the following section we present new hypotheses about the determinants of agents' marketing behavior, review existing hypotheses about the causes of discrimination, and describe the specific hypotheses that we test with our data.

The Unit-Based Data Set

Each HDS audit is based on a randomly selected advertisement. Two auditors, one white and one black, separately visit the same real estate agency to inquire about the advertised unit and other similar units that might be available. Each auditor then records the address of every house or condominium that he or she inspected. We compared the addresses of housing units shown to the white and black teammates in a given audit to determine which units were shown to only one teammate and which units were shown to both.[4] Our sample consists of the 2,465 units—both advertised and other—shown to either teammate.

The real estate agents have access to available housing units either in their files or through a multiple listing service (MLS), and they must decide which units to show each customer. An audit study observes two decisions about each available unit: whether the agent shows it to the white customer and whether he shows it to the black customer. These two

decisions result in four possible outcomes for each available housing unit and each audit team: the unit is shown to both customers, the unit is shown to the white customer only, the unit is shown to the black customer only, and the unit is not shown to either customer. In a later section, we develop a multinomial logit model for analyzing these outcomes as a function of the (actual and assigned) characteristics of the auditor, the housing agency, the audit, and the housing unit, given that one outcome (the unit is not shown to either auditor) is never observed. In this section, we describe the data structure available for testing hypotheses about these agent decisions.

For both marketing and discrimination, all of our hypotheses tests involve the impact of an explanatory variable on an agent's decision to show a house to a customer. Some of these explanatory variables, including auditor, agent, and agency characteristics have nothing to do with the housing unit. These variables are listed in Table 1. As shown below, hypothesis tests involving these variables are well known from previous studies and require no alterations for our unit-based data set. Our study also brings in additional variables that are associated with the housing unit being shown. These variables are listed in Table 2 and include whether the unit is the advertised unit, the asking price of the unit, physical characteristics of the unit, and information about the unit's location, such as whether it is located in an integrated neighborhood or in the central city.

To enrich our set of hypothesis tests, we use this information on housing unit characteristics to define four types of explanatory variables: (1) the characteristics of the unit being shown, (2) the characteristics of the advertised unit that was initially requested by the auditor, (3) interactions between the characteristics of the unit being shown and whether that unit is the advertised unit, and (4) variables to represent the match between the unit being shown and the advertised unit on each housing characteristic.

These four types of variables are explained in detail in the first panel (i.e. the first four rows) of Table 3. This panel shows how to calculate each type of variable for a unit characteristic that takes on the values of zero and one, using "whether the unit is located in an integrated area" as an example. This example involves an audit in which the advertised unit (unit 1) is in an integrated area and in which two other units, one of which (unit 2) is in an integrated area, are shown to at least one auditor (so that we can observe them). This audit yields three observations in our data set – one for each unit – as shown by the three columns in the table. The first type of variable (the first row) measures a characteristic of the unit itself, so it takes on a value of 1 (= integrated area) for unit 1 and unit 2, but not for unit 3. The second type of variable (the second row) measures a characteristic of the advertised unit associated with the relevant audit. In this audit, the advertised unit is in an integrated area, so this variable takes a value of 1 for all three observations. The third type of variable describes a characteristics of the advertised unit, as well, but only applies when the observation is itself the advertised unit.[5] In this example, therefore, this variable equals one for unit 1 and zero for the other two units. The fourth type of variable compares the value of one housing characteristic for the advertised unit and for the unit that defines an observation. This variable equals one by definition when the unit is the advertised unit. As shown in the fourth row of Table 3, it also equals one for unit 2 in our example (because unit 2, like the advertised unit, is in an integrated area) but equals zero for unit 3 (which is not in an integrated area).

The second panel in Table 3 applies to a continuous housing characteristic, using asking price as an example. The four types of variables in this panel are defined in a similar way. The key difference arises in the construction of the fourth type of variable, namely the match between the unit being shown and the advertised unit. When the unit characteristic is continuous, the match between the unit and the advertised unit is described using a spline based on whether the

unit has a value for this variable that is higher or lower than the value for the advertised unit. The spline values are shown in the last two rows of Table 3. The use of this spline implies that the coefficient estimates for the characteristics of the unit being shown (type 1 variable) and the advertised unit (type 2 variable) are not both identified. As a result, the unit characteristic variable is not shown in the second panel and is not included in the specification for continuous unit characteristics.

The Form of Hypotheses Concerning Marketing

The four types of explanatory variables lead to four forms for hypotheses tests concerning marketing. These four forms are given in the first column of Table 4. To begin, the characteristics of the unit being shown lead to hypotheses of the following form: the decision to show a unit depends on the characteristics of that unit, or, to put it another way, agents are more likely to show some types of units than others. The characteristics of the advertised unit lead to hypotheses of a different form, namely, that marketing depends on the customer's initial request. Hypotheses associated with the third type of explanatory variable indicate that marketing is different for advertised units, which, in the audit context, are the units initially requested, than for other units, which my or may not have been advertised by the agent. Finally, hypotheses associated with the fourth type of variable take yet another form, namely, that agent marketing behavior for a housing unit depends on the match between that unit and the unit initially requested.

The Form of Hypotheses Concerning Discrimination

To test hypotheses about the causes of discrimination, one more dimension must be added to the data structure. To be specific, the variables defined in Table 2 must be interacted with the minority status of the auditor, thereby creating four more types of variables. These variables make it possible to determine whether the impact of a housing unit's characteristics on

an agent's decision to show the unit is the same for minority and white auditors. The forms for the resulting hypotheses tests are indicated in the second column of Table 2. Characteristics of the unit that defines an observation interacted with minority status yield hypotheses of the following form: discrimination in showing a unit depends on the characteristics of the unit. As indicated in the other entries in this column, the other three forms of interaction variable yield different forms of hypotheses, namely, discrimination depends on the initial request, discrimination is different for the advertised unit, or discrimination depends on the match between a unit and the auditor's initial request.

Hypotheses About The Decision to Show a Housing Unit

We now turn to the specific hypotheses that we test in our estimations. We first consider hypotheses related to the marketing of housing units in general and then turn to hypotheses concerning discrimination.

Hypotheses Concerning Marketing

The shift to a unit-based data set opens the door to testing hypotheses about marketing behavior by real estate agents that does not involve discrimination. This type of test is possible because the unit-based data set involves two observations for each housing unit, one for each audit teammate, and it is possible to determine whether units are more likely to be shown to both teammates than to a single teammate, irrespective of race, under some circumstances.

Although this type of behavior does not involve discrimination on the basis of a customer's race, it has the potential to shed light on discrimination in two ways. First, it can reveal whether real estate agents respond to incentives that are not connected to the minority status of a customer. Any finding that they do so increases the plausibility of a finding that they respond to similar incentives directly related to a customer's minority status. Second, one kind of

marketing behavior, redlining against houses in integrated areas, has a discriminatory dimension even though it applies equally to black and white customers. Our approach makes it possible to observe this type of behavior, which is illegal under the Fair Housing Act.[6]

As noted in the introduction, our principal hypothesis about marketing is that real estate agents make **inferences about a customer's preferences** on the basis of his or her initial housing request and then, to maximize the probability of a successful match, concentrate on showing the customer houses that best match these inferred preferences. We explore this hypothesis with two types of tests. First, we test the hypothesis that a housing agent is more likely to show a unit if it is the advertised unit, that is, the unit about which the customer inquired. This test, which takes the form defined in row 3 of Table 2, is not a very strong test, however, because it cannot rule out three other hypotheses, namely, that housing agents only advertise units they want to show, that agents behave differently when they know a customer is aware that a unit is for sale, or that agents are more likely to show houses they advertise because other houses might be taken from a multiple listing service, in which case the commission would have to be shared with the listing agent.[7]

Second, we test the hypothesis that agents are more likely to show units that match the unit about which the auditor inquired than they are to show units that differ from this advertised unit in some way. This type of test, which takes the form defined in row 4 of Table 2, can be applied to any housing characteristic in Table 3. For example, we test the hypotheses that agents are less likely to show a unit that differs from the advertised unit in terms of asking price, number of bedrooms, type of neighborhood, and whether it is new. Note that the HDS auditors were instructed not to explicitly reveal any neighborhood preferences. Nevertheless, real estate agents may interpret the neighborhood in which the advertised unit is located as an indication of the auditor's neighborhood preferences. As a result, we can test this inferred-preference

hypothesis by determining whether both blacks and whites are more likely to be shown a unit located in the type of neighborhood (white or integrated) that matches the neighborhood of the advertised unit than a unit located in another type of neighborhood.

A second hypothesis builds on the fact that real estate **agents are paid a percentage of the sales price**. Under the assumption that the cost of selling a house is not related (or only weakly related) to house value, this feature of the housing market leads to the prediction that agents will work harder (that is, be more likely to show units) for customers that inquire about more show more expensive houses, which yield a higher net commission. We test this hypothesis by determining whether the probability that an agent will show a house increases with the advertised unit's asking price. This test takes the form defined by the second row of Table 2.

A third hypothesis is that some agents practice **redlining**, defined as an unwillingness to show houses in integrated neighborhoods to any customers, regardless of their minority status. This type of behavior could arise because agents believe that lenders and home insurance companies practice redlining against these neighborhoods (see Schill and Wachter 1993) and want to avoid wasting time showing houses that are unlikely to sell. This neighborhood-discrimination hypothesis is supported by Galster, Freiberg, and Houk (1987), Newburger (1995), and Turner (1992), who find that houses located in minority neighborhoods are less likely than houses in white neighborhoods to be advertised in the newspaper or marketed through an open house. It also could arise, however, because agents have had trouble finding buyers for houses in integrated neighborhoods in the past or because they simply want to avoid working in such neighborhoods. Our data set does not allow us to determine which of these incentives is at work, but it does allow us to test the hypothesis that redlining exists.

Finally, we test three hypotheses about **the nature of the marketing process**. First, we test the hypothesis that new houses are less likely to be shown because they are often part of a

housing development containing similar houses that is marketed through a model home or through the house that is the most convenient to show. This test has the first form in Table 2. Second, we test the hypothesis that agents try to conserve their driving time. We test this hypothesis with a variable to measure the distance between a unit and the advertised unit, a test that takes the fourth form in Table 2. Third, we test the hypothesis that different real estate agents in the same agency select different houses to show. We test this hypothesis using a variable in Table 1, namely, whether both auditors encountered the same real estate agent; if our hypothesis is correct, a unit is more likely to be shown when the same agent is encountered.

