# Mortgages, immigrants and discrimination: An analysis of the interest rates in Spain

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## ABSTRACT

In this paper, we use a unique data set on granted mortgages to investigate whether immigrant and native borrowers are treated differently by lenders in the Spanish mortgage market. We observe that immigrant borrowers are charged substantially higher interest rates in their mortgages than their native counterparts. These differentials remain high and significant even after controlling for differences in creditworthiness and other factors. Further analyses based on the decomposition of the native–immigrant interest rate gap reveal that the differences in observable factors only account for 12% of the gap. The empirical evidence we find here suggests that these differentials are due to discrimination.

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## 1. Introduction

During the first decade of this century, Spain experienced an economic and housing boom that coincided with the most important immigration wave in recent Spanish history. During this period, many of these immigrants became homeowners. This situation led the lending industry to expand through the mortgage market. The high competition among lenders, lack of regulation and supervision from the Spanish Central Bank and lenders' myopia in anticipating a potential economic downturn caused a dramatic lowering of credit standards. During that period, it was not unusual for a significant number of borrowers to devote almost two-thirds of their monthly earnings to paying their mortgage, to hold mortgages with a loan-to-value above 100% or to be granted a mortgage despite having an unstable job situation. Some statistics produced by the Central Bank of Spain reveal that in 2012 there were more than 220 billion dollars in doubtful mortgage loans in Spain. This constitutes 27% of the total mortgage portfolio in Spain. Nowadays, many analysts indicate this phenomenon as the main reason for the actual financial crisis in Spain.

In such a competitive context, with decreasing interest rates also boosting the demand for mortgages it is not unusual to charge higher mortgage interest rates and fees to minorities compared to white homebuyers with similar characteristics.[1] Another potential consequence is that minority borrowers are shifted into mortgages with conditions in which the a priori probability of foreclosure is high. This dramatic decline in the credit standards in the Spanish mortgage industry has led to an epidemic of foreclosures. In this situation, immigrants are in a weaker position than natives. According to raw statistics produced by the Central Bank of Spain, in 2008, just after the burst of the housing bubble, 12.5% of immigrant borrowers were unable to meet their monthly mortgage payments, while this share was only 1.6% for natives (Banco de España, 2009). As a consequence of this, segregation

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[1] As we will discuss in the next section, the mortgage interest rate in Spain is composed of a benchmark interest rate (EURIBOR), which is determined exogenously (European Central Bank), and a differential interest rate (ADIR), which is determined by the lender. Therefore, it is in the ADIR where lenders may discriminate against minorities. During the housing boom, the EURIBOR followed a decreasing trend month after month; from 5.2 percentage points in 2000 to 2.2 in 2005. This circumstance was also one of the determinants that boosted the demand for housing during that period.

can be exacerbated. Displaced families relocate to more racially isolated neighborhoods with less access to or lower quality of services. Racial segregation also has consequences in urban housing markets, i.e., neighborhoods of growing immigrant settlement become less desirable to natives. This causes changes in how natives perceive the quality of their local amenities, which in turn has a negative impact on the house value appreciation of the enclaves where immigrants tend to settle. Saiz and Wachter (2011) and Accetturo et al. (2012) find evidence of this in the US and Italy, respectively.

In this paper, using unusually rich Spanish data on granted loans, we test whether: i) immigrants are systematically charged larger interest rates on their mortgages; and ii) whether the gap in mortgage interest rates between immigrants and natives can be explained by observables (i.e. differences in borrower and mortgage characteristics). We find that, on average, immigrants are charged almost 0.18 percentage points more for their mortgages than their native counterparts. An obvious explanation for this result could be that immigrants are riskier borrowers. However, we observe that after controlling for the set of variables determining the risk profile and creditworthiness of a borrower, the gap remains significant and practically unaltered. Indeed, a further analysis based on the decomposition of the mortgage interest rate gap between immigrants and natives using the Oaxaca-Blinder decomposition method reveals that only 12% of this gap can be attributed to differences in observable individual and mortgage characteristics.[2]

A potential explanation for this gap in the mortgage interest rates between immigrants and natives is that lenders discriminate against immigrants. In the context of an economic and housing boom, with lenders competing to attract new borrowers, banks have a lower incentive to acquire information on their potential borrowers, which causes a tendency to rank them as risky, charging higher interest rates (Petersen and Rajan, 1995; Degryse and Ongena, 2007). If immigrant borrowers are perceived as riskier borrowers, lenders might use statistical discrimination as a shield against the lack of information (Canner, 1981; Stiglitz and Weiss, 1981). Although lenders may argue that for the sake of business this behavior is not unfair, according to article 23 of the Spanish Immigration Law, it is illegal.[3]

In this context, detecting whether the immigrant–native mortgage interest rate gap is driven by market factors or statistical discrimination sis a puzzle that is not easy to disentangle.[4] Although we control for a large number of variables determining borrowers' risk and creditworthiness, we must admit that factors determining this gap that are not observable to the researcher may always exist. Therefore, we cannot rule out the possibility that our results might be affected by this omission. However, as we will see in the empirical section, we think that in our case the room left for potential omitted variable bias is fairly small. The empirical evidence obtained here suggests that the gap in mortgage interest rates between immigrants and natives might be due to discrimination.

In this paper, we analyze for the first time the existence of mortgage price differentials between minority and non-minority borrowers outside the US. As in the previous literature based on US data, we observe that immigrants/minorities are charged higher mortgage interest rates. However, in contrast to the US evidence, we find that the role borrower characteristics play in explaining this gap is quite limited. These differences might be explained by two reasons. First of all, migratory flows in Spain are quite recent, so the composition of immigrants groups is different and they are less financially integrated with respect to the US. Second, the mortgage market in Spain is much less mature than that in the US. This circumstance implies that, in contrast to the US, there is a lack of regulation in Spain regarding mortgage markets and the protection of borrowers, especially minorities.[5]

It is important to remark that the Spanish mortgage system is extremely lender-friendly, which for lenders facilitated the use of abusive mortgage contracts during the housing boom. We consider that this could be the main reason why borrower characteristics play such a poor role in explaining the mortgage price differentials between immigrants and natives. In 2013, following the epidemic of foreclosures that has affected the Spanish economy, and once an important share of mortgage contracts had been declared as illegal by the Court of Justice of the EU, the Government has initiated a reform of the mortgage law in order to protect borrowers a little more from the predatory behavior of lenders.

With the aim mentioned above, the paper is structured as follows. In Section 2, we explain how mortgages are priced in the Spanish lending market. Section 3 describes the data. In Section 4, we carry out the empirical analysis. In Section 5, we conduct some robustness checks and discuss the potential shortcomings of our analysis. Finally, in Section 6, we summarize and conclude.

## 2. Mortgage pricing in Spain

The price of a mortgage in Spain is made up of the *annual interest rate* (hereafter AIR) and the *opening fee*, which is a percentage (around 1%) of the total loan amount and is paid to the lending institution at the moment when the mortgage contract is signed. The AIR comprises a *benchmark interest rate* (hereafter BIR) and the *annual differential interest rate* (hereafter ADIR). For a mortgage indexed with a variable interest rate, the BIR is updated yearly. The BIR is determined exogenously and is fixed for all mortgages signed during the same month; therefore, it is in the ADIR that mortgage price differentials are likely to appear. The Spanish mortgage legislation does not set upper bounds for the ADIR.[6] Thus, each lender is free to set its own maximum differentials. Additionally, borrowers can be charged a cancelation fee if they pay off their mortgage early, either partially or totally. The cancelation fee varies depending on whether the early pay-off is made over all or a fraction of the outstanding mortgage. The total cancelation fee is the only one for which the Central Bank of Spain sets a maximum.

