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Rental housing discrimination and the persistence of ethnic enclaves

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Abstract We conduct a field experiment to show that discrimination in the rental market represents a significant obstacle for the residential mobility of immigrants and contributes to the ethnic residential segregation observed in large cities. We employ the Internet platform to identify vacant rental apartments in different areas of the two largest Spanish cities, Madrid and Barcelona. We send emails showing interest in the apartments and signal the applicants' ethnicity by using native and foreign-sounding names. We find that, in line with previous studies, immigrants face a differential treatment when trying to rent an apartment. Our results also indicate that this negative treatment varies considerably with the share of immigrants in the area. In neighborhoods with a scarce presence of immigrants the response rate is 30 percentage points lower for immigrants than for natives, while this differential decays towards zero as the immigration share increases. This evidence indicates that discriminatory practices may perpetuate the spatial segregation of minority groups.

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1 Introduction

Upon arrival to a new country immigrants often settle in segregated neighborhoods. Ethnic networks are useful to find a job and facilitate the adjustment to the new society (Bartel 1989; Zavodny 1997; Jaeger 2000; Bauer et al. 2002, 2005). As the newcomers or their descendants assimilate—find a steady job, accumulate some wealth and form families—they may be willing to move out of the ethnic enclave. A different address in a less segregated neighborhood may signal that the immigrant family has economically and socially improved (Logan and Alba 1993; South and Crowder 1998; Fong and Wilkes 1999; Freeman 2000). However, a well-established empirical regularity is that immigrants in advanced societies tend to live spatially concentrated within large cities; see Bartel (1989), Alba and Nee (1997), Borjas (1998) and Freeman (2002) for examples in the US and Musterd (2005), Phillips (1998), and Bolt and van Kempen (2010) for Europe.

The most common theories to explain the formation of ethnic enclaves are based on the fact that immigrants prefer living near people with similar tastes and who speak the same language (Cutler et al. 1999). Hence, the concentration of immigrants in particular areas is demand driven. However, it has also been suggested that the native's behavioral response towards immigration may contribute to the surge of ethnic enclaves (Card et al. 2008; Saiz and Wachter 2011). The literature has identified two main mechanisms. First, natives may be willing to move to all-native neighborhoods and pay a premium to avoid immigrants (decentralized discrimination). Second, natives can find ways to effectively restrict immigrant location choices to certain areas (centralized discrimination).

Several studies have documented an important degree of discrimination against minorities in the rental housing market of both the US and Europe. Most of those studies conduct field experiments based on written applications to vacant apartments. For example, Carpusor and Loges (2006) make enquiries via email regarding available apartments in the US. They signal ethnicity through Arabic, African-American or European sounding names and find that Arab and African-American applicants receive significantly fewer responses than their white counterparts. Similar studies have been conducted for Italy (Baldini and Federici 2011), Sweden (Ahmed and Hammarstedt 2008; Ahmed et al. 2010) and Spain (Bosch et al. 2010). All these papers report an important degree of discrimination against the minority group.

Another important finding is that discrimination against immigrants or racial minorities does not decrease with the quality of the applicant. In Bosch et al. (2010) and Ahmed et al. (2010) applicants from different ethnic backgrounds are discriminated relative to their native counterpart despite signaling a favorable employment career and socioeconomic background. This result suggests that discrimination is driven by natives' preferences (i.e. taste based discrimination) rather than a lack of information about the reliability of the minority group (i.e. statistical discrimination).

The current paper investigates whether these discriminatory practices contribute to the high degree of residential segregation observed in large cities. The existing evidence has produced mixed results regarding the geographical variation of ethnic discrimination. For the US, there is evidence that discrimination against African-Americans is more severe in neighborhoods that are 80 to 95 % whites (Yinger 1986; Page 1995; Hanson and Hawley 2011). In contrast, Auspurg et al. (2011) find that in Germany discrimination against Turkish applicants increases with the proportion of foreigners living in the neighborhood.

Our experiment is conducted in different neighborhoods of the two largest Spanish cities (i.e. Madrid and Barcelona). Spain is a country with a fairly recent history of international immigration. The number of residents born abroad grew from 1 million in 1996 to 6 million in 2008 out of a total population of 46 million. While the labor market impact of this supply shock seems to be negligible, the immigration episode has reshaped the ethnic composition of Spanish cities.[1] Bosch et al. (2010) have documented a substantial degree of discrimination in the Spanish rental market mainly driven by natives' preferences against immigrants. Another characteristic of the Spanish native population is its low degree of geographical mobility.[2] In this context, discriminatory practices can be useful to restrict the location choices of immigrants and thus preserve the desired ethnic composition of the neighborhood.

The level of segregation in Spanish cities is lower than in the US or other Western and Northern European countries, however segregation has not disappeared as immigrants' stay in the country has lengthened.[3] Residential ethnic segregation is a complex phenomenon with different dimensions measured by a battery of indices (Massey and Denton 1988). In this paper, segregation is defined at the general level, as the overrepresentation of a particular group in some parts of a city and its under-representation in others. We measure the overrepresentation of immigrants in an area (i.e. neighborhood or census district[4]) by the share of foreign born residents with or without Spanish citizenship.[5]

To isolate the effect that discriminatory practices have in determining residential sorting we conduct a field experiment where native and immigrant candidates apply to vacant rental apartments announced on the Internet. We employ Moroccan and Spanish-sounding names in the applications to signal the ethnicity of the candidate.

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[1] Several studies analyze the economic impact of immigration in Spain and find no significant effect on the wages and employment opportunities of natives (González and Ortega 2011; Carrasco et al. 2008).

[2] The current rate of internal migration is less than 1 % despite the severe crisis that has hit the country (Izquierdo et al. 2014).

[3] See Fernández-Huertas Moraga et al. (2009) for a detailed description of the evolution of ethnic segregation in Spain.

[4] Residential or spatial segregation can be measured at different levels. Figures at the street or block level are useful to find out the relation between neighborly contacts but they are almost never available. Figures at the neighborhood level refer to the direct living environment of an individual household. Daily shopping often takes place in the neighborhood and young children go to primary school there. Larger levels of aggregation may not be very meaningful as they may hide important differences within areas.

[5] The share of foreign born in the neighborhood has been employed in previous studies to conduct empirical studies on the spatial segregation of immigrants (see, for example, Card et al. 2008; Hanson and Hawley 2011).

