The neighbor is king:

Customer discrimination in the housing market[*]

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Abstract

This paper provides a way to detect customer-based discrimination in the housing market using survey data. We build a matching model with ethnic externalities where landlords differ in the number of housing units they own within the same neighborhood. In the event of customers' prejudice against the minority group, landlords who own several apartments discriminate more often than single-dwelling landlords because they internalize a negative externality on their probability to fill their other vacancies. Using the French National Housing Survey, we show that tenants with non-European origin are less likely to rent from a multiple-dwelling landlord than other tenants. We then show that the proportion of multiple-dwelling landlords at the local level is positively correlated with the probability of non-Europeans to be living in public housing, whereas this is not the case of other ethnic groups.

JEL codes: R21, J71.

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1 Introduction

If discrimination in the housing market happens to be the main driving force behind urban patterns, this could dramatically affect the design of any public policy geared towards improving the life of urban minorities (Zénou (2009)). For example, fair housing legislation could then become a useful tool against spatial mismatch on the labor market. That said, providing conclusive evidence of housing market discrimination remains a challenging empirical entreprise (Dymski (2002)). It either requires very detailed datasets (to estimate credible hedonic prices) or the conduct of randomized experiments (Yinger (1986)). Moreover, most research on housing market discrimination has not yet benefited as much as it could have from Becker (1957)'s theoretical insights on the rationale for customer discrimination, even though the housing market is the quintessential customer market (Lang (2007)) and it is now agreed that "most discriminatory behavior in the housing market is founded upon either the personal prejudices of agents or their belief that it is in their financial interest to cater to the presumed prejudices of their Anglo customers" (quoted in Farley, Steeh, Krysan, Jackson, and Reeves (1994)). In particular, the respective roles played by landlords' and tenants' prejudice in the discrimination process are seldom clearly disentangled, even though the parallel is easily drawn between landlords and employers and between customers and tenants. This paper addresses both the theoretical and empirical challenges: to our knowledge, it provides the first theoretical model of customer discrimination in the housing market, which then paves the way to a simple test for customer discrimination.

Becker's model of customer discrimination focuses on the good market. In Becker (1957), firms do not hire black applicants for jobs in contact with customers because white customers' racial prejudice reduces the productivity of black employees. Transposed to the housing market, Becker's reasoning means that tenants' utility depends on the ethnic composition of the neighborhood. Prejudiced applicants care about the racial makeup of the neighborhood and they refuse to move in next to a neighbor whose ethnic type they dislike. Landlords know that and it may affect their decision to accept a minority tenant regardless of their own prejudice. However, and unlike the clients of a particular firm, the flats and houses in a given neighborhood do not necessarily belong to the same owner. Accepting a minority tenant creates a negative externality at the neighborhood level. How landlords react to prejudiced whites depends on their ability to internalize the externality, which in turn depends on the number of apartments they own within the same neighborhood. Namely, the more apartments they own, the more sensitive to applicants' prejudice and the more often they discriminate.

In this paper, the negative externality created by a minority tenant takes place at the building level. We focus on the rental market and model landlords' decision-making process in a dynamic framework with ethnic heterogeneity and matching frictions (Section 2). Rents are fixed and some Whites are prejudiced against black tenants. Landlords have to choose whether they accept an applicant or not. We demonstrate that they may gain from refusing some types

of applicants, even if this increases the mean delay to fill the dwelling. Our model gives a ratio-nale for customer discrimination by showing that, provided enough applicants are prejudiced against another group of applicants, any landlord can find himself in a situation where she would gain from refusing access to the members of this group. This result cannot be directly tested since both tenants and landlords may be prejudiced against the same group of applicants. To come up with an identification strategy between tenants' and landlords' prejudice, we go one step further and consider the situation where landlords are in fact heterogeneous with respect to the number of housing units they own within the same building. Our model predicts that land-lords who own several contiguous apartments discriminate more often than those who only own one apartment: indeed, the latter only care about the impact of their selection decision on their ability to rent out the same apartment again in the future, while the former also care about the impact of their decision on their current ability to rent out their other vacant lots. This leads to the prediction that black tenants should less often have landlords who own several housing units within the same neighborhood only in the event of customer-based discrimination against black applicants. This prediction is testable on regular survey data and constitutes a direct test for the presence of customer-based discriminatory practices in the housing market.

We then provide an empirical application on French data (Sections 3 and 4). The French case is relevant for two reasons. First, the difficult integration of ethnic minorities is a major public policy concern. The urban riots of Fall 2005, where more than nine thousand vehicles were burned down in three weeks (with a climax of almost four thousand in three nights), showed the world that France also had race-relation issues, even though the mere possibility of a specifically racial problem had long been denied by French political philosophy, intention-ally color-blind. We argue that some of the difficulties experienced by ethnic minorities in France may be attributed to housing market discrimination and its consequences, segregation and un-employment. The second reason for picking France is that there is little legal room for price discrimination in the French rental market, which fits well our fixed-price model. Contrary to what happens on the home-sale market, the asked rent is generally posted on the adds and land-lords are not allowed to increase it unilaterally before signing the lease. Moreover, a set of laws and regulatory practices prevents them from fixing prices at their will on many segments of the private rental market. Price discrimination must be covert: it may involve the amount of the security deposit, or temporary discounts in exchange for improving the quality of the dwelling, but this cannot be the sole force behind the differential treatment of undesired ethnic groups and most discrimination, if any, has to come through quantity rationing.

Our empirical analysis proceeds in two stages. Section 3 conducts a direct empirical test of the theory. This test lays on the assumption that, conditional on all other observable characteris-tics of the dwelling, applicants do not observe or do not care about their future landlord's type (whether she owns several contiguous apartments or not). In other words, search is random. Under this assumption, the conditional allocation of tenants across landlords' types can be in-terpreted as the result of a natural experiment, which only reflects the supply side of the market and does not raise any of the usual selection issues regarding the choice of residence. Using data from the French National Housing Survey, we show that first-generation immigrants of non-

European origin who live in privately-rented apartments are less likely to have a landlord who owns the entire building. In the absence of any conclusive alternative explanation, this result is interpreted as the expression of a supply constraint exerted by multiple-dwelling landlords upon minority applicants and constitutes a strong indication of customer-based discriminatory practices in the French private rental market.

Section 4 makes advantage of the fact that, unlike audit data, the National Housing Survey makes it possible to extend the analysis to the macroscopic consequences of customer discrimination on the housing consumption patterns of ethnic minorities. In particular, besides income differences, their over-representation in public housing has generally been accounted for, either by ethnic-specific preferences, or by the history of immigration. We here provide an alternative explanation of such a "social housing magnet" (Verdugo (2011)) where customer discrimination plays a key role. In that purpose, since housing consumption stems from a complex nexus of decisions about many possible outcomes, we restrict ourselves to a very simplified dual rental market where some segments are privately-rented by potentially discriminating landlords and the rest is administered by a supposedly color-blind public authority. Then, using a methodology derived from the empirical literature on spatial mismatch on the labor market, we construct a zone variable which defines the relative weight of multiple-dwelling landlords in each local housing market. We finally show that the probability of tenants of non-European origin to be living in public housing is positively correlated with this zone variable, whereas the correlation does not stand for any other ethnic group. Provided this probability partly reflects the difficulty to access the private rental market, this second result gives valuable information regarding the impact of customer discrimination on the residential location of ethnic minorities.

The direct test is a new way to provide empirical evidence on housing market discrimination. So far, two interesting methodologies have been developed in order to detect discrimination in consumer markets but both are subject to criticism (Yinger (1998)). The first is to make use of available survey data and to look for the effect of the ethnic status of consumers on the characteristics of the goods which they have access to. This is done to answer the following question: everything else equal, do minorities have to resort to lower quality goods and/or pay higher prices than other consumers? In the US, price discrimination in the housing market has been studied since the 1960s, when the growing expansion of the Afro-American and Hispanic middle class was starting to modify the racial makeup of Suburbia (Rapkin (1966), King and Mieszkowski (1973)). Numerous studies based on hedonic methodology and geographical discontinuities show that Blacks often have to pay a premium to enter formerly all-white neighborhoods (Yinger (1997)). The use of large-scale representative surveys is very interesting from a policy-oriented viewpoint since it gives an idea of the aggregate impact of discrimination. However, this methodology requires to dispose of very detailed information in order to minimize the risk that the observed pattern might be due to a third factor, either from the consumers' side or from the suppliers' side. This condition is even harder to meet when one thinks that tastes, which are largely unobservable, are likely to be partially ethnic-specific. Moreover, this methodology does not provide evidence on discrimination in the making: how and why agents discriminate remains unknown and the phenomenon of discrimination, if attested, re-

mains a black box. For all these reasons, most empirical evidence have come from pair-based audits, which highlight the role played by realtors. Many such audits have been conducted in the US since the late 1970s. For instance, using the results from an audit conducted in 1981 in Boston, Yinger (1986) shows that black applicants are offered up to 30% fewer opportunities to visit housing units: two decades later, this gap has narrowed but has not closed and by far (Zhao, Ondrich, and Yinger (2006)). Another example could be found in the Housing Discrimination Study of 1989, where a series of audits on 25 US metropolitan areas leads to another wave of evaluations. In one of them, Ondrich, Stricker, and Yinger (1999) explicitly distinguish between three possible causes of discrimination: agents' prejudice, customers' prejudice and agents' mis-perception of Blacks' preferences. As for the customer prejudice hypothesis, it is tested through three different channels. First, the authors look at the impact of the individual characteristics of black applicants that prejudiced neighbors are most likely to care about. Second, they identify the characteristics of the neighborhood which should in theory impact customer discrimination as well. Finally, they argue that a larger agency, which benefits from a broader client base, may discriminate less. Although the research strategy is plausible, those three different channels can be criticized on the basis that one may come up with many alternative interpretations for each variable. In order to capture the sole effect of customer discrimination, we argue that one needs a variable which specifically takes into account the impact of the neighborhood external-ity on realtors' decision-making process. In addition, while similar audits could be conducted in France,[1] they are costly [2] and their partial equilibrium framework makes their results difficult to interpret. To paraphrase Yinger (1998), an audit study only indicates the discrimination that occurs during certain phases of a market transaction when minority customers visit a random sample of firms and are qualified to buy what the firm is offering, not the average discrimination faced by an average minority customer. In other words, audits give causes, but not results. Our methodology borrows from both kinds of studies. We go back to the theory of discrimination and we extract one specific rationale for discrimination out of the black box. We then derive an identification strategy which relies on fairly weak assumptions regarding consumers' and sup-pliers' tastes. Thanks to the use of an original variable on the geography of landlords' real estate portfolios, we are able to isolate more precisely the impact of customer discrimination. Then, we make use of large-scale, easily available survey data, which allows us to pursue analyses at the aggregate level as well.

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[1]To our knowledge, the first audit of the French housing market has been conducted in 2010 by the municipality of Villeurbanne (in the suburbs of Lyon), in collaboration with a network of private landlords. It has shown that applicants with Maghrebian origin were more than 50% less likely to have their application accepted (ISM-CORUM (2011)).

[2] Recently, field experiments using newly available matching techniques, such as the Internet, have been con-ducted. Ahmed and Hammarstedt (2008) have provided strong evidence for gender and ethnic discrimination in the Swedish rental market, by looking at the reaction of landlords who had posted an ad on the Web and were contacted by fictitious applicants with distinctively ethnic and gender names. Even more recently, Hanson and Hawley (2011) have conducted a similar study on U.S. cities.

2 Customer discrimination in the rental market: theory

2.1 The model

We describe the rental pattern of a two-dwelling building in a context where some of the majority renters are prejudiced against minority people. We distinguish two cases, whether the building is owned by a unique landlord or by two separate landlords who act non-cooperatively. We shall refer to single-dwelling landlords as of type-1 landlords and to multiple-dwelling landlords as of type-2 landlords.

Set-up.—Time is continuous. The building is composed of two apartments. Each apartment is occupied by a white tenant (w), a black tenant (b), or is vacant (v). The state space for each building is $\{w, b, v\} \times \{w, b, v\}$. Owners with a vacant dwelling meet applicants at constant rate η. The applicant may be white with probability $p_w = p$ or black with complementary probability $p_b = 1 - p$. Prejudice is one-sided: nobody is prejudiced against Whites; Blacks are not prejudiced against Blacks; a fixed fraction α of the population of Whites is prejudiced against Blacks.[3] Prejudiced Whites refuse to enter in a dwelling when the neighbor is Black. However, they do not move out if a black tenant moves in next to them.[4]

When the applicant is willing to enter the dwelling, the landlord accepts with some probability. In all generality, such a probability may depend on many different factors like building state history (including the contemporaneous state) and time. We here assume that such a probability depends only on contemporaneous building state. Let $\beta = (\beta_{kl}) \in [0, 1]^6$ denote the vector of stationary probabilities of entering state $k = w, b$ when the other dwelling is in state $l = w, b, v$. Similarly, $\bar{\beta} = (\bar{\beta}_{kl}) \in [0, 1]^6$ denote the vector of stationary probabilities for the other dwelling.

Landlords receive a *fixed* rent R that does not depend on tenant race. However, to account for the event of statistical discrimination, the "net" rent is ethnic-specific with $R_w \geq R_b$. This assumption accounts for cases where Blacks would be more likely to default on the rent or cause higher maintenance costs. The differential rent may also result from arbitrary beliefs that landlords may have vis-à-vis Blacks.