In this paper, we will focus on analyzing the gap in the ADIR between immigrants and natives. The size of the ADIR depends, among other factors, on the BIR used to price the mortgage. In Spain, the two main BIRs used by lenders are the reference interest for mortgage loans (hereafter RIML) and the Euribor. The RIML may also vary depending on whether the loan is granted by a *savings bank* (Caja de ahorros) or a *conventional bank*. At the beginning of the housing boom, both types of BIR were used indistinctively by lending institutions. However, as the mortgage market became more competitive and interest rates fell month after month, the Euribor became the most commonly used type of BIR, since in this scenario it was more attractive for borrowers. Statistics produced by the National Statistics Bureau (INE) reveal that in 2005 almost 80% of the mortgages were priced using the Euribor, while only 9% used

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[2] As we will explain in Section 3, our data is provided by a real estate company that operates in a specific segment of the Spanish housing market (medium-low and low profile dwellings). All the data refer to borrowers that have bought the dwelling from the listings of this company. This circumstance means that our results might not be generalized to the whole housing market, but just to the specific segment where this company operates.

[3] Article 23 of the Spanish Immigration Law explicitly prohibits: "… imposing more expensive (tax/fee) conditions on foreigners than on Spaniards, or the act of refusing to facilitate goods or services to foreigners, just because they pertain to a specific race, religion, ethnicity or nationality."

[4] Some studies have successfully analyzed discrimination in the housing rental market using an Internet field experiment (e.g. Hanson and Hawley, 2011). However, this methodology is unfeasible in the context of our research.

[5] US legislators have tried to protect minorities and disadvantaged households from unfair lending in the mortgage and housing markets by means of certain statutes. These are the Fair Housing Act (1968), the Equal Credits Opportunity Act (1974), the Home Mortgage Disclosure Act (1975), the Community Reinvestment Act (1977) and the Financial Institutions Reform, Reregulation and Enforcement Act (1989).

[6] The only limitation aimed at preventing abusive interest rates in Spain, which is not usually respected in mortgage contracts in Spain, can be found in the Anti-Usury Law of 1908. Indeed, recently the EU Court of Justice declared that most of the mortgage contracts were illegal because they included a number of abusive clauses. Indeed, an immigrant residing in Spain won this case against his lender at the EU Court of Justice.

the RIML of the savings banks and the remaining 11% used other types of BIR. Indeed, our sample reproduces these figures. During our sample period, 2006–2007, 81.47% of the mortgages in our data were priced using the Euribor. Since the RIML constitutes a marginal part of the market, in this paper, we will focus only on mortgages priced using the Euribor.[7]

The ADIR is a risk premium that tries to protect lenders from the risk of error in the inflation estimate when pricing the mortgage or when calculating the risk of default of a potential borrower. It is in the latter concept that borrowers' socio-economic and mortgage characteristics play an important role because these are the variables that also determine the probability of default, and therefore it is also here that price differentials between immigrants and natives may appear. As we mentioned above, if the competition among lenders is high and the incentives to collect further information about potential borrowers is low, immigrants will tend to be systematically ranked as riskier borrowers than natives. This situation leads to the circumstance in which, ceteris paribus, immigrants will be discriminated against by being charged larger ADIRs.

Larger ADIRs may also appear because of the behavior of both borrowers and lenders. For borrowers, a lack of financial information, severe liquidity constraints or unwillingness to pursue negotiations for a better deal could lead to a larger ADIR. Thus, mortgage price differentials may also arise due to potential unobserved differences in bargaining skills between minority and non-minority borrowers. However, these factors remain generally unobservable for the researcher and determining their impact on the price of a mortgage is generally not feasible. In this regard, it is important to remark that in our sample all the mortgages have been granted through the intermediation of the own mortgage brokers of the real estate company selling the dwellings. That is, potential borrowers do not deal face to face with lenders. Therefore, we think that in this context, the impact of borrowers' bargaining skills on the ADIR charged should be limited.

## 3. Data and variables

### 3.1. Selected sample

The data set used in this paper refers to mortgages granted between 2006 and 2007. The data were collected each semester and pooled in a unique data set. Our sample consists of 15,034 observations that provide full information about all the variables of interest. Of these observations, 9670 correspond to natives (64.32%) and 5634 to immigrants (35.68%). Among the immigrants, 234 observations correspond to European Union[8] (1.56%), 2985 to Latin American (19.85%), 1068 to African (7.1%), 311 to Asian (2.07%) and 766 to Eastern European (5.1%) borrowers.

The data are provided by a real estate company that possesses its own mortgage brokerage branch. It mediates between homebuyers and lenders in the event that borrowers have difficulties in dealing directly with lenders or are unwilling to search for a mortgage and initiate negotiations with lenders. All the homebuyers in our sample have bought their dwelling from the list of this real estate company and their mortgages have been granted with the mediation of the mortgage brokers of this company. It is important to remark that this company operates in a specific segment of the housing market and that the flats it sells are medium and medium-low profile. This circumstance implies that the mortgages and borrowers in our sample should be quite homogenous regarding their socio-economic and dwelling characteristics.

### 3.2. Variables: the determinants of the ADIR

The variables that determine the price of a mortgage can be divided into two main groups: market factors and demand factors. Market determinants are undoubtedly led by the movements in interest rates over time and expected movements in inflation. Depending on the direction of these movements, both lenders and borrowers may find their bargaining position strengthened. In our empirical model, we control for this by including a set of *time dummies*, one per month. We also include dummies for municipality in order to control for the fact that immigrants and natives may be located in different local labor markets or cities.

One interesting feature of our data set is that we can identify which bank granted each mortgage. This information allows us to include *bank fixed effects* in our empirical model, which makes it possible to control for the fact that some lenders might have more market power or different lending policies than others or for other unobserved bank heterogeneity. Our data set also provides information on some mortgage underwriting variables that are important in order to determine the risk profile of the borrower, and hence also the ADIR in the mortgage contract. These are the *repayment mortgage term*, the *loan amount* and, more importantly, the *loan-to-value ratio* (LTV) and the *debt-to-income ratio* (DTI).

The second group of variables that determines the ADIR is related to demand factors and is mainly composed of the set of borrower characteristics. Our data set also provides information regarding borrowers' *net monthly earnings*, *type of labor contract* (fixed-term or indefinite) and *education*. These three variables are crucial in determining the risk profiles of a borrower and hence his/her probability of defaulting. Borrower's *education* is not only an indicator of an individual's future earnings potential, but is also a good proxy for his/her *bargaining skills* and financial literacy. We expect better-educated individuals to be more informed and possess better bargaining skills than less-educated borrowers. We also control for the type or labor contract of the mortgagor. We find that this variable is also crucial since it is a good indicator of a borrower's job stability. Other individual controls in our data set are the borrower's *age*, *marital status* and *occupation*. It is worth noting that these individual characteristics, especially those regarding job stability, are generally not available in previous studies. We believe these variables to be better predictors of the probability of default than other more commonly used variables, such as the borrower's credit history. Table 1 displays a list of the variables used in this study and their definitions.

### 3.3. Are immigrant borrowers riskier?

In Table 2, we show separate tests of the equality of means in the ADIR between immigrant and native borrowers. The gap in the ADIR is 0.178. By birthplace, these gaps are 0.174, 0.198, 0.179, 0.121 and −0.003 for Latin America, Africa, Eastern Europe, Asia and the EU15, respectively. With the exception of EU15 borrowers, the average gap is similar among immigrants and the differences from natives are statistically significant in all cases.