By nationality the most numerous groups of immigrants come from Romania (14.2 %), Morocco (12.7 %), Ecuador (7.4 %) and Colombia (5.2 %).[6] We restrict our analysis to Moroccan immigrants as their names, as opposed to those of Ecuadorians and Rumanians, are clearly distinguishable from those of natives. We then compare the response rate differentials between native and Moroccan applicants across areas with different concentration of immigrants to identify the extent to which rental housing discrimination represents a barrier for the geographical assimilation process. Our results uncover a significant negative correlation between the immigration share in a particular neighborhood and the degree of discrimination against Moroccan applicants. That is, discrimination against immigrants is particularly intense in areas where there are very few immigrants. In particular, the response rate to applications signed with a Moroccan-sounding name is, on average, 18 percentage points lower than to those signed by natives. However, in all-natives neighborhoods this differential would increase up to 30 percentage points. As the share of immigrants increases the differential treatment decays. Accordingly where this share is around 30 %, immigrants would be 14 percentage points less likely to be contacted than natives. Similar results are obtained when the share of all immigrants is replaced by the share of only Moroccan immigrants. We also show that the geographical variation of discrimination is not affected by the characteristics of flats (i.e. price or nationality of the owner) or that of the applicants (i.e. gender or occupation), reinforcing the view that discriminatory practices are mainly driven by negative attitudes towards immigrants rather than other economic reasons. Our findings strongly suggest that discrimination restricts the residential choices by immigrants and contributes to preserve the desired ethnic composition of neighborhoods.

The rest of the paper is organized as follows. The next section describes the characteristics of the housing market and the geographical distribution of immigrants in Spain, Sect. 3 describes the experimental setup, Sects. 4 and 5 discusses our main results and some conclusions follow in Sect. 6.

2 Immigration in Spain

The immigration episode in Spain began in the late 1990's. Over a period of 10 years, the share of foreign born population shifted from 3 % in 1996 to 14 % in 2008. As a result of the international financial crisis, that has severely hit Spain, the stock of immigrants has remained fairly constant from 2008 to 2011 and slowly decreased since then. Immigrants represent a 13 % of the total population in January 2013. This enormous inflow of immigrants have changed the ethnic composition of the country.[7]

Immigrants are unevenly distributed across Spain. Regions in the Mediterranean coast, the Canary and Balearic Islands and the province of Madrid have received the bulk of immigration. In 2008 these regions account for the 53 % of the native population in Spain and the 75 % of the immigrant one (Fernández-Huertas Moraga

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[6] Source: Spanish Statistical Office, Local Population Registry, 2009.

[7] Our definition of immigrant is a foreign born individual living in Spain, with or without Spanish citizenship.

et al. 2009). Economic reasons and network effects seem to be responsible for this regional concentration (Farré et al. 2011; González and Ortega 2013). Immigrants are more likely to be in urban than in rural areas and within cities the degree of segregation is not negligible (Fernández-Huertas Moraga et al. 2009; Ballester and Vorsatz 2014).

This paper focuses on the two major Spanish cities, Madrid and Barcelona. The reasons for this choice are twofold. First, those are the only two cities with a magnitude comparable to that of other international studies (i.e. 3.2 million residents in Madrid and 1.6 million in Barcelona in 2008). Second, the share of immigrants in each city is around 20 % in 2008, well above the country average of 14 %.

The level of residential ethnic segregation in Spain is lower than in the US and other Northern and Western European countries, and has remained fairly constant during the last decade. At the national level, segregation measured by the dissimilarity index slightly decreased from 0.41 to 0.37 between 2001 and 2008. In big cities, segregation is higher but presents a similar pattern: the dissimilarity index decreased from 0.55 to 0.50 in Barcelona and from 0.50 to 0.45 in Madrid. Despite the slight decrease in segregation, immigrants tend to be overrepresented in certain areas within cities. Figures 1 and 2 display the share of immigrants in the different census districts in Madrid and Barcelona for 2008 (see also Tables 6, 7 in the Appendix).[8] For example, in downtown Madrid the share of immigrants in 2008 was 31 %, while it was less than 15 % in the residential areas located in the north of the city (see Fig. 1; Table 6). Differences in immigrant concentration across districts are even more pronounced in Barcelona (see Fig. 2; Table 7).

Spain hosts immigrants from a variety of ethnic origins. The bulk of the immigration flow, however, comes from Latin America (30 %), Eastern Europe (20 %) and North Africa (13 %). Because we employ the soundness of the name to signal ethnicity, our experimental study focuses only on Moroccan immigrants whose names are clearly distinguishable from those of natives. Given the geographical proximity between Morocco and Spain, this group already represented a substantial share of the foreign born population at the beginning of the immigration boom. By 2008, they were still one of the most popular minority groups accounting for almost the 13 % of all immigrants. Their spatial distribution does not exhibit important differences relative to that of other groups. According to the results in Fernández-Huertas Moraga et al. (2009) the dissimilarity index at the metropolitan area level oscillates between 0.3 and 0.5 for Moroccans, Ecuadorians and Rumanians during the whole immigration episode. Tables 6 and 7 also display the share of Moroccan immigrants by census districts in 2008. They are clearly overrepresented in certain areas such as downtown Barcelona and the Usera district in Madrid.

In this paper we focus on the presence of discrimination in the private rented housing market.[9] According to Rubio (2014), in 2008 rental dwellings in Spain represented

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[8] There are 10 census districts in Barcelona and 21 in Madrid. The census districts are geographical subdivisions created for the collection of statistical data. Their average population size is 155,780 inhabitants, with a standard deviation of 56,569, a minimum of 43,951 and a maximum of 265,866. Source: Spanish Local Population Registry.

[9] The size of the social rented sector in Spain is only 1 %, therefore the total sector is almost private rented sector.
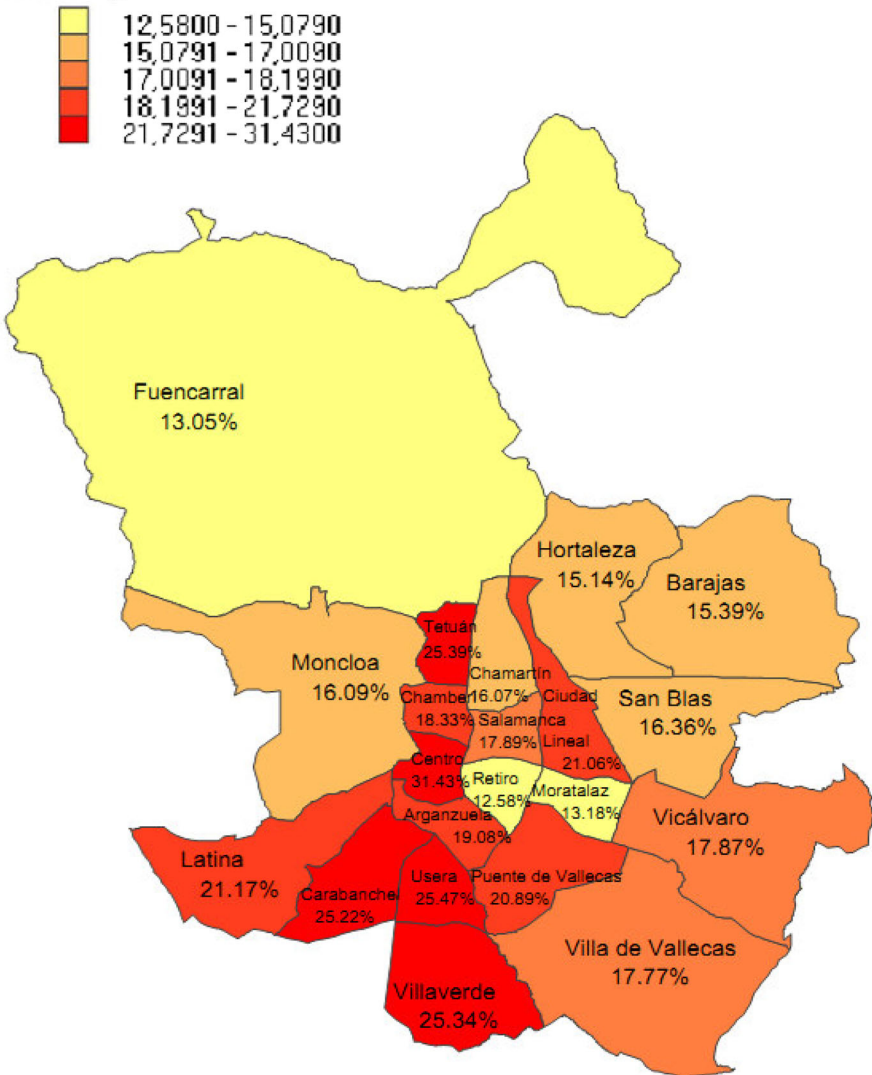
Fig. 1 Immigrant share by census districts in Madrid