At each date, landlords cannot evict a tenant, but tenants leave the apartment they rent with flow probability q.

Dwellings' values.—Landlords, whatever their type, are risk neutral and discount time at rate r. Let $\Pi : [0, 1]^6 \times [0, 1]^6 \to \mathbb{R}^9$ denote the function of gains associated with the ownership of *one* apartment. The typical element is $\Pi^{kl}(\beta, \bar{\beta})$. The dependence vis-à-vis β and $\bar{\beta}$ will be omitted whenever this does not cause a misunderstanding.

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[3]US studies show that more than 70% of Whites are not willing to move into a neighborhood which is more than 50% Afro-American, whereas more than 80% of Afro-Americans are willing to move into a neighborhood with only a few black neighbors (Farley, Steeh, Krysan, Jackson, and Reeves (1994)).

[4]We implicitly assume that there are moving costs, and that such costs override the negative externality. From her observation of current trends in American neighborhoods, Ellen (2000) draws a two-sided conclusion. On the one hand, Whites' willingness to move into a neighborhood really seems to be affected by the presence of African Americans; on the other hand, Whites' willingness to remain in their current neighborhood is not clearly affected by African Americans moving in. According to Ellen, this means that Whites use racial composition to stereotype neighborhoods, while they do not necessarily prefer to reside in all white neighborhoods.

For all $i, j = w, b$, the elements of the gain function are recursively defined as follows:

$$r\Pi^{ij} = R_i + q\left[\Pi^{vj} + \Pi^{iv} - 2\Pi^{ij}\right], \tag{1}$$

$$r\Pi^{iv} = R_i + q\left[\Pi^{vv} - \Pi^{iv}\right] + \eta \sum_l p_l (1 - \alpha_{li}) \bar{\beta}_{li} \left[\Pi^{il} - \Pi^{iv}\right], \tag{2}$$

$$r\Pi^{vj} = q\left[\Pi^{vv} - \Pi^{vj}\right] + \eta \sum_k p_k (1 - \alpha_{kj}) \beta_{kj} \left[\Pi^{kj} - \Pi^{vj}\right], \tag{3}$$

$$r\Pi^{vv} = \eta \sum_i p_i \beta_{iv} \left[\Pi^{iv} - \Pi^{vv}\right] + \eta \sum_i p_i \bar{\beta}_{iv} \left[\Pi^{vi} - \Pi^{vv}\right], \tag{4}$$

with $\alpha_{wb} = \alpha$ and $\alpha_{kl} = 0$ in all the other cases.

The system (1)–(4) is composed of nine linear equations. Changes in the occupation status of one dwelling generally affects the value of the other because having a black neighbor leads prejudiced Whites to refuse the dwelling. Consider equation (2); it states that a dwelling occupied by a type-i tenant with no neighbor yields instantaneous profit R_i but its value is subject to turn into Π^{vv} if the tenant leaves (an event which occurs at rate q) as well as into Π^{il} is the other dwelling is filled with a type-l tenant: this new tenant, which will arrive at rate η, will be of type l with probability p_l, will accept the dwelling offer with probability $(1 - \alpha_{li})$ and will be accepted by the landlord with probability $\bar{\beta}_{li}$ (see Appendix A for the proper derivation of these value functions).

Single-dwelling landlords' strategies.—Landlords choose who they accept and who they refuse. In other words, they set the probability vectors β and $\bar{\beta}$. They accept or reject applicants in a non-cooperative way. We reduce the possible strategies to state-dependent strategies. This forbids more sophisticated strategies that may yield the cooperative outcome. For each owner the *strategy space* is reduced to $B = \{\beta_{kl}; \beta_{kl} \in [0, 1], k = w, b$ and $l = w, b, v\}$. The *profit function* of a particular landlord is $\Pi_1 : B \times B \to \mathbb{R}^9$ with typical element $\Pi_1^{kl}(\beta, \bar{\beta}) = \Pi^{kl}(\beta, \bar{\beta})$.

A *best-response strategy* to strategy $\bar{\beta} \in B$ is a strategy $\beta \in B$ such that

$$\beta \in \arg\max_{\tilde{\beta} \in B} \Pi\left(\tilde{\beta}, \bar{\beta}\right). \tag{5}$$

From equations (1)–(4), best-response strategies are such that

$$\beta_{kl} = \begin{cases} 1 \text{ if } \Pi^{kl}\left(\tilde{\beta}, \bar{\beta}\right) > \Pi^{vl}\left(\tilde{\beta}, \bar{\beta}\right) \\ [0, 1] \text{ if } \Pi^{kl}\left(\tilde{\beta}, \bar{\beta}\right) = \Pi^{vl}\left(\tilde{\beta}, \bar{\beta}\right) \\ 0 \text{ else} \end{cases}. \tag{6}$$

A *symmetric Nash equilibrium* is a vector β such that

$$\beta^* \in \arg\max_{\tilde{\beta} \in B} \Pi\left(\tilde{\beta}, \beta^*\right). \tag{7}$$

A *pure-strategy symmetric equilibrium* is a symmetric Nash equilibrium with $\beta_{kl} = 0$ or $\beta_{kl} = 1$ for all $k = w, b$ and all $l = w, b, v$. We will only focus on such pure-strategy symmetric Nash equilibria.

The game is dynamic and the set of conditions (7) includes subgame perfection requirements.

Suppose for instance that the Nash equilibrium features $\beta_{bv}^* = \beta_{bw}^* = 0$. In words: Blacks are discriminated against when the other dwelling is vacant or when it is occupied by a White tenant. If both dwellings start vacant, then there will never be black tenants in the building. Landlords will never be confronted to a Black neighbor; they do not need to compute optimal strategies in such a case. However, subgame perfection requires that equilibrium strategies must also be optimal in situations that do not occur along the equilibrium path. Such conditions are important because they set individual-deviation gains. To pursue the example, suppose also that $\beta_{bb}^* = 1$: landlords do not discriminate against Blacks when the other dwelling is occupied by a Black. Deviating in the first stage then means accepting a black tenant knowing that the other landlord may well accept a black tenant in the future. This reasoning is crucial to establish that not deviating is the best strategy.

Subgame perfection conditions can receive an alternative interpretation. History may give the initial occupancy status of each dwelling. The Nash equilibrium must predict what the landlords do in all historically-driven initial situations. Back to the previous example, the game may start with a black tenant in one of the dwellings, or even in both. The equilibrium strategy $\beta_{bv}^* = \beta_{bw}^* = 0$ and $\beta_{bb}^* = 1$ implies that there will be no Blacks in the buidling in the long run. However, Black occupation can persist for some period of time, especially when the quit rate q is low.

Multiple-dwelling landlord's strategies.—The strategy set is $B_2 = B \times B$. The profit function is $\Pi_2 : B \times B \to \mathbb{R}^9$ with typical element $\Pi_2^{kl}(\beta, \bar{\beta}) = \Pi^{kl}(\beta, \bar{\beta}) + \Pi^{lk}(\bar{\beta}, \beta)$. Multiple-dwelling landlords maximize the value of the building rather than the value of each dwelling separately. Since the externality takes place at the building level, type-2 landlords will be able to make efficient decisions.

A *symmetric efficient strategy*, therefore, results from

$$\beta \in \arg\max_{\tilde{\beta} \in B} \Pi_2\left(\tilde{\beta}, \tilde{\beta}\right). \tag{8}$$

Such a strategy must satisfy

$$\beta_{kl} = \begin{cases} 1 \text{ if } \Pi^{kl}(\beta, \beta) + \Pi^{lk}(\beta, \beta) > \Pi^{vl}(\beta, \beta) + \Pi^{lv}(\beta, \beta) \\ [0,1] \text{ if } \Pi^{kl}(\beta, \beta) + \Pi^{lk}(\beta, \beta) = \Pi^{vl}(\beta, \beta) + \Pi^{lv}(\beta, \beta) \\ 0 \text{ else} \end{cases}. \tag{9}$$

The comparison of type-1 and type-2 best-reponse strategies reveals a key difference. The Nash equilibrium of the two type-1 landlords' game must be robust vis-à-vis individual deviations; described in similar terms, the efficient strategy must be robust vis-à-vis simultaneous deviations for both dwellings. This latter requirement is more demanding than the former one. Discriminatory behavior, if any, will be more likely when the building is controlled by a unique owner than when it is jointly owned by two separate landlords.

2.2 Understanding customer discrimination

Proposition 1 A DESCRIPTION OF OPTIMAL STRATEGIES *(i) Discriminating a white applicant is never an optimal strategy; (ii) Discriminating against Blacks is never an optimal strategy when $\alpha = 0$ and $R_w = R_b$ or when η is equal to 0.*

First, landlords never discriminate against white applicants. As long as the net rent from a white tenant is equal to or larger than the net rent from a black tenant, a landlord is always better off with a white tenant than with a vacant unit. Indeed, Whites do not either exert any negative externality, and they are never discriminated against. The reasoning holds whether we consider the efficient strategy of a multiple-dwelling landlord or the strategies implemented by the two single-landlords in Nash equilibrium.

Second, Blacks also are never discriminated for some values of the parameters. If there are no prejudiced applicants ($\alpha = 0$) and there is no room for statistical discrimination ($R_w = R_b$), discrimination does not occur. The limit property on η, the flow probability to receive an application to a vacant apartment, shows that discrimination requires market power. Landlords cannot discriminate when they have no chance of finding another tenant. Rejecting an application is a very costly strategy as the corresponding option value is nil in this case. Put otherwise, discrimination requires prejudiced individuals ($\alpha > 0$), or rent differences between both groups ($R_w > R_b$), and market power ($\eta > 0$).

We now compare the equilibrium strategies with the efficient strategy.

Proposition 2 COMPARING SINGLE- AND MULTIPLE-DWELLING LANDLORDS *(i) If type-2 landlords choose not to discriminate in all circumstances, then not discriminating in all circumstances is also a Nash equilibrium of the two single-dwelling landlords' game—that is, for all $j = w, b, v$, we have*

$$\Pi^{bj}(1) - \Pi^{vj}(1) > \Pi^{jv}(1) - \Pi^{jb}(1) \Longrightarrow \Pi^{bj}(1) - \Pi^{vj}(1) > 0; \tag{10}$$

(ii) If discriminating in all circumstances is a Nash equilibrium of the two single-dwelling landlords' game, then discriminating in all circumstances is also the optimal strategy of type-1 landlords—that is, for all $j = w, b, v$, we have

$$\Pi^{bj}(0) - \Pi^{vj}(0) < 0 \Longrightarrow \Pi^{bj}(0) - \Pi^{vj}(0) < \Pi^{jv}(0) - \Pi^{jb}(0); \tag{11}$$

(iibis) If discriminating for a particular occupancy status of the other dwelling is a Nash equilibrium of the two single-dwelling landlords' game, then the optimal strategy of type-1 landlords also involves discriminating for the same occupancy status of the other dwelling—that is, there is $j \in \{w, b, v\}$ such that

$$\Pi^{bj}(\beta^*) - \Pi^{vj}(\beta^*) < 0 \Longrightarrow \Pi^{bj}(\hat{\beta}) - \Pi^{vj}(\hat{\beta}) < \Pi^{jv}(\hat{\beta}) - \Pi^{jb}(\hat{\beta}); \tag{12}$$

(iii) If there are no prejudiced Whites, then the Nash equilibrium of the two type-1 landlords' game coincides with the optimal strategy of the type-2 landlord—that is

$$\beta^* \in \arg\max_{\beta \in B} \Pi_1(\beta, \beta^*) \Longleftrightarrow \beta^* \in \arg\max_{\beta \in B} \Pi_2(\beta, \beta) \tag{13}$$

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Point (i) and (ii)-(iibis) reveal a fundamental property. Given the other tenant's type, the fact that a type-1 landlord discriminates implies that a type-2 landlord discriminates. Customer discrimination implies that accepting a black tenant entails two externalities. The first externality is static. Having a black tenant today reduces the chances that the other dwelling will be rented out by a white tenant. Therefore the value of the other dwelling goes down. Type-1 landlords do not take this effect into account. The second externality is dynamic. Accepting a black tenant today affects the future composition of the building. In turn, this composition may alter the chances to find another tenant in case of separation. Both types of landlords face the dynamic externality, whereas only type-2 landlords internalize the static externality.[5] They are more likely to discriminate as a result.

Point (iii) shows that type-1 and type-2 landlords behave similarly when there is no customer discrimination. In this case, the only reason why Blacks may be discriminated against is that the net rent they induce is lower. Statistical discrimination becomes equally likely for both types of landlords. This result provides a simple strategy to test for the presence of customer discrimination on the rental market. If Blacks are discriminated against by multiple-dwelling landlords and not by single-dwelling landlords, then it means that there are prejudiced tenants (Whites) and that landlords take them into account prior to renting the apartment to a black tenant, whether there is room for statistical discrimination or not.

2.3   From the theory to the empirical strategy

Our model of customer discrimination predicts that multiple-dwelling landlords discriminate more against Blacks than single-dwelling landlords do only if there are prejudiced persons in the population of white tenants. This prediction leads to an eye-ball test of ethnic customer-based discrimination in the rental market.