In Table 3, we report the tests of the equality of means in the ADIR between native and immigrant borrowers across banks. This table is useful in order to detect the potential existence of patterns of mortgage price differentials across lenders. We split the sample between *conventional banks* and *savings banks*, since most of the conventional banks operate at the national level while savings banks, with few exceptions, tend to operate in their region or province. In order to have representative samples, we do not split the sample by birthplace and only report the results for those banks with a sample of at least 50 immigrant borrowers and 50 native borrowers. We assess statistical significance at

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[7] The Euribor is determined by the European Central Bank and is quoted daily, while the RIML is the average of the annual interest rate (BIR + ADIR) of all mortgages lent during the month when the mortgage contract is signed. Because of its nature, the RIML is not only higher than the Euribor, but is also less volatile and reacts less sharply to changes in market interest rates than the Euribor. This makes the RIML more advantageous for lenders in a context of decreasing interest rates.

[8] In this category, we only include the fifteen EU countries before the enlargement in 2004. We also consider in this group non-EU rich countries such as the US, Canada, Switzerland, etc.

**Table 1**
Description of the variables.

| Variable | Description |
| --- | --- |
| Annual differential interest rate (ADIR) | Differential applied over the benchmark interest rate |
| Loan-to-value (LTV) | Loan amount against the value of the dwelling |
| Debt-to-income (DTI) | Monthly repayment against monthly household income |
| Age | Age (in years) of the principal holder of the mortgage. |
| Income | Net monthly household income |
| *Loan amount* | |
| Repayment term | Number of years to repay the mortgage |
| Type of job | Dummies for the borrower's type of job Administrative officer, Manager, White collar, Blue collar, other |
| Education | Dummies for the borrower's level of education Primary or lower, Secondary, University |
| Type of contract | Type of contract of the borrower |
| Indefinite | Dummy variable: 1 = Indefinite contract; 0 = Other |
| Indefinite discontinuous | Dummy variable: 1 = Indefinite discontinuous contract; 0 = Other |
| Without contract | Dummy variable: 1 = without contract; 0 = Other |
| Fixed-term | Dummy variable: 1 = fixed-term contract; 0 = Other |
| For a specific project or service | Dummy variable: 1 = For a specific project or service contract; 0 = Other |
| Marital status | Marital status of the borrower |
| Married | Dummy variable: 1 = married; 0 = Other |
| Living with a partner | Dummy variable: 1 = living with a partner; 0 = Other |
| Separated | Dummy variable: 1 = separated; 0 = Other |
| Single | Dummy variable: 1 = single; 0 = Other |
| Widow | Dummy variable: 1 = widowed; 0 = Other |
| Bank | Dummy variable for each bank granting the mortgage |
| Time | Monthly dummies |

the 5% level. We observe that with one exception (bank L), all the banks charge higher interest rates to immigrants, though the gap tends to be slightly smaller in savings banks. This suggests that there are no specific patterns across banks. The average gaps are quite heterogeneous across the board and range from 0.045 in Bank N to 0.347 in Bank K.

Table 4 shows the summary statistics of our sample broken down by immigrant status. We focus on those borrower and mortgage characteristics that are relevant in order to draw the risk profile of a borrower and hence his/her propensity to default. These variables are the loan-to-value (LTV) and debt-to-income (DTI) ratio, the size of the mortgage, the mortgage repayment term, the borrower's net monthly earnings, the type of labor contract and education. First at all, it is worth noting that EU15 and native borrowers display a similar profile in terms of risk. Indeed, in some of the variables, they perform better than natives. EU15 borrowers are by far the most educated and hold better jobs than natives. They are also granted smaller loans and they report the smallest

**Table 2**
Test of the difference of means in the ADIR between immigrants and natives.

| | N | Mean | s.d. | Gap | t-Stat |
| --- | --- | --- | --- | --- | --- |
| Native | 9670 | 0.982 | 0.183 | | |
| Immigrant | 5364 | 1.151 | 0.360 | 0.169 | 32.12 |
| Latin America | 2985 | 1.156 | 0.359 | 0.174 | 25.51 |
| Africa | 1068 | 1.180 | 0.336 | 0.198 | 18.91 |
| Este | 766 | 1.161 | 0.393 | 0.179 | 12.47 |
| Asia | 311 | 1.103 | 0.340 | 0.121 | 6.26 |
| EU15 | 234 | 0.980 | 0.337 | −0.003 | −0.12 |

**Table 3**
Tests of mean differences in the ADIR between immigrants and natives by bank.

| Bank | Immigrants | | | Natives | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | N | Mean | s.d. | N | Mean | s.d. | Gap | t-Stat |
| *Conventional Banks* | | | | | | | | |
| A | 893 | 1.330 | 0.478 | 534 | 0.988 | 0.310 | 0.342 | 16.37 |
| B | 48 | 0.980 | 0.119 | 68 | 0.783 | 0.189 | 0.196 | 6.86 |
| C | 783 | 1.125 | 0.284 | 2887 | 1.002 | 0.134 | 0.123 | 11.80 |
| D | 183 | 0.993 | 0.227 | 76 | 0.910 | 0.206 | 0.083 | 2.87 |
| E | 148 | 1.493 | 0.514 | 107 | 1.181 | 0.533 | 0.312 | 4.68 |
| F | 22 | 1.186 | 0.348 | 68 | 0.852 | 0.186 | 0.334 | 4.32 |
| All | 2622 | 1.191 | 0.388 | 6480 | 0.994 | 0.168 | 0.196 | 25.01 |
| *Savings banks* | | | | | | | | |
| H | 368 | 1.096 | 0.191 | 2663 | 0.992 | 0.092 | 0.103 | 10.22 |
| I | 159 | 1.172 | 0.272 | 27 | 0.907 | 0.300 | 0.265 | 4.30 |
| J | 49 | 1.055 | 0.225 | 66 | 0.817 | 0.243 | 0.238 | 5.42 |
| K | 1179 | 1.156 | 0.373 | 345 | 0.809 | 0.333 | 0.347 | 16.57 |
| L | 49 | 1.245 | 0.349 | 95 | 1.245 | 0.387 | 0.000 | 0.00 |
| N | 694 | 1.032 | 0.187 | 2275 | 0.987 | 0.082 | 0.045 | 6.20 |
| O | 100 | 1.182 | 0.288 | 40 | 0.776 | 0.306 | 0.406 | 7.23 |
| P | 114 | 1.185 | 0.183 | 96 | 1.032 | 0.246 | 0.153 | 5.04 |
| All | 2742 | 1.113 | 0.327 | 3190 | 0.958 | 0.208 | 0.155 | 21.43 |

LTVs and DTIs. Given this circumstance and the fact that EU15 borrowers are not charged a higher ADIR than natives, we will omit EU15 borrowers from the sample since they could distort our sample of immigrants. They are also the smallest group in the sample.

Now comparing natives with the remaining groups of immigrants, we observe that, on average, creditworthiness factors differ between immigrants and natives. Immigrants report a higher LTV (89.3% vs. 85.9%) and a higher DTI (64.8% vs. 59.7%), but a smaller loan amount ($253,098 vs. $270,588). Immigrants also report lower net monthly earnings ($1887 vs. $2360) and lower job stability and are less educated. Of native borrowers, 64% hold an indefinite labor contract and 35% have completed at least secondary education. For immigrants, these figures are 51% and 17%, respectively. If we compare immigrant mortgagors according to their birthplace, we do not observe substantial differences among them.

## 4. Econometric results

### 4.1. Determinants of the ADIR

We assume that the ADIR is determined by the following linear relationship:

$$Y_{ijkt} = \beta' X_{it} + u_t + b_j + m_k + \varepsilon_{ijkt}, \tag{1}$$

where the outcome $Y_{ijkt}$ is the ADIR for individual $i$ buying a flat in municipality $k$ in period $t$ and granted by bank $j$, $X_{it}$ is a set of the mortgage and borrower's socio-economic characteristics, including his/her native/immigrant status, $b_j$ are bank fixed effects, $u_t$ are time-specific effects, $m_k$ are municipality fixed effects, $\beta$ is the set of parameters to be estimated and $\varepsilon_{it}$ is a random error term. Bank-specific effects are considered in order to control for the existence of differentials in market power across banks, while time dummies are included to control for time shocks in demand. Municipality dummies are included to control for the fact that immigrants and natives may be located in different local labor markets or cities.