about 15 % of the total stock of houses while the rental share in Europe was 33.2 % on average. The size of the private rented sector is larger in Madrid (17 %) and Barcelona (29 %). Despite its relatively small size, immigrants are overrepresented in the rental sector because they lack the financial resources to buy real estate. According to the National Immigrant Survey 2007 (ENI 2007), 64 % of the respondents lived in private rented dwellings. These figures are slightly higher in Madrid (68 %) and Barcelona (67 %).

All immigrants 2008

14,730 – 15,079
15,080 – 17,009
17,010 – 18,199
18,200 – 21,729
21,730 – 47,260

Nou Barris
18.10%

Horta-Guinardó
14.92%

Sant Andreu
15.21%

Sarrià-Sant Gervasi
15.08%

Gràcia
18.20%

Sant Martí
17.01%

Les Corts
14.73%

Eixample
20.59%

Ciutat Vella 47.26%

Sants-Montjuïc
21.73%
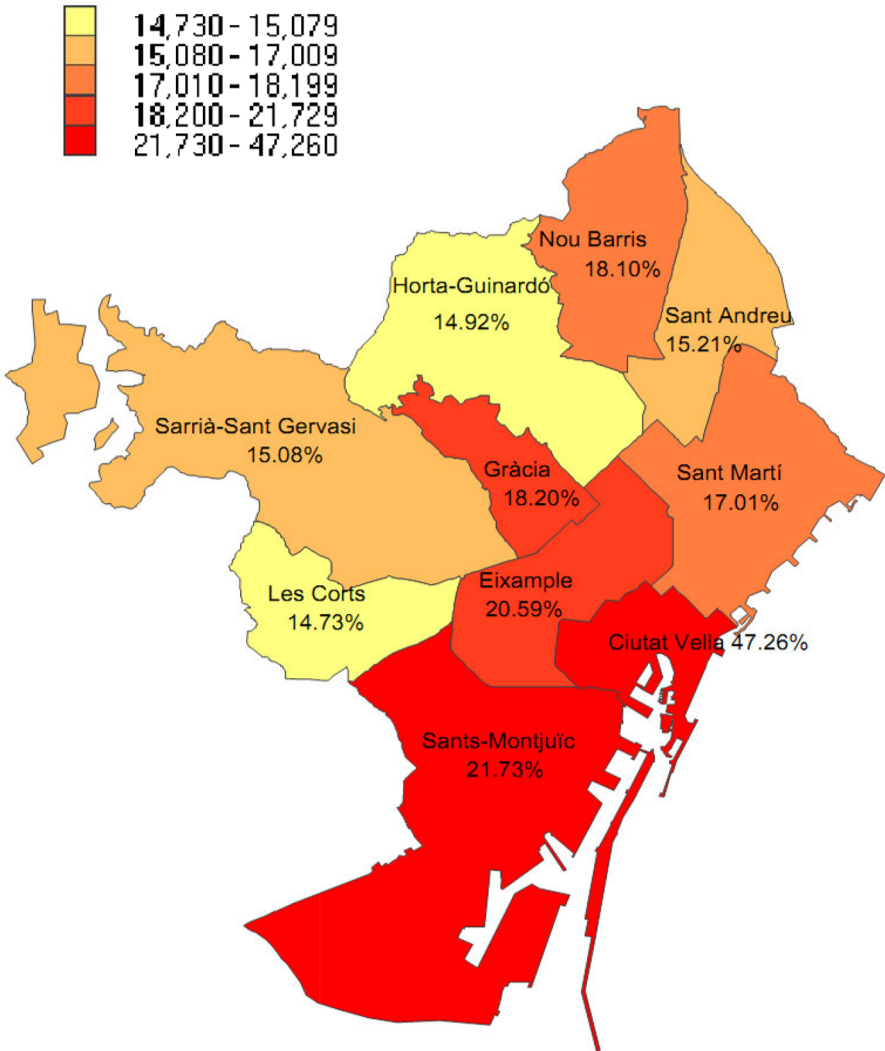
Fig. 2 Immigrant share by census districts in Barcelona

In some countries the presence of public housing in the stock of dwellings has affected the level of ethnic segregation (see for example, Giffinger 1998 in Austria, Goodchild and Cole 2001 in the UK). The share of public housing in Spain is less than 2 %, thus its impact on segregation (if any) is likely to be negligible.[10]

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[10] In the National Immigrant Survey 2007 (ENI 2007) less than 1 % of the respondents report to be in social housing.

From the previous discussion, it is clear that the private rental housing market is the relevant one to investigate immigrants' residential mobility decisions. Within this market we restrict the attention to private landlords. We exclude from the analysis dwellings rented by real estate agents, as they may receive several emails within our experiment and distort the results. Also, when including real state agents in the analysis it is not clear whether we are capturing their attitudes towards immigrants or that of their clients.

3 Experimental design

Our experimental design is similar to that in other studies that have attempted to identify discrimination in the rental housing market (Ahmed and Hammarstedt 2008; Ahmed et al. 2010; Bosch et al. 2010). Next we briefly summarize our strategy and highlight the main differences with respect to previous approaches.

We use the email correspondence testing method to examine the chances of natives and immigrants to rent a flat in areas with different presence of foreign born population. Written applications are sent to rental vacant apartments advertised on www.idealista.com, which is the leading real estate website in Spain.[11] On this platform, private owners and real estate agencies can advertise properties for sell or rent. For private owners, the first ad is free of charge. Fees for agencies start at a minimum of 79 Euros per month. In contrast, individuals interested in a particular housing unit can send an electronic application containing the name, email address and a short message at no cost.