Hypotheses Tests Concerning Discrimination

We now turn to hypotheses and hypotheses tests concerning the causes of discrimination. Our objective is to gain insight into the reasons that real estate agents withhold units from black customers. The hypotheses in this section are all based on some form of belief or perception by real estate agents. Because these beliefs and perceptions are not observed, all of our hypothesis tests are indirect, that is, they determine whether discrimination is more likely under circumstances that are associated with a particular belief or perception. Existing audit studies test hypotheses about the causes of discrimination by determining whether differences in treatment between minority and white auditors are associated with auditor, agent, or audit characteristics, such as those in Table 1. See Galster (1990b), Ondrich, Stricker, and Yinger (1998, 1999), Page (1995), Roychoudhury and Goodman (1992, 1994), or Yinger (1995). In this section, we review the three main hypotheses and associated tests in the literature and present additional hypothesis tests made possible by a unit-based data set. These three hypotheses about the causes of discrimination are not mutually exclusive, and most studies find that more than one cause is at work. Moreover, as we will see, it is difficult to identify tests that distinguish the effects of one hypothesis from that of another.

The **agent-prejudice hypothesis**, which is based on Becker (1971), states that housing agents discriminate because of their own personal prejudice. Like previous studies, we test this hypothesis by determining whether discrimination is influenced by variables that are likely to be correlated with prejudice. In particular, we look at four such variables in Table 1: the race, age, and sex of the real estate agent and the sex of the auditor. Black agents are presumably less prejudiced against black customers than are white agents, on average, so a finding that black agents are less likely to discriminate supports this hypothesis. In addition, prejudice is higher in older cohorts than in younger cohorts, men tend to be more prejudiced than women, and agents may be more averse to dealing with black men than black women.[8] Thus, we can test the agent prejudice hypothesis by determining whether discrimination is higher when the agent is older or male and when the auditor is male.

Another test of the agent-prejudice hypothesis is based on the assumption that one can make inferences about an agent's prejudice by the houses he accepts as listings. This assumption leads to the prediction that an agent who advertises a listing in a black or integrated neighborhood, where some of his customers are more likely to be black or Hispanic, will be less likely to discriminate. This test takes the second form in Table 2.

The **white-customer-prejudice hypothesis** says that housing agents discriminate to protect their actual or potential business with prejudiced white customers.[9] Our data allow us to carry out several tests of this hypothesis. First, we can look for evidence that agents who draw business from a largely white area are more likely to discriminate than are agents who work in minority neighborhoods. Although we cannot directly observe the location of an agent's business, we can approximate this location by observing the location of the advertised unit. Thus, this hypothesis leads to the same prediction as the previous one, namely that discrimination will be higher when an agent advertises a unit in a white neighborhood.

Second, we can determine whether discrimination is relatively high in integrated neighborhoods in the central city, where the introduction of a few minority households could result in tipping, and thereby drive away the agent's existing contacts (a test with the first form in Table 2). (This prediction does not hold for integrated areas in the suburbs, which tend to be far from established black areas so that they are unlikely to be threatened by tipping.) Third, this hypothesis indicates that larger real estate agencies, which have a broader customer base, are less likely to discriminate than smaller agencies, which may depend on obtaining customers from particular neighborhoods. Another test of this hypothesis, therefore, one based on a variable in Table 1, is whether larger firms are less likely to discriminate than smaller firms.[10]

A fourth prediction of this hypothesis is that real estate agents may decide not to work with black customers who express a preference for living in a neighborhood where their presence would threaten the agent's established business. This hypothesis would be supported, therefore, by a finding that agents are more likely to discriminate when a black customer requests to see a unit in an integrated area in the central city (a test of the second form in Table 2). Finally, this hypothesis predicts that housing agents might treat married black customers better than single black customers on the grounds that their potential white customers would rather not have black single people as neighbors. This is a very weak test, however, because over 90 percent of the auditors played the role of a spouse (see Table 1) and this prediction is also consistent with other hypotheses.[11]

The third hypothesis is that real estate agents practice **statistical discrimination**. This type of discrimination is well known in the case of employment (Arrow 1972; Cain 1986; Phelps 1972) and lending (Ladd 1998; Yinger 1995). In the case of housing, a few authors have proposed a "perceived preference" hypothesis that is equivalent to statistical discrimination, but this equivalence is not widely recognized and statistical discrimination has not been emphasized

in studies of the marketing of houses.[12] In general, statistical discrimination is said to exist if an economic agent treats people in different groups differently because the agent believes that (a) it is profitable to base treatment on some unobserved characteristic and (b) this characteristic differs across groups.[13] These beliefs might be accurate, in which case statistical discrimination is profitable (but still illegal) or it might be based on an inaccurate stereotype, and therefore lead to unprofitable behavior.[14] Any difference in housing marketing based on minority status, including statistical discrimination, is illegal according to the Fair Housing Act.[15]

Our unit-based data set makes it possible to test for statistical discrimination in a variety of ways. First, statistical discrimination might be linked to unit or neighborhood characteristics (tests of the first form in Table 2). Two tests of this type are particularly compelling. The first test involves the asking price of a unit. In particular, real estate agents may assume that black customers are unlikely to be able to buy relatively expensive houses. Despite the fact that audit teammates are equally qualified, therefore, agents' may wasting time on transactions perceived to be unlikely by refusing to show higher-priced units to blacks.[16] A finding that discrimination increases with asking price therefore is consistent with the existence of statistical discrimination. Note that agents' preconception in this case could take the form of a believe that black customers, unlike white customers, are unlikely to be qualified for expensive houses, even if they explicitly ask to see them, or a belief that the more expensive the housing the more likely it is that blacks will encounter discrimination from lenders or home insurance companies.[17] In either case, acting on the basis of this preconception constitutes statistical discrimination because it involves using a perceived average trait for a group to predict an outcome for an individual member of that group.

The second type of test involves neighborhood characteristics. Real estate agents might believe, for example, that all households prefer to live with members of their own race and that a

housing transaction is unlikely to be completed when a black customer is matched to a white neighborhood or a white customer is matched to a black or integrated neighborhood. This statistical discrimination based on preconceived preferences predicts that blacks are more likely to encounter discrimination when a housing unit is in a white area than when it is in a black or integrated area.[18] This type of agent behavior is called steering. Note that this prediction is different from that of the customer-prejudice hypothesis, so this test provides a way to differentiate between these two causes of discrimination.

Real estate agents may also believe that lenders are unwilling to approve a mortgage (or insurance companies to provide home insurance) when the race or ethnicity of a customer does not match that of the neighborhood where the relevant house is located. Because a transaction cannot proceed without a mortgage (and home insurance), agents may want to avoid investing time showing houses where the race or ethnicity of the customer and neighborhood do not match. Our test, namely, whether discrimination is higher in white than in integrated areas, cannot identify the source of real estate agents' perceptions about the likelihood of transactions in various types of neighborhoods, but it can determine whether their behavior involves neighborhood-based steering, as predicted by the statistical discrimination hypothesis.[19]

Finally, statistical discrimination could be reflected in the way agents respond to a customer's initial request. This possibility leads to a series of tests that take the fourth form in Table 2; that is, we determine whether discrimination depends on the match between a unit and the unit initially requested. The strongest of these tests, in our view, concerns the possibility that for blacks, but not for whites, a unit is more likely to be shown if its value is below that of the advertised unit. A finding of this type is consistent with the view that real estate agents expect blacks, but not whites, to request more expensive units than they can afford and that agents then act upon this belief – a form of statistical discrimination.[20]

Other tests of this type concern the match between the other characteristics of a unit or its neighborhoods and those of the advertised unit. A request to see a unit in an expensive neighborhood, for example, might be accepted as an indication of neighborhood preferences for a white customer but rejected for a black customer because of a preconception about the types of neighborhoods blacks prefer. Acting on such a belief, that is, refusing to show houses in expensive neighborhoods to blacks even when they are requested, is a form of statistical discrimination. Because our regressions hold housing price constant, these results must be interpreted with care. A different agent response the same initial request by whites and blacks suggests that agents believe blacks and whites have different trade-offs across housing characteristics – despite the contrary information in their initial request. The agent behavior just described, for example, is consistent with a belief on the part of agents that blacks, but not whites, would be willing to save money by living in a neighborhood with low average house values in exchange for some other housing or neighborhood characteristics of equal market value.

Estimation Technique

A sales audit involves two visits to a real estate agency and has two critical properties. First, even after controlling for observable variables, the outcomes for the two visits are not independent because the auditors are paired on unrecorded characteristics, receive similar training, are sent to the same real estate agency at about the same time, and are instructed to inquire about the same advertised unit. Second, for every relevant unit that is available in that agency, four outcomes are possible: the unit is shown to both auditors, the unit is shown to the white auditor only, the unit is shown to the black auditor only, or the unit is not shown to either

auditor. A unit can appear in our sample only if it falls into one of the first three cases, so we face a selection bias in the sample of observed units.[21]

A simple solution to this sample selection problem is available if the error terms for the different choices are assumed to be independent and identically distributed with a Weibull distribution. In this case, the four-choice problem can be characterized as a multinomial logit model, which has the Independence of Irrelevant Alternatives (IIA) property (Boersch-Supan, 1987). This property is that the ratio of the probabilities (or relative odds) of any two outcomes does not depend on the presence of characteristics of a third outcome. In a multivariate context, the IIA property implies that the coefficient estimates for one choice relative to a second can be estimated consistently even though data associated with the third choice is missing from the sample.