In Table 5, we report the results of the OLS estimation of Eq. (1). In each column, we estimate two models, one including a dummy picking up the immigrant status of the borrower and the other considering birthplace dummies (Latin America, Africa, Eastern Europe and Asia), in order to capture the potential differences across groups of immigrants. In Column 1, we estimate a model considering only birthplace and month dummies. On average, independently of their birthplace, immigrant borrowers are charged higher ADIRs than natives. This estimate

**Table 4**
Summary statistics.

| | Natives | | All immigrants | | Latin American | | African | | Eastern European | | Asian | | EU15 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | s.d. | Mean | s.d. | Mean | s.d. | Mean | s.d. | Mean | s.d. | Mean | s.d. | Mean | s.d. |
| Loan-to-value (LTV) | 85.922 | 11.794 | 89.303 | 12.120 | 90.763 | 11.668 | 86.877 | 12.719 | 89.622 | 11.914 | 87.551 | 10.587 | 82.783 | 13.345 |
| Debt-to-income (DTI) | 59.761 | 26.483 | 64.811 | 27.837 | 69.949 | 27.578 | 54.506 | 23.749 | 61.555 | 28.064 | 69.435 | 31.553 | 49.498 | 21.730 |
| Repayment term (years) | 36.601 | 4.907 | 34.225 | 5.180 | 34.201 | 5.092 | 34.891 | 4.883 | 33.737 | 5.281 | 33.873 | 6.003 | 33.530 | 5.814 |
| Borrower's age | 31.688 | 6.925 | 34.433 | 7.813 | 34.675 | 8.036 | 33.939 | 7.198 | 34.060 | 7.641 | 35.173 | 7.480 | 33.731 | 8.425 |
| Net monthly earnings ($) | 2360 | 902 | 1887 | 963 | 1862 | 908 | 1771 | 773 | 1925 | 1026 | 2011 | 1169 | 2456 | 1202 |
| Loan amount ($) | 270,588 | 78,799 | 253,098 | 89,786 | 270,070 | 83,741 | 205,022 | 77,830 | 243,833 | 88,931 | 284,369 | 104,978 | 240,125 | 82,524 |
| *Type of labor contract* | | | | | | | | | | | | | | |
| Indefinite | 0.640 | 0.480 | 0.511 | 0.500 | 0.530 | 0.499 | 0.375 | 0.484 | 0.508 | 0.500 | 0.688 | 0.464 | 0.650 | 0.478 |
| Fixed-term | 0.322 | 0.467 | 0.425 | 0.494 | 0.415 | 0.493 | 0.560 | 0.497 | 0.421 | 0.494 | 0.194 | 0.396 | 0.261 | 0.440 |
| Other | 0.038 | 0.192 | 0.065 | 0.246 | 0.055 | 0.228 | 0.065 | 0.246 | 0.072 | 0.258 | 0.117 | 0.322 | 0.090 | 0.286 |
| *Education* | | | | | | | | | | | | | | |
| Primary | 0.592 | 0.491 | 0.795 | 0.403 | 0.796 | 0.403 | 0.882 | 0.323 | 0.787 | 0.410 | 0.765 | 0.424 | 0.466 | 0.500 |
| Secondary | 0.351 | 0.477 | 0.169 | 0.375 | 0.174 | 0.379 | 0.101 | 0.301 | 0.186 | 0.390 | 0.201 | 0.401 | 0.316 | 0.466 |
| University | 0.057 | 0.232 | 0.035 | 0.184 | 0.030 | 0.171 | 0.017 | 0.130 | 0.026 | 0.161 | 0.034 | 0.181 | 0.218 | 0.414 |
| *Occupation* | | | | | | | | | | | | | | |
| Clerical | 0.013 | 0.115 | 0.011 | 0.102 | 0.011 | 0.104 | 0.004 | 0.060 | 0.005 | 0.071 | 0.015 | 0.123 | 0.051 | 0.221 |
| Managerial | 0.016 | 0.125 | 0.021 | 0.145 | 0.018 | 0.133 | 0.009 | 0.095 | 0.014 | 0.117 | 0.068 | 0.252 | 0.090 | 0.286 |
| White collar | 0.386 | 0.487 | 0.271 | 0.444 | 0.257 | 0.437 | 0.241 | 0.428 | 0.325 | 0.469 | 0.204 | 0.403 | 0.479 | 0.501 |
| Blue collar | 0.333 | 0.471 | 0.567 | 0.496 | 0.586 | 0.493 | 0.591 | 0.492 | 0.562 | 0.496 | 0.546 | 0.499 | 0.256 | 0.438 |
| Other | 0.252 | 0.434 | 0.131 | 0.337 | 0.128 | 0.334 | 0.155 | 0.363 | 0.094 | 0.293 | 0.167 | 0.373 | 0.124 | 0.330 |
| *Marital status* | | | | | | | | | | | | | | |
| Married | 0.131 | 0.321 | 0.403 | 0.491 | 0.422 | 0.461 | 0.304 | 0.500 | 0.487 | 0.495 | 0.407 | 0.511 | 0.333 | 0.472 |
| Single | 0.835 | 0.371 | 0.578 | 0.494 | 0.557 | 0.497 | 0.686 | 0.464 | 0.500 | 0.500 | 0.580 | 0.494 | 0.585 | 0.494 |
| Other status | 0.034 | 0.181 | 0.019 | 0.137 | 0.020 | 0.140 | 0.010 | 0.100 | 0.013 | 0.112 | 0.012 | 0.111 | 0.081 | 0.274 |
| N | 9670 | | 5364 | | 2985 | | 1068 | | 766 | | 311 | | 234 | |

