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Banks, Lies and Bricks: The Determinants of Home Value Inflation in Spain during the Housing Boom

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ABSTRACT

During the first decade of this century, Spain experienced the most important economic and housing boom in its recent history. This situation led the lending industry to dramatically expand through the mortgage market. The high competition among lenders caused a dramatic lowering of credit standards. During this period, lenders operating in the Spanish mortgage market artificially inflated appraised home values in order to draw larger mortgages. By doing this, lenders gave financially constrained households access to mortgage credit. In this paper, we analyze this phenomenon for this first time. To do so, we resort to a unique dataset of matched mortgage-dwelling-borrower characteristics covering the period 2004–2010. Our data allow us to construct an unbiased measure of property's over-appraisal, since transaction prices in our data also includes any potential side payment in the transactions. Our findings indicate that i) in Spain, appraised home values were inflated on average by around 30% with respect to transaction prices; ii) credit-constrained households were more likely to be involved in mortgages with inflated house values; and iii) a regional indicator of competition in the lending market suggests that inflated appraisal values were also more likely to appear in more competitive regional mortgage markets.

Keywords: Housing demand, appraisal values, house prices, housing bubble, credit constraints, mortgage market

JEL Classification: R21, R31

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1. Introduction

During the first decade of this century, Spain experienced the most important economic and housing boom of its recent history that ended up with a housing bubble that burst in 2008. Between 2000 and 2008, housing prices grew by up to 105%. The high competition among lenders, lack of regulation, poor supervision from the Central Bank of Spain, lenders' myopia in anticipating a potential economic downturn and lenders' predatory behavior caused a dramatic lowering of mortgage 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 pay the mortgage loan, which in many cases had associated a loan-to-value (LTV) above 100%, or to be granted a mortgage despite being credit-constrained. 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. Most of these mortgages were originated during the period of the housing boom. Nowadays, there is no doubt that this phenomenon is exacerbating the current financial crisis in Spain more severely than in other countries.

Driven by the irrational exuberance of the moment, during this period the lending industry expanded dramatically through the mortgage market.[1] A common practice during that period consisted of appraisal companies, which were generally owned by banks, artificially inflating the appraisal values of dwellings in order to allow banks to draw larger mortgages and give credit-constrained borrowers access to mortgage loans. This behavior is extremely risky from both the lender and the borrower's side. On the one hand, when the gap between a dwelling's transaction price and appraisal value is large, borrowers are in a weak position since the total mortgage loan amount can be higher than the market price of the dwelling. On the other hand, when foreclosures occur, the balance sheets of banks are

[1] The term "irrational exuberance" is taken from Shiller (2005), who uses this phenomenon to explain the stock market bubble at the end of the 1990s.

full of overvalued assets, which cannot be sold at the market price since this would generate huge losses to banks. This predatory behavior by lenders (i.e. inflating home values) is in part responsible not only for the current epidemic of foreclosures in Spain, but also for the dramatic increase in home prices during the years before the bursting of the housing bubble.

In this paper, we examine for the first time the circumstances in which inflated appraised home values occur and correlate this phenomenon with lenders' incentives, mortgage performance and borrower characteristics. This analysis allows disentangling whether this practice of artificially inflating home values was systematic on all bought properties or more selective depending on the type of borrower. To do so, we resort to a unique dataset provided by a real estate company covering the period 2004–2010 that matches dwelling transactions data with the corresponding granted mortgage loan associated with each transaction. Our data allow us to know not only the transaction price and its corresponding appraisal value, but also the characteristics of the dwelling, the mortgage loan amount, and the characteristics of the mortgage and of the borrower.

Our results indicate that the average overvaluation was about 30% and was not systematic. We empirically prove that inflated transactions responded to lenders' incentives. We also observe that credit-constrained borrowers, who because of their more precarious economic conditions generally have a higher probability of foreclosure, were more likely to be engaged in inflated transactions. There can be no doubt that this practice jointly with the dramatic lowering of credit standards is in part responsible for the epidemic of foreclosures in Spain since the bursting of the housing bubble in 2008.