To implement this solution, we must solve two methodological problems: potential correlation between the choices and interpretation of the estimated coefficients. The independence assumption is implausible in the context of a fair housing audit. The two auditors are assigned to the same real estate agency, given the same training, and told to inquire about the same advertised unit within a short time interval. This paired structure creates a correlation between the unobserved determinants of showing the unit to the minority auditor and showing the unit to the white auditor. To solve this problem, that is, to ensure that the error terms are not correlated across choices, our statistical model includes a specification for the unobservable attributes that are associated with a test, such as the real estate agency or advertised unit.[22] The independence assumption is only imposed upon the error terms that remain after controlling for the heterogeneity associated with an audit and with the participating auditors.[23]

The interpretation problem arises because coefficients cannot be estimated relative to the choice that is omitted from the sample. As a result, we can estimate the effect of observable unit

attributes on the decision to show a unit to a white and not a minority auditor relative to the decision to show the unit to both auditors, but we cannot estimate the effect of this attribute on the decision to show a unit to a white and not a minority auditor relative to the decision not to show the unit to either. The structure of a housing audit provides a solution to this limitation. Specifically, auditors make independent visits to the same real estate agency, and the real estate agent is unaware of any connection between the visits. After controlling for the common effect of being assigned to the same real estate agent and same advertised unit, the model describing treatment during each tester's visit can be described independently of the model for the other visit. See Ondrich, Ross and Yinger (2000) and Kenny and Wissoker (1994) for examples of this approach. This structure results in models describing the treatment of the white and minority auditors, respectively, and these two models can be estimated when information is available on only three of the four possible outcomes.

The econometric analysis builds on two indicator variables, Y_W and Y_B, for each unit that the agency has available. $Y_W (Y_B)$ equals one if the unit is shown to the white (black) auditor. Conditional on relevant covariates and an unobserved audit-specific effect for each auditor, the probabilities of a unit being shown take the simple binary logit form:

$$
\begin{aligned}
P(Y_W = 1 \mid Z_W, Z_B, \theta_W, \theta_B) &= P(Y_W = 1 \mid Z_W, \theta_W) \\
&= \exp\left\{\theta_W + Z_W'\beta\right\} / \left(\exp\left\{\theta_W + Z_W'\beta\right\} + 1\right) \\
P(Y_B = 1 \mid Z_W, Z_B, \theta_W, \theta_B) &= P(Y_B = 1 \mid Z_B, \theta_B) \\
&= \exp\left\{\theta_B + Z_B'(\beta + \delta)\right\} / \left(\exp\left\{\theta_B + Z_B'(\beta + \delta)\right\} + 1\right),
\end{aligned}
\tag{1}
$$

where $Z_W (Z_B)$ is a column vector of observed characteristics of the white (black) auditor and her visit, the unit itself, the advertised unit, and the real estate agent and agency; β is the vector

of coefficients associated with Z_W; δ gives the difference in the coefficient vectors of blacks and whites; and $\theta_W(\theta_B)$ is the unobserved effect for the white (black) auditor.

The correlation problem is addressed by controlling for the testing process that creates the correlation in the first place. Namely, after controlling explicitly for audit effects, there is assumed to be no source of correlation between the choices, and conditional on Z_W, Z_B, θ_W, and θ_B, the random variables Y_W and Y_B for each unit are assumed to be statistically independent. The probabilities for the four possible joint events are:

$$\begin{aligned}
P(Y_W = 1, Y_B = 1 \,|\, Z_W, Z_B, \theta_W, \theta_B) &= \exp\left\{\theta_W + Z_W'\beta + \theta_B + Z_B'(\beta+\delta)\right\} / D \\
P(Y_W = 1, Y_B = 0 \,|\, Z_W, Z_B, \theta_W, \theta_B) &= \exp\left\{\theta_W + Z_W'\beta\right\} / D \\
P(Y_W = 0, Y_B = 1 \,|\, Z_W, Z_B, \theta_W, \theta_B) &= \exp\left\{\theta_B + Z_B'(\beta+\delta)\right\} / D \\
P(Y_W = 0, Y_B = 0 \,|\, Z_W, Z_B, \theta_W, \theta_B) &= 1 / D,
\end{aligned} \tag{2}$$

where

$$D = \exp\left\{\theta_W + Z_W'\beta + \theta_B + Z_B'(\beta+\delta)\right\} + \exp\left\{\theta_W + Z_W'\beta\right\} + \exp\left\{\theta_B + Z_B'(\beta+\delta)\right\} + 1. \tag{3}$$

Equations (2) and (3) define a four-choice multinomial logit model of real estate agent behavior for each unit available to the agent.

Note that the model for the choice to allow both auditors to see the unit is simply the sum of the models to allow only the white or only the minority auditor to see the unit. In a standard model, such as the bivariate probit, this restriction identifies the correlation between the choice unobservables, but in our model with its missing choice, this restriction results in treatment coefficients ($\beta$and δ) that are exactly identified. We do not need to estimate a correlation directly because the potential correlation between choice unobservables is captured by the auditor effects.

This four-choice multinomial logit model cannot be estimated in the usual manner because no units for which the agent chooses the fourth outcome in (2) namely $(Y_W = 0, Y_B = 0)$ appear in the data set. Therefore, it is necessary to adjust the first three probabilities in (2) for the sample selection criterion. Letting *S* be the indicator for sample selection, the sample selection probability is given by

$$P(S=1|Z_W, Z_B, \theta_W, \theta_B) = 1 - P(Y_W = 0, Y_B = 0|Z_W, Z_B, \theta_W, \theta_B) = (D-1)/D. \quad (4)$$

Conditional on $S=1$, joint probabilities for the three outcomes observed in the data are:

$$\begin{aligned} P(Y_W = 1, Y_B = 1|S=1, Z_W, Z_B, \theta_W, \theta_B) &= \exp\left\{\theta_W + Z_W'\beta + \theta_B + Z_B'(\beta+\delta)\right\}/(D-1) \\ P(Y_W = 1, Y_B = 0|S=1, Z_W, Z_B, \theta_W, \theta_B) &= \exp\left\{\theta_W + Z_W'\beta\right\}/(D-1) \\ P(Y_W = 0, Y_B = 1|S=1, Z_W, Z_B, \theta_W, \theta_B) &= \exp\left\{\theta_B + Z_B'(\beta+\delta)\right\}/(D-1). \end{aligned} \quad (5)$$

Equation (5) defines a three-choice multinomial logit model. Because the random effects are unobserved, the conditional probabilities in a standard likelihood function cannot be evaluated for given values of the parameters.

The panel nature of the unit sample provides the necessary information to control for the audit effects. The estimator follows a standard three-choice multinomial logit form within a test. The joint likelihood function can be evaluated for all units in a test at any value of the pair (θ_W, θ_B), and the pair can be integrated out over its joint distribution. The distribution of the pair in the estimated model is based on the Heckman-Singer (1984) non-parametric mixing distribution.[24]

Data

Our HDS unit-based data set is described in Tables 3 and 4, which presents means and standard deviations for all variables except location and time dummies. The neighborhood data

in Table 4 is based on the 1990 Census, which was neither available for the HDS reports nor used for any previous research based on HDS data.[25] This table reveals, for example, that the average asking price was $137,805, that 45.0 percent of the units were advertised units, and that 17.9 percent of the units were in integrated neighborhoods. We define an integrated neighborhood as a census tract with a population more than 15 percent black. This may seem like a low percentage for such a dividing line, but few houses in the HDS data set are located in neighborhoods that are heavily integrated or predominantly black (see Turner and Mickelsons 1992).[26] Moreover, as shown below, the 15 percent dividing line has explanatory power.

Estimates of the incidence of discrimination are presented in Tables 5 through 7. These tables also provide hints about the variables that might influence when discrimination takes place. Formal, multivariate hypothesis tests are presented below. Each table contains five columns of sample statistics. The first column gives the number of observations in the relevant subsample. The second column indicates the probability that a unit is shown to both the white and black auditor. This probability, along with all other probabilities in these tables, is weighted to account for the HDS sampling plan (see Urban Institute 1991). The third column indicates the probability that a unit is shown to the white but not the black auditor, which is the probability that the white is favored, and the fourth column shows the probability that the black is favored. The difference between columns (3) and (4) is called the net incidence of adverse treatment, which is widely used as a measure of discrimination.

Panel A of Table 5 shows that the net incidence of adverse treatment for the entire sample is 12.6 percent. The other panels reveal that this net incidence is by no means the same under all circumstances. Table 6 examines differences in adverse treatment based on a unit's neighborhood characteristics. This table does not reveal any clear patterns. Somewhat surprisingly, for example, net incidence is not much different in white and integrated

neighborhoods. Table 7 investigates whether adverse treatment depends on the match between the unit being shown and the advertised unit. The closeness of the match appears to matter. For example, net adverse treatment is high for units that are more expensive (panel A) or in more expensive neighborhoods (panel B) than the advertised unit.

Results Concerning Agent Marketing

The first column of Table 8 and Table 9 present the results of our hypotheses tests concerning agent marketing behavior. In almost every case, we find support for the hypotheses developed earlier. First, the evidence in Table 9 strongly supports the view that housing agents interpret a customer's initial request as an indication of his or her preferences and then act upon that interpretation in showing houses. Advertised units are more likely to be shown than other units (row 1, first column). Agents are less likely to show a unit that has either more or fewer bedrooms than the advertised unit (row 3, third and fourth columns) or that is a neighborhood with more or less old housing than the neighborhood in which the advertised unit is located (row 5, third and fourth columns).[27] One puzzling result that seems to cut the other way is that agents are less likely to show central city units when a customer requests a unit in the central city (row 9, third column). This effect is weaker for the advertised unit itself (row 9, fifth column), however, which suggests that agents are responding to inferred preferences, but also to some unidentified incentive related to location in the central city.

Second, we find evidence that agents respond to the economic incentive created by a percentage commission. To be specific, the higher the asking price of the advertised unit, the more likely it is that any unit will be shown (row 2, second column). Interestingly, however, this result does not hold for the advertised unit itself (row 2, fifth column), which suggests that the incentive to increase marketing effort as asking price increases is offset by the incentive to

increase marketing effort on units that match the customer's inferred preferences, which the advertised unit does by definition.

Third, we find evidence to support two of our three hypotheses about housing marketing. Agents are less likely to show a house that is new instead of old, particularly if it is the advertised unit (row 7, first and last columns); however, new houses other than the advertised unit are no less likely to be shown if the customer asked to see a unit that is new (row 7, third column, significant at the 10 percent level). The first two results support the view that agents market through model homes in new developments, whereas the last result shows inferred preferences at work; when a customer inquires about a new unit, other new units, not just model units or convenient units, are shown at the same rate as are older units. We also find that units are more likely to be shown when both auditors see the same agent (see Table 8). This result indicates, as explained earlier, that different agents choose to show different units. Finally, we find no evidence that agents consider the distance between units in making their showing decisions (Table 9, row 13).