**Table 5**
OLS estimation of the determinants of the ADIR.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| All immigrants | 0.221*** | 0.191*** | 0.162*** | 0.167*** | 0.163*** | 0.150*** |
| | (0.00513) | (0.00512) | (0.00556) | (0.00574) | (0.00571) | (0.00825) |
| All immigrants ∗ conventional | | | | | | 0.0362*** |
| | | | | | | (0.0102) |
| Conventional bank | | | | | | 0.0220*** |
| | | | | | | (0.00799) |
| Latin America | 0.221*** | 0.194*** | 0.166*** | 0.172*** | 0.169*** | |
| | (0.00594) | (0.00598) | (0.00632) | (0.00652) | (0.00643) | |
| Africa | 0.234*** | 0.191*** | 0.152*** | 0.152*** | 0.146*** | |
| | (0.00855) | (0.00839) | (0.00869) | (0.00885) | (0.00858) | |
| Asia | 0.160*** | 0.156*** | 0.142*** | 0.156*** | 0.148*** | |
| | (0.0147) | (0.0143) | (0.0143) | (0.0143) | (0.0138) | |
| Eastern Europe | 0.225*** | 0.196*** | 0.168*** | 0.175*** | 0.175*** | |
| | (0.00981) | (0.00956) | (0.00970) | (0.00982) | (0.00950) | |
| Loan-to-value (LTV) | | 0.00431*** | 0.00390*** | 0.00414*** | 0.00389*** | 0.00393*** |
| | | (0.000202) | (0.000203) | (0.000210) | (0.000203) | (0.000203) |
| Debt-to-income (DTI) | | 0.00272*** | 0.00343*** | 0.00356*** | 0.00317*** | 0.00318*** |
| | | (0.000123) | (0.000161) | (0.000161) | (0.000153) | (0.000153) |
| Mortgage term (years) | | 0.00300*** | 0.00450*** | 0.00445*** | 0.00311*** | 0.00309*** |
| | | (0.000513) | (0.000578) | (0.000584) | (0.000586) | (0.000585) |
| Log (loan amount) | | 0.524*** | 0.555*** | 0.450*** | 0.446*** | 0.442*** |
| | | (0.0851) | (0.0873) | (0.0872) | (0.0829) | (0.0829) |
| Log (loan amount) sq. | | −0.0320*** | −0.0345*** | −0.0292*** | −0.0278*** | −0.0276*** |
| | | (0.00366) | (0.00382) | (0.00384) | (0.00365) | (0.00365) |
| Log (monthly earnings) | | | −0.0588*** | −0.0507*** | −0.0544*** | −0.0539*** |
| | | | (0.0171) | (0.0173) | (0.0165) | (0.0165) |
| Log (monthly earnings) sq. | | | 0.00891*** | 0.00822*** | 0.00813*** | 0.00806*** |
| | | | (0.00150) | (0.00153) | (0.00146) | (0.00146) |
| Fixed-term labor contract[(a)] | | | 0.0542*** | 0.0503*** | 0.0465*** | 0.0460*** |
| | | | (0.00541) | (0.00543) | (0.00524) | (0.00524) |
| Other type of contract[(a)] | | | 0.00993 | 0.00462 | −0.00413 | −0.00429 |
| | | | (0.0101) | (0.0100) | (0.00958) | (0.00958) |
| Secondary education[(b)] | | | −0.0346*** | −0.0228*** | −0.0142** | −0.0173*** |
| | | | (0.00604) | (0.00625) | (0.00603) | (0.00606) |
| University[(b)] | | | −0.127*** | −0.117*** | −0.101*** | −0.101*** |
| | | | (0.0107) | (0.0108) | (0.0103) | (0.0103) |
| Age | | | 0.00665*** | 0.00548*** | 0.00594*** | 0.00565*** |
| | | | (0.00165) | (0.00164) | (0.00156) | (0.00156) |
| Age sq. | | | −7.27e−05*** | −5.7e−05*** | −6.41e−05*** | −6.12e−05*** |
| | | | (2.12e−05) | (2.11e−05) | (2.01e−05) | (2.01e−05) |
| Constant | 0.898*** | −1.390*** | −1.640*** | −1.171** | −1.255*** | −1.135*** |
| | (0.0135) | (0.499) | (0.500) | (0.497) | (0.473) | (0.079) |
| Month dummies | Yes | Yes | Yes | Yes | Yes | Yes |
| Occupation dummies | No | No | Yes | Yes | Yes | Yes |
| Marital status dummies | No | No | Yes | Yes | Yes | Yes |
| Municipality dummies | No | No | No | Yes | Yes | Yes |
| Bank dummies | No | No | No | No | Yes | No |
| Observations | 14,800 | 14,800 | 14,800 | 14,800 | 14,800 | 14,800 |
| R-squared | 0.146 | 0.203 | 0.230 | 0.251 | 0.328 | 0.329 |

Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Base categories: (a) Indefinite contract; (b) Primary education.

simply replicates the raw differences in Table 2, but corrected for the month of origination of the mortgage. In the remainder of Table 5, Columns 2 to 6, we sequentially include additional groups of explanatory variables to hold constant the differences in individual and mortgage characteristics that may vary across borrowers depending on their birthplace.[9] In Columns 2 and 3, we consider a number of controls related to the creditworthiness of the borrower. In Column 2, we first include the set of mortgage characteristics (LTV, DTI, term and loan amount). In Column 3, we add the group of variables regarding individual characteristics, which includes, among others, the borrower's net monthly income, education and type of labor contract. All these variables determining the risk profile of a borrower turn out to be statistically significant and behave according to expectations. LTV and DTI exert a positive impact on the ADIR, while the effect of the loan amount is an inverted U-shape, i.e. positive but decreasing. We also observe that borrowers with a better employment situation and income conditions (more educated, more earnings and greater employment stability) are

charged a smaller ADIR. It is remarkable that even after controlling for these differences in creditworthiness, the coefficients associated with birthplace dummies are still high and statistically significant. Indeed, we observe little variation in these coefficients after including these controls.

The estimates reported in Columns 4 and 5 consider additional factors that control for bank fixed effects and municipality. These variables control for the potential existence of a specific lender attitude towards immigrants and geographical patterns. Although some of these dummies are statistically significant, we observe again that the coefficients associated with birthplace dummies are still high and significant with a fairly small variation with respect to Columns 2 and 3. It is also worth noting that after including the variables determining the mortgagors' risk profile in the model, the differences in the ADIR do not differ substantially among the different groups of immigrants (Column 5). All these results taken together suggest that the differences in mortgage interest rates between immigrants and natives might not be driven by the differences in the observable characteristics.

Finally, in Column 6, we estimate the same model as in Column 5 but interacting the immigrant status dummy with one dummy reflecting

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[9] We follow the same strategy as Blanchflower et al. (2003).

**Table 6**

Oaxaca–Blinder decomposition of the ADIR gap between immigrants and natives.

|  | Full simple | Conventional banks | Savings banks |
|---|---|---|---|
| Estimated ADIR immigrants | 1.159*** | 1.200*** | 1.121*** |
|  | (0.00501) | (0.00782) | (0.00629) |
| Estimated ADIR natives | 0.982*** | 0.994*** | 0.958*** |
|  | (0.00186) | (0.00209) | (0.00368) |
| Estimated gap | 0.177*** | 0.206*** | 0.163*** |
|  | (0.00534) | (0.00810) | (0.00728) |
| Endowments | 0.0211*** | 0.0296*** | 0.0295*** |
|  | (0.00663) | (0.00836) | (0.0101) |
|  | *12.20%* | *14.56%* | *18.40%* |
| Coefficients (different treatment) | 0.155*** | 0.176*** | 0.133*** |
|  | (0.00776) | (0.00995) | (0.0115) |
|  | *87.80%* | *85.44%* | *81.60%* |
| Observations | 14,800 | 8948 | 5852 |

Standard errors in parentheses; *** p < 0.01, ** p < 0.05, * p < 0.1.

whether the lender is a conventional bank or a savings bank. As we already observed in Table 4, conventional banks charge higher interest rates than savings banks. We find that after controlling for creditworthiness, conventional banks charge 2.2 percentage points more to natives and almost 6 percentage points more to immigrants with respect to savings banks. This result suggests that banks operating nationwide (conventional banks) may have fewer incentives to collect more information about their potential borrowers, especially if they are immigrants, than banks operating at a more local level (savings banks).

Estimates reported in Column 6 indicate that in the most complete specification immigrants are charged in their mortgages with 18 basis points more than their native counterparts. One may find this gap not to be substantial if we compare it with the gap between native and minorities in the small firms' loan market observed in other countries. Albareto and Mistrulli (2011) find a gap of 70 basis points between immigrants and natives running micro-firms in Italy; while Blanchflower et al. (2003) estimate a gap of 50 and 100 basis points between white and Hispanic and Black borrowers in the US.

One potential explanation for these differences is that lending policies in both markets are different. We should expect soft information (e.g., reputation, etc.) to be more important in the small business lending sector than in the mortgage market, where in the context of the housing boom demand for housing was massive. During our sample period, more than 2.5 million of mortgages were granted in Spain.