The test strategy requires that the survey documents the ownership and occupancy status of each housing unit and so we can identify whether a dwelling belongs to a multiple-dwelling landlord or not. Survey data do not tell who applied to the dwelling; they describe the personal characteristics of successful applicants and of their dwelling.

Prediction 1.1 DETECTING CUSTOMER DISCRIMINATION IN THE HOUSING MARKET *If black tenants are less likely to have a type-2 landlord than white tenants, then there are prejudiced Whites in the rental market.*

In the absence of prejudiced Whites, black and white tenants are equally likely to have a multiple-dwelling landlord. The probability is equal to the proportion of dwellings owned by multiple-dwelling landlords. When there are prejudiced Whites, multiple-dwelling landlords may discriminate more than single-dwelling landlords. In this case, black tenants are less likely to have a multiple-dwelling landlord. Consequently, the only reason we could observe in the model a difference between single- and multiple-dwelling landlords is because there are prejudiced white tenants.

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[5]Note that if the model was not dynamic, this externality would not exist and type-1 landlords would therefore never practice customer discrimination, which would be less realistic.

At the equilibrium, landlords may have three different strategies : not discriminate, discriminate against Blacks when the other dwelling is vacant and discriminate against Blacks when the other dwelling is not occupied by a black tenant. We call "weak discrimination" the second strategy and "strong discrimination" the third strategy. At the steady state, under weak discrimination, Blacks end up being under-represented in the rental market, whereas under strong discrimination, they are completely barred from the rental market. There may be up to three different situations that enable us to identify the role of the landlord's type on the probability of Blacks to access the rental market: When type-2 landlords weakly discriminate and type-1 landlords do not discriminate at all, when type-2 landlords strongly discriminate and type-1 landlords still do not discriminate, and when type-2 landlords strongly discriminate and type-1 landlords also discriminate but weakly. As long as one of these situations at least has an empirical counterpart, Blacks should be less likely to have a type-2 landlord.
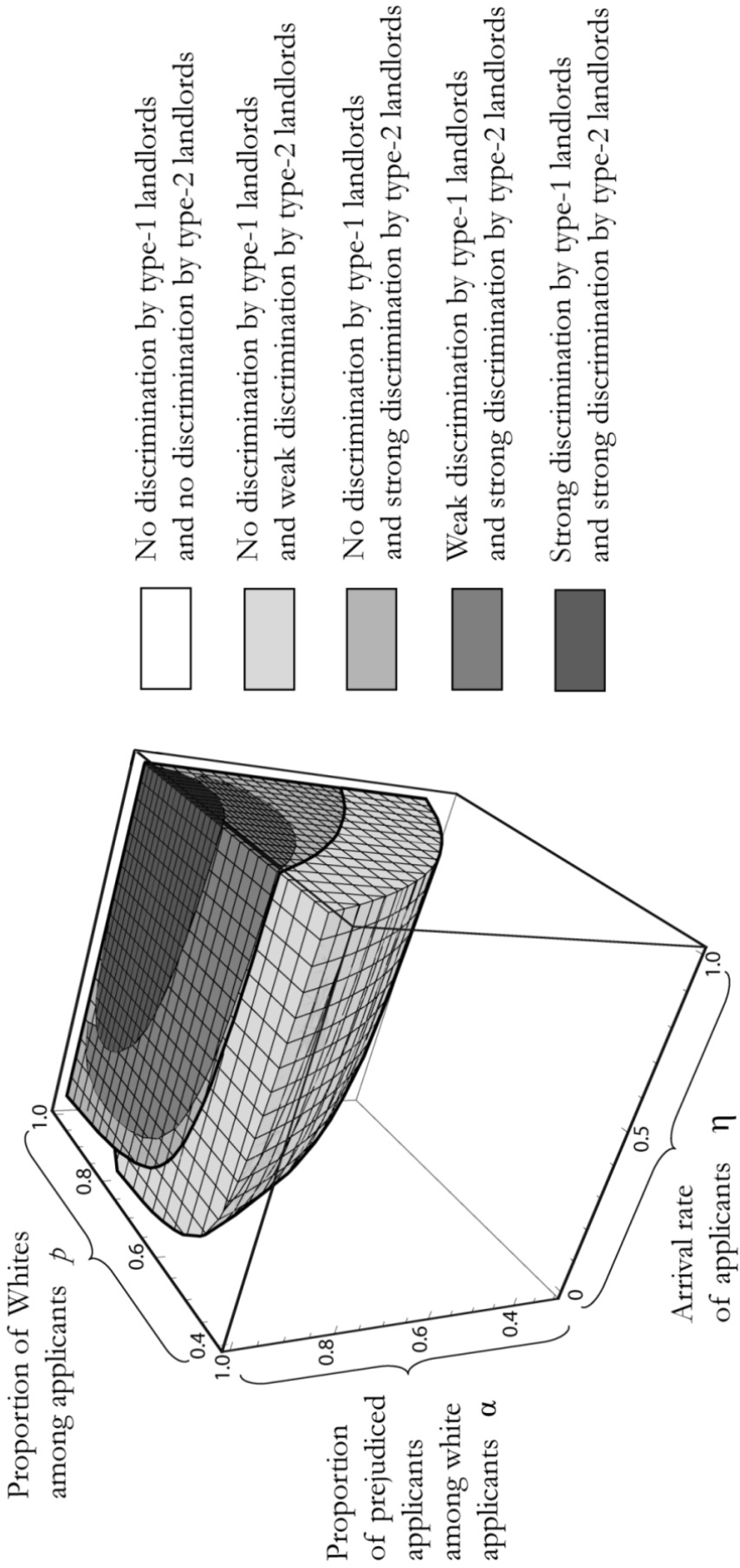
2.4 Comparative statics

Whereas one could go directly to our empirical test, we can move before deeper into intuition regarding the comparative statics of our model by parameterizing and simulating it, keeping in mind the study of racial segmentation in different local housing markets. We abstract from statistical discrimination and assume $R_w = R_b = 1$ since its impact is fairly clear. We completed simulations for a large range of values[6] for r and q. Both parameters act as deterrents against discrimination. If r is high, landlords care a lot about current vacancy and do not discriminate; if q is high, accepting a black applicant has a lower impact on profit since the turnover is faster. This is fairly straightforward and these two parameters should not vary so much across local housing markets, the reason why we display results only for an annual interest rate of 5% and for an average stay of 6 years.[7] We focus on the other three parameters p, α and η, which are likely to drive most of the heterogeneity across local housing markets.

Figure 1 draws in the space (p, α, η) the solids for which discrimination is a dominant strategy for each landlord type. It illustrates several features of the model. What strikes first is that discrimination is often a dominated strategy. If Whites are locally outnumbered ($p \leq 1/2$) or if enough of them are unprejudiced ($\alpha \leq 0.4$), no unprejudiced landlord will ever discriminate. The same happens in the event of a completely frozen rental market ($\eta \leq 0.05$). However, these threshold values would decrease with the addition of a pecuniary motive to discriminate (higher net rents for Whites) or prejudiced landlords. It is confirmed that type-2 landlords always discriminate when type-1 landlords discriminate. When both types discriminate, type-1 never discriminate more strongly than type-2.

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[6]Between 0.1% and 1% for r, which is a considered to be a monthly interest rate, and between 0.01 and 0.1 for q, which corresponds to an average stay between 100 and 10 months.

[7]Both values were chosen to be close to our data. Further simulations are available upon request.

Figure 1: Triplets (p, α, η) for which discrimination is a dominant strategy

No discrimination by type-1 landlords
and no discrimination by type-2 landlords

No discrimination by type-1 landlords
and weak discrimination by type-2 landlords

No discrimination by type-1 landlords
and strong discrimination by type-2 landlords

Weak discrimination by type-1 landlords
and strong discrimination by type-2 landlords

Strong discrimination by type-1 landlords
and strong discrimination by type-2 landlords

Proportion of Whites
among applicants p

Proportion
of prejudiced
applicants
among white
applicants α

Arrival rate
of applicants η

Weak discrimination occurs when the other dwelling is vacant and strong discrimination occurs when the other dwelling is not occupied by a black tenant

The effect of α and η is unambiguous: if white applicants are more prejudiced, customer discrimination increases and, similarly, a more fluid market makes it less risky to discriminate by ensuring that other applicants will be met shortly. In almost all cases, an increase in p also leads to an increase in discrimination: if more applicants are white, accepting a black applicant is more costly since it will be difficult to meet another black applicant in the future. All of this corresponds to the intuition. However, when p gets close to 1, its effect becomes ambiguous, especially for type-1 landlords. This reflects the fact that the dynamic externality is no longer a concern. If almost all applicants are white (and provided there still are some white applicants who are not prejudiced), accepting a black applicant will not increase the probability that the other apartment will be occupied by a black tenant when the landlord has to find another tenant.

2.5 Discussion

In this subsection, we discuss the theoretical robustness of our test strategy to detect customer discrimination in the housing market by considering various possible extensions about landlords' prejudice, pecuniary externalities, endogenization of some parameters, stronger prejudice from consumers, ethnic matching between different buildings and the home sale market.

Taste-based discrimination and statistical discrimination.—Introducing taste-based discrimination does not alter the working of the model. Suppose that a proportion β of landlords are themselves prejudiced and systematically refuse to rent their apartment to a black tenant. As far as this proportion is broadly the same among type-1 and type-2 landlords, the fact that landlords have a taste for discrimination does not affect the theoretical prediction according to which black tenants should be less likely to have a multiple-dwelling landlord. Actually, the same remark holds for statistical discrimination. Our model assumes that the potentially negative effects that Blacks may have on landlord's profits do not change with landlord's type. To put it another way, our strategy is robust to various omitted factors provided that such factors are not correlated with landlord's type.

However, the test strategy is not robust to omitted externalities at the building level. Consider the case of pecuniary externalities. Suppose that the net rent decreases for both apartments as soon as a black tenant has been accepted in the building. This might arise if unobservable characteristics correlated with ethnicity make Blacks more likely to deteriorate the common property of the building for instance. Accepting a black tenant in one of the two apartments lowers the value of the entire building. Type-1 landlords do not internalize this externality, while type-2 do. Therefore, Blacks could be less likely to have a type-2 landlord, even though there is no customer discrimination and even though a direct effect of statistical discrimination is at work for both types of landlords. However, such externalities are very associated with the formation of white prejudice. If black tenants deteriorate the common parts of the building, white tenants are likely to avoid black neighbors. From this perspective, the consideration of omitted externalities at the building level has more to do with the origins of racial prejudice than with a competing theory for the under-representation of Blacks in rentals owned by multiple-dwelling landlords.

Endogenization of the parameters.—Many parameters of the model could be made endoge-

nous. The applicants arrival rate η might depend on the proportion of black applicants and on ethnic-specific rents net of maintenance costs. This would require specifying a matching function and the supply of buildings. Prejudice may also depend on the ethnic make-up of the population. Moreover, the proportion of black applicants may respond to discriminatory behavior. In particular, if p were made endogenous, discrimination might lead to segregation through the constitution of a dual housing market where landlords would specialize in one type of tenant or another. Those various extensions would enrich the theoretical model and help understand discrimination issues better. However, they would not affect the test strategy that relies on individual discriminatory behavior. Optimal tenant acceptance or rejection do not depend on the particular way of closing the model.

Rents also could be made endogenous. For instance, they could be bargained between the tenant and the landlord. Bargaining requires to set an outside option for the potential tenant. In case of agreement, the bargained rent would imply that the tenant's utility is between the reservation utility and the highest level compatible with landlord's acceptance. As the latter utility level must be lower for a black tenant than for a white tenant, black tenants would pay higher rents at given reservation utility. When the match surplus becomes negative, there is no rent compatible with landlord's acceptance and black applications get rejected. Assuming that match surplus is larger with white than with black tenants (that condition does not seem too demanding, but it depends on the reservation utility that may vary across ethnic groups), the test strategy would be unaffected. Multiple-dwelling landlords would still account for the negative externality that a black tenant originates. In other words, multiple-dwelling landlords would reject black applicants more often than single-dwelling landlords. We do not elaborate more on this extension, since statistical regressions presented in the next section do not conclude that minority tenants pay higher rents, regardless of landlord's type.

Stronger definition of prejudice.—We could add the possibility of a white flight, with prejudiced Whites moving out as soon as they have a black neighbor. How this stronger prejudice would affect landlords' behavior would depend on whether tenants' prejudice is observable or not. However, in both cases, type-2 landlords will keep on discriminating more. For instance, in case prejudice is observable on tenants, type-2 landlords with a prejudiced white tenant in their second apartment will always reject black applicants. Type-1 landlords, on the other hand, might care about knowing that they are about to make the neighbor move out, but this will not always prevent them from accepting a black applicant. In case prejudice is unobservable, both types will discriminate more often than with the previous definition of prejudice. However, type-1 landlords still do not care as much as type-2 landlords about the impact of their acceptance decision on the probability that the other tenant might leave as a result.