Finally, the results in Table 9 support the hypothesis that agents practice redlining against integrated neighborhoods (row 10, first column), but only in suburbs, not in central cities (row 14, first column).[28] Moreover, we find that redlining does not arise when the agent can infer from the auditor's request that the auditor prefers an integrated area (row 10, third column). Hence, these results are consistent with both redlining and behavior based on inferred preferences. Another sign of redlining is that agents are more likely to withhold advertised units if they are in white neighborhoods that are close to integrated neighborhoods (row 11, fifth column).[29]

To provide more insight into the complex relationship between neighborhood characteristics and agent marketing behavior, Tables 11 and 12 sum the relevant coefficients to

show net effects for advertised and non-advertised units in various neighborhood situations compared to units in white, suburban neighborhoods.[30] These tables also present t-statistics and the number of observations in each cell. Table 11 shows that advertised units are about evenly split between central cities and suburbs, but are more likely to be located in white than in integrated areas. The coefficients suggest that advertised units are marketed less strenuously if they are in the central city or in an integrated neighborhood, but only the effect for suburban integrated neighborhoods is statistically significant (at the 10 percent level). Although this result is not highly significant, it is striking to find evidence that agents are likely to steer a customer away from a unit in an integrated neighborhood even when she explicitly asks to see it.

Table 12 provides corresponding results for non-advertised units. This table is more complicated than Table 11 because outcomes for non-advertised units depend on outcomes for the advertised unit. Three results stand out in this table. First, the table confirms the role of inferred preferences concerning integrated neighborhoods.[31] In every case, the probability that a unit will be shown is higher if it is in the same type of neighborhood, white or integrated, as the advertised unit. Specifically, the entries in the first row (both units in integrated areas) are always larger than the corresponding entries in the second row (only the inspected unit in an integrated area) and the entries in the fourth row (both units in white areas) are always larger than the corresponding entries in the third row (only the inspected unit in a white area).

Second, Table 12 strengthens the conclusion that agents are more likely to withhold units in suburban, integrated neighborhoods. The strongest result, in the last column of the first row, indicates that auditors are significantly less likely to be shown units in integrated than in white neighborhoods even if they inquire about just such a unit. The coefficients in the last two columns of the second row are also negative and significant (one at only the 10 percent level);

these results could reflect either inferred preferences or differential treatment of integrated neighborhoods.

Third, the results in Table 12 confirm that, contrary to the prediction of inferred preferences, a non-advertised unit in the central city is less likely to be shown when the advertised unit is in the central city than when it is in the suburbs. In fact, the entries in the second column are all statistically indistinguishable from zero, whereas three of the entries in the first column are negative and significant.[32] The negative, significant coefficients in the last row of the first column provide evidence that agents are more likely to withhold units in central city neighborhoods; even when a customer inquires about a unit in a white neighborhood in the central city, she is unlikely to be shown other units in such neighborhoods. This type of behavior, which is not illegal, could arise if agents believe central city neighborhoods, unlike suburban ones, are very different from each other and interpret an auditor's initial query as a preference for the particular neighborhood in which the advertised unit is located, not for the central city in general. In this case, other central city units are unlikely to be in the same or similar neighborhoods and therefore are relatively unlikely to be shown.

Given the small sample sizes involved, the results in the second and third columns of Table 12 should be interpreted with caution. However, one possible explanation is consistent with the existence of inferred preferences. Because almost no central city units are shown to either auditor when the initial request involves a unit in the suburbs, the central city units that are shown may have unobserved features that make them similar enough to the customer's request to be worth showing;[33] in fact, judging from the small, insignificant coefficients in the second column, these units are just as worth showing as units in white suburbs, the omitted category. Thus, these coefficient estimates may reflect the impact of the unobserved features, not the impact of inferred preferences. Ironically, therefore, agents' decisions to withhold units in

response to inferred preferences may make it impossible for us to observe other responses to inferred preferences with our data. This same phenomenon could explain why the coefficients in the third column are not significantly different from those in the fourth column.

Results Concerning Discrimination

Results concerning discrimination can be found in the second column of Table 8 and in Table 10. These results provide no support for the agent prejudice hypothesis. Table 8 shows that discrimination does not depend on the race, age, or sex or the agent or the sex of the auditor. Table 10 shows that discrimination does not depend on an agent's revealed willingness to advertise a unit in or near an integrated area (rows 10 and 11, second column). These results do not, of course, prove that agent prejudice is not at work; instead they might indicate that our data set does not include any variables that allow us to isolate the effects of agent prejudice.

In contrast, several results support the white-customer-prejudice hypothesis.[34] To be specific, Table 8 shows that discrimination increases with the size of the agency and is higher for married than for single blacks. Moreover, Table 10 indicates that discrimination is relatively high in central city, integrated areas, which are the ones most likely to be threatened with tipping (rows 10 and 14, first column).[35] These results are consistent with the findings of previous studies, but they are certainly not definitive. Two of the results are based on imperfect proxies (agents encountered as a measure of agency size and central city integrated areas as a measure of neighborhoods most likely to tip) and, as noted earlier, the third is consistent with other hypotheses, as well.

Table 10 also provides three types of results that support the hypothesis that agents practice statistical discrimination. First, discrimination increases with the advertised unit's asking price (row 2, second column).[36] Combined with the comparable result in Table 9, this result implies that agents' marketing efforts increase with asking price for whites, but not for

blacks, an implication that is consistent with the hypothesis that agents practice statistical discrimination based on a preconception about the ability of black customers to purchase expensive homes.

Second, we find less discrimination in integrated areas than in white areas (row 10, column 1). As explained earlier, this result is consistent with the view that agents try to maximize the chances of a successful match by making race-based assumptions about a customer's preferences, which is a form of statistical discrimination. Note that the coefficient for integrated areas is not as large in absolute value as the analogous coefficient in Table 9, which implies that houses in suburban integrated neighborhoods are less likely than houses in other types of neighborhoods to be shown to either blacks or whites. In combination, these results imply that real estate agents practice both redlining and steering.[37] The difference between the estimates in Tables 9 and 10 (i.e. -2.5751 + 0.5957 = 1.9794) therefore provides an estimate of redlining and the result in Table 10 (0.5957) provides an estimate of steering – the result consistent with statistical discrimination.

This result is confirmed by a table analogous to Table 12 but for the neighborhood variables interacted with race. This table, which is not presented here, reveals that when the advertised unit is in a suburban white neighborhood, agents are significantly less likely (coefficient = 0.596, t-statistic = 2.15) to withhold units in suburban neighborhoods from black than from white customers. In other words, a request for a unit in a white suburban neighborhood is more likely to be interpreted as an indication of a customer's preferences when the customer is white than when she is black, a result consistent with statistical discrimination.

These results do not carry over to integrated neighborhoods in central cities (row 14, column 1). In this case, the measure of redlining is much smaller, 1.0751 (= -2.5751 +1.8306 + 0.5957 - 0.9263), and the measure of steering, -0.3306 (= 0.5957 - 0.9263) actually has the

opposite sign, which implies that blacks are steered away from integrated areas. This is the result that supports the white-customer-prejudice hypothesis. Overall, therefore, our test based on neighborhood integration does not provide a clear-cut acceptance of one hypothesis over another, but instead supports statistical discrimination in the suburbs and white customer prejudice in the central city.

Third, we find that in several cases agents' responses to an initial housing query are different for black and white customers. The most striking result of this type involves asking price: for blacks, but not for whites, a unit is more likely to be shown if its value is below that of the advertised unit (row 2, fourth column). This result is consistent with the hypothesis that agents practice statistical discrimination on the basis of the perception that blacks, but not whites, request more expensive units than they can afford.

Two other results of this type involve neighborhood characteristics. In particular, agents increase their marketing efforts for blacks if a unit is in a neighborhood that has an average house value below (row 4, fourth column) or has less old housing than (row 5, fourth column) the advertised unit's neighborhood. Neighborhoods with low average values and low shares of old housing are likely to be the least established neighborhoods, in the first case because of high turnover and in the second case because they are new. These results suggest, therefore, that housing agents believe, despite the contrary information they receive in an audit context, that blacks, unlike whites, want to live in neighborhoods that are not well established, perhaps to avoid clashing with entrenched white residents.[38] Acting on this belief, as agents appear to do, is another form of statistical discrimination.

The final result of this type is that agents are more likely to show a non-advertised unit to blacks if both it and the advertised unit have some problems (row 8, third and fifth columns).[39] Agents do not go out of their way to show units with problems to blacks, but they are more likely

to show these units to blacks when the initial request indicates a willingness to consider a house with some problems. This type of request has no impact on the treatment of a white auditor (see Table 9), but it appears to confirm agents' stereotypes about black customers and therefore leads agents' to show other units with problems to blacks. Thus, this result provides further evidence of statistical discrimination, as agents treat blacks and whites differently based on preconceptions about what customers from different racial groups prefer.

Although these tests are indirect, they provide extensive support for they hypothesis that real estate agents practice statistical discrimination. To put it another way, we know of no other explanation for the clear link between discrimination and particular housing characteristics, such as asking price or neighborhood integration, or between discrimination and the unit/advertised unit match.

One might also ask whether the effects found here are large in magnitude, as well as statistically significant. Table 13, which focuses on discrimination in non-advertised units, provides an answer. The results in the first row yield the breakdown of outcomes for our actual sample of non-advertised units. This row indicates that 9.1 percent of these units were shown to both auditors, 54.4 percent were shown to the white auditor only, and 36.5 percent were shown to the black auditor only, for a net incidence of 17.9 percent (= 54.4 – 36.5). Every unit appears in a single audit, and every audit is defined by an advertised unit. The second row eliminates all differences between non-advertised units and the advertised unit that defines its audit. This baseline case predicts treatment for a non-advertised unit that has the average characteristics of the advertised units in our sample and that is identical (in terms of observable characteristics) to the advertised unit that defines the audit. For two tract variables, namely whether the tract is in the central city or in an integrated neighborhood, we define this baseline case using the mode, not the mean. The modal category is a unit in a white, suburban tract. The second row of

Table 13 indicates that, for a baseline unit defined in this way, our estimates predict a 50.8 percent chance that the unit will be shown to the white auditor only and a 27.0 percent chance that it will be shown to the black auditor only, for a predicted net incidence of 23.8 percent.