In our experimental setup, the potential tenants applied to all rental ads published by private owners on idealista.com between December 2009 and June 2010. For each housing unit, the site contains information on the rental price per month, the exact address, the number of rooms, the size in squared meters and, in most cases, the name and, therefore, the gender of the person placing the ad. Each week, we collected information on available flats on Tuesdays and sent the applications on the next day. One week later we recorded whether emails sent by the fictitious applicants received a response. Those candidates invited to visit the apartment or to provide additional information politely declined the invitation.

Common native and Moroccan-sounding names are used to signal the ethnicity of the candidate. Based on name frequency data provided by the Spanish National Statistics Office (http://www.ine.es), we select the most popular Spanish male names (Manuel, Antonio, José and Juan) and female names (Ana, Isabel, Carmen and María) and the four most common Spanish surnames (García, González, Fernández and Rodríguez). We also use the most common Moroccan names for males in Spain (Mohamed, Ahmed, Rachid and Youssef), the most common for females (Rachida,

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[11] According to this website almost 50 % of people in Spain use the Internet to search for housing. During 2011 idealista.com was one of the 50 webpages more visited in Spain and the only property advertising site that appears in this ranking. Popular press such as The New York Times, The Telegraph, The Wall Street Journal and The Washington Post, identifies idealista.com as the largest Spanish online property advertising site (http://www.idealista.com/pagina/ranking).

Aicha, Naima and Khadija) and the four most common Moroccan surnames (El Idrissi, Mohamed, Saidi and Serroukh).[12]

Applicants use email accounts which have been created from three different providers: gmail, hotmail and yahoo. For example: carmen.garcia1969@yahoo.com; mohamed_ahmed@gmail.com or rachidamohamed22@hotmail.com.

Previous studies show that information about the socioeconomic characteristics of the candidates affect discriminatory practices. Accordingly, we send emails containing different amount of information about the occupation of the candidate. We consider two types of candidates: (1) an applicant who sends an email showing interest in the flat and without any information other than the name; (2) an applicant whose email contains information about his/her highly reliable job and therefore represents the ideal tenant for property owners (i.e. university professor or banking clerk).

Our fictitious applicants sent the Spanish version of the following emails:

No information

"Hello,

I am interested in renting this apartment. I would be very grateful if you contacted me. Thank you. NAME"

High-paying occupation

"Hello,

I am interested in this flat. I work as a financial analyst for a bank (La Caixa/Caja Madrid). I have recently moved to the city (Barcelona/Madrid) and I am looking for a flat where to live for at least a couple of years. I would be happy to provide a financial guarantee. Please contact me if interested. Many thanks. NAME"

Or alternatively:

"Hello,

I am a Professor at the Department of Political Science of the University (Pompeu Fabra/Carlos III de Madrid). I have been living in the city (Barcelona/Madrid) for a couple of years and I would like to find a new apartment. I have a permanent contract with the University. I am very interested in your flat and I would be very grateful if you could contact me. Best regards. NAME".

We create eight types of fictitious applicants: a Moroccan and a native, male and female, candidates who do not provide information about their socioeconomic status, and four more candidates (Moroccan and native, male and female) with information about their occupations. We use a random assignment procedure, where each vacant apartment is contacted by only one of the eight applicants. We apply to 1,186 apartments, and each type of applicant applied, approximately, to 150 apartments. Our experimental design based on written applications has the same two potential caveats than the one in Bosch et al. (2010). That is, (i) sending an email may not be the most common flat searching method, (ii) the correspondence test is not valid to detect discrimination against immigrants whose names are similar to the native population. To

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[12] Notice that the third largest minority group in Spain are Ecuadorians that tend to have also Spanish sounding names. Thus it could be that landlords assigned emails signed with a Spanish sounding name to Latin-American immigrants, who also face an important degree of discrimination in the rental market (Bosch et al. 2010). In this scenario, our estimated measure of discrimination would be underestimated and we would be identifying a lower bound in the degree of discrimination against Moroccan applicants.

circumvent these problems Bosch et al. (2010) conduct an audit study where trained auditors from different nationalities make phone calls to rental properties and find very similar results across nationalities and testing procedures.

The focus of this paper however is not on the average discrimination that immigrants are subject to, but on how discrimination varies across different areas within cities. From the Internet platform we obtain the complete address where each vacant flat is located.[13] We match this information with the share of immigrants obtained from the Spanish Local Population Registry.[14] In particular, we employ two levels of spatial disaggregation at the city level: the census district and the ZIP or postal code, being the latter a more disaggregated spatial subdivision.[15] Barcelona and Madrid add up to 31 census districts and 90 ZIP codes.

The randomness in our experimental design ensures that both immigrants and natives apply on average to similar apartments and hence, the differential treatment that we observed is only attributable to the soundness of names. In order to check the validity of our randomization exercise, we have computed the mean differences (and standard errors) in flat characteristics between rental units contacted by natives and immigrants. Results are available upon request. We do not find any systematic differences in the type of flats that the two groups apply for.[16]

Despite the randomness of our design, the source of variation that we are exploiting (i.e. the share of immigrants in the area) is not an exogenous variable. During the searching process, immigrants and natives may apply at different rates to flats located in areas with different concentration of foreigners. These different patterns may affect the response of landlords to emails signed by candidates of a certain nationality just because they are not used to their enquiries. It may also be that landlords in areas with a low concentration of immigrants may afford not to deal with them as the pool of potential native tenants is larger. As a result, our estimates do not have a causal interpretation as part of the differential treatment captured may respond to variations in the ethnic composition of the pool of applicants across neighborhoods.[17]

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[13] The websites used in previous studies to investigate rental market discrimination do not contain the address of the housing units, hence it is not possible to conduct the type of analysis that we propose here.

[14] The Registry is conducted at the municipality level and it provides a very accurate measure on the number of immigrants, including the undocumented ones. The reason is that registration is required in order to have access to public healthcare and education, but also to be eligible in the event of an amnesty. The process of registration does not require proof of legal residence and the data are confidential (that is, cannot be used to expel undocumented migrants). Thus immigrants have strong incentives to register.

[15] While census districts are geographical subdivisions with statistical purposes, ZIP or postal codes are smaller geographical areas designed to facilitate the postal service. Their average population size is 4,198 inhabitants, with a standard deviation of 9,647, a minimum of 1 and a maximum of 116,455. Source: Spanish Local Population Registry.

[16] Similar results are found at the ZIP code level.

[17] Unfortunately this conjecture cannot be investigated as we do not have information on the characteristics of the pool of applicants by neighborhoods.