Heterogeneity in building size and collusion behavior.—The discrimination strategies we depict have consequences in terms of long-run patterns of segregation. Under weak discrimination, Blacks are under-represented in the rental market; under strong discrimination, they are completely barred from it. However, if the goal of the model were to predict the allocation of tenants across types according to ethnicity, many other factors should be included, such as the history of ownership in the building and the heterogeneity of the housing supply with respect to the num-

ber of apartments within each building. This is not the purpose of the model, which only aims to identify individually optimal strategies and derive a prediction out of them. In that sense, the assumption of homogeneity of building size is justified.[8] The main theoretical drawback of a framework with only two apartments in the building is that it makes it difficult to rule out the possibility of collusion between the two type-1 landlords of the same building: if both landlords cooperate, they can no longer be distinguished from a type-2 landlord. Both features (heterogeneity in building size and the possibility of collusion between type-1 landlords), if included in the model, would decrease the probability to observe prediction 1.1 in the data. However, since the bias can only be downward, this does not affect the relevance of the test.

Ethnic matching between different buildings—If landlords own apartments in several buildings, they should be able to direct applicants to a building or to another, according to their group. This kind of spatial targeting may act as a substitute for discrimination. In that case, the set of landlords' strategies becomes quite complex because each strategy is now a combination of a discrimination strategy and an allocation strategy. The existence of an allocation strategy hinges on a series of assumptions ensuring that the reallocation of applicants between different buildings can be made instantaneously at no cost. This is seldom the case. The apartments may not be substitutable because their characteristics, such as location or size, differ too much from one another. Also, there may be visit costs, since visiting different places takes time. Last but not least, the various apartments may be attributed by a real estate firm that accounts for the various landlords' discrimination strategies, but, given the magnitude of its flat portfolio, does not necessarily reallocate potential tenants towards apartments belonging to the same landlord. However, since our empirical strategy relies on the prediction of the model, it is worth examining if such an extension is likely to jeopardize it or not.

In Appendix C, we develop the simplest case of "type-4" landlords, who own two buildings. We describe their most efficient tenant allocation strategy that can take applicants' prejudice into account. Contrary to intuition, this allocation strategy is is not the most segregative strategy, which would consist in the systematic regrouping of all tenants according to their type. Here, landlords try to avoid one situation above all: a vacant apartment next to a black tenant. For this purpose, they will scatter white applicants, except when this requires them to bet on white applicants' own prejudice, which we assume is unobservable ex ante; on the contrary, they will regroup black tenants, even when this means to "free ride" on a white tenant. Given the complexity of the system, we perform simulations on α, p and η to check whether this strategy reduces the incentives to discriminate. These simulations, available upon request, show that even though we cannot rule out the possibility that type-4 landlords sometimes discriminate less than type-1 landlords, this situation is rather unlikely. Moreover, since type-4 landlords cannot be distinguished from type-2 landlords in the data, the bias can only be downwards and this extension does not substantially affect the relevance of the test.

Home-sale market.—Separation parameter q is what mostly distinguishes our framework from a model of the home-sale market. The matching for a sale is one-shot. Once the lot is sold,

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[8]The next section will show that using real data implies to compare type-n landlords ($n \geq 2$), who own the entire building, to type-k landlords ($k \in \{1, ..., n-1\}$), who do not. For a given building of size n, former type-1 landlords may then greatly differ from one another.

the seller is no longer interested in its future evolution, hence $q = 0$ for ever. The modelling of the home-sale market does not require many additional changes. One can still consider a city of identical buildings with two identical apartments, with apartments for sale belonging to unprejudiced owners. We distinguish between type-1 sellers, who only sell one apartment, and type-2 sellers, who sell both apartments simultaneously yet in two separate lots. Absent statistical discrimination and own prejudice, type-1 sellers will never discriminate out of the prejudice of white buyers because there is no more dynamic externalities. On the contrary, if the sale process is sequential and if applicants observe the type of their potentially future neighbor before accepting to buy the apartment, type-2 sellers may discriminate against Blacks who apply for the first of their two apartments (once they have sold one apartment, type-2 sellers become type-1 and they stop discriminating). We do not elaborate more on this extension since the type of seller from which homeowners have bought their dwelling is not present in the dataset we use.

3   Customer discrimination in the rental market: test

This section tests for the presence of customer discrimination in the French rental housing market. We describe our dataset and notably the fact that tenants state whether their landlord owns the entire building or not. The main test consists in confronting Prediction 1.1 to data. The test shows that tenants with non-European origin are less likely to rent from a landlord who owns the entire building. We then check that this result is robust to several possible issues.

3.1   Data

Our dataset consists in the pooling of the last three[9] waves (1996, 2002 and 2006) of the French national housing survey (*Enquête Nationale Logement*, henceforth ENL). The ENL is a detailed cross-sectional survey on a nationally-representative sample of around thirty thousand households, thirty-five thousand dwellings and seventy-five thousand individuals.

The main drawback of the ENL is inherited from a French political tradition, which makes it still controversial to collect racial or ethnic statistics. Consequently, we isolate a group of "Blacks" composed of first-generation immigrants of non-European origin: both non-European citizens and people born out of Europe and not French at birth. Three quarters of them come from Africa, and most of the quarter left come from South and Southeast Asia. This measure of ethnicity misses a large number of people, because of colonial history (people born in the colonies were given French citizenship at birth), of French West Indies and of the increasing number of second, third and even fourth-generation immigrants of non-European origin in France. Moreover, it does not clearly disentangle ethnicity and immigration status. We address this issue in two ways: first, we always consider the group of "European origin" (both non-French European citizens and people born out of France, in Europe and not French at birth) as a second control group, intermediate between "the French-born" and "non-Europeans". This

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[9]Previous waves lack critical information about the origin of the respondent.

group should be subject to the same difficulties as all immigrants in terms of language or cultural knowledge of France, but its members are not expected to be discriminated against out of race and skin colour. Second, we drop from our sample all the households whose respondent was not living in France or was living at someone else's place four years before. By doing so, we focus on immigrants who are really settled in France and may have started to integrate in the labor market. Each one of these two groups of not-too-recent first-generation European and non-European immigrants represents around 4.5% of the population of households whose respondent had a place of her own four years before the survey.

Table 8 in Appendix D shows that non-Europeans are over-represented both in the private rental market and in the market of apartments (broadly defined here as dwellings which share a building with at least another dwelling). As a consequence, the share of non-European immigrants in the population of tenants in privately-rented apartments is twice as high as the share of French-born or European tenants. Within this sub-population of tenants, Table 9 in Appendix D shows that non-European tenants differ in terms of individual characteristics, which is therefore important to control for in regressions. Non-european tenants are less often women and are less educated, their household is less rich per consumption unit, has more members and children.

Apart from individual characteristics, the ENL provides a lot of information about the characteristics of the dwelling. It includes a dummy variable that indicates whether the apartment is located in a building owned by a single landlord or not. This variable is informed by the respondent himself or, if he does not know, by his neighbors or by the caretaker of the building.[10] Even if this variable does not allow us to identify the cases where the landlord owns part but not the entire building, it gives an idea of the magnitude of multiple ownership. It regards 40% of privately-rented apartments. This rate is surprisingly high and varies a lot across regions. From now on, a "multiple-dwelling landlord" is a landlord who owns an entire building, while a "single landlord" does not. Table 10 in Appendix D shows that both types of apartments are similar in terms of size and comfort. However, rents are somewhat lower and buildings are both older and smaller in case of multiple-dwelling landlords. Finally, multiple-dwelling landlords are not randomly allocated across France: they are fewer in densely populated areas and in areas with more single-parent families. All these features are accounted for in the specification we use to test for customer discrimination in the next subsection.

3.2 Test of the main prediction

Prediction 1.1 states that there is evidence of consumer-based discrimination in the rental market if black tenants less often have a landlord who owns several apartments within the same building. In order to test this prediction, we use the sub-sample of tenants in privately-rented apartments to estimate a probit model of the probability to have a landlord who owns the entire building. We regress this probability on a dummy variable which indicates whether the respondent is of non-European origin or not. If the coefficient on this variable is negative, there is consumer-based discrimination according to our model. As already mentioned, this variable

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[10]In the model, we assume that the applicant does not observe the landlord type. Although, in the dataset, the information is provided by the tenant himself, it is probably revealed after the match is completed.

of multiple ownership does not identify all the intermediate cases where landlords own several apartments but not the entire building. If the latter discriminate as much as the former, the coefficient is biased downward. Similarly, the non-European variable misses many racial minority households who are not first-generation immigrants. If these migrants are as discriminated as much as first generation immigrants, our coefficient is again biased downward. In any case, we hope these measurement issues do not affect too much our strategy, the main risk being a lack of significance due to the somewhat narrow categories of discriminating and discriminated groups we consider. Finally, this reduced-form strategy does not allow us to model the selection process into the private rental market; however, this selection is likely to reduce the differences in unobserved heterogeneity between immigrants and non-immigrants.

Table 1 shows that the marginal effect of non-European origin remains significantly negative, regardless of the specification. In particular, it does not decrease when we control for every available characteristics of the tenant, location and apartment (column 4): non-Europeans remain less likely to have a landlord who owns the entire building by 4 percentage points. We can interpret this negative marginal effect in terms of customer discrimination if we are confident that the other variables included in the regression control adequately for the main differences in the housing supply and the marketing process of both types of landlords. In this perspective, it is interesting to see how the marginal effect varies with the set of controls. Column 2 controls for tenant characteristics and the effect goes up. As explained before, Non-European households are poorer and larger, while housing units owned by multiple-dwelling landlords are typically cheaper and contain more rooms. Therefore, non-Europeans should be over-represented in housing units owned by a multiple-dwelling landlord. When we control for their characteristics, the effect is now as high as 8.3% points. However, we also have to account for the uneven spatial distribution of multiple landlords. For this reason, in columns 3 and 4, we also control for location, through two sets of fixed effects: the first is a set of MSA fixed effects.[11] Each MSA is assumed to form a separate local housing market. However, since MSAs do not form a partition of France, we also include a set of "départements "fixed effects, which are intended to proxy a local housing market for households living in rural areas.[12] Controlling for location in columns 3 and 4 reduces the marginal effect (in absolute value). It is due to the fact that multiple-dwelling landlords are over-represented in small cities and rural areas, while Non-European tenants live in larger cities. Finally, controlling for the apartment characteristics slightly re-increase the effect in absolute value: once controlled for the tenant and location characteristics (which matters a lot for prices), multiple-dwelling landlords apartments have characteristics favorable to Non-Europeans; when they are controlled for, discrimination appear as even stronger.

To sum up, upward and downward effects controlled for, our preferred estimate in column 4

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[11]We use the most recent definition of MSA (2010), which distinguishes between 765 MSAs in continental France and regroups half of all French municipalities. The definition of MSAs is functional: they are formed by a main employment center, with at least 1,500 jobs, and by all the surrounding municipalities which send at least 40% of their employed residents to this empoyment center or to a municipality that does so. In 2008, 85% of the French population live in a MSA. Households in our sample come from 276 different MSAs. However, we are more precise for the ten largest MSAs, for which we distinguish the main municipality of the MSA. For Paris MSA, in addition to isolating Paris municipality, we also distinguish between the 20 different boroughs (the "arrondissements ").

[12]Départements are roughly comparable US districts. The 94 départements form a partition of continental France.

remains very significant and of a magnitude similar to the raw effect displayed in column 1. This allows us to conclude to a non-rejection of our model and to a significant presence of customer discrimination in the French housing market. Moreover, the magnitude of the coefficient can be interpreted in the following way. There is a direct effect of discrimination that reduces the probability to get a multiple-dwelling landlord by as much as 8.3 percentage points for identical characteristics of the tenant. Now, Non-Europeans appear to be located in places where multiple-dwelling are less numerous, which reduces their possibility to be discriminated. If locations choices are exogenous, i.e. not at all related to the internalization of the multiple-dwelling landlords' discriminating behavior, the effect is 4 points only. If, at the other extreme, the Non-European population location choices constitute entirely in an endogenous response to discrimination, the overall impact of discrimination is really at 8.3 points, which reduces to 4 points only due to an indirect impact effect of discrimination on location choices that mitigates the direct effect by 4.3 points. In other words, we estimate an upper and a lower bound of the effect of discrimination, which is between 4 and 8.3 percentage points depending on how much such a discrimination has an impact on the location choices of discriminated populations.

Table 1: Probability to have a landlord who owns the entire building

	(1)	(2)	(3)	(4)
Non-European origin	-0.033**	-0.083***	-0.037**	-0.040**
	(0.013)	(0.013)	(0.016)	(0.017)
European origin	0.016	-0.019	-0.006	-0.031
	(0.023)	(0.023)	(0.025)	(0.026)
Individual characteristics		X	X	X
Location fixed effects			X	X
Apartment characteristics				X
Time dummies	X	X	X	X
N	11139	11139	10972	10875
Pseudo-R^2	0.01	0.03	0.14	0.21

Notes: (i) Marginal effects of a Probit model reported. (ii) Standard errors in parentheses. Significance: ***: 1%, **: 5%, *: 10% (iii) Sample: All tenants in privately-rented apartments who had a place of their own in France four years before the survey. (iv) Individual and apartment characteristics: Those reported in Tables 9 and 10 (in Appendix D). (v) Location fixed effects: MSAs and départements. (vi) Source: INSEE, ENL 1996, 2002 and 2006

In Appendix E, we replicate these estimations but we distinguish non-European immigrants between African immigrants and non-African immigrants. The estimates for these two subgroups are very similar. However, smaller sample sizes make them less precise. As a consequence, we stick to our ternary partition of the population.