### 4.2. Decomposing the gap: counterfactual analysis

In this section, we refine the analysis reported in the previous subsection. We resort to the Oaxaca–Blinder decomposition to quantify the role of observables in explaining the mortgage price gap between immigrant and native borrowers. This method consists of estimating Eq. (1) separately for immigrants and natives. Then the estimated coefficients for each group are used to decompose the estimated gap in the ADIR between the two groups as follows:

$$\hat{Y}_m - \hat{Y}_n = (\overline{X}_m - \overline{X}_n)\hat{\beta}_n + \overline{X}_n(\hat{\beta}_m - \hat{\beta}_n), \tag{2}$$

where $Y$ is the outcome variable (ADIR) as defined in Eq. (1) and the subscripts $m$ and $n$ refer to immigrants and natives, respectively. The left-hand side of Eq. (2) measures the estimated gap of the ADIR between the two population groups. The first term on the right-hand side picks up the part of the gap attributed to differences in individual and mortgage characteristics (*endowments*), while the second term concerns the part of the gap caused by differences in the coefficients

**Table 7**

Counterfactual analysis.

|  | Immigrant | Native | Counterfactual |
|---|---|---|---|
| Estimated ADIR | 1.1588 | 0.9823 | 0.9512 |
| Estimated differential ADIR |  | 0.1765 | 0.2076 |
| Estimated mortgage total repayment ($) | 583,851 | 571,035 | 568,790 |
| Estimated differential amount ($) |  | 12,816 | 15,061 |

Calculations are based on an average mortgage of 240,000$, to be repaid in 35 years. The value for the Euribor is 4%.

(*not explained*). The latter component would reflect the share of the gap that could be attributable to potential discrimination. However, as Neumark (1988) suggests, there is no reason to assume $\hat{\beta}_n$ as the non-discriminatory parameter vector. Therefore, $\hat{\beta}_n$ is replaced by $\hat{\beta}^*$, which is estimated from a native–immigrant pooled model and includes an immigrant status dummy variable. The results of the decomposition are reported in Table 6.

The results of the decomposition analysis indicate that *endowments* only account for 12% of the gap in the ADIR. The interpretation of this result is the following: if the average immigrant was endowed with the characteristics of the average native borrower, the gap in the ADIR would decrease by only 12% (from 0.177 to 0.156). In order to detect whether this result may vary by the type of bank, we repeat the same analysis, splitting the sample into *conventional* and *savings banks*. Recall that most of the conventional banks operate nationwide, while most of the savings banks operate at the regional or provincial level. The results do not vary substantially with respect to those obtained without splitting the sample. In both cases, endowments explain less than 19% of the gap.

Although statistically significant, apparently the mortgage price differentials reported in this paper do not seem to be very large. As we mentioned in the previous subsection, one may think that a gap in the ADIR between immigrants and natives of 0.18 percentage points is in practice immaterial compared to other type of loans. However, as we will see, this differential in the ADIR generates a substantial cost for immigrants. In order to quantify this cost, we resort to counterfactual analysis by means of the following equation:

$$\hat{y}_m^n = \hat{\beta}_n \overline{X}_m, \tag{3}$$

where $\hat{y}_m^n$ is the expected ADIR of the average immigrant borrower if he/she was endowed with the mortgage and individual characteristics of the average native borrower. $\hat{\beta}_n$ is the set of estimated parameters in the ADIR regression for natives and $\overline{X}_m$ are the average values of individual and mortgage characteristics for immigrant borrowers. We use the outcome of Eq. (3), which is the counterfactual value of the ADIR for immigrants, to compute the expected mortgage loan payback of an immigrant borrower if he/she was treated by lenders as a native.[10] The total cost derived from the mortgage price differentials in the ADIR is the difference between this counterfactual value and the observed average mortgage loan payback for an immigrant borrower. The results are reported in Table 7.

Our simulation is based on a mortgage of $240,000, to be paid back over 35 years, with a value of the Euribor of 4%. With these values, the total average payback for an immigrant borrower with an average observed ADIR of 1.158 is $583,851. Eq. (3) yields a counterfactual value of the ADIR of 0.951. If we use this value to recalculate the total average payback for immigrants, we obtain a value of $568,790. According to these numbers, the mortgage price differentials in the ADIR fully or partially attributable to discrimination generate an average cost for immigrants of more than $15,000, which is remarkably high. This amount

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[10] The common formula for computing the monthly mortgage payment (MMP) is known as the Loan French System: $MMP = (L \cdot I)/[100 \cdot (1 - (1 + (I/100)^{-m})]$, where $L$ is the mortgage loan amount, $I$ is the monthly interest rate and $m$ is the loan duration in months.

would represent one year's net income for one-fourth of our sample. This cost will increase linearly with the size of the mortgage loan.

## 5. How reliable are our results?

One may always fear the devastating effect of omitted variables or sample selection bias. Both the loan approval process and the mortgage pricing are affected, among other factors, by the probability of default, which in turn depends on a set of variables that determine the risk and creditworthiness of the loan. While some of them are observable at the time of the loan approval, others are not evident at that point and may arise after loan approval. Obviously, there are no mortgage application data that combine both loan approval and default information; therefore, lenders and researchers have to resort to what is observable at the time of the loan application and not at the time of default. Because of this, we cannot rule out the possibility that a number of factors that determine the gap in the ADIR between immigrants and natives are observable for lenders but not for the econometrician. If unmeasured omitted characteristics are correlated with the immigrant status, then the estimates of the determinants of the ADIR for immigrant mortgagors might be biased. However, the following additional analyses and discussion suggest that in the context of our research, if this bias exists, it should be fairly modest.

### 5.1. The loan officer

In the models presented in Table 5, we do not control for the loan officer who mediates between borrowers and lenders. This information could be potentially important, since the loan officer might make use of so-called soft information, such as reputation, etc. Unfortunately, we do not have information regarding the loan officer for the whole sample period. This information is available only for the first semester of 2006.[11] Therefore, we only have 2487 observations for which the loan officer who originates the mortgage is reported. We estimate two models using this information. The results are reported in Table 8.

In Column 2, we report the results of the full model (all controls considered in Table 5), also including loan officer dummies, while in Column 1, we estimate the same model using the same sample but excluding loan officer dummies. We observe that after including loan officer dummies, the differentials in the ADIR between immigrants and natives remain practically unaltered. This result suggests that in our case, this variable does not seem to be important in explaining the immigrant–native gap in the ADIR. It is worth noting that although in Columns 1 and 2 of Table 6 we use less than one-fourth of the sample, we are still able to reproduce practically the same results as in Table 5. In both tables, the magnitude and significance of the coefficients associated with the birthplace dummies are quite similar.

### 5.2. Market structure

In highly competitive markets, banks have a lower incentive to acquire information on their potential borrowers, which causes them to rank them as risky, charging higher interest rates (Petersen and Rajan, 1995; Degryse and Ongena, 2007). In this analysis, we replicate Alesina et al. (2013) and investigate the impact of competition among lenders on interest rates. As they do, we use the Herfindahl–Hirschman Index (HHI), computed by province, as a proxy for the level of competition in the mortgage market. The results are reported in Table 9, Columns 5 and 6. In Column 5, we include only the HHI, which is negative and statistically significant. In this regard, we reproduce the same result as Alesina et al. (2013), who also find that interest rates tend to be higher in more competitive markets. However, once more, the

**Table 8**
Determinants of the ADIR with and without loan officer dummies.

|  | (1) | (2) |
|---|---|---|
| All immigrants | 0.157*** | 0.157*** |
|  | (0.0119) | (0.0125) |
| Latin American | 0.156*** | 0.150*** |
|  | (0.0133) | (0.0140) |
| African | 0.155*** | 0.160*** |
|  | (0.0182) | (0.0189) |
| Asian | 0.174*** | 0.186*** |
|  | (0.0182) | (0.0187) |
| Eastern European | 0.114*** | 0.103*** |
|  | (0.0295) | (0.0303) |
| All controls in Table 5 | Yes | Yes |
| Loan officer dummies | No | Yes |
| Observations | 2487 | 2487 |
| R-squared | 0.355 | 0.441 |

Standard errors in parentheses.
*** p < 0.01.
** p < 0.05.
* p < 0.1.

coefficient associated with immigrant status remains practically unaltered after including the HHI. In Column 6, we interact the HHI with the immigrant status dummy. Now, the interaction is highly significant and negative, while the coefficient associated with the HHI is practically zero. This result is quite revealing, since it indicates that the market structure has an impact on mortgage interest rates, but only for immigrants. In the absence of further information about borrowers, in more competitive markets immigrants are more likely to be classified as riskier than natives. This suggests the potential existence of statistical discrimination against immigrants.