Table 1 Descriptive statistics

	All	Males	Females	No information about occupation	High paying occupation
Natives (%)	71.83[a]	72.85	70.81	65.48	74.94
No. obs.	600[b]	302	298	197	403
Immigrants (%)	53.75	46.74	60.68	41.88	59.49
No. obs.	586	291	295	191	395

[a] Percentage of applicants that receive an email back from the renter
[b] Number of emails sent

4 Results

Table 1 presents the descriptive statistics of our experimental exercise.[18] The first column shows that the response rate for natives is almost 20 percentage points higher than for Moroccans. Interestingly, as in previous studies (Ahmed et al. 2010; Bosch et al. 2010), discrimination presents a clear gender pattern against males. Compared to their native counterparts their response rate is 25 percentage points lower, while it is 10 points lower for females. The table also suggests that the response rate increases when positive information about the socioeconomic status of the applicant is revealed. Finally, there is evidence that a reliable job reduces the response differential between natives and immigrants: from 23.6 percentage points among those applicants without information to 15.45 among those in high-paying occupations.

The main result of the paper is illustrated in Fig. 3. We plot, by ZIP code, the response rate differential in favor of natives against the share of immigrants in that particular ZIP code. Positive numbers in the y-axis indicate that emails signed with a native-sounding name obtain a higher response rate than those signed with a foreign-sounding one. The figure also displays the fitted values from regressing the response rate differential on the share of immigrants, weighted by number of observations at the ZIP level. Although, arguably, there is some noise in the data, a negative relationship emerges, indicating that as the share of immigrants increases in a particular area rental housing discrimination decreases. This evidence suggests that while many factors are likely to be responsible for the geographical distribution of immigrants within cities, the presence of artificial barriers to their residential choices may contribute to the persistence of ethnic residential segregation in large cities.

We next estimate a set of econometric models to investigate the statistical significance of the previous evidence. Let us first discuss the results for our baseline model. Following previous studies we run a regression to estimate the probability of being contacted (i.e. receiving a response email to the flat enquiry) as a function of a set of socioeconomic characteristics including the applicant's ethnicity:

$$C_i = \beta_0 + \beta_1 Img_i + \beta_2 Fem_i + \beta_3 Info_i + \beta_4 (Fem_i \times Img_i) + \beta_5 (Info_i \times Img_i)$$
$$+ \beta_6 (Fem_i \times Info_i) + \beta_7 (Fem_i \times Info_i \times Img_i) + u_i$$

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[18] See also Tables 6 and 7 in the Appendix which contain the descriptive statistics of the flats contacted.
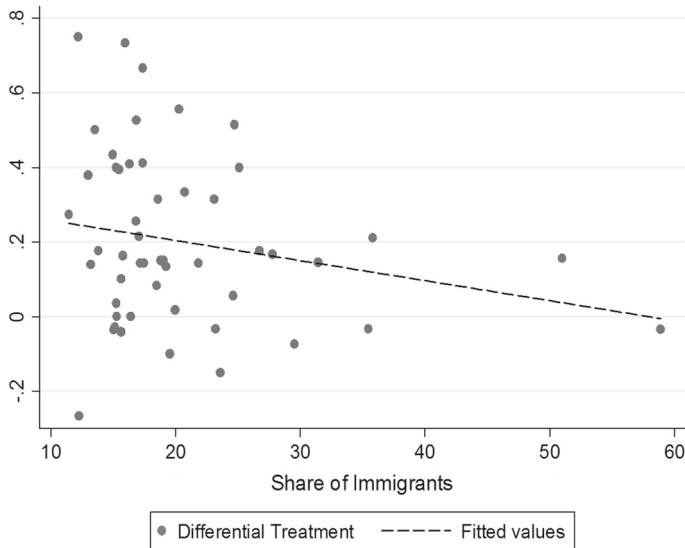
Fig. 3 Difference in response rates and ethnic segregation. *Note* The *horizontal axis* displays the share of immigrants at the ZIP code level constructed from the registry data. The *vertical axis* displays the differential treatment in favor of natives at the ZIP code level defined as the percentage of emails answered to native applicants minus the percentage of emails answered to foreign candidates. The *line* corresponds to a regression of the difference in response rates on the share of immigrants weighted by number of observations at the ZIP level

where C_i is an indicator variable that takes value 1 if the applicant is contacted and 0 otherwise; Img_i is an indicator that takes value 1 if the email is signed with a foreign-sounding name; Fem_i is 1 for females and $Info_i$ is a dummy variable that equals to 1 if positive information about the applicant's occupation is provided in the email. The model also includes interactions between the immigrant indicator and the gender and information variables to unveil patterns of discrimination along those dimensions. Finally, u_i is an error term that given the experimental nature of our setup can be assumed to be uncorrelated with the explanatory variables.

Table 2 displays the estimates of the baseline model. The estimates in the table correspond to a linear probability model and the coefficients can be directly interpreted as marginal effects.[19] The first column shows the raw level of discrimination, where the dependent variable in the previous equation is regressed only on the immigrant indicator. Accordingly an email signed with a Moroccan-sounding name has 18 percentage points lower probability of getting and answer than an email signed with a native-sounding one. Column (2) shows the results for the same regression but including flat characteristics, such as price per squared meter, number of rooms and city

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[19] We have also estimated the models using non-linear estimation methods (i.e. logit and probit) and the results, available upon request from the authors, are unaffected. This is not surprising given that the percentage of zeros (ones) in the dependent variable is around 50 %. In this situation the non-linear models are expected to generate marginal effects close to OLS because the underlying nonlinear conditional expectation function is roughly linear in the middle (see, for example, Angrist and Pischke 2009).

Table 2 Baseline discrimination

	(1)	(2)	(3)	(4)	(5)
Img_i (β_1)	−0.181*** (0.028)	−0.171*** (0.027)	−0.249*** (0.038)	−0.227*** (0.047)	−0.357*** (0.063)
Fem_i (β_2)			−0.018 (0.036)	−0.024 (0.051)	−0.024 (0.051)
Info_i (β_3)				0.086** (0.040)	0.082* (0.047)
$\mathrm{Fem}_i \times \mathrm{Img}_i$ (β_4)			0.155*** (0.054)		0.257*** (0.084)
$\mathrm{Info}_i \times \mathrm{Img}_i$ (β_5)				0.081 (0.056)	0.157** (0.074)
$\mathrm{Fem}_i \times \mathrm{Info}_i$ (β_6)					0.006 (0.034)
$\mathrm{Fem}_i \times \mathrm{Info}_i \times \mathrm{Img}_i$ (β_7)					−0.1498 (0.096)
Constant (β_0)	0.718*** (0.018)	0.729*** (0.099)	0.745*** (0.101)	0.716*** (0.073)	0.728*** (0.077)
Flat characteristics		X			
No. observations	1,186	1,186	1,186	1,186	1,186
R^2	0.035	0.104	0.114	0.120	0.133

Flat characteristics include price per squared meter, number of rooms and city fixed effects. The estimates correspond to a linear probability model

*, **, ***: Significant at 10, 5 and 1 % respectively

fixed effects. Given the experimental nature of our data, it is not surprising that our results are unaffected by the inclusion of these controls. In column (3) we include as additional regressors the gender dummy and its interaction with the immigrant indicator. The coefficient on this interaction is positive, large in magnitude and highly significant. The point estimate indicates that female immigrants are 15 percentage points more likely to be contacted than their male counterparts. This is evidence of the large penalty that male immigrants face in the rental housing market.