The third and fourth rows use our estimates to determine how the baseline estimate would change if the asking price of a unit goes up or down by one standard deviation, holding constant the asking price of the advertised unit. Raising the asking price has little impact on the net measure (third row), but lowering the asking price lowers the predicted net incidence of discrimination by almost 30 percent, from 23.8 percent (row 2) to 17.3 percent (row 4). This effect corresponds to the highly significant coefficient in row 2 of Table 10. Similarly, raising the average house value in a unit's tract by one standard deviation has little impact on net incidence (fifth row), but lowering this average value cuts the net incidence measure by about 34 percent, from 23.8 percent (row 2) to 15.8 percent (row 6). The effect of altering the share of old housing in a unit's tract is similar, with little impact from an increase (row 7) and a large impact of a decrease (row 8). In fact, lowering average value by one standard deviation cuts net incidence by about 25 percent (to 17.6). The effects in rows 6 to 8 correspond to the significant coefficients in rows 4 and 5 of Table 9.

Finally, Table 13 shows that the predicted net incidence of discrimination falls dramatically when a unit is in an integrated neighborhood but the advertised unit is not. In fact, the result in the last row of this table reveals that the predicted net incidence measure falls to zero if the unit is in a suburban integrated tract and the advertised unit is in a white suburban tract.[40] Thus, the significant effect in row 10 of Table 10 is large, indeed.

Conclusion

We find that agents interpret a customer's initial request as an indication of the customer's preferences. As a result, agents are relatively likely to show the advertised unit and relatively unlikely to show units that differ from the advertised unit in terms of asking price, size (number of bedrooms), or neighborhood quality (average house value, share of old housing).

Our results also indicate that real estate agents practice redlining in the suburbs, defined as a low marketing effort in or near integrated neighborhoods. This behavior, which is illegal under the Fair Housing Act, arises even for advertised units, that is, even for units that a customer explicitly asks to see. This behavior does not take place, however, in central cities.

Discrimination could be driven by agent prejudice, white customer prejudice, or statistical discrimination. We find no evidence to support the agent-prejudice hypothesis, but our tests are not very powerful. We find some evidence to support the customer-prejudice hypothesis. Specifically, larger real estate agencies are less likely to discriminate and discrimination is relatively high in integrated neighborhoods where tipping appears to be likely.

Our most striking results point to the existence of statistical discrimination. Agents' marketing efforts for blacks, unlike those for whites, do not increase as the asking price of the advertised house increases; however, these efforts do increase as the asking price of a house falls below the price of the advertised unit. These results indicate that agents believe the probability of a successful transaction with a black customer decreases with the asking price, regardless of the customer's initial request. This belief could reflect an agent's experience with black customers but it cannot, of course, reflect the qualification of the black auditors. In any case, acting on this belief is a form of statistical discrimination, because it uses a preconceived characteristic of blacks on average as a signal about an individual black customer.

In addition, we find less discrimination in suburban integrated areas than in other areas and we find that real estate agents make different inferences about the preferences of black and white customers who make the same housing request. Discrimination is relatively low for houses in neighborhoods with an average house value or a share of old housing below that in the advertised unit's neighborhood, and it is relatively low for houses with visible problems, so long as the advertised unit has problems too. These effects are not linked to particular housing traits, as such, but instead are linked to differences between a house and the house initially requested. Thus, agents typically accept the initial request as an accurate portrayal of a white's preferences but adjust the initial request made by a black to conform with their preconceptions. In the case of houses with visible problems, agents refuse to accept the initial request as a sign that whites want such a house, but have no trouble making this inference for blacks. These actions are all consistent with statistical discrimination.

Previous research has not uncovered the prevalence of statistical discrimination largely because it could not connect discrimination to customer's initial requests or to the characteristics of individual houses. Our research supports the view that real estate agents' preconceptions are a central cause of housing discrimination and that statistical discrimination is widely practiced in housing sales. Because statistical discrimination is based on anticipated profits, this finding indicates that some housing discrimination has economic causes and may prove to be difficult to eradicate without active enforcement of fair-housing legislation.[41]

Our findings also raise several issues of more general interest. First, customer requests play an important role in many markets, including the labor and mortgage markets, and empirical analysis of these markets needs to consider the impact of such requests on estimates of discrimination. Because these requests are typically unobservable, accounting for them constitutes a major challenge for empirical research, particularly when the requests are

influenced by past or expected discriminatory acts. Second, theoretical research on search and agency could consider the role of customer requests as signals to agents.[42] This type of extension might provide new insights into both the incentives for statistical discrimination and the long-run impact of such discrimination on markets.

Table 1. Auditor, Agent, and Audit Characteristics

Variable	Mean	Standard Deviation	Minimum	Maximum
Auditor Characteristics				
Age of auditor[a]	37.337	6.988	24	66
Audit role = married couple[a]	0.881	0.323	0	1
Auditor is female[a]	0.605	0.489	0	1
Audit role = previous owner[a]	0.493	0.497	0	1
Agent and Agency Characteristics				
Age of agent	42.392	10.795	20	74
Agent is Black	0.025	0.154	0	1
Agent is female	0.661	0.473	0	1
Agent used an MLS	0.516	0.500	0	1
Advertised unit is not inspected	0.123	0.328	0	1
Maximum number of people encountered	1.811	1.169	0	8
Audit teammates see the same agent	0.547	0.546	0	1
Audit Characteristics				
Audit is in July	0.479	0.500	0	1
Audit is in August	0.055	0.228	0	1
Audit is in the morning	0.329	0.470	0	1
Black auditor goes first	0.508	0.500	0	1

[a]Auditor characteristics refer to the black auditor. White auditor characteristics are the same or similar.

Table 2. Housing Unit Characteristics

Variable	Mean	Standard Deviation	Minimum	Maximum
Unit is the advertised unit	0.450	0.498	0	1
Asking price of unit	137805	82664	11500	520000
Median housing price in unit's neighborhood	158735	116308	22100	500001
Number of bedrooms in the unit	2.815	0.982	0	9
Unit is a condominium	0.263	0.440	0	1
Unit is newly constructed	0.092	0.289	0	1
Unit has visible problems[a]	0.190	0.399	0	1
Advertised unit is in the central city	0.449	0.495	0	1
Distance to integrated tract	2.953	2.916	0.118	21.649
Distance to agent's office	4.073	4.412	0	37.434
Distance to advertised unit	1.515	3.365	0	35.900
Share of housing built before 1940	0.449	0.495	0	1
Unit's neighborhood > 15 percent black	0.178	0.383	0	1

[a]Visible problems include peeling paint (interior or exterior), broken windows, and debris in the yard.

Table 4. Variables and General Hypotheses

Variable Type	Hypothesis For:	
	Variable	**Interaction with Race**
Characteristics of the unit being shown (the unit that defines an observation	Marketing depends on characteristics of the unit	Discrimination depends on characteristics of the unit
Characteristics of the advertised unit (the unit that is the entry for an audit)	Marketing depends on initial request	Discrimination depends on initial request
Characteristics of the unit being shown when it is the advertised unit (which equal 0 for non-advertised units)	Marketing is different for advertised unit	Discrimination is different for advertised unit
Variables to describe the match between the unit being shown and the advertised unit (which are interactions)	Marketing depends on match with initial request	Discrimination depends on match with initial request

Table 3. Examples for an Audit with Three Units

	Value for Unit 1	Value for Unit 2	Value for Unit 3
Example 1: Discrete Variable[a]			
Characteristics of the unit being shown (the unit that defines an observation)	1	1	0
Characteristics of the advertised unit (the unit that is the entry for an audit; does not vary within an audit)	1	1	1
Characteristics of the unit being shown when it is the advertised unit (which equal 0 for non-advertised units)	1	0	0
The Match between the unit being shown and the advertised unit (an interaction)	1	1	0
Example 2: Continuous Variable[b]			
Characteristic of the advertised unit (the unit that is the entry for an audit; does not vary within an audit)	135	135	135
Characteristic of the unit being shown when it is the advertised unit (which equals zero for non-advertised units)	135	0	0
Difference between the unit being shown and the advertised unit when this difference is positive (an interaction)	0	0	10
Absolute value of the difference between the unit being shown and the advertised unit when this difference is negative (an interaction)	0	15	0

[a]Based on the variable INTEG = 1 if unit is in an integrated area. Unit 1: The advertised unit, in an integrated area; Unit 2: Not the advertised unit, also in an integrated area; Unit 3: Not the advertised unit, NOT in integrated area.

[b]Based on variable ASKPRICE = Asking Price of Unit ($1,000). Unit 1: The advertised unit, ASKPRICE = 135; Unit 2: Not the advertised unit, ASKPRICE = 120; Unit 3: Not the advertised unit, ASKPRICE = 145.