3.3 Discussion

Quality and price discrimination. To test Prediction 1.1, we need both types of landlords to provide a similar good, so that all kinds of applicants are indifferently looking across both types.

The set of controls we introduce makes it unlikely that the characteristics of the dwelling itself might be sufficiently different between the two types of landlords to explain the exclusion of non-Europeans by differences in tastes with respect to housing. Similarly, different prices between the two types of landlords should not play a large role in this phenomenon, first because of the French institutional design of the housing market we already comment in the Introduction. Typically, any significant increase between posted price (on the ad) and asked price (before signing the lease) may be considered as an expression of misleading advertising and, as such, be prohibited by article 121-1 of the French Consumer Code. Importantly, our preferred specification includes the level of rent among controls: Even if the price elasticity of non-Europeans' demand for housing was different because of unobservable characteristics correlated with ethnicity, this last specification should take it into account. This addresses the concern that, compared to smaller landlords, multiple-dwelling landlords might behave as local price makers, which would enable them to set higher rents in order to impede the arrival of non-European applicants.

Finally, Table 2 below presents the regression of the rent paid by tenants without and with controls (the individual and apartment characteristics, the same location effects as before, the tenant origin and the landlord's type, the last two being also interacted). Without any controls, non-European immigrants pay higher rents, which completely disappears when controls are introduced. This is mainly due to the fact that they live in larger cities where housing prices are higher, the reason why the effect disappears when location controls are introduced. In any case, they do not pay higher rents when they rent to multiple-dwelling landlords, even without any controls. Multiple landlords propose lower rents for all tenants, which is mainly due to the type of apartments they rent even if the effect does not completely disappear with all controls. This is anyway a question fairly orthogonal to our strategy, as the fact that European immigrants do face slightly lower prices than non-European immigrants and French-born. This could be explained either by a bias due to the small sample they represent (4% of the sample, with respect to 18% for non-Europeans) or to the fact that micro-geographic factors are not controlled for (European immigrants correspond to older immigration waves, which could have allowed them to locate in cheaper neighborhoods within cities where rents are on average higher). Again, this price advantage is not related to the type of the landlord, which is the important concern for us. Therefore, the crucial conclusion from Table 2 is that, everything else equal, non-European tenants do not face higher rents, even when they rent to multiple-dwelling landlords. This constitutes a strong indication that non-European tenants do not seem to pay any kind of racial premium, either from single- or from multiple-dwelling landlords.

Taste-based discrimination.—One must be also confident that, in the absence of applicants' prejudice, both types of landlords would equally provide their apartments to all kinds of applicants. However, racial preferences might be correlated with landlord's type. For instance, it is likely that multiple-dwelling landlords are less often immigrants and wealthier, hence maybe more conservative. Both features make them more likely to be racially prejudiced and no data is available to control for it. Conversely, one may also think that both types of landlords are personally prejudiced but only multiple-dwelling landlords have enough market power to be able

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Table 2: Determinants of the rent

	(1)	(2)
Non-European origin	0.252***	0.007
	(0.016)	(0.012)
European origin	-0.113***	-0.086***
	(0.031)	(0.021)
Multiple landlord	-0.265***	-0.091***
	(0.011)	(0.008)
Non-European origin × Multiple landlord	-0.029	-0.016
	(0.027)	(0.018)
European origin × Multiple landlord	0.024	0.007
	(0.049)	(0.032)
Controls		X
Observations number	11055	11055
R^2	0.54	0.65

Notes: (i) Ordinary-least-square regression of the log of rent by squared meter (2006 euro). (ii) Standard errors in parentheses. Significance: ***: 1%, **: 5%, *: 10% (iii) Controls: Those considered in column (4) of Table1, except rent. (iv) Sample: All tenants in privately-rented apartments who had a place of their own in France four years before the survey. (v) Source: INSEE, ENL 1996, 2002 and 2006

to afford to discriminate at their will. This interpretation is interesting but is not empirically relevant, since there are very few landlords who control enough segments of a local housing market to be in this position. A more relevant issue is that personal prejudice should be playing a more important role if the landlord (or the real estate agent, in case the landlord is a firm) also lived in the neighborhood. While our data does not indicate when the landlord also lives in the building, it has been shown that this situation is largely restricted to small buildings of two or three apartments, often located in rural areas and involving intergenerational co-residence (Bessière and Laferrère (2002)). This specificity of the housing supply of multiple-dwelling landlords could explain part of our result. Table 3 shows that this is not the case. The effect of being of non-European origin does not decrease in absolute value when the size of the building increases, if anything it slightly increases. Finally, one may also think of other interactions between the landlord and the tenant, apart from coresidence. In particular, the payment of the rent constitutes another potentially regular interaction. If multiple landlords are more prejudiced and also tend to collect the rent more directly than single landlords, this omitted variable bias could explain our result. We have information about this in the ENL, where households are asked whether the rent is collected by an intermediary, or directly by the landlord. Indeed, 69% of tenants who have a multiple landlord declare that they give the rent directly to the landlord, against 55% of tenants with a single landlord.[13] However, as shown in column (2) of Table 4, controlling for this factor does not affect our result.

Statistical discrimination.—Statistical discrimination would mean that non-European immigrants are, on average, worse tenants. This could mean that they cause greater maintenance

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[13]Both differences are significant at the 1% confidence level.

Table 3: Replication of column (4) of Table 1 by building size

Number of apartments	All	≥ 5	≥ 20	≥ 40
Non-European origin	-0.040**	-0.052***	-0.044**	-0.075**
	(0.017)	(0.015)	(0.019)	(0.030)
European origin	-0.031	-0.032	-0.032	0.009
	(0.026)	(0.025)	(0.030)	(0.055)
Controls	X	X	X	X
N	10879	8631	3625	1502
Pseudo-R^2	0.21	0.16	0.15	0.20

Notes: (i) Marginal effects of a Probit model reported. (ii) Standard errors in parentheses. Significance: ***: 1%, **: 5%, *: 10% (iii) Sample: All tenants in privately-rented apartments who had a place of their own in France four years before the survey. (iv) Controls: Those considered in column (4) of Table 1. (v) Source: INSEE, ENL 1996, 2002 and 2006

costs or that their probability of default on rent is higher. Statistical discrimination would not be an issue for our test strategy if we could confidently assume that both types of landlords would react similarly to this situation. We discuss here two stories that might go against this assumption. On the matter of maintenance costs, it has already been mentioned that the test strategy is not robust to omitted externalities at the building level. If unobservable characteristics correlated with origin make non-European tenants more likely to cause damages to common property in the building, multiple-dwelling landlords will be more likely to internalize this externality, regardless of tenants' prejudice. This possibility is partly taken into account in the last specification of Table 1, which controls for whether the respondent complains about recent deterioration of common property of the building. When housing characteristics are controlled for in a regression not presented here but available upon request, it is observed that non-European tenants are not more likely than the other tenants to have witnessed this kind of deterioration in their building. However, both arguments are not fully compelling. A more clear-cut test of statistical discrimination would consist in replicating the test of the tenant model prediction on the market of privately-rented houses, where common property does not matter as much. Provided prejudiced applicants also care about their neighbors when they look for a house, this new test would enable us to assess the respective importance of the two effects. Unfortunately, it is not possible to implement it with the ENL that does not indicate landlord's type when the rental is not located in a collective building. As for the probability to default on rent, one may argue that multiple landlords, who dispose of a greater information set, are more likely to know the differences in default risk between the different groups of tenants. If, in addition, unobserved characteristics correlated with ethnicity make non-European immigrants more likely to default on rent, this omitted variable may jeopardize our test strategy. In the ENL, tenants are asked if they have had difficulty paying the rent in the past two years. We believe that this question is indirect enough to be considered as a good proxy for default risk, in spite of its declarative nature. If we take this variable seriously, we see that non-European immigrants are, indeed, more likely to default on rent. The unconditional probability for non-European immigrants to answer "yes" to this question is twice higher than for the rest of the population of tenants (26% against

13%) and the gap does not fully close when controlling for household observed characteristics, such as current income.[14] To rule out this statistical discrimination story, we therefore control for the default variable in our main specification. As shown in column (3) of Table 4, this does not affect our result.

Could search be directed by heterogenous marketing channels?—One last possible issue involves differences in the marketing process of both types of landlords. For example, single landlords may be more likely to use non-standardized advertising, where social networks help applicants to be notified of a new vacancy. If, simultaneously, non-European applicants are more likely to mobilize social networks when they search, they will more often be matched with single landlords. This might be due to ethnic-specific search behavior but it might also be due to discrimination in the more standardized segments of the market. This story can be tested with the ENL that provides information on the way private tenants who have moved in for less than four years had heard about the place they currently occupy. It appears that non-European applicants do mobilize social networks more frequently: on average during the decade 1996-2006, 33% of non-European private tenants who had recently moved in a new apartment had heard about it from a friend or a relative, while this was only the case of 22% of the other private tenants in apartments. However, multiple-dwelling landlords also seem to be largely benefiting from such informal networks. If anything, they benefit from them even more than single landlords, since, among all the tenants who had recently moved in their apartment, 27% of those with a multiple-dwelling landlord had heard about their apartment from a friend or a relative, while this was only the case of 20% of the tenants facing a single landlord.[15] Column (4) in Table 4 reproduces the estimation results of column (5) in Table 1 for this sample of tenants who have moved for less than four years. It shows that controlling for the nature of the information channel does not substantially affect the result. Finally, column (5) shows that controlling for the three variables altogether (the way rent is paid, the proxy for default and the information channel), does not change the result either. All things considered, we believe that the result displayed in Table 1 is robust to all these issues and constitutes a strong indication that ethnic minorities suffer from customer-based discriminatory practices in the French private rental market.

4   Discrimination and ethnic composition of public housing

We turn to the macroscopic implications of the presence of customer discrimination in the housing market we prove in section 3. We show that the probability to live in public housing for non-European immigrants is positively correlated with the local proportion of apartments owned by multiple-dwelling landlords, while this correlation does not stand for the French-born and European immigrant tenants.

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[14]Part of the explanation probably stems from a higher volatility in earnings for this population, as shown in Decreuse and Schmutz (2012) for African immigrants.

[15]Both differences are significant at the 1% confidence level.

Table 4: Replication of column (4) of Table 1 with controls for taste-based discrimination, statistical discrimination or networks

	(1)	(2)	(3)	(4)	(5)
Non-European origin	-0.040**	-0.043**	-0.038**	-0.046*	-0.043*
	(0.017)	(0.017)	(0.017)	(0.028)	(0.025)
European origin	-0.031	-0.027	-0.031	0.056	-0.023
	(0.026)	(0.026)	(0.026)	(0.061)	(0.046)
Rent paid directly		0.093***			0.105***
		(0.011)			(0.034)
Proxy for default			0.014		-0.022
			(0.015)		(0.021)
Friends or relatives				0.025	0.001
				(0.018)	(0.143)
Controls	X	X	X	X	X
N	10879	10857	10861	5232	5232
Pseudo-R^2	0.21	0.22	0.22	0.23	0.23

Notes: (i) Marginal effects of a Probit model reported. (ii) Standard errors in parentheses. Significance: ***: 1%, **: 5%, *: 10% (iii) Rent paid directly: rent is paid directly to the landlord; proxy for default: has had difficulty paying the rent in the past two years; Friends or relatives: the vacancy was heard of through friends or family networks. (iv) Sample: Columns 1 to 3: All tenants in privately-rented apartments who had a place of their own in France four years before the survey; columns 4 and 5: Restricted to those who have recently moved in. (v) Controls: Those considered in column (4) of Table 1. (vi) Source: INSEE, ENL 1996, 2002 and 2006

4.1 The French public housing market: magnet or buffer stock?

In France, public housing is a very large and old public program which dates back to the 1920s. Publicly-subsidized, rent-controlled housing units represent 40% of the rental market, 15% of the total stock of main homes. It is generally denoted by the acronym HLM, which stands for *Habitations à Loyer Modéré*. Even if the HLM constellation is very diverse, in terms of quality, location and inhabitants, a large part of the HLM supply is located in derelict, suburban areas which have become ethnic ghettos along the past thirty-five years (Laferrère and LeBlanc (2006)). Non-European immigrants are notably over-represented in the HLM complex: according to the ENL, more than 40% of non-European immigrants live in HLM, compared to about 15% of European immigrants and French-born. After controlling for differences in socioeconomic characteristics, this gap narrows but remains high (Fougère, Kramarz, Rathelot, and Safi (2011)).

It has been argued that this situation partly reflects the historical specificity of non-European immigrants' housing demand. For instance, Verdugo (2011) finds some evidence of a causal relationship between HLM supply at the city level and the location decision of immigrants when they first arrived in France, for a few non-European ethnic groups. From this starting point, one can imagine how HLM ethnic communities arose and have kept reinforcing ever since, sometimes with the direct help from the HLM agencies themselves, which practiced ethnic matching. However, this story does not explain why the over-representation of non-European immigrants is also true in relative flows both within and between various housing markets. We first provide some empirical evidence of the magnitude of this phenomenon.