With the aim described above, the paper is structured as follows. In section 2, we explain the conceptual framework for this study. In section 3, the dataset is presented. In

section 4, we present the econometric analysis. Finally, section 5 summarizes and concludes.

2. Background

The appraisal value of a dwelling is one of the most important variables in a mortgage loan contract because it supports the underwriter's determination of whether there is sufficient and appropriate collateral to back the mortgage transaction. Therefore, a mortgage contract based upon an inflated home value becomes very risky for both lenders and borrowers in the event of a mortgage default. The risk of a mortgage contract based on inflated prices crucially depends on whether there is a downwards or upwards trend in home prices when a mortgage default occurs. In the context of an economic downturn with declining home prices, mortgage defaulters in Spain will end up in a situation in which they have to face the payment of a mortgage loan that could be remarkably higher than the market value of the property. If, at the moment of the mortgage default, the market price of the property is not below its appraisal value, then the extra mortgage loan amount due to an overvaluation of the property can be taken as a loan on the appreciation of the value of the property. However, even in a scenario of increasing home prices, the problem may persist if the market price does not catch up with the appraisal value at the moment of the foreclosure.

Transactions can be inflated in three ways. First, appraisers may use a method that provides appraisals of low quality. In this case, contrary to the other two cases we describe below, the inflation of appraised values is involuntary; however, the consequences are also severe. Lacourt-Little and Malpezzi (2003), using US (Alaska) data, find evidence that appraisal quality is correlated with default risk.

The second way of inflating home values consists of expanding the scope of transactions, adding items such as appliances, transaction costs, cars, coupons and often cash. That is, credit-constrained borrowers would agree with sellers (who push appraisers to inflate the appraisal) to inflate the home value. The resulting mortgage will be high enough to cover not only the transaction price but also the transaction costs and potential penalty in mortgages derived from a higher LTV (Ben-David, 2011). Of course, this practice is illegal since in developed countries home appraising is highly regulated and appraisers are required to provide fair value appraisals. In this situation, sellers and borrowers are the ones who sneakily act and commit mortgage fraud. Ben-David (2011) analyzes this phenomenon in the US (Michigan) and finds that the rate of inflated transactions was 9.2% of all highly leveraged transactions between 2005 and 2008.

The third and most straightforward way of inflating home values, which is our case, occurs when lenders directly inflate appraisal values. In this way, lenders increase potential demand from financially constrained borrowers by drawing a larger mortgage. This mechanism was used by lenders operating in Spain to expand their business volume through the mortgage market. In this context, the question would be how big these concessions should be. In the US, these are small and all lenders limit concessions to 2–6% (Ben-David, 2011); however, lenders should still ask appraisers to provide fair appraisal values. In Spain, the context is totally different. Because appraisal firms are generally owned by banks, it is lenders who inflate the price. In contrast to the US, in Spain lenders allowed appraised home values to be inflated disproportionately. Our data indicate that appraised home values used to determine mortgage loan amounts were, on average, around 30% higher than the transaction prices. Another crucial difference between the US and Spain is that in the US appraisers are independent of lenders, and sellers are the ones who hire the appraising services; therefore, mortgage fraud is committed by sellers against lenders. On the contrary, since in Spain appraisers are owned by lenders, lenders commit

fraud against themselves. In Spain, the appraisal methodology used to appraise home values is regulated by law.