Next we study how the discriminatory behavior changes with the amount of information disclosed in the application. The model in column (4) contains an information dummy and its interaction with the immigrant indicator to capture differences between "high-quality" candidates and those who do not provide any information on their socioeconomic status. According to our estimates candidates signaling a high-paying occupation are 8.6 percentage points more likely to be contacted than those who do not report any information about their jobs. The interaction of this variable with the immigrant indicator suggests the presence of some additional informational premium for immigrants of around 8 percentage points, which is statistically insignificant. Hence information does not eliminate the difference in response rate between natives and immigrants.[20] A similar result holds in column (5) when the gender dummy and its interaction with the immigrant and the information indicator are included in estimation.[21]

In all, the results in Table 2 confirm the previous findings in the literature. Property owners use the informational content of names to differentially treat immigrants. This differential treatment is substantially larger for males and it does not disappear when information about the socioeconomic status of the candidate is revealed. This last result indicates that either information other than the socioeconomic status is relevant or that negative attitudes towards immigrants are behind the substantial amount of discrimination observed in the rental market.[22]

Table 3 explores discriminatory practices across neighborhoods with different ethnic composition as measured by the share of immigrants. Column (1) displays the estimates of the model for the raw level of discrimination including as additional regressor the share of immigrants at the ZIP code level (*ZIP-Img-Share$_i$*) interacted with the immigrant indicator. The results indicate that in all-native areas immigrants are on average 30 percentage points less likely to be contacted than natives. However this differential decreases as the presence of immigrants in the area increases. In particular, a 10 percentage points increase in the immigration share at the ZIP code level increases the chances of being contacted (relative to those of natives) by 5.5 percentage

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[20] The F-test for the hypothesis that information eliminates the gap in the response rate between natives and immigrants (i.e. $\beta_1 + \beta_5 = 0$) takes a value of 20.12 with a p-value = 0.

[21] The F-test for the hypothesis that information eliminates the response rate differential for males (i.e. $\beta_1 + \beta_5 = 0$) takes a value of 20 with a p-value of 0. For females (i.e. $\beta_1 + \beta_4 + \beta_5 + \beta_7 = 0$) the F-test is 4.31 with a p-value of 0.038. In both cases, the null hypothesis for the absence of discrimination is rejected at the 5 % level of significance.

[22] See Bosch et al. (2010) for a deeper discussion about the effect of information on discrimination.

Table 3 Discrimination and immigrant concentration

	(1)	(2)	(3)	(4)	(5)	(6)
Img_i	−0.304*** (0.048)	−0.308*** (0.062)	−0.448*** (0.097)	−0.282*** (0.061)	−0.349*** (0.074)	−0.365*** (0.080)
$ZIP\text{-}Img\text{-}share_i \times Img_i$	0.549*** (0.172)	0.576** (0.237)	1.232** (0.468)	0.510** (0.234)	0.555** (0.221)	0.625*** (0.229)
$ZIP\text{-}Img\text{-}share_i \times Img_i \times Fem_i$						−0.001 (0.003)
$ZIP\text{-}Img\text{-}share_i \times Img_i \times Info_i$						−0.000 (0.003)
Fem_i					−0.032 (0.040)	−0.032 (0.040)
$Fem_i \times Img_i$					0.173*** (0.055)	0.180** (0.090)
$Info_i$					0.090** (0.043)	0.090** (0.043)
$Info_i \times Img_i$					0.094* (0.055)	0.060 (0.097)
Constant	0.718*** (0.016)	0.658*** (0.034)	0.720*** (0.017)	1.223*** (0.117)	1.339*** (0.112)	1.334*** (0.111)
ZIP fixed effects		X	X	X	X	X
Flat characteristics				X	X	X
No. observations	1,186	1,186	938	1,186	1,186	1,186
R^2	0.042	0.112	0.051	0.175	0.203	0.203

Evidence at the ZIP code level. Flat characteristics include price per squared meter, number of rooms and city fixed effects. The estimates correspond to a linear probability model where the standard errors are clustered by ZIP code level

*, **, ***: Significant at 10, 5 and 1 % respectively

points. Accordingly discrimination will disappear in areas where the concentration of immigrants is around 50 %.[23]

The remaining columns in Table 3 investigate the robustness of the previous finding. Column (2) adds ZIP code fixed effects to control for unobserved characteristics that may affect the probability of being contacted. Due to the experimental nature of our design the results are unaltered. Column (3) investigates the effect of outlier observations. According to Fig. 3 one could think that our results are driven by those extreme values. We estimate the model excluding the observations at the top and bottom 10 % of the immigrant share distribution. While the relationship between discrimination and immigrant share remains positive and significant, the point estimate increases to 1.23. This increase is mainly due to the substantial reduction in the variance of the immigrant share across neighborhoods after excluding the extreme values. Column (4) adds to the specification with all the observations the set of flat characteristics. Again, the relationship between discrimination and immigrant concentration remains unaffected. Column (5) includes the gender and the information dummy and their interactions with the immigrant indicator. No significant changes affect our results. Finally column (6) investigates whether the relationship between the share of immigrants and discrimination varies with the applicants' characteristics. We do not find evidence that the relationship varies with the gender or the quality of the applicant.[24]

A similar analysis can be conducted using the share of Moroccan immigrants at the ZIP code level. The results are presented in Table 4. The point estimate on the interaction between the share of Moroccan immigrants (*ZIP-Moroccan-Share$_i$*) and the immigrant indicator is larger, due to the smaller mean and variance of this variable.[25] The point estimate suggests that a 1 percentage point increase in the share of Moroccans at the ZIP code level, increases the chances of response to an email signed by a Moroccan applicant by 5 percentage points. This effect is large and reinforces the view that while several factors may be responsible for the important overrepresentation of immigrants in certain areas within cities, part of it is due to discriminatory practices in the rental housing market. In particular, property owners through the Internet platform seem to be effectively blocking the supply of housing units immigrants have access to.

5 Discussion

We now investigate the effect of a series of confounding factors that could threaten the validity of our previous results. One possibility is that the quality (or price) of flats in areas with few immigrants is different from that in other areas. Property owners in high quality flats could discriminate more due to, for example, a higher level of risk aversion. In this case, the characteristics of flats in a neighborhood would be

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[23] We have also estimated other functional forms including several polynomials of the variable ZIP-Img-Share to explore a possible non-linear relationship between discrimination and the share of immigrants. Our main conclusions do not change.

[24] The results using a probit model instead of a linear probability model are extremely similar and are available upon request.

[25] The share of Moroccan immigrants in the sample has mean 1.14 and standard deviation 0.97. The share of all immigrants in the sample has mean 22.05 and standard deviation 9.93.