### 5.3. Personal guarantors

The results of this analysis are also reported in Table 9. In mortgages in which lenders are worried about the solvency of a borrower, they may ask for a guarantor. As these borrowers are classified as high-risk borrowers, we should expect them to be charged a higher interest rate. Our results indicate that for mortgages in which a guarantor is required the interest rate is modestly higher (Column 1). The interaction of the guarantor dummy with the immigrant status dummy is not statistically significant, which suggests that in this regard immigrants and natives receive the same treatment from lenders (Column 2). However, when we distinguish whether the guarantor is a native or an immigrant, we observe that mortgages with an immigrant guarantor are charged a substantially higher interest rate than if the guarantor is a native. This effect is even more pronounced for immigrant borrowers (Columns 3 and 4). Interestingly, we observe again that after including these new controls, the coefficient associated with immigrant status experiences little variation.

### 5.4. Credit history

In our data set, we cannot account for borrowers' credit history. Studies on mortgage price differentials in the US have found that credit history is statistically significant in models estimating the likelihood of a mortgage application being turned down. Borrowers must have an acceptable credit history to be granted a mortgage. However, we think that in our case this omission is not that problematic. First, we believe that all unmeasured characteristics potentially correlated with immigrant status that might bias our results, such as the borrower's credit history, should already have had an impact on the loan approval process. That is, if the loan applications of immigrants with a bad credit history are turned down, we should expect the potential bias caused by this omission, if there is any, to be fairly small. Second, and more importantly, we control for most of the relevant variables that determine the

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[11] Because of changes in the confidentiality policy of the company providing the data, after the first semester of 2006, information regarding the loan officer was no longer provided.

**Table 9**
Determinants of the ADIR including HHI and guarantors (basic model include all controls in Table 5.)

|  | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Immigrant | 0.165***<br>(0.00562) | 0.171***<br>(0.00651) | 0.163***<br>(0.00582) | 0.166***<br>(0.00596) | 0.160***<br>(0.00561) | 0.214***<br>(0.0104) |
| Guarantor | 0.0186**<br>(0.00759) | 0.0255**<br>(0.0104) |  |  |  |  |
| Guarantor * immigrant |  | −0.0113<br>(0.0140) |  |  |  |  |
| Immigrant guarantor |  |  | 0.0298***<br>(0.0110) | 0.0870<br>(0.101) |  |  |
| Native guarantor |  |  | 0.0131<br>(0.00968) | 0.0233**<br>(0.0104) |  |  |
| Native guarantor * immigrant |  |  |  | −0.0688***<br>(0.0253) |  |  |
| Immigrant guarantor * immigrant |  |  |  | −0.0591<br>(0.101) |  |  |
| HHI |  |  |  |  | −0.0748***<br>(0.0262) | 0.00322<br>(0.0290) |
| HHI * immigrant |  |  |  |  |  | −0.205***<br>(0.0331) |
| Observations | 14,787 | 14,787 | 14,787 | 14,787 | 14,800 | 14,800 |
| R-squared | 0.323 | 0.323 | 0.323 | 0.323 | 0.318 | 0.320 |

Standard errors in parentheses.
*** p < 0.01.
** p < 0.05.
* p < 0.1.

risk profile of a borrower, such as the type of labor contract (indefinite or fixed-term), income, education and type of job. We think that these variables are excellent proxies for a borrower's credit history. One should expect credit history to be determined by past realizations of these variables. Indeed, we consider these variables to be better predictors of the probability of default than credit history.[12]

Furthermore, the results of the analyses reported in Tables 5, 6 and 7 suggest that the potential bias that might arise from the omission of variables, if there is any, should be modest. As shown by Altonji et al. (2005) and Oster (2013), under the assumption of proportional selection, movements in the coefficient of interest, with controls for which one is concerned about omitted components, are informative about the remaining bias. More specifically, Oster (2013) proves that if the coefficient of interest does not change much after considering these controls, this suggests limited bias. This is what we find here.

*5.5. Sample selection*

One shortcoming that we face in this paper is that we cannot control for the loan approval process. This circumstance does not allow us to control for the potential bias arising from the sample selection. As far as we are aware, the previous literature analyzing discrimination in mortgage pricing does not account for selection[13]; therefore, we cannot say much about whether mortgage interest rate differentials between minority and non-minority borrowers are likely to disappear once sample selection bias is taken into account.[14] However, from a technical point of view, we can resort again to Altonji et al. (2005) to discuss potential sample selection in our estimates. Selection bias may arise when factors determining the probability of a mortgage application being turned down are correlated with immigrant status. However, as Altonji et al. (2005) argued, strong reasons exist to believe that the relationship between the unobservables and immigrant status is weaker than the relationship between the observables and immigrant status. This leads to the idea that since we control in our interest rate regressions for a large set of borrowers' and mortgage variables that are also determinants of the probability of a mortgage application being rejected, then selection bias should be attenuated.

Still, we must admit that our incapability of controlling for sample selection is a limitation; therefore, despite the arguments we borrow from Altonji et al. (2005), we cannot rule out the possibility that our results might be biased. However, we think that in the context of our research the amount of selection we face is fairly small. Hence, the potential bias arising from selection, if there is any, should be modest. In order to justify this we will resort to other data sources. Our data refer to the years 2006 and 2007 and coincide with the housing boom in Spain. This period was characterized by a dramatic decline in credit standards. This circumstance can be attributed to the high level of competition in the lending industry during that period and the uncontrolled willingness of lenders to expand, taking advantage of the housing boom. Own computations, based on the *Spanish Family Financial Survey* (Encuesta Financiera de las Familias—EFF), reveal that in 2002, 98% of the surveyed individuals who applied for a mortgage were granted one, while in 2005 this percentage was 100%. For personal loans, these percentages were 98.82% and 96.44%. Given this low probability of rejection, we believe that in our data selection should not be an issue, at least among native borrowers.

In the EFF, we cannot identify the nationality of potential borrowers; therefore, we cannot discard the possibility that among immigrant borrowers the rejection rates were higher. However, if this was the case, in the context of the housing boom and according to the figures mentioned above, we should not expect the rejection rates among immigrants to be so high as to cause a severe problem of selection bias. In Table 8, we compare our sample of immigrant borrowers with the characteristics of the immigrant population in the *Spanish National Immigrant Survey of 2007* (ENI2007). According to this analysis, we do not observe substantial differences between the average immigrant not holding a mortgage in the ENI2007 and our sample of immigrant borrowers at the bottom of the income distribution. The average income in the ENI2007 was $1223, while in our data the tenth and twenty-fifth

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[12] A decrease in the accuracy of credit scores based on borrowers' credit history for predicting loan delinquency has been recently proved in a Fitch study in the US. Indeed, some banks have abandoned credit scores for other risk analyses based on, among other factors, borrowers' employment. These more reliable scores use as inputs variables such as the ones we use here regarding borrowers' labor status.

[13] Courchane and Nickerson (1997), Black et al. (2001, 2003), Boehm and Schlotmann (2007) and Courchane (2007).

[14] One exception, but in the context of the small business credit markets, is the analysis carried out by Blanchflower et al. (2003). These authors observe that after controlling for selection among minority firm owners, the gap in the interest rate between minority and white firm owners is still positive and statistically significant. They conclude that these differentials are probably due to discrimination.