The mechanism through which inflated appraisal values operate is the following. Suppose that a credit-constrained household is willing to buy a property whose market price is $272,000, and agree with the lender in inflating the appraised home value with respect to the market price by 30% (average in our sample). With a threshold of 85% (average in our sample) in the LTV, it can thus draw a mortgage loan amount of $300,560. With this inflated loan amount, this financially constrained borrower not only avoids the downpayment, but also once the dwelling is paid, there remains $28,560. This remaining money can be used to pay for the following expenses: i) the opening fee of the mortgage consisting of 1% of the mortgage loan amount ($3,005); ii) taxes to be paid to the government, which can be around 7.5% of the transaction price ($20,543); and iii) deed expenses, which vary depending on the appraised home value and mortgage loan amount ($1,330). In addition, after facing all these expenses, the borrower still has around $5,000 in cash that can be used to pay for furniture, refurbishment and so on.[2]

This mortgage is very risky since the mortgage loan amount is above the market price of the dwelling; however, since the LTV is not high, this mortgage is apparently not risky in eyes of the supervisor (Central Bank of Spain).[3] Both the appraised home value and the mortgage loan amount can be inflated with the LTV kept constant, or even reduced if appraised home values are increased at a higher rate than the mortgage loan size. Indeed, as can be seen in Figure 1, in our sample the association between the size of the overvaluation and the LTV is clearly negative. This circumstance may also help credit-

[2] Several studies show that credit-constrained households are less likely to become homeowners. Linneman and Wachter (1989), Haurin et al. (2007) and Barakova et al. (2003) find evidence of this negative link in the US, while Bourasasa (1995) and Diaz-Serrano (2005) find the same evidence for Australia and Italy, respectively.

[3] Contrary to what happens in the US, borrowers with an LTV above 80% are not penalized with Private Mortgage Insurance (PMI), since this type of insurance does not exist in Spain. However, lenders conceding mortgages with an LTV above 80% can be penalized in terms of weighted assets.

constrained households be granted a mortgage in the event that other indicators of loan creditworthiness are not good at the time such borrowers apply for a mortgage.

[Insert Figure 1 around here]

In Spain, mortgage legislation is extremely lender friendly. Mortgage defaulters not only have to undertake the outstanding mortgage debt after a foreclosure, but also are penalized with abusive late payment interest rates, sometimes above 20%, before a foreclosure occurs, which generally takes up to two years.[4]. In the event of a foreclosure lenders may sell the dwelling at auction. If the transaction price at auction plus the amount the borrower already paid is smaller than the total mortgage loan amount, then borrowers still owe the lender the outstanding mortgage loan amount. The most dramatic situation for borrowers is that in which there is a collapse of housing prices. In this context, lenders do not have incentives to sell the dwellings since this transaction would appear as a loss on their balance sheets. This is what happened after the bursting of the housing bubble. Many defaulting borrowers, after having paid the interest of the mortgage loan for some years, still had to return practically the totality of the loan amount. Since they were granted larger mortgages because appraised home values were inflated disproportionately, the outstanding debt became even more unaffordable.

The asymmetries in the risk-sharing of mortgage contracts could be a plausible explanation of why in Spain lenders were promoting the inflation of appraised home values to give access to mortgage credit to risky borrowers. However, even if borrowers continue to owe the loan balance at the time of foreclosure, that does not mean that banks fully recover the amount of the loan either then or over the borrower's lifetime.

[4] One proof of this predatory behavior by lenders is that in 2013 the EU Court of Justice declared that most of the mortgage contracts in Spain were illegal because they included a number of abusive clauses.

Another potential explanation is the existence in Spain of a subprime product, which was not as popular as in the US, but still allowed Spanish banks to increase the supply of mortgage credit. This was also responsible of the strong competition among lenders that caused the dramatic lowering of the credit standards. However, even with the existence of this secondary market in Spain, these practices caused to Spanish banks substantial losses in the residential housing market.

One essential difference between the Spanish and the US mortgage markets during their respective housing booms is that, as Ben-David (2011) points out, contrary to popular belief, in the US mortgage financing was not available to everyone. The rejection rate during the boom period was 30–50%, which is substantially high (Ho and Pennington-Cross, 2007; Zywicki and Adamson, 2008). However, our own computations based on the Spanish Family Financial Survey reveal that in 2002, 98% of the surveyed individuals who applied for a mortgage were granted one, while in 2005, the year of the peak of the housing bubble, this percentage was 100%. For personal loans, these percentages were 98.8% and 96.4%.[5]