Table 5 displays the raw transition rates between households' tenancy status. As previously, the time span is four years and we restrict the sample to households who have moved out at least once during these four years. Non-European immigrants who were not initially living in HLM are more likely, by more than 10% points than other origin households, to end up living in one: 23% (28%) of non–European homeowners (resp. private tenants) move in a HLM, whereas it is only the case of 9% (resp. 18%) of European homeowners (resp. private tenants) and 10% (resp. 14%) of French-born homeowners (resp. private tenants). As for the group who was initially living in HLM, non-European immigrants are more likely by more than 25% points to end up living in another HLM (69% against 41% of European HLM tenants and 44% of French-born HLM tenants). These large differences are not driven by differences in socioeconomic characteristics, as shown by the last matrix ('French-born weighted'), which gives the mobility pattern of a counterfactual group of French-born whose characteristics were matched to the characteristics of non-European immigrants.[16] A likelihood ratio test shows that the residential mobility pattern of non-European immigrants is significantly different from any other group, including 'French-born weighted' households, which is not the case of European immigrants, whose mobility is not significantly different from French-born households.[17]

Moreover, if HLMs were specifically chosen by non-Europeans for cultural reasons, they should be enjoyed more by non-Europeans than by other tenants, whereas our data seems to indicate that the opposite is actually true. Indeed, Table 6 shows that a non-European HLM tenant is more likely by 15 points to declare that he would move out if he could than his French-born or European counterparts. Even after controlling for any observable characteristic of the dwelling, this remains at 5 points. Therefore, if anything, non-European HLM tenants are less satisfied with their dwelling than other HLM tenants.

4.2   Public housing as a mirror of discrimination

We argue that the over-representation of non-Europeans in a type of housing that they do not particularly like but where they are more easily accepted partly reflects customer discrimination on the private housing market. People make residential choices, even HLM tenants. Notably, they choose whether trying to rent a place in the private market, or staying in HLM. Each option has expected gains net of costs, and individuals compare the gains attached to each option prior to selecting one of them. Discrimination in the private rental market alters residential choices through two effects. First, if some groups of HLM tenants are barred from some segments of the private rental market, they will need more time to find a place, hence they will automatically stay longer in HLM. This is the buffer stock effect. Second, the value of search in the private rental market is lower, which deters HLM tenants from even trying their luck. This is the dis-

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[16]These characteristics are: age, gender, education and employment status four years ago (employed, unemployed or inactive, retired, student or in the military) of the respondent, total household size and number of children in the household.

[17]A limitation to this reweighting exercise stems from the fact that previous income of the household is unknown. As a consequence, only current household income may be used as a control variable, which is difficult to justify. Despite this concern, we provide a kernel-matching estimate of this French-born weighted matrix which takes household income as a matching variable in Appendix G: this matrix is more similar to the matrix of non-Europeans, but substantial differences remain.

Table 5: Transition matrix of residential mobility for households who have recently moved out

		Previous Status	Current Status		
			Home.	HLM	Private
French-born	6739	Homeowners	0.62	0.10	0.29
	4010	HLM	0.31	0.44	0.25
	11029	Private Tenants	0.35	0.14	0.51
			Home.	HLM	Private
Non-European	314	Homeowners	0.44	0.23	0.33
origin	609	HLM	0.20	0.69	0.10
	1225	Private Tenants	0.16	0.28	0.56
			Home.	HLM	Private
European	261	Homeowners	0.69	0.09	0.22
origin	130	HLM	0.41	0.42	0.17
	393	Private Tenants	0.38	0.18	0.44
			Hom.	HLM	Private
French-born	6601	Homeowners	0.64	0.09	0.26
weighted	3930	HLM	0.36	0.42	0.22
	10787	Private tenants	0.40	0.15	0.45

Notes: (i) Sample: All tenants in privately-rented apartments who had a place of their own in France four years before the survey and moved in for less than four years. (ii) Reading: Among the 4010 French-born households who where living in HLM four years before the survey and have moved in the past four years, 31% have become homeowners, 44% still live in a HLM and 25% are now renting a place on the private rental market. (iii): Source: INSEE, ENL 1996, 2002 and 2006

couragement effect. Its magnitude depends on how people react to what they perceive of their opportunity set. In Appendix F, we provide an extension of the model in Section 2 to illustrate how these two effects may come in play and may resume in a snowball effect with possibly large equilibrium segmentation effects in local housing markets. This model leads to Prediction 2.1:

Prediction 2.1 CONSEQUENCES OF CUSTOMER DISCRIMINATION *If there is customer discrimination in the private rental market, then the probability for black tenants to be living in public housing is positively correlated with the proportion of multiple-dwelling landlords in the private rental market. This is not the case for white tenants.*

Prediction 2.1 can be tested empirically using the same data as in Section 3.

4.3 Empirical Strategy

We focus on the sample of tenants in the public and private market. Given our theoretical framework, we expect non-Europeans to live more frequently in HLM in locations where more landlords own entire buildings. This local rate of multiple-dwelling landlords should not have any impact on the probability of the other tenants to enter the private rental market. For each household i, living in département $z(i)$, we construct the zone variable $Share_{z(i)}$ as the proportion of multiple-dwelling landlords in the market of privately-rented apartments in $z(i)$. Then, we regress the probability for the household to be living in HLM on this zone variable. We control for the same individual and housing characteristics as before, including the household's income

Table 6: Probability to declare to be willing to move out of one's HLM

	(1)	(2)
Non-European origin	0.147***	0.049***
	(0.012)	(0.014)
European origin	-0.032	0.028
	(0.019)	(0.022)
Controls		X
Observations number	15254	15081
Pseudo-R^2	0.02	0.18

Notes: (i) Marginal effects of a probit model reported (ii) Standard errors in parentheses. Significance: ***: 1%, **: 5%, *: 10% (iii) Sample: All HLM tenants who had a place of their own in France four years before the survey. (iv) Controls: Those considered in column (4) of Table1. (v) Source: INSEE, ENL 1996, 2002 and 2006

on which a specific focus is given here. The share of multiple-dwelling landlords being a variable at the département level, it cannot be identified separately from département fixed effects that cannot be introduced anymore. Therefore, we introduce now région fixed effects (a larger geographical classification that considers 21 units) and still continue to control for the city size class, which is a priori the most important geographical control.

The use of local explanatory variables is widespread in the spatial mismatch literature. For instance, Hellerstein, Neumark, and McInerney (2008) regress the employment probability of Afro-Americans on very local employment rates (computed for the census track), controlling for MSA fixed effects. A focus on so small spatial units would not fit our purpose as well: while Hellerstein, Neumark, and McInerney (2008) take residential location as given and look at its impact on employment, we are interested in the residential location process itself. Along this process, households must generally be considering a wider range of location opportunities than the small census track. Consequently, our approach deals with larger geographical units, département, controlling for region fixed effects and city size.

4.4 Results

The probit model is estimated on three different samples of tenants: French-born, European and non-European immigrants. Results are provided in Table 7.

Results strongly match Prediction 2.1. The local share of multiple-dwelling landlords is not correlated with the probability of French-born or of European immigrants to be living in HLM (columns 2 and 3). Its marginal effect is positive and significant on the probability of non-European immigrants (column 3). Another interesting feature regards the effect of income, which varies a lot according to the population of interest. It is unsurprisingly large and negative if we consider French-born or European immigrant tenants. It reflects the fact that rich households can afford choosing their housing in the private housing market. On the contrary, the coefficient becomes unsignificant (at 5%, it is even slightly positive) for the non-European immigrants. A possible interpretation consistent with our theoretical framework would be that

Table 7: Probability to be living in HLM: The role of the local share of multiple-dwelling land-lords

	French-born	European immigrants	Non-European immigrants
	(1)	(2)	(3)
Share	0.034	0.147	0.361***
	(0.023)	(0.111)	(0.072)
Household income	-7.41***	-7.15***	2.37*
	(0.41)	(1.97)	(1.27)
Other controls	X	X	X
N	26631	1334	4438
Pseudo-R^2	0.14	0.12	0.19

Notes: (i) Marginal effects of a Probit model reported. (ii) Standard errors in parentheses. Significance: ***: 1%, **: 5%, *: 10% (iii) Sample: All tenants in privately-rented apartments who had a place of their own in France four years before the survey. (iv) 'Household income': Household income by consumption unit (millions of 2006 euro) (v) 'Other controls': individual characteristics (see Table 9 in Appendix D), city size dummies (in 9 categories) and région fixed-effects. (vi) Source: INSEE? ENL 1996, 2002 and 2006

the force of customer discrimination overcomes the income effect.

As shown in Appendix G, this result is robust to numerous specification and sampling variations. It is not driven by control for région fixed effects and city size, nor by a spurious correlation of the share of multiple-dwelling landlords with the level of the local HLM supply (the proportion of HLMs in the total housing market of the département, as measured in the 1990 French census). The correlation remains also stable if we control for an indicator of quality (or attractiveness) of this HLM supply, measured by the vacancy rate within the local HLM stock. Finally, it is not affected when we control for the overall local proportion of non-European immigrants and of European immigrants, as measured in the 1990 French census as well. When we restrict the sample to the population who lives in a département for which there are more than thirty observations in the survey, the effect become slightly significant for French-born (but not European immigrants) but it remains more than four times smaller than for non-European immigrants. Finally, the inclusion of homeowners in the sample reduces the magnitude of the effect, which confirms our assumption regarding the separation of the rental and the home-sale markets.

Provided that the probability to be living in HLM reflects, at least partly, the difficulty to access the private rental market once controlled for individual characteristics and in particular income, this result gives valuable information regarding the impact of customer discrimination on the residential location of ethnic minorities. Given the high level of concentration and isolation of the French public housing market, this result can even be considered as providing an alternative explanation of the existence of public housing ghettos in France. This explanation neither involves a magnetic effect of the public housing supply on immigrants' location decision (Verdugo (2011)), nor the aggregate effect of preference-based tipping mechanisms (Card, Mas, and Rothstein (2008)). Whether housing discrimination still is a major factor behind the persistent racial segregation found in U.S. metropolitan areas today is a fairly controversial sub-

ject (Ross (2008)). However, as far as France is concerned, this result gives some ground to the "collective action racism" theory, according to which "ghettos are the result of collective action taken by Whites to enforce separation from Blacks" (Cutler, Glaeser, and Vigdor (1999)).

5   Conclusion

The nature of the links between discrimination and urban patterns has long been argued about. However, most works on the subject miss the role played by the structure of real estate ownership, although it is a key background factor for apprehending the diversity of urban patterns. This paper is an attempt to illustrate why housing ownership structure matters, both theoretically and empirically. We construct a matching model with ethnic externalities where landlords are heterogenous with respect to the number of housing units they own within the same neighborhood. We show that, regardless of their own preferences, landlords who own several units are more likely to discriminate against ethnic minorities if these minorities are subject to the prejudice of a fraction of the population of mainstream tenants. This prediction and its implications are then tested and never rejected on French data. This confirms the existence of customer-based discriminatory practices against immigrants of non-European origin on the French housing market. We believe that our empirical investigation could fruitfully be adapted to other countries as well.

In France, housing market discrimination may partly explain why non-European immigrants, and especially African immigrants, remain stuck in public housing. On the labor market, one consequence of this situation is that these populations cannot easily take advantage of employment opportunities when those are located in another city or region and they suffer from a situation of regional spatial mismatch, which may account for part of their much higher unemployment rate (Bouvard, Combes, Decreuse, Laouénan, Schmutz, and Trannoy (2009)). If this is the case, the social consequences of housing market discrimination may therefore be so negative that they justify the intervention of policymakers. In particular, since larger landlords can be more easily monitored, it should not be impossible to impose ethnic quotas upon them. However, since larger landlords are also more likely to provide local public goods, it is unclear whether policymakers should give them incentives to scatter their real estate portfolio.