**Table 10**
Summary statistics for immigrants in the ENI and our sample.

| Characteristic | National Survey of Immigrants 2007 (ENI2007) | | Our data | | |
| --- | --- | --- | --- | --- | --- |
| | With a mortgage | No mortgage | Average | 10% | 25% |
| Age | 34.40 | 36.64 | 34.45 | 35.35 | 33.94 |
| Married | 71.55% | 50.60% | 40.37% | 45.44% | 36.72% |
| Primary education | 87.52% | 78.14% | 80.76% | 82.70% | 79.52% |
| Permanent contract | 53.12% | 41.77% | 50.05% | 45.62% | 48.61% |
| Monthly income | 1394$ | 1223$ | 1867€ | 1105$ | 1345$ |
| Observations | | | 5130 | 526 | 757 |

percentiles were $1105 and $1345, respectively. Indeed, the differences between the two samples regarding their education and job stability were not important.

Despite the figures reported above being quite informative, we still admit that we cannot rule out the possibility that we suffer from sample selection bias in the sample of immigrants. However, these figures indicate that immigrant borrowers at the bottom of the distribution do not perform better than the average immigrant not holding a mortgage. We think that this is indicative that if sample selection bias exists, it should not be important. One indication that lenders relaxed their credit standards with immigrant borrowers is that, according to the raw statistics produced by the Central Bank of Spain, in 2008, 12.5% of the non-Spanish-born borrowers were not able to meet their monthly mortgage payments, while this share was only 1.6% for natives (See Table 10).

## 6. Conclusions

We observe that immigrants are charged significantly higher interest rates in their mortgages than their native counterparts. These differences persist even after controlling for differences in creditworthiness and other relevant factors. We are able to control for factors such as borrowers' job stability, which are not commonly used in the previous literature. The magnitude of the gap in the mortgage interest rate that we observe in our data is substantial. Our analyses suggest that immigrant borrowers could be discriminated against in the Spanish mortgage market. In a highly competitive mortgage market in which lenders have few incentives to acquire further information about potential borrowers, lenders would tend to rank immigrants with similar characteristics to natives as riskier, charging a higher interest rate. This is statistical discrimination. Although lenders may justify this behavior for the sake of business necessity, discrimination, either prejudiced or statistical, is illegal.

To understand the plausibility of our results, it is necessary to put them into context. First at all, our data are based on intermediated mortgages; therefore, borrowers and lenders do not deal face to face. This circumstance entails that in our case factors such as bargaining skills or soft information about borrowers (reputation, beliefs, etc.) do not play a role. Second, the data were collected during the last years of the housing boom in Spain, which was characterized by: i) high competition in the lending industry to attract new borrowers; ii) the monetary illusion of the economic boom and; iii) the irrational expectation of both lenders and borrowers that housing prices could never fall. This context may explain not only the dramatic lowering of the credit standards, but also the discriminatory behavior against immigrants. Of course, we cannot rule out the possibility that there are some factors that are observable to lenders but not to the researchers. However, the analyses carried out in this paper suggest that the potential bias arising from this omission, if there is any, should be modest.

Our data refer to granted mortgages intermediated by the mortgage brokers of the real estate firm selling the flats. All the borrowers in our data bought their dwellings from the list of this real estate firm, which operates in the segment of medium- and medium-low-quality flats. Borrowers who make use of the mortgage brokers of this real estate firm are generally those who consider that they could experience difficulties in being granted a mortgage if they bargain face to face with lenders, do not possess information about the mortgage market or simply are unwilling to undertake negotiations with lenders. This circumstance may explain why in our sample the percentage of immigrant borrowers is so high (35%). There are no official data about the amount of mortgages granted to immigrants during the housing boom in Spain. However, according to the Spanish Ministry of Housing, in 2006, almost 12% of real estate transactions were made by immigrants, which effectively suggest that immigrant borrowers are overrepresented in our sample.

All these figures taken together might cast doubt on the generality of our results. Are credit standards in intermediated mortgages lower than those in mortgages directly bargained between borrowers and lenders? Is the market of intermediated mortgages in Spain a kind of a hidden subprime market? Unfortunately, we do not have direct information on non-intermediated mortgages to answer these questions. However, as we mentioned in the Introduction section, in 2012, 27% of the total mortgage portfolio was composed of doubtful mortgage loans, while in 2007, the market share of intermediated mortgages was only a little more than 7%. This figure suggests that the credit standards in non-intermediated mortgages were no better than those in intermediated ones (our sample).

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## References

Accetturo, A., Manaresi, F., Mocetti, S., Olivieri, E., 2012. Don't stand so close to me: the urban impact of immigration. Temi di discussione (Economic working papers) 866, Bank of Italy, Rome.

Alesina, A., Lotti, F., Mistrulli, P., 2013. Do women pay more for credit? Evidence from Italy. J. Eur. Econ. Assoc. 11, 45–66.

Albareto, G., Mistrulli, P., 2011. Bridging the gap between migrants and the banking system. Temi di discussione (Economic working papers) 794, Bank of Italy, Rome.

Altonji, J., Elder, T., Tabber, C., 2005. Selection on observed and unobserved variables: assessing the effectiveness of Catholic schools. J. Polit. Econ. 113 (1), 151–184.

Banco de España, 2009. Boletín Financiero del Banco de España. May, Madrid.

Black, H.A., Boehm, T.P., DeGennaro, R.P., 2001. Overages, mortgage pricing and race. Int. J. Financ. 13, 2057–2073.

Black, H.A., Boehm, T.P., DeGennaro, R.P., 2003. Is there discrimination in mortgage pricing? The case of overages. J. Bank. Financ. 27, 1139–1165.

Blanchflower, D., Levine, P., Zimmerman, D., 2003. Discrimination in the small-business credit market. Rev. Econ. Stat. 85 (4), 930–943.

Boehm, T.P., Schlotmann, A., 2007. Mortgage pricing differentials across Hispanic, black, and white households. J. Policy Dev. Res. 9, 93–136.

Blinder, A., 1973. Wage discrimination: reduced form and structural estimates. J. Hum. Resour. 8, 436–455.

Canner, G.B., 1981. Redlining and mortgage lending patterns. In: Henderson, J.V. (Ed.), Research in Urban Economics. JAI Press, Greenwich, pp. 67–101.

Courchane, M., Nickerson, D., 1997. Discrimination resulting from overage practices. J. Financ. Serv. Res. 11, 133–152.

Courchane, M., 2007. The pricing of home mortgage loans to minority borrowers: how much of the APR differential can we explain? J. Real Estate Res. 29, 399–440.

Degryse, H., Ongena, S., 2007. The impact of competition on bank orientation. J. Financ. Intermed. 16, 399–424.

Hanson, A., Hawley, Z., 2011. Do landlords discriminate in the rental housing market? Evidence from an internet field experiment in U.S. cities. J. Urban Econ. 70, 99–114.

Neumark, David, 1988. Employers' discriminatory behavior and the estimation of wage discrimination. J. Hum. Resour. 23 (3), 279–295.

Oaxaca, R., 1973. Male–female wages differentials in urban labor markets. Int. Econ. Rev. 14, 693–709.

Oster, E., 2013. Unobservable selection and coefficient stability: theory and validation. NBER working paper #w19054.

Petersen, M.A., Rajan, R.G., 1995. The effect of credit market competition on lending relationships. Q. J. Econ. 110, 407–443.

Saiz, A., Wachter, S., 2011. Immigration and the neighbourhood. Am. Econ. J. Econ. Policy 3, 169–188.

Stiglitz, J.E., Weiss, A., 1981. Credit rationing in markets with imperfect information. Am. Econ. Rev. 71, 393–410.