The artificial inflation of appraised home values not only has direct consequences for both lenders and mortgage borrowers, but also has an impact on housing market prices. In Spain, official home price indexes are generally constructed with appraisal values, since transaction prices, which are unbiased, are generally not available and registered prices cannot be trusted because in practice all transactions have side payments covering a fraction of the market price. Therefore, the use of inflated home values biases the price perception of outside observers. This also causes future home market prices to be biased upwards.[6] In the case of Spain, this phenomenon was undoubtedly one of the

[5] These numbers are based on survey data; therefore, they may deviate from the real rate of mortgage rejection. However, we still think that these figures are indicative of the dramatic lowering of credit standards in Spain during the period of the economic and housing boom.

[6] For instance, in Spain official house price indexes were often based on appraisals and not on observed transaction prices. In addition, forecasts of home prices made public in the media were also based on appraisals.

elements that exacerbated the housing bubble. In our data set we account for transaction prices, which also include side payments.

Despite its relevance, the literature analyzing this issue is virtually non-existent. On the one hand, inflated transactions in which the price is inflated through a side payment from the seller to the borrower are generally non-identifiable, since the side payment is not observable.[7] On the other hand, transactions where lenders artificially inflate appraisal value, which is our case, can be identified but they require data that match transaction prices, appraisal values and mortgage characteristics, which are rarely available. Fortunately, these types of data have been made available to us through a real estate company. These data are explained in more detail in the next section.

3. Data and variables

The dataset used in this paper refers to dwelling transactions during the period 2004 to 2010. The data were collected twice a year and pooled into a unique dataset. They were 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 dwellings from the list of this real estate company and their mortgages have been granted through the mediation of the mortgage brokers of this company. This circumstance made it possible for us to create a unique dataset that matches dwelling, borrower and mortgage characteristics. In this dataset, we account, among other variables, for the list and transaction prices and the appraised home values. Our measure of over-appraisal is the

[7] As far as we are aware, Ben-David (2011) is the only paper that analyzes this issue. He uses a seller's hints to identify inflated transactions.

ratio between these two variables. It is important to remark that transaction prices are the real prices at which properties are sold; therefore, any unregistered side payment in the transaction is also included in our over-appraisal indicator. This means that this indicator is unbiased. In addition, we can also identify lenders and the real estate office in charge of selling the property. This company operates in a specific segment of the housing market and that the properties on its list are medium and medium-low profile. This circumstance implies that the mortgages and borrowers in our sample are homogeneous regarding their socio-economic and dwelling characteristics.

Our sample consists of about 4,100 observations that provide valid cases on dwelling transaction prices, appraised home values, mortgage loan amounts and dwelling and borrower characteristics. Following Levitt and Syverson (2008), we remove transactions with extreme prices. We also eliminate observations with extreme appraisal values and extreme mortgage loan amounts. We do this by excluding all observations in the top and bottom 1% of the distribution of these three variables. As in Ben-David (2011), we also exclude those observations with a leverage (LTV) we consider to be out of the market lending terms, i.e. below 40% and above 125%. We find that the LTV ratios out of these bounds are likely to contain coding errors in either the mortgage loan amount or the appraisal value. In Table 1, we show the summary statistics of the variables used in the econometric analysis.

[Insert Table 1 around here]

The average appraisal value is $266,560, while the average transaction price is $210,028. The average over-appraisal is 30%. We find this value to be remarkably high. Indeed, as shown in Figure 2, more than one-third of the properties in our sample are

inflated by between 15% and 30%. The average LTV is a bit smaller than 86%, which suggests, as shown in Figure 1, that appraisal values are inflated in a way that LTVs are not inflated as well. As we can see in Figure 3a, the distribution of the LTV is bimodal, with the most popular LTVs 80% and 100%. The average of the ratio between the mortgage loan amount and selling price is 1.11, which indicates that the size of the mortgage loan is on average 11% higher than the market value of the bought property. As we can see in Figure 3b, the distribution of this ratio is unimodal, with 1.10 the most popular value.