Table 5. Adverse Treatment by Unit Characteristics

	Sample Size	Equal Treatment	White Favored	Black Favored	Net Incidence
A. Entire Sample					
Entire sample	2,465	0.304	0.411	0.285	0.126
B. Whether Unit is Advertised Unit					
Not advertised unit	1,357	0.091	0.544	0.365	0.179
Advertised unit	1,108	0.564	0.248	0.188	0.060
C. Asking Price of Unit Compared to Metropolitan Average					
Lower asking price	1,332	0.302	0.411	0.287	0.124
Higher asking price	1,133	0.307	0.410	0.283	0.127
D. Whether Unit is a Condominium					
Not a condominium	1,818	0.334	0.401	0.265	0.136
Condominium	647	0.219	0.439	0.342	0.097
E. Number of Bedrooms in Unit					
Fewer than three	779	0.268	0.429	0.303	0.126
Three	1,145	0.331	0.397	0.272	0.125
More than three	541	0.299	0.414	0.287	0.127
F. Whether the Unit is Newly Constructed					
Previously owned	2,239	0.321	0.406	0.273	0.133
Newly constructed	226	0.137	0.456	0.407	0.049
G. Whether Unit has Visible Problems					
No problems	1,975	0.273	0.430	0.297	0.133
Problems	490	0.430	0.333	0.237	0.096

Table 6. Adverse Treatment by Neighborhood Characteristics

	Sample Size	Equal Treatment	White Favored	Black Favored	Net Incidence
A. Average Value in Neighborhood Compared to MSA Aveage					
Lower average value	1,458	0.299	0.407	0.284	0.113
Higher average value	1,007	0.311	0.416	0.273	0.143
B. Racial Composition of Neighborhood					
< 5 percent Black	2,025	0.314	0.405	0.281	0.124
> 15 percent Black	440	0.259	0.436	0.305	0.131
C. Central City Location					
In central city	1,098	0.326	0.403	0.271	0.131
In suburbs	1,345	0.283	0.419	0.298	0.120
D. Distance to Integrated Area					
High distance	868	0.323	0.386	0.291	0.094
Low distance	1,597	0.294	0.425	0.282	0.143
E. Distance to Agent's Office					
High distance	819	0.315	0.381	0.304	0.077
Low distance	1,646	0.298	0.426	0.276	0.150
F. Share of Old Housing					
High share	767	0.321	0.419	0.261	0.158
Low share	1,698	0.296	0.408	0.296	0.111

Table 7. Adverse Treatment Based on Characteristics of

Unit Compared to Advertised Unit

	Sample Size	Equal Treatment	White Favored	Black Favored	Net Incidence
A. Asking Price of Unit Compared to Advertised Unit					
Unit's price lower	399	0.095	0.499	0.406	0.093
Similar price	1,560	0.324	0.343	0.233	0.110
Unit's price higher	506	0.099	0.551	0.350	0.201
B. Average Value in Unit's Neighborhood Compared to Advertised Unit					
Unit's value lower	313	0.073	0.492	0.435	0.057
Similar value	1,502	0.347	0.326	0.227	0.099
Unit's value higher	650	0.084	0.568	0.348	0.220
C. Number of Bedrooms in Unit Compared to Advertised Unit					
Unit has fewer	216	0.102	0.532	0.366	0.167
Unit has same	1,945	0.357	0.387	0.256	0.131
Unit has more	304	0.109	0.477	0.414	0.063
D. Whether the Unit or Advertised Unit is Newly Constructed					
Both previously owned	2,126	0.332	0.399	0.269	0.130
Unit new	70	0.029	0.543	0.429	0.114
Unit previously owned	113	0.097	0.549	0.354	0.195
Both new	156	0.186	0.417	0.397	0.020
E. Whether Unit or Advertised has Visible Problems					
Neither with problems	1,839	0.286	0.420	0.294	0.126
Unit with problems	240	0.179	0.496	0.325	0.171
Unit without problems	136	0.088	0.574	0.338	0.236
Both with problems	250	0.696	0.176	0.152	0.024

Table 8. Coefficient Estimates for Auditor, Agent, and Audit Characteristics

Variable	Coefficient	Coefficient for Interaction with Race
Auditor Characteristics		
Age of the auditor	-1.1627 (-1.314)	0.2887 (0.325)
Audit role = married couple	-0.1053 (-0.289)	0.4966* (2.445)
Auditor is female	0.2783 (1.187)	1.2789 (1.004)
Audit role = previous owner	-0.0305 (-0.145)	0.0058 (0.039)
Agent and Agency Characteristics		
Age of agent	0.1679 (0.267)	0.2127 (0.344)
Agent is black	0.0500 (0.129)	0.0638 (0.171)
Agent is female	0.0639 (0.467)	0.0958 (0.711)
Agent used an MLS	-0.0207 (-0.084)	0.0606 (0.440)
Advertised unit not inspected	-1.2258 (-1.692)	0.3329 (1.108)
Maximum number of people encountered	-0.0927 (-0.879)	1.2453* (2.398)
Audit teammates see the same agent	1.1425* (4.826)	0.0006 (0.005)
Audit Characteristics		
Audit is in July	-1.0230 (-0.001)	-0.0240 (-0.000)
Audit is in August	-0.7694 (-1.416)	-0.1141 (-0.400)
Audit is in the morning	0.0726 (0.615)	0.0229 (0.144)

Black auditor goes first	0.1540	-0.1799
	(0.735)	(-0.446)

Note: t-statistics are in parentheses. An * indicates significance at the 5 percent level (two-tailed test). Estimated with a multinomial logit model. Results for site dummies are not reported.

Table 9. Coefficient Estimates for Unit Characteristics[a]

Row/Variable Name	Unit Attribute	Advertised Unit Attribute	Unit Attribute*Adv. Unit Attribute		Advertised Unit*Unit Attribute
			One	Two	
1. Advertised Unit	3.7605*				
	(2.957)				
2. Asking Price[b]		7.3351*	-0.3465	0.3374	-6.5129
		(2.072)	(-0.426)	(0.394)	(-1.858)
3. Number of Bedrooms[b]		-2.6366	-1.3542*	-1.4165*	0.1415
		(-1.001)	(-3.279)	(-2.641)	(0.045)
4. Tract Average Value[b]		-0.0004	-1.3376	0.1517	0.0051
		(-0.002)	(-1.831)	(0.409)	(0.017)
5. Tract Share of Old Housing		-0.0750	-8.3666*	-1.3740*	-0.8549*
		(-0.001)	(-2.511)	(-3.097)	(-2.017)
6. Condominium	-0.4695	-1.0425	0.7204		-1.2580
	(-0.784)	(-1.274)	(0.794)		(-1.940)
7. New Construction	-2.0580*	-0.3816	2.0752		-1.7205*
	(-2.193)	(-0.696)	(1.701)		(-2.292)
8. Problems with Unit	0.4265	0.5113	0.2302		0.8852
	(1.125)	(0.970)	(0.332)		(1.488)
9. Unit in Central City	0.8211	0.3086	-2.4428*		1.0511*
	(1.430)	(0.399)	(-2.591)		(2.006)
10. Tract Integrated	-2.5751*	-1.3209	2.4275*		0.5525
	(-3.009)	(-1.573)	(2.139)		(-0.650)
11. Distance to Integrated Tract	-0.0565	-0.1461	0.0057		0.1944*
	(-0.663)	(-1.251)	(0.496)		(2.332)
12. Distance to Agent's Office	0.0060	-0.0791	-0.0003		0.0409
	(0.0098)	(-0.380)	(-0.110)		(0.622)
13. Distance from Unit to Advertised Unit	-0.0083				
	(-0.133)				
14. Tract Integrated x Unit in Central City	1.8306*				-1.2944
	(2.018)				(-1.164)

[a]Absolute values of t-statistics are in parentheses. The symbol * represents significance at the 5 percent level or higher (two-tailed test). Estimated with a multinomial logit model.

[b]This variable is continuous. The unit attribute does not enter the specification directly. Rather, two variables are included: (1) the difference between unit and advertised unit attribute when the difference is positive, and (2) the absolute value of the difference between unit and advertised unit attribute when the difference is negative. Their estimated coefficients are listed in columns labeled one and two, respectively.

Table 10. Coefficient Estimates for Unit Characteristics Interacted with Race[a]

Row/Variable Name	Unit Attribute	Advertised Unit Attribute	Unit Attribute*Adv. Unit Attribute		Advertised Unit*Unit Attribute
			One	Two	
1. Advertised Unit	0.3566				
	(0.480)				
2. Asking Price[b]		-5.1591*	0.1865	1.0630*	3.7200
		(-3.069)	(0.702)	(7.440)	(1.921)
3. Number of Bedrooms[b]		1.1264	0.2332	-0.1211	-1.2796
		(0.938)	(1.618)	(-0.592)	(-0.684)
4. Tract Average Value[b]		0.1515	-0.1065	0.4550*	0.0090
		(1.437)	(-0.657)	(2.091)	(0.061)
5. Tract Share of Old Housing		-0.0423	0.9461	2.4158*	0.1120
		(-0.000)	(1.102)	(2.185)	(-0.457)
6. Condominium	0.3148	0.6974	-0.5770		-0.6380
	(-1.031)	(1.443)	(-1.064)		(-1.679)
7. New Construction	0.2739	-0.2160	0.2986		0.0439
	(0.934)	(-0.858)	(0.638)		(0.106)
8. Problems with Unit	-0.0974	-0.0956	0.9848*		-0.8127*
	(-0.485)	(-0.406)	(2.675)		(-2.206)
9. Unit in Central City	-0.0009	-0.0276	0.4342		-0.1694
	(-0.003)	(-0.072)	(0.954)		(-0.541)
10. Tract Integrated	0.5957*	0.1136	-0.4332		-0.0953
	(2.085)	(0.387)	(-1.032)		(-0.204)
11. Distance to Integrated Tract	0.0546	0.0769	-0.0053		-0.0286
	(1.441)	(1.586)	(-1.011)		(-0.522)
12. Distance to Agent's Office	0.0440	0.0110	-0.0006		-0.0005
	(1.699)	(0.439)	(-0.377)		(-0.016)
13. Distance from Unit to Advertised Unit	-0.0330				
	(-1.352)				
14. Tract Integrated x Unit in Central City	-0.9263*				0.9138
	(-2.532)				(1.506)

[a]Absolute values of t-statistics are in parentheses. The symbol * represents significance at the 5 percent level or higher (two-tailed test). Estimated with a multinomial logit model.

[b]This variable is continuous. The unit attribute does not enter the specification directly. Rather, two variables are included: (1) the difference between unit and advertised unit attribute when the difference is positive, and (2) the absolute value of the difference between unit and advertised unit attribute when the difference is negative. Their estimated coefficients are listed in columns labeled one and two, respectively.