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A   Expected profits

Let us consider the computation of $\Pi^{bv}(t)$, the expected profit of a landlord whose tenant is black while the neighboring apartment is vacant. Over a period of length dt, the landlord gets the rent $R_b dt$, which corresponds to the first line in (14). With probability qdt, the tenant leaves. Then, with probability $(1 - \eta dt)$, no application emerges, which result in an expected profit $\Pi^{vv}(t + dt)$ at date $t + dt$, ie $qdt(1 - \eta dt)\Pi^{vv}(t + dt)$ in expectation, hence the second line in (14). With probability ηdt, there is an applicant, who is black with probability $1 - p$. In expectations, the landlord gets $qdt\eta dt\left[(1 - p)\beta^{bv}\Pi^{bv}(t + dt)\right]$. One then proceeds similarly in the case the applicant is white and one can deal similarly with the cases where the tenant does not leave, which occurs with probability $1 - qdt$. This leads to

$$
\begin{aligned}
(1 + rdt)\Pi^{bv}(t) = \ & R_b dt \\
+ \ & qdt(1 - \eta dt)\Pi^{vv}(t + dt) \\
+ \ & qdt\eta dt\left[(1 - p)\beta^{bv}\Pi^{vb}(t + dt)\right] \\
+ \ & qdt\eta dt\left[(1 - p)\left(1 - \beta^{bv}\right)\Pi^{vv}(t + dt)\right] + qdt\eta dt\left[p\beta^{wv}\Pi^{vw}(t + dt)\right] \\
+ \ & qdt\eta dt\left[p(1 - \beta^{wv})\Pi^{vv}(t + dt)\right] + (1 - qdt)(1 - \eta dt)\Pi^{bv}(t + dt) \\
+ \ & (1 - qdt)\eta dt\left[(1 - p)\beta^{bb}\Pi^{bb}(t + dt)\right] \\
+ \ & (1 - qdt)\eta dt\left[(1 - p)\left(1 - \beta^{bb}\right)\Pi^{bv}(t + dt)\right] \\
+ \ & (1 - qdt)\eta dt\left[(1 - \alpha)p\beta^{wb}\Pi^{bw}(t + dt)\right] \\
+ \ & (1 - qdt)\eta dt\left[(1 - \alpha)p\left(1 - \beta^{wb}\right)\Pi^{bv}(t + dt)\right] \\
+ \ & (1 - qdt)\eta dt\left[\alpha p\Pi^{bv}(t + dt)\right]
\end{aligned}
\tag{14}
$$

Re-arranging, dividing by dt both sides of the equality and considering the limit of this equality when dt tend towards 0, one gets:

$$
\begin{aligned}
r\Pi^{bv}(t) = \ & \lim_{dt \to 0} r\Pi^{bv}(t + dt) \\
= \ & R_b + q\Pi^{vv}(t) + \dot{\Pi}^{bv}(t) - q\Pi^{bv}(t) - \eta\Pi^{bv}(t) \\
+ \ & \eta\left[(1 - p)\beta^{bb}\Pi^{bb}(t)\right] + \eta\left[(1 - p)\left(1 - \beta^{bb}\right)\Pi^{bv}(t)\right] \\
+ \ & \eta\left[(1 - \alpha)p\beta^{wb}\Pi^{bw}(t)\right] + \eta\left[(1 - \alpha)p\left(1 - \beta^{wb}\right)\Pi^{bv}(t)\right] + \eta\left[\alpha p\Pi^{bv}(t)\right]
\end{aligned}
\tag{15}
$$

The steady state where $\dot{\Pi}^{bv}(t) = 0$, satisfies once dropped t:

$$
r\Pi^{bv} = R_b + q\left[\Pi^{vv} - \Pi^{bv}\right] + \eta\left[(1 - p)\beta^{bb}\left(\Pi^{bb} - \Pi^{bv}\right) + p(1 - \alpha)\beta^{wb}\left(\Pi^{bw} - \Pi^{bv}\right)\right]
\tag{16}
$$

B Proofs

B.1 Proof of Proposition 1

(i) is obvious. (ii) results when we solve the value functions for $\alpha = 0$ and $R_w = R_b = 0$ on the one hand and for $\eta = 0$ on the other hand.

B.2 Proof of Proposition 2

Part (i). We solve system (1)–(4) when $\beta = \bar{\beta} = (1,1,1)$. We then show that $\Pi^{jv}(1) - \Pi^{jb}(1) \geq 0$ for all $j = w, b, v$. Inequality (10) then follows. The solving yields:

$$\Pi^{jv} - \Pi^{jb} = \alpha p \eta [(q+r)R_w + \eta(1-p)(R_w - R_b)]N^j/D \tag{17}$$

for all $j = w, b, v$, with $D > 0$ and $N^j > 0$. Indeed,

$$D = \left\{ \begin{array}{l} (q+r)^2\,(2q+r) \\ +\eta\,(q+r)\,(q\,(3-\alpha p) + r\,(2-\alpha p)) \\ +\eta^2\,(q\,(1-\alpha p^2) + r\,(1-\alpha p)) \end{array} \right\} \times$$

$$\left\{ \begin{array}{l} (q+r)^2\,(2q+r)^2 + \eta\,(q+r)\,(2q+r)\,(q\,(5-\alpha p) + r\,(4-\alpha p)) \\ +\eta^2 \left[\begin{array}{l} 4q^2\,(2\,(1-\alpha p) + \alpha p^2) + r^2\,(5-3\alpha p) \\ +qr\,(10\,(1-\alpha p) + 3\,(1+\alpha p^2)) \end{array} \right] \\ +2\eta^3 \left[q\left(\alpha\,(1-p)^2 + (1-\alpha) \right) + r\,(1-\alpha p) \right] \end{array} \right\} > 0,$$

$$N^w/q = \begin{array}{l} 4q^3 + (r+\eta)\,(r+2p\eta)\,(r+\eta\,(1-\alpha p)) \\ +q^2\,(8r + 2\eta\,(2 + p\,(3-\alpha))) \\ +q \left[\begin{array}{l} 5r^2 + r\eta\,(6 + p\,(7-3\alpha)) \\ +\eta^2\,(1 + p\,(7 - 2\alpha\,(1+p))) \end{array} \right] \end{array} > 0,$$

$$N^b/q = \begin{array}{l} (q+r)\,(2q+r)^2 + 2p\eta^3\,(1-a) \\ +\eta\,(2q+r)\,[q\,(2+p\,(3-\alpha)) + r\,(2+p\,(2-\alpha))] \\ +\eta^2 \left[\begin{array}{l} q\,(1 + p\,(5\,(1-\alpha)) + 2 + \alpha p) \\ +r\,(1 + p\,(4-3\alpha)) \end{array} \right] \end{array} > 0,$$

$$N^v = \begin{array}{l} (q+r)\,(2q+r)^3 + \eta(2q+r)^2\,[q(3+p(2-\alpha)) + r\,(3+p\,(1-\alpha))] \\ +\eta^2\,(2q+r) \left[\begin{array}{l} q\,(3 + p\,(3\,(1-\alpha) + 2 - \alpha p)) \\ r\,(1 + p\,(2-\alpha p)) + 2\,(1-\alpha p) \end{array} \right] \\ +\eta^3 \left[\begin{array}{l} q\,((1-\alpha p) + p\,(3 - \alpha\,(1+p+p^2))) \\ +r\,(1+p)\,(1-\alpha p) \end{array} \right] \end{array} > 0.$$

Part (ii). We solve system (1)–(4) when $\beta = \bar{\beta} = 0_3 = (0,0,0)$. We then show that $\Pi_1^{jv}(0_3) - \Pi_1^{jb}(0_3) \geq 0$ for all $j = w, b, v$. Inequality (11) then follows. For $j = w, b$, we have

$$\Pi^{jv}(0_3) - \Pi^{jb}(0_3) = \frac{\alpha p q \eta R_w}{(q+r)\,(q+r+p\eta)\,(2q+r+(1-\alpha)\,p\eta)} \geq 0. \tag{18}$$

Moreover

$$\Pi^{vv}(0_3) - \Pi^{vb}(0_3) = \frac{\alpha p(2q+r)\eta R_w}{(q+r)(q+r+p\eta)(2q+r+(1-\alpha)p\eta)} \geq 0. \tag{19}$$

Part (iii). When $\alpha = 0$, we have $\Pi^{ij}(\beta, \bar{\beta}) = \Pi^{ik}(\beta, \tilde{\beta})$ for all $j, k = w, b, v$ and all $(\beta, \bar{\beta}, \tilde{\beta}) \in B^3$. Dwellings' values do no longer depend on the occupancy status of the other dwelling. We have

$$\max_{\beta \in B} \Pi_2(\beta, \beta) \iff \max_{\beta \in B} \Pi_1(\beta, .) \iff \max_{\beta \in B} \Pi(\beta, .) \tag{20}$$

C   Ethnic matching between different buildings

The purpose of this appendix is to discuss what happens when two buildings are now involved. In theory, we should at least consider two new types of landlords: very large landlords (henceforth "type-4 landlords"), who own two whole buildings, and "scattered" landlords, who own one apartment in each building. However, scattered landlords are not likely to be frequent in the real world: while the assumption of identical housing units in different buildings remains plausible in the case of type-4 landlords such as large-scale developers, it is much more dubious when the buildings are not entirely owned by the same landlord. If scattered landlords do exist, their portfolio has all chances of being also scattered on a larger scale (between different neighborhoods or even different cities), which dramatically prevents from reallocating applicants from one building to another. As a consequence, we will focus on type-4 landlords, who manage two buildings, each composed of two flats with identical housing characteristics, and without visit costs. For simplicity, the rent net of maintenance costs is the same for both ethnic groups. Let $\Pi_4^{t_1 t_2 t_3 t_4}$ denote the value of the two buidlings owned by a type-4 landlord when the first one is occupied by tenants t_1 and t_2, while the second one is occupied by tenants t_3 and t_4, with $t_i = b, w, v$, $i = 1, ..., 4$. We also have to change the notation of the acceptance probabilities. We introduce a subscript which indicates in which building there is a vacancy; then, β_1^{ijkl} denotes the probability to accept a type-i applicant (with a type-j neighbor and a type-kl other building) and β_2^{ijkl} denotes the probability to accept a type-k applicant (with a type-l neighbor and a type-ij other building). This yields:

$$r\Pi_4^{ijkl} = 4R + q\left\{\left[\Pi_4^{vjkl} - \Pi_4^{ijkl}\right] + \left[\Pi_4^{ivkl} - \Pi_4^{ijkl}\right] + \left[\Pi_4^{ijvl} - \Pi_4^{ijkl}\right] + \left[\Pi_4^{ijkv} - \Pi_4^{ijkl}\right]\right\} \quad (21)$$

$$r\Pi_4^{vjkl} = 3R + q\left\{\begin{array}{c}\left[\Pi_4^{vvkl} - \Pi_4^{vjkl}\right] \\ + \left[\Pi_4^{vjvl} - \Pi_4^{vjkl}\right] \\ + \left[\Pi_4^{vjkv} - \Pi_4^{vjkl}\right]\end{array}\right\} + \eta\left\{\begin{array}{c}\beta_1^{wjkl}(1-\alpha_j)\,p\left[\Pi_4^{wjkl} - \Pi_4^{vjkl}\right] \\ + \beta_1^{bjkl})(1-p)\left[\Pi_4^{bjkl} - \Pi_4^{vjkl}\right]\end{array}\right\} \quad (22)$$

$$r\Pi_4^{vvkl} = 2R + q\left\{\begin{array}{c}\Pi_4^{vvvl} - \Pi_4^{vvkl} \\ + \Pi_4^{vvkv} - \Pi_4^{vvkl}\end{array}\right\} + 2\eta\left\{\begin{array}{c}\beta_1^{wvkl}p\left[\Pi_4^{wvkl} - \Pi_4^{vvkl}\right] \\ + \beta_1^{bvkl}(1-p)\left[\Pi_4^{bvkl} - \Pi_4^{vvkl}\right]\end{array}\right\} \quad (23)$$

$$r\Pi_4^{vjvl} = 2R + q\left\{\begin{array}{c}\Pi_4^{vvvl} - \Pi_4^{vjvl} \\ + \Pi_4^{vjvv} - \Pi_4^{vjvl}\end{array}\right\} \quad (24)$$

$$+2\eta\left\{\begin{array}{c}p\max\left\langle(1-\alpha_j)\,\beta_1^{wjvl}\left[\Pi_4^{wjvl} - \Pi_4^{vjvl}\right],(1-\alpha_l)\,\beta_2^{vjwl}\left[\Pi_4^{vjwl} - \Pi_4^{vjvl}\right]\right\rangle \\ + (1-p)\max\left\langle\beta_1^{bjvl}\left[\Pi_4^{bjvl} - \Pi_4^{vjvl}\right],\beta_2^{vjbl}\left[\Pi_4^{vjbl} - \Pi_4^{vjvl}\right]\right\rangle\end{array}\right\}$$

$$r\Pi_4^{vvvl} = R + q\left[\Pi_4^{vvvv} - \Pi_4^{vvvl}\right] \quad (25)$$

$$+3\eta\left\{\begin{array}{c}p\max\left\langle\beta_1^{wvvl}\left[\Pi_4^{wvvl} - \Pi_4^{vvvl}\right],(1-\alpha_l)\,\beta_2^{vvwl}\left[\Pi_4^{vvwl} - \Pi_4^{vvvl}\right]\right\rangle \\ + (1-p)\max\left\langle\beta_1^{bvvl}\left[\Pi_4^{bvvl} - \Pi_4^{vvvl}\right],\beta_2^{vvbl}\left[\Pi_4^{vvbl} - \Pi_4^{vvvl}\right]\right\rangle\end{array}\right\}$$

$$r\Pi_4^{vvvv} = 4\eta\left\{p\beta_1^{wvvv}\left[\Pi_4^{wvvv} - \Pi_4^{vvvv}\right] + (1-p)\,\beta_1^{bvvv}\left[\Pi_4^{bvvv} - \Pi_4^{vvvv}\right]\right\} \quad (26)$$

There are many symmetric cases. Indeed, $\Pi_4^{ijkl} = \Pi_4^{jikl} = \Pi_4^{ijlk} = \Pi_4^{klij}$ for all $i,j,k,l = b,w,v$. However, the system remains much more complex than in the case of type-1 or type-2 landlords: one can check that it now involves 21 independent equations.

The novelty comes from the possibility to allocate potential tenants between the two buildings. Formally, there is a new $\max$ operator in the equations defining Π_4^{vjvl} and Π_4^{vvvl}. The three non trivial cases where we need to distinguish between β_1 and β_2 concern Π_4^{vbvw}, Π_4^{vvvw} and Π_4^{vvvb}.