Table 4 Discrimination and concentration of Moroccan immigrants

	(1)	(2)	(3)	(4)
Img_i	−0.233*** (0.040)	−0.217*** (0.038)	−0.281*** (0.053)	−0.271*** (0.060)
ZIP-Moroccan-share$_i$ × Img_i	4.598** (2.186)	4.118** (1.980)	4.809** (1.989)	4.016 (2.482)
ZIP-Moroccan-share$_i$ × Img_i × Fem_i				0.004 (0.029)
ZIP-Moroccan-share$_i$ × Img_i × Info_i				−0.013 (0.038)
Fem_i			−0.032 (0.041)	−0.032 (0.041)
Fem_i × Img_i			0.172*** (0.055)	0.157** (0.074)
Info_i			0.090** (0.044)	0.090** (0.044)
Info_i × Img_i			0.095 (0.055)	0.100 (0.071)
Constant	0.678*** (0.029)	1.224*** (0.116)	1.342*** (0.112)	1.346*** (0.112)
ZIP fixed effects	X	X	X	X
Flat characteristics		X	X	X
No. observations	1,186	1,186	1,186	1,186
R^2	0.111	0.174	0.202	0.202

Evidence at the ZIP code level. Flat characteristics include price per squared meter, number of rooms and city fixed effects. The estimates correspond to a linear probability model where the standard errors are clustered by ZIP code level

*, **, ***: Significant at 10, 5 and 1 % respectively

driving our results. We investigate this possibility in the first column of Table 5, where we allow the coefficient on the interaction between the share of immigrants and the immigrant indicator to vary by flat characteristics. None of those interactions is statistically significant and our main result remains invariant, suggesting that the reason for the observed spatial pattern is not that discrimination occurs in expensive/high-quality flats that happen to be in areas where there are few immigrants.

The overrepresentation of immigrants that we observe in certain areas of Madrid and Barcelona may also respond to the fact that owners in those areas are immigrants themselves and less prone to discriminate against those of their own kind. However, the immigration phenomenon in Spain is relatively recent and originates mainly from low income countries. Hence, the home ownership rate among immigrants is relatively low. According to the National Immigrant Survey 2007 (ENI 2007) this rate is around 30 %. Thus it is unlikely that our results are driven by a substantial share of immigrants operating on the supply side. We can actually test this hypothesis with our data. We have the name of approximately 80 % of the property owners or renters in our sample, either because they were advertising it in the rental ad or because they would sign the reply email. With this information we can infer the nationality of the owner and test whether it is responsible for the observed discriminatory patterns. In our sample 85 % of all the owners (for which we have names) have a Spanish-sounding name. We then compute the share of "non-Spanish" owners by ZIP code and interact it with the immigrant indicator. The results for this specification appear in column (2) of Table 5. We do not find any significant effect for this variable suggesting that our results identify mainly the behavior of native owners.[26]

Finally, we discuss two possible channels that can explain the correlation between discrimination and the share of immigrants in the area by studying the evolution of the latter during the last decade. Information on the past distribution of immigrants within cities is only available at the census district level, thus first we need to confirm our previous finding at this higher level of aggregation. Column (3) in Table 5 presents the estimates for our basic specification using the share of immigrants at the census district level as explanatory variable. At this level, a 10 percentage points increase in the share of immigrants is associated with a 6 percentage points increase in the probability that an immigrant will be contacted. Thus our previous finding is reassured.

We now explore the relationship between the increase in the immigrant share in a particular neighborhood and the current level of discrimination. We employ as explanatory variable the growth in the share of immigrants by district between 2000 and 2008 interacted with the immigrant indicator. Column (4) shows that there is a very strong correlation. In particular, a 1 percentage point increase in the share of immigrants in one district is associated to a fall in discrimination of 0.85 percentage points. One possible explanation for this result is that districts discriminating more in 2008 were also over discriminating in 2000, thus generating a lower influx of immigrants. Alternatively, one could argue that immigrants moving into certain districts brought in new

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[26] In another specification we have also included a dummy variable that takes value 1 if the owner is immigrant. Results, which are available upon request, show that this variable is only significant at 10 % when interacted with the immigrant indicator. Nevertheless, the share of immigrants at the ZIP code level (*ZIP-Img-Share$_i$*) interacted with the immigrant indicator is still significant.

Table 5 Robustness checks

	(1)	(2)	(3)	(4)
Img_i	0.000 (0.000)	−0.286*** (0.063)	−0.294*** (0.050)	−0.305*** (0.048)
ZIP-Img-share$_i$ × Img$_i$	0.496* (0.251)	0.487* (0.249)		
ZIP-Img owners-share$_i$ × Img$_i$		0.064 (0.220)		
District-Img-share$_i$ × Img$_i$			0.559*** (0.150)	
Increase in share$_i$ × Img$_i$				0.848*** (0.187)
Constant	1.236*** (0.137)	1.226*** (0.116)	0.681*** (0.101)	0.688*** (0.102)
ZIP fixed effects	X	X		
District fixed effects			X	X
Flat characteristics	X	X	X	X
Flat characteristics × Img	X			
No. observations	1,186	1,186	1,186	1,186
R^2	0.175	0.175	0.133	0.134

Flat characteristics include price per squared meter, number of rooms and city fixed effects. The estimates correspond to a linear probability model where the standard errors are clustered by ZIP code level

*, **, ***: Significant at 10, 5 and 1 % respectively

information and increased acceptance of the foreign born population. Unfortunately our data do not allow us to disentangle these two explanations.

On the whole, our results indicate that the degree of discrimination varies substantially with the ethnic composition of the neighborhood. We find evidence that property owners or renters discriminate more in areas with a lower share of immigrants. This result is affected neither by the characteristics of flats (i.e. quality or nationality of the owner) nor by those of the applicant (i.e. gender or socioeconomic status), which suggests that discrimination is mainly driven by negative attitudes towards immigrants rather than other economic reasons. Nonetheless our finding could also respond to differences in the ethnic composition of the pool of applicants across neighborhoods. If immigrants were more reluctant to apply to "native" neighborhoods, landlords in those areas could afford a higher degree of discrimination as the pool of potential native tenants would be larger. While the experimental setting does not allow us identifying the forces behind discriminatory practices, our results allow us to conclude that those practices are used to restrict the location choices of immigrants and thus preserve the desired composition of neighborhoods.

6 Conclusions

In this paper we conduct a field experiment to show that discrimination against immigrants in the rental housing market is strongly correlated with their spatial distribution in the two largest Spanish cities, Madrid and Barcelona. Our estimates indicate that in areas with very few immigrants the differential in response rates between natives and immigrants reaches a magnitude of 30 percentage points. As the share of immigrants increases, this differential is reduced. In particular, a 10 percentage points increase in the share of immigrants at the ZIP or postal code level increases the chances that an immigrant will be contacted by the property owner or renter by 6 percentage points (relative to their native counterpart). We also show that this spatial pattern does not respond to differences in the quality and price of flats or the ethnic origin of the owners across geographical areas.