Table 11. Agent Marketing Behavior by Unit Location, Advertised Units[a]

Unit in Integrated Neighborhood	Unit in Central City	
	Yes	**No**
Yes	-0.642 (-1.199) [124]	-0.916* (-1.648) [73]
No	-0.262 (-0.471) [412]	0.000 (n.a.) [455]

[a]Each cell contains three entries. The first number is the coefficient estimate, the number in parentheses is the t-statistic, and the number of observations is in brackets. An asterisk indicates significance at the 10 percent level or higher (two-tailed test). Based on the multinomial logit results in Table 9

Table 12. Agent Marketing Behavior by Unit Location, Non-advertised Units[a]

Unit in Integrated Neighborhood	Unit in Central City: Yes — Advertised Unit in Central City	Unit in Central City: Yes — Advertised Unit in Suburbs	Unit in Central City: No — Advertised Unit in Central City	Unit in Central City: No — Advertised Unit in Suburbs
Yes				
Advertised unit in integrated neighborhood	-0.951 (-1.199) [62]	1.118 (1.347) [2]	-1.160 (-1.073) [2]	-1.469* (-1.998) [54]
Advertised unit in white neighborhood	-2.058* (-2.432) [21]	0.077 (0.090) [25]	-2.266 (-1.934) [2]	-2.575* (-3.009) [55]
No				
Advertised unit in integrated neighborhood	-2.634* (-2.751) [29]	-0.500 (-0.490) [0]	-1.012 (-0.896) [4]	-1.321 (-1.573) [32]
Advertised unit in white neighborhood	-1.313* (-2.826) [282]	0.821 (1.430) [126]	0.309 (0.399) [9]	0.000 (n.a.) [607]

[a]Each cell contains three entries. The first number is the coefficient estimate, the number in parentheses is the t-statistic, and the number of observations is in brackets. An asterisk indicates significance at the 5 percent level or higher (two-tailed test). Based on the multinomial logit results in Table 9.

Table 13. Predicted Treatment for Non-Advertised Units Under Various Circumstances (share of cases)

	Equal Treatment	White Favored	Black Favored	Net Incidence
Baseline Predictions				
Sample of Non-Advertised Units	0.091	0.544	0.365	0.179
For Mean "Matching" Non-Advertised Unit[a]	0.222	0.508	0.270	0.238
Predictions with One Variable Changed				
Higher Asking Price than Advertised Unit[b]	0.217	0.506	0.278	0.228
Lower Asking Price than Advertised Unit[b]	0.243	0.465	0.292	0.173
Higher Mean Value than Advertised Unit's Tract[b]	0.150	0.560	0.289	0.271
Lower Mean Value than Advertised Unit's Tract[b]	0.247	0.456	0.298	0.158
More Old Housing than Advertised Unit's Tract[b]	0.142	0.539	0.319	0.220
Less Old Housing than Advertised Unit's Tract[b]	0.144	0.531	0.355	0.176
Unit in Integrated Suburban Tract[c]	0.040	0.478	0.482	-0.004
Unit in White Central City Tract[c]	0.337	0.437	0.226	0.211
Unit in Integrated Central City Tract[c]	0.082	0.460	0.458	0.003

[a]Predicted treatment for a non-advertised unit that has the average characteristics of the sample of advertised units and that is associated with an advertised unit with those same characteristics. Two characteristics, namely whether unit is in central city or in an integrated tract, are set at their modes, not at their means. The modal category is a white, suburban tract.

[b]Predicted treatment based on the case in row 2 with only one change, namely an increase or decrease of one standard deviation in the identified characteristic.

[c]Predicted treatment for a non-advertised unit in the type of tract indicated, assuming that the advertised unit is still in a white, suburban tract, as in row 2.

References

Akaike, H. 1973. "Information Theory and an Extension of the Maximum Likelihood Principle." In B. Petrov and F. Coake (eds.), *Second International Symposium on Information Theory*. Budapest: Akademiai Kiado.

Arrow, Kenneth. 1973. "The Theory of Discrimination." In O. Ashenfelter and A. Rees (eds.), *Discrimination in Labor Markets.* Princeton, NJ: Princeton University Press, pp. 3-33.

Becker, Gary S. 1971. *The Economics of Discrimination*, 2nd Edition. Chicago, IL: University of Chicago Press.

Boersch-Supan, Axel. 1987. *Econometric Analysis of Discrete Choice*. Berlin: Springer-Verlag.

Cain, Glen G. 1986. "The Economic Analysis of Labor Market Discrimination: A Survey." In O. Ashenfelter and R. Layard (eds.), *Handbook of Labor Economics*, volume 1. New York: Elsevier Science Publishers, pp. 693-785.

Courant, Paul N. 1978. "Racial Prejudice in a Search Model of the Urban Housing Market." *Journal of Urban Economics 5* (July): 329-345.

Federal Financial Institutions Examination Council. 1999b. *Interagency Fair Lending Examination Procedures*. http://www.ffiec.gov/press.htm.

Fix, Michael, George C. Galster, and Raymond J. Struyk. 1993. "Introduction." In M. Fix and R.J. Struyk (eds.), *Clear and Convincing Evidence: Testing for Discrimination in America.* Washington, DC: The Urban Institute Press, pp. 1-68.

Galster, George C. 1990a. "Racial Discrimination in Housing Markets During the 1980s: A Review of the Audit Evidence," *Journal of Planning Education and Research* 9: 165-175.

Galster, George C. 1990b. "Racial Steering by Real Estate Agents: Mechanisms and Motives." *Review of Black Political Economy* 19 (Summer): 39-63.

Galster, George, C. 1990c. "Racial Steering in Urban Housing Markets: A Review of the Audit Evidence." *Review of Black Political Economy* 18 (Winter): 105-129.

Galster, George C., Fred Freiberg, and Diane Houk. 1987. "Racial Differences in Real Estate Advertising Practices: An Exploratory Analysis." *Journal of Urban Affairs* 9: 99-215.

Heckman, James J., and Burton Singer. 1984. "A Method for Minimizing the Impact of Distributional Assumptions in Econometric Models for Duration Data." *Econometrica* 52: 271-320.

Ladd, Helen F. 1998. "Evidence on Discrimination in Mortgage Lending." *Journal of Economic Perspective,* 12 (Spring): 41-62.

Newburger, Harriet. 1995. "Sources of Difference in Information Used by Black and White Housing Seekers: An Exploratory Analysis." *Urban Studies* 32 (April): 445-450.

Ondrich, Jan, Stephen Ross, and John Yinger. 2001. "The Geography of Housing Discrimination." Working Paper, Center for Policy Research, Syracuse University, June.

Ondrich, Jan, Stephen Ross, and John Yinger. 2000. "How Common is Housing Discrimination? Improving on Traditional Measures." *Journal of Urban Economics 47* (May): 470-500.

Ondrich, Jan, Alex Stricker, and John Yinger. 1998. "Do Real Estate Agents Choose to Discriminate? Evidence from the 1989 Housing Discrimination Study." *Southern Economic Journal* 64 (April): 880-901.

Page, Marianne. 1996. "Racial and Ethnic Discrimination in Urban Housing Markets: Evidence from a Recent Audit Study." *Journal of Urban Economics* 2 (September): 183-206.

Phelps, Edmund S. 1972. "The Statistical Theory of Racism and Sexism." *American Economic Review* 62: 659-661.

Roychoudhury, Canopy, and Allen C. Goodman. 1992. "An Ordered Probit Model for Estimating Racial Discrimination Through Fair Housing Audits." *Journal of Housing Economics* 2 (December): 358-373.

Roychoudhury, Canopy, and Allen C. Goodman. 1996. "Evidence of Racial Discrimination in Different Dimensions of Owner-Occupied Housing Search." *Real Estate Economics* 24(2): 161-178.

Shill, Michael H., and Susan M. Wachter. 1993. "A Tale of Two Cities: Racial and Ethnic Geographic Disparities in Home Mortgage Lending." *Journal of Housing Research* 4(2): 245-275.

Trussell, James, and Toni Richards. 1985. "Correcting for Unmeasured Heterogeneity in Hazard Models Using the Heckman-Singer Procedure." *Sociological Methodology*. San Francisco: Jossey-Bass.

Turner, Margery A. 1992. "Discrimination in Urban Housing Markets: Lessons from Fair Housing Audits." *Housing Policy Debate,* 3(2): 185-215.

Turner, Margery A., and Maris Mickelsons. 1992. "Patterns of Racial Steering in Four Metropolitan Areas." *Journal of Housing Economics,* 2 (September): 199-234.

The Urban Institute. 1991. *Housing Discrimination Study: Methodology and Data Documentation.* Washington, DC: U.S. Department of Housing and Urban Development.

Yavas, Abdullah. 1995. "Economics of Brokerage: An Overview." *Journal of Real Estate Literature* 2 (July): 169-195.

Yinger, John. 1998. "Housing Discrimination is Still Worth Worrying About." *Housing Policy Debate* 9(4): 893-927.

Yinger, John. 1997. "Cash in Your Face: The Cost of Racial and Ethnic Discrimination in Housing." *Journal of Urban Economics 42* (November): 339-365.

Yinger, John. 1995. *Closed Doors, Opportunities Lost: The Continuing Costs of Housing Discrimination.* New York: Russell Sage Foundation.

Yinger, John. 1986. "Measuring Discrimination with Fair Housing Audits: Caught in the Act." *American Economic Review* 76 (December): 881-93.

Endnotes

1. To keep the exposition concise, this paper refers to non-Hispanic whites as whites and treats "race" as a socially defined category. See Yinger (1995).

2. This shift also has two other advantages not connected to requests. First, it eliminates an endogeneity problem that arises because a real estate agent's decisions simultaneously determine the number of houses shown to a customer (an dependent variable in the traditional approach) and the characteristics of those houses (explanatory variables). In our approach, an agent's decision to show a house obviously cannot affect that house's characteristics. Second it expands the sample size from the number of audits to the number of houses shown to either auditor.

3. The HDS data are used by Page (1995); Ondrich, Ross, and Yinger (1999); Ondrich, Stricker, and Yinger (1998, 1999); Turner and Michelsons (1992); and Yinger (1995).

4. Some address information is missing, especially unit numbers for condominiums, which made up 16 percent of the housing units in the sample. As a result, we developed procedures to rule out the possibility that teammates saw the same unit when teammates saw units that had the same, incomplete, address information but differed in some observable characteristic, such as number of rooms or location in the building.

5. In a few cases, particularly with condominiums, there is more than one advertised unit, in which case these characteristics refer to the average unit in this set.

6. The Fair Housing Act says, for example, that it is illegal to "to induce or attempt to induce any person to sell or rent any dwelling by representations regarding the entry or prospective entry into the neighborhood of a person or persons of a particular race, color, religion, sex, handicap, familial status, or national origin."

7. For a given audit, we know that the unit about which the auditors inquire was advertised and listed by the visited agent, but we do not know whether other units that arise during the audit were advertised nor do we know whether these units were listed by another agent and accessed through a MLS. However, we do not that these other units might not have been advertised and might be listed by another agent.