Type-4 landlords have many strategies at their disposal, all of which do not require discrimination. We focus on the following strategy :

(1) If one building is fully vacant while there already is a tenant inside the other one, a black applicant will always be directed to the building where there already is another tenant. On the contrary, a white applicant will always be directed to the fully vacant building.

(2) If one building is occupied by a black tenant and the other is occupied by a white tenant, the black applicant will be directed to the apartment with the black neighbor. On the contrary, since prejudice is unobservable, the white applicant will be directed to the apartment with the white neighbor.

D Descriptive Statistics

Table 8: Tenure status by immigration status

	French-born	European immigrants	Non-European immigrants
Private rental (share)	0.195	0.188	0.289
	(0.516)	(0.391)	(0.454)
Apartment (share)	0.368	0.425	0.763
	(0.628)	(0.495)	(0.425)
Privately-rented apartment (share)	0.121	0.130	0.247
	(0.425)	(0.336)	(0.431)
Observations number	78388	3776	5868

Notes: (i) Sample: All households who had a place of their own in France four years before the survey. (ii) Source: INSEE, ENL 1996, 2002 and 2006

Table 9: Tenant characteristics by immigration status

	French-born	European immigrants	Non-European immigrants
Share of woman (household head)	0.41	0.38	0.25
	(0.492)	(0.486)	(0.432)
Average age (household head)	46.1	53.4	44.8
	(17.81)	(18.24)	(13.72)
Middle school degree (household head, share)	0.31	0.23	0.17
	(0.463)	(0.419)	(0.376)
High school degree (household head, share)	0.10	0.04	0.08
	(0.303)	(0.202)	(0.269)
University degree (household head, share)	0.35	0.21	0.27
	(0.476)	(0.410)	(0.444)
Household income by consumption unit (2006 euro)	18938	16580	12594
	(14073)	(14726)	(10944)
Household number of persons	1.83	2.09	2.74
	(1.080)	(1.197)	(1.695)
Household number of children	0.39	0.45	1.05
	(0.782)	(0.829)	(1.341)
Year of arrival in the dwelling	1994	1990	1994
	(11.1)	(11.4)	(8.6)
Observations number	8669	455	1932

Notes: (i) Sample: All tenants in privately-rented apartments who had a place of their own in France four years before the survey. (ii) Source: INSEE, ENL 1996, 2002 and 2006

Table 10: Characteristics of the apartment, the building and the location, by landlord's type

	Multiple landlord	Single landlord
Number of rooms (logarithm)	0.96	0.83
	(0.465)	(0.486)
Size in squared meters (logarithm)	4.06	3.96
	(0.448)	(0.463)
Rent by squared meter (2006 euro)	7.22	9.63
	(4.289)	(4.973)
Balcony (share)	0.29	0.52
	(0.455)	(0.500)
Private outdoor space (share)	0.09	0.04
	(0.279)	(0.189)
Large bathtub (share)	0.57	0.69
	(0.495)	(0.463)
Safety device (share)	0.31	0.41
	(0.462)	(0.492)
Parking space (share)	0.28	0.37
	(0.448)	(0.483)
Tenant suffers from cold (share)	0.18	0.16
	(0.381)	(0.362)
Tenant suffers from noise (share)	0.47	0.45
	(0.499)	(0.498)
Number of levels in the building	3.16	5.00
	(2.916)	(3.729)
Number of apartments in the building	14.2	29.5
	(27.38)	(43.78)
Building built between 1949 and 1974 (share)	0.25	0.39
	(0.435)	(0.488)
Building built after 1974 (share)	0.19	0.30
	(0.390)	(0.459)
Recent deterioration of common property (share)	0.15	0.19
	(0.353)	(0.389)
Département population (1990 Census)	417936	494465
	(292032)	(304918)
Public housing (1990 Census, département share)	0.15	0.14
	(0.060)	(0.058)
Homeowners (1990 Census, département share)	0.51	0.49
	(0.106)	(0.113)
Families with at least three children (1990 Census, département share)	0.09	0.08
	(0.027)	(0.027)
Observations number	4287	6769

Notes: (i) Sample: All tenants in privately-rented apartments who had a place of their own in France four years before the survey. (ii) Source: INSEE, ENL 1996, 2002 and 2006

E   African immigrants vs non-European immigrants

Table 11: Probability to have a landlord who owns the entire building, distinguishing between African immigrants and non-European, non-African immigrants

	(1)	(2)	(3)	(4)
African immigrant	-0.030**	-0.084***	-0.034*	-0.040**
	(0.014)	(0.015)	(0.017)	(0.019)
Non-European immigrant	-0.040*	-0.080***	-0.047	-0.041
	(0.022)	(0.022)	(0.025)	(0.026)
European immigrant	0.016	-0.019	-0.006	-0.031
	(0.023)	(0.024)	(0.025)	(0.026)
Individual characteristics		X	X	X
Location fixed effects			X	X
Apartment characteristics				X
Time dummies	X	X	X	X
N	11139	11139	10972	10879
Pseudo-R^2	0.01	0.03	0.14	0.21

Notes: (i) Marginal effects of a Probit model reported. (ii) Standard errors in parentheses. Significance: ***: 1%, **: 5%, *: 10% (iii) Sample: All tenants in privately-rented apartments who had a place of their own in France four years before the survey. (iv) Individual and apartment characteristics: Those reported in Tables 9 and 10 in Appendix D. (v) Location fixed effects: MSAs and départements. (vi) Source: INSEE, ENL 1996, 2002 and 2006

F   A model for Prediction 2.1

Our model assumes that public housing acts as a complete safety net: people always have immediate access to a HLM and once inside, HLM tenants cannot be evicted. On the contrary, they have to search for a private rental, with no guarantee of success. We consider a tenant of ethnic group $i = w, b$ who has to choose whether to stay in HLM or search for a place in the private rental market. Tenants from both ethnic groups are exactly alike, apart from their probability x_i to be accepted by a private landlord whom they have been matched with. They compare their utility level in HLM, U_i^{HLM} to their utility level in a private rental, U_i^{PR}. We normalize the instant utility people derive from living in HLM to zero and let a be the corresponding utility in a private rental which accounts for the price differential with HLM and better amenities. The search cost is c and meeting occurs at rate μ. A meet between a private landlord and a type-i tenant is completed with probabiliy μx_i. Moreover, private tenants are never secured in their dwelling. With rate λ, which may for example be related to a drop in income, they will have to depart and go back to a HLM. Finally, r is the discount rate.

The value functions U_i^{HLM} and U_i^{PR} are given by the following equations:

$$rU_i^{HLM} = \max\left\{0, -c + \mu x_i \left[U_i^{PR} - U_i^{HLM}\right]\right\}, \qquad (27)$$
$$rU_i^{PR} = a + \lambda \left[U_i^{HLM} - U_i^{PR}\right]. \qquad (28)$$

Solving for (27) and (28), one gets that an HLM tenant enters search if and only if $c/a \leq \mu x_i/(r + \lambda)$. Let c/a follow the distribution Ψ. The proportion of HLM tenants ready to enter search is equal to $\Psi\left(\mu x_i/(r + \lambda)\right)$. If we note HLM_i the long-run probability of a tenant i to be living in HLM, we now have

$$HLM_i = \frac{\lambda}{\lambda + \mu x_i \Psi\left(\mu x_i/(r + \lambda)\right)}. \qquad (29)$$

The probability HLM_i is an increasing function of the return rate λ and a decreasing function of the matching parameter μ and the acceptance parameter x_i. Since the probability to be discriminated against is simply equal to $1 - x_i$, the expression $\mu x_i \Psi(\mu x_i/(r+\lambda))$ captures both the buffer stock and the discouragement effects of discrimination: μx_i is the probability of success given that people search and $\Psi(\mu x_i/(r + \lambda))$ indicates how likely people are to start searching. We now specify x_i. We still consider a framework where only Blacks may be discriminated against. Consequently, $x_w = 1$.

We then draw from the results of Section 3 to write an expression of x_b that depends on the probability for an applicant to meet a multiple-dwelling landlord. We have

$$x_b = (1 - \beta)\left[Share \times I_2 + (1 - Share) \times I_1\right]. \qquad (30)$$

where $Share$ is the proportion of multiple-dwelling landlords in the local market of privately-rented apartments, β is the proportion of prejudiced landlords who will refuse black applicants regardless of whether it is a dominant strategy or not and I_2 (resp. I_1) is the probability for a black applicant to be accepted by an unprejudiced multiple-dwelling (resp. single-dwelling)

landlord.

The effect of $Share$ on the probability that a Black lives in HLM, HLM_b, is

$$\frac{dHLM_b}{dShare} = \frac{dHLM_b}{dx_b}\frac{dx_b}{dShare} \tag{31}$$

$$= (HLM_b)^2 \left(\frac{\mu\Psi\left(\frac{\mu x_b}{r+\lambda}\right)}{\lambda}\right)\left[1 + \frac{\mu x_b}{r+\lambda}\left(\frac{\psi\left(\frac{\mu x_b}{r+\lambda}\right)}{\Psi\left(\frac{\mu x_b}{r+\lambda}\right)}\right)\right](1-\beta)(I_1 - I_2).$$

where $\psi(\cdot) = \Psi'(\cdot)$. Equation (31) shows that, if $\psi\left(\mu x_i/\left(r+\lambda\right)\right)$ is very large, then the effect of $Share$ is much larger than the sole effect of customer discrimination as measured by $I_1 - I_2$. This is the case if c/a is closely distributed around $\mu x_i/(r+\lambda)$.

There are other multiplicative effects which have not been taken into account here. For example, the ethnic composition of the different segments of the rental market (HLM, private with single-dwelling landlord, private with multiple-dwelling landlord) should also impact white willingness to come and live in one of them. Another important issue concerns homeownership. Since Blacks, for many reasons which are not documented here, are also largely excluded from the home-sale market, prejudiced Whites may use homeownership to enter homeowners' neighborhood and avoid black neighbors as a result. All these issues aside, we at least know that if there is customer discrimination, then $I_1 \geq I_2$, hence $dx_b/dShare \leq 0$ and $dHLM_b/dShare \geq 0$. On the contrary, since $dx_w/dShare = 0$, then $dHLM_w/dShare = 0$. This allows us to establish Prediction 2.1.

G Robustness checks for Section 1.4

The following transition matrices display the raw transition rates between occupancy status for non-immigrants, non-European immigrants and the reweighted sample of non-immigrants who are matched to non-European immigrants through a kernel-matching methodology with a 10% bandwidth. The matching variables are: household income by consumption unit, number of persons and of children in the household, age, gender and diploma of the respondent. Survey weights are not used here, which explains that the coefficients in the first two matrices are somewhat different from the ones in Table 5.

Table 12: Transition matrix of residential mobility: kernel matching of non-immigrants on the characteristics of non-European immigrants

		Previous Status	Current Status		
			Home.	HLM	Private
French-born	6739	Homeowners	0.62	0.10	0.27
	4010	HLM	0.33	0.46	0.21
	11029	Private Tenants	0.38	0.16	0.47
			Home.	HLM	Private
Non-European	314	Homeowners	0.39	0.16	0.47
origin	609	HLM	0.22	0.62	0.17
	1225	Private Tenants	0.13	0.25	0.63
			Home.	HLM	Private
French-born	6639	Homeowners	0.58	0.13	0.29
matched	4010	HLM	0.25	0.53	0.22
	11029	Private tenants	0.28	0.21	0.51

Notes: (i) Sample: All tenants in privately-rented apartments who had a place of their own in France four years before the survey and moved in for less than four years. (ii) Reading: Among the 4010 French-born households who where living in HLM four years before the survey and have moved in the past four years, 33% have become homeowners, 46% still live in a HLM and 21% are now renting a place on the private rental market. (iii) Source: INSEE, ENL 1996, 2002 and 2006

Table 13: Variants for the effect of the share of multiple-dwelling landlord

	French-born	European immigrants	Non-European immigrants
	(1)	(2)	(3)
No control for city size and no region fixed effects	-0.002 (0.017)	0.100 (0.078)	0.532*** (0.054)
N	26631	1334	4451
Pseudo-R^2	0.08	0.06	0.13
Control for the HLM rate at the département level	0.017 (0.023)	0.106 (0.113)	0.307** (0.080)
N	26631	1334	4438
Pseudo-R^2	0.15	0.12	0.19
Control for the HLM vacancy rate at the district level	0.044* (0.023)	0.174 (0.113)	0.369*** (0.072)
N	26631	1334	4383
Pseudo-R^2	0.14	0.12	0.19
Control for the immigrants shares at the département level	0.012 (0.024)	0.070 (0.114)	0.298*** (0.073)
N	26631	1334	4438
Pseudo-R^2	0.14	0.13	0.21
Only in départements with at least 30 private tenants in apartments	0.094** (0.037)	0.149 (0.166)	0.490*** (0.084)
N	21002	1080	4014
Pseudo-R^2	0.14	0.10	0.17
Including homeowners	-0.001 (0.007)	0.023 (0.041)	0.208*** (0.054)
N	78067	3774	5856
Pseudo-R^2	0.21	0.12	0.10

Note: (i) Variants for the effect of the share of mutiple-dwelling landlords of on the probability to be living in HLM (Table 7). (ii) Source: INSEE, ENL 1996, 2002 and 2006