These results do not allow us to conclude that discriminatory practices generated the current distribution of immigrants across neighborhoods. Probably other factors, like house prices and immigrants' preferences to live close to each other played a substantial role in shaping the spatial distribution we observed today. Nonetheless our results show that, even if other forces would have been responsible for triggering ethnic segregation, the discriminatory behavior of property owners and renters would have created persistency once segregation started and thus restrict immigrants' location choices. Accordingly public intervention in the form of, for instance, social housing could be desirable in order to redistribute immigrants across locations and contribute to the geographical mobility of ethnic minorities.

Appendix

See Tables 6 and 7.

Table 6 Descriptive statistics of flats contacted (Madrid)

	Flats (number of flats contacted)	Rooms (number of rooms)	Price (rental price per month)	M2 (squared meters)	Gender-L (proportion of female landlord)	Native-L (proportion of native landlord)	Img-share (all immigrants 2008)	Moroccan-share (Moroccans 2008)
(1) Centro	28	2.43[a] (1.00)[b]	1,037.3 (398.0)	94.2 (43.3)	0.33[c] (0.48)	0.92[c] (0.27)	31.43	1.08
(2) Arganzuela	28	2.07 (1.05)	1,115.9 (407.0)	88.1 (45.6)	0.42 (0.51)	0.87 (0.34)	19.08	1.75
(3) Retiro	51	1.63 (0.82)	838.8 (228.1)	65.1 (23.9)	0.55 (0.50)	0.98 (0.15)	12.58	0.84
(4) Salamanca	29	1.86 (1.06)	1,040.7 (389.1)	82.1 (41.0)	0.50 (0.51)	0.91 (0.29)	17.89	0.84
(5) Chamartín	20	2.55 (1.00)	1,091.5 (375.6)	100.3 (42.5)	0.29 (0.47)	0.95 (0.23)	16.07	0.60
(6) Tetuán	9	2.44 (1.01)	938.9 (223.3)	87.8 (31.2)	0.86 (0.38)	0.87 (0.35)	25.39	0.57
(7) Chamberí	36	1.86 (0.90)	1,076.9 (459.2)	69.4 (32.9)	0.43 (0.50)	0.88 (0.33)	18.33	0.68
(8) Fuencarral	45	1.96 (1.07)	1,167.9 (691.8)	84.6 (48.5)	0.53 (0.51)	0.85 (0.36)	13.05	1.71
(9) Moncloa	39	1.92 (0.87)	896.5 (305.0)	72.9 (26.4)	0.48 (0.51)	0.84 (0.37)	16.09	0.74
(10) Latina	22	2.09 (1.10)	834.1 (190.5)	76.7 (27.4)	0.39 (0.50)	1.00 (–)	21.17	0.70
(11) Carabanchel	110	1.45 (0.72)	899.1 (311.2)	58.2 (25.0)	0.62 (0.49)	0.92 (0.27)	25.22	0.64
(12) Usera	32	2.12 (0.98)	994.2 (234.6)	80.8 (34.2)	0.42 (0.50)	0.93 (0.26)	25.47	2.39
(13) Puente de Vallecas	8	2.75 (0.71)	784.9 (170.2)	81.0 (29.1)	0.50 (0.55)	1.00 (–)	20.89	1.14
(14) Moratalaz	2	2.50 (0.71)	735.0 (49.5)	79.5 (6.36)	0.50 (0.70)	1.00 (–)	13.18	1.36
(15) Ciudad Lineal	32	2.41 (0.91)	794.1 (150.9)	80.8 (24.7)	0.68 (0.48)	0.77 (0.42)	21.06	0.64
(16) Hortaleza	32	2.09 (1.00)	788.9 (154.1)	74.9 (26.4)	0.43 (0.51)	0.96 (0.20)	15.14	0.66
(17) Villaverde	13	2.08 (0.86)	853.1 (130.2)	86.5 (20.4)	0.30 (0.48)	0.77 (0.44)	25.34	0.52
(18) Villa de Vallecas	39	1.92 (0.98)	877.1 (206.3)	68.3 (24.7)	0.43 (0.50)	0.86 (0.35)	17.77	1.11
(19) Vicálvaro	18	1.94 (0.80)	716.7 (132.2)	74.2 (28.8)	0.53 (0.52)	0.87 (0.34)	17.87	0.55
(20) San Blas	16	2.62 (0.81)	694.7 (104.8)	76.4 (20.6)	0.57 (0.51)	0.93 (0.26)	16.36	0.94
(21) Barajas	12	2.00 (1.13)	801.7 (182.7)	84.7 (40.7)	0.71 (0.49)	0.88 (0.33)	15.39	1.63

[a] Average characteristics (i.e. number of rooms) between housing units contacted

[b] Standard error of the characteristics (i.e. number of rooms)

[c] This number has been computed with a smaller number of housing units, since, for some of the flats, the name of the owner was not available

Table 7 Descriptive statistics of flats contacted (Barcelona)

	Flats (number of flats contacted)	Rooms (number of rooms)	Price (rental price per month)	M2 (squared meters)	Gender-L (proportion of female landlord)	Native-L (proportion of native landlord)	Img-share (all immigrants 2008)	Moroccan-share (Moroccans 2008)
(1) Ciutat Vella	115	1.74[a] (0.89)[b]	944.8 (374.8)	63.9 (30.9)	0.55[c] (0.50)	0.75[c] (0.44)	47.26	3.55
(2) Eixample	94	2.70 (1.08)	1,103.2 (303.7)	86.7 (27.8)	0.62 (0.49)	0.84 (0.37)	20.59	0.56
(3) Sants-Montjuïc	50	2.34 (0.89)	845.6 (185.4)	69.5 (19.4)	0.53 (0.51)	0.77 (0.43)	21.73	1.42
(4) Les Corts	34	2.56 (1.19)	1,147.9 (346.3)	90.2 (37.3)	0.50 (0.51)	0.81 (0.40)	14.73	0.46
(5) Sarrià-Sant Gervasi	69	2.35 (1.23)	1,213.2 (464.6)	88.5 (44.9)	0.55 (0.50)	0.88 (0.33)	15.08	0.34
(6) Gràcia	60	2.12 (0.92)	892.6 (225.9)	70.2 (25.2)	0.70 (0.46)	0.73 (0.45)	18.20	0.54
(7) Horta-Guinardó	63	2.62 (0.91)	831.7 (259)	73.9 (23.3)	0.40 (0.49)	0.88 (0.33)	14.92	0.62
(8) Nou Barris	33	2.54 (0.71)	741.2 (112.1)	67.0 (15.3)	0.57 (0.51)	0.81 (0.40)	18.10	1.01
(9) Sant Andreu	32	2.84 (0.88)	869.4 (171.6)	81.2 (27.4)	0.50 (0.51)	0.89 (0.32)	15.21	1.01
(10) Sant Martí	73	2.67 (1.01)	1,057.8 (426.9)	81.0 (25.5)	0.50 (0.51)	0.79 (0.41)	17.01	0.92

[a] Average characteristics (i.e. number of rooms) between housing units contacted

[b] Standard error of the characteristics (i.e. number of rooms)

[c] This number has been computed with a smaller number of housing units, since, for some of the flats, the name of the owner was not available

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