8. An agents potential customers might also care about the sex of an unmarried black neighbor, but this possibility is not relevant here because virtually all of the auditors in these audits were assigned the role of a married person.

9. This hypothesis, like the previous one, can be traced to Becker (1971) who showed that an employer might discriminate against black applicants to keep down the wage demands of prejudiced white employees.

10. A finding that larger agencies are less likely to discriminate is also consistent with the hypothesis that these firms devote more resources to fair-housing education, either

because of economies of scale in such training or because their visibility makes them more likely targets of discrimination suits.

11. For example, agents may believe that black singles are particularly unlikely to complete a transaction, wither because of assumed financial limitations or anticipated discrimination in mortgage lending. This is an example of statistical discrimination, which is discussed below.

12. See Yinger (1998) for more on the equivalence of the perceived preference hypothesis and statistical discrimination. One test for statistical discrimination in the marketing of housing can be found in Yinger (1995), who presents evidence to support the view that landlords are reluctant to rent to single black women because of the stereotype that these women are often on welfare.

13. A key issue in the labor literature on statistical discrimination is that the quality of the observable information may differ across groups. See Phelps (1972) and Cain (1986). In a housing audit, the quality of the information about a customer's purchasing power, which is analogous to productivity, is identical across audit teammates so this issue does not arise.

14. The theory of statistical discrimination predicts that preconceptions not connected to profits will be driven out by competition, at least in the long run, but we have no way to test for a link to profitability. Also, this behavior is not statistical discrimination if the agent acts on the basis of preconceptions that he does not connect to profits. Real estate agents, like other people, are certainly not immune to race-based preconceptions that have nothing to do with profits, but there is no reason to think that these preconceptions are related to particular housing characteristics. As we will see, the link to particular housing characteristics gives power to these tests for statistical discrimination.

15. The Fair Housing Act makes it illegal to "make unavailable or deny, a dwelling to any person because of race, color, religion, sex, familial status, or national origin."

16. Phelps (1972) makes it clear that statistical discrimination cannot arise unless the cost of gaining the necessary information is "excessive." In an audit, a housing agent could obtain the information he needs about a customer's purchasing power simply by asking, but apparently, inquiries of this type are not usually made. Moreover, they are more likely to be made for blacks than for whites. In HDS, for example, agents didn't even ask about a customer's income in over half the audits and the probability that they made this inquiry was 8 percentage points higher for blacks than for whites (Yinger 1995, Table 3.3).

17. For reviews of the evidence on discrimination in mortgage lending, see Goering and Wienk (1996), Ladd (1998), and Ross and Yinger (forthcoming).

18. Using audit data for Detroit, Roychoudhury and Goodman (1992) find some evidence to support this prediction, which is often associated with the perceived preference hypothesis.

19. We attempted to determine which of these two possibilities was at work using 1990 Home Mortgage Disclosure Act Data, which indicates applications and loan denials by location by race. We could not find any HMDA variables with any explanatory power in our regressions. See also Ondrich et al. (2001). This could indicate that real estate agents' beliefs do not reflect actual experience with lenders or it could indicate that the HMDA data are not up to the task. For more on these data, see Goering and Wienk (1996). Note also that there is a third possible source of these agent preferences, namely, that agents believe that white sellers of more expensive homes tend not to be willing to sell to blacks (even without contact between the agent and the seller, as is typical in a MLS transaction). This seems unlikely, however, because prejudice tends to decline with income and neighborhoods with expensive houses are not usually threatened with tipping.

20. This belief might be based on experience. Munnell et al. (1996) find, for example, that, on average, black mortgage applicants have higher loan-to-value and debt-to-income ratios than do whites.

21 We observe the outcome for the advertised unit even if it is withheld from both auditors. In this case, however, many of the unit characteristics relevant to the analysis are missing from the data. Thus, we exclude from our sample the few advertised units withheld from both auditors.

22 We ran a model without controls for omitted variables and obtained substantially different results for several coefficients. The complete results, i.e., without audit random effects, are available upon request.

23. HDS sent the same audit-teammate pairs to conduct several audits each. This makes it possible to construct models in which θ_W and θ_B are each the sum of an audit-specific effect and a pair-specific effect. We estimated two such models and found the improvement of fit measured by Akaike's Information Criterion (see Akaike 1973) to be small enough to reject the incorporation of the additional pair-specific effect. See also Ondrich, et al. (2001).

24. Because Z_W and Z_B contain unit-specific information, their values can change across observed units within an audit. Let *j* index an observed unit within an audit. Then conditional on the Z_{Wj}'s and the Z_{Bj}'s and all sample S_j's being one, the joint likelihood contribution of all *J* observed units within an audit is given by

$$L(\beta,\delta)=\prod_{k=1}^{J}\left(\sum_{j=1}^{K}P\left(Y_W=Y_{Wj},Y_B=Y_{Bj}\,\middle|\,S_j=1,Z_{Wj},Z_{Bj},\theta_{Wk},\theta_{Bk}\right)P\left(\theta_W=\theta_{Wk},\theta_B=\theta_{Bk}\right)\right),$$

where (Y_{Wj}, Y_{Bj}) is the observed outcome for unit *j* and *K* is the number of points of increase. The likelihood function to be maximized is the product of joint likelihood contributions across audits in the sample. To specify *K*, we follow Trussell-Richards (1985) by starting with a single point of increase and successively adding a new point

until likelihood improvement stops. We stopped at k=3. Estimates for $\{(\theta_{Wk}, \theta_{Bk}),\ k = 1,...,K\}$ and $p_1,...,p_{k-1}$ are available from the authors upon request, where p_i is the probability associated with θ_{Wi} and θ_{Bi} in the mixing distribution. Note that p_K does not provide independent information because the sum of the probabilities is one.

25. Neighborhood characteristics in the HDS reports and in subsequent research using the HDS data (see note 3) are based on a private firm's estimates of demographics in each census tract in 1988.

26. For a discussion of net incidence and other measures of discrimination, see Fix, Galster, and Stuyk (1993), Yinger (1995), and especially, Ondrich, et al. (1999).

27. Agents are also less likely to show units in neighborhoods that have a higher average value than the advertised unit's neighborhood (row 4, third column), but this result is only significant at the 10 percent level.

28. We find no evidence of redlining against neighborhoods with low house values (Table 9, row 4). Because there is some evidence of redlining against low-income neighborhoods by lenders (Ross and Tootell, forthcoming)and because house value is highly correlated with income, our negative finding hints that redlining by real estate brokers is not driven by their expectation of redlining by lenders.

29. Although we control for several neighborhood characteristics other than integration, the results discussed in this paragraph could be subject to omitted variable bias because of neighborhood characteristics we do not observe.

30. Consider, for example, an advertised unit in an integrated neighborhood in the central city. For this type of unit, all the variables in rows 9, 10, and 14 in Table 9 are switched "on," so the net effect (relative to an advertised unit in a white, suburban neighborhood) involves the sum of all ten coefficients in these three rows. If we had presented odds ratios instead of the log odds ratio, we would, of course, have to multiply coefficients to obtain the net effects. The sample size information in Tables 10 and 11 indicate that our results are based on 73 advertised units and 113 other units in suburban, integrated neighborhoods.

31. The frequencies also are consistent with the presence of inferred preferences, as agents who advertise in white areas tend not to show units in integrated areas (see the low frequencies in the second row) and agents who advertise in integrated areas tend not to show units in white areas (see the low frequencies in the third row). However, these frequencies might also indicate that real estate agents tend to specialize in either white or integrated areas.

32. Implicit across-cell restrictions in the functional form in Table 10 yield an estimate for the third row of the second column of Table 12 even with no observations in that cell.

The coefficients in several other cells with only two observations also are identified primarily based on across-cell restrictions.

33. Agents who advertise a unit in the suburbs rarely show units in the central city (see the low frequencies in the second column) and agents who advertise in the central city rarely show units in the suburbs (see the low frequencies in the third column). These counts may indicate that agents choose not to show units conflicting with a customer's inferred preferences even if those units are available, or they may indicate that agents with central city listings have access to different information sources about available housing than do agents with suburban listings.

34. Another result in Table 10 that supports the white-customer-prejudice hypothesis is only significant at the 10 percent level. To be specific, the farther a unit from the agent's office, the more likely the agent will show it to blacks (row 12, first column), presumably because selling units far from the agent's office to blacks is unlikely to have repercussions for the agent's reputation with his established white customers. Ondrich et al. (2001) find that this result is highly significant in some metropolitan areas.

35. This result does not appear to hold for the advertised unit (row 14, fifth column). This difference for the advertised unit, which is not quite significant at the 10 percent level, might be another sign of inferred preferences at work or it might indicate that agents only advertise in integrated, central city neighborhoods when they are not worried about tipping.

36. The coefficient for the asking price of the advertised unit itself (row 2, fifth column, significant at the 10 percent level) indicates that this effect is smaller for the advertised unit, but still exists. As in other cases, this result suggests that inferred preferences offset statistical discrimination to some degree.

37 . See Ondrich et al. (2001) for a more detailed discussion of redlining and steering. Steering is also discussed at length by Galster (1990b) and Turner and Mickelsons (1992).

38. The white-customer-prejudice hypothesis suggests that agents might steer blacks toward less established neighborhoods. This hypothesis can be tested with variables of the first form in Table 2. These variables are not significant in Table 10, unlike those associated with statistical discrimination (which have the fourth form in Table 2).

39. In row 8, the coefficients in both the third and fifth columns are highly significant. Since both of these coefficients apply to the advertised unit and the one in the third column is larger in absolute value, they imply that advertised units with problems are also more likely to be shown to blacks than to whites, although this effect is small.

40. Discrimination declines relative to the baseline when the unit is in an integrated tract in the central city because the coefficient in row 10 of Table 10 is more than offset by the

significant coefficient in the last row of Table 10. However, this combined effect is not statistically significant ($t = 0.851$).

41. The cost of this discrimination is difficult to estimate. For one attempt, see Yinger (1997).

42. Yavas (1995) surveys the theoretical literature on real estate agency. This literature focuses on a search process with buyer and seller uncertainty but has not yet considered the signals sent by a buyer to the real estate agent. Courant (1978) and Yinger (1997) examine the impact of discrimination on a home buyer's search problem.