[Insert Figure 2 around here]

[Insert Figure 3 around here]

4. Empirical analysis

4.1. Drivers of inflation in appraised home values: The role of lenders

One crucial question is whether inflation in appraised home values is random or some lenders were more prone than others to over-appraise properties. Borrowers who are financially constrained would agree with lenders to inflate the appraisal value of the purchased property in order to draw a larger mortgage, since these borrowers would not otherwise have the chance to become homeowners. By doing this, lenders not only grant a new borrower, but also get more benefit (interest rate and commission) from drawing a larger mortgage. In addition, financially constrained borrowers would otherwise be pushed to acquire financial products from the bank (e.g. life and home insurance, payroll bank accounts, deposits, etc.).

In order to test whether inflated appraisal values can be explained by lenders' practices, we propose a straightforward test. As explained earlier, an appraised home value (A) used to draw the mortgage is determined by an appraiser who is generally owned by the lender. Suppose that appraisal value A is determined according to the following hedonic appraisal linear function:

$$\ln(A)_{it} = X_{it}\delta + d_t\theta + (\mu_b + e_{it}), \quad (1)$$

where appraisal values A are per square meter. X_{it} are a set of dwelling characteristics for dwelling i sold at period t, d_t are time dummies and the error term $(\mu_b + e_{it})$ is composed of what is observable to the appraiser but not to the researcher (e_{it}) and the bias introduced by the appraiser (μ_b). In this case, the appraiser is the lender. The bias in the appraisal induced by lenders can be accounted for by estimating equation (1), resorting to a fixed-effects model with specific bank effects.

Consider now an alternative appraisal value A^* of the same property, which is provided by appraisers who are independent of the lender. This appraisal A^* can be also determined as

$$\ln(A^*)_{it} = X_{it}\beta + d_t\eta + (\lambda_a + \nu_{it}), \quad (2)$$

where the observable characteristics X_{it} are the same as in equation (1), while the residual $(\lambda_a + \nu_{it})$ is again composed of what is observable to the appraiser but not to the researcher (ν_{it}) and the bias, if there is any, introduced by the "independent" appraiser (λ_a).

Consider now the following model:

$$\ln(A^*)_{it} = X_{it}\beta + d_t\eta + (\mu_b + \lambda_a + \nu_{it}), \quad (3)$$

Since banks can manipulate A, but not A^*, then if the inflation in appraised home values (A) is driven by bank incentives, bank fixed-effects should be statistically significant in equation (1), but not in equation (3). This would mean that some banks systematically were more prone to over-appraise than others; therefore, it can be inferred that had incentives to do that.

The outcome variable in equation (1) is the appraised home value used to draw the mortgage, which is determined by the appraisers in the hands of lenders. In equation (3), as a proxy of A^*, we use the list price of the property. These home values are determined by the appraisers working in the real estate company in charge of selling the dwellings, which are independent of banks. Of course, these values may contain some bias originated by using the appraisal method or the misperception of home values by owners (sellers); however, this bias is already controlled for through the agency fixed-effects (λ_a).

Since the overvaluation of a dwelling is determined by the ratio between the appraisal value used to draw the mortgage (A) and the transaction price (P), we can also test our hypothesis through the following model:

$$\frac{A_{it}}{P_{it}} = X_{it}\gamma + d_t\pi + (\mu_b + \lambda_a + \zeta_{it}). \quad (4)$$

As in equation (1), if home values inflation responds to lender incentives, in equation (4) the bank fixed-effects (μ_b) should be statistically significant as well.

The results of the test are reported in Table 2. In order to have a meaningful test, we restrict the sample according to the number of observations per bank. To estimate equations (1), (3) and (4), we exclude from the sample those observations that correspond to dwellings that have been bought through a mortgage granted by a bank with fewer than 50 observations. Our results indicate that the lender fixed-effects are not statistically significant in the estimation of the determinants of list prices (equation 3), but they are statistically significant at the 1% level in the estimation of the determinants of appraised home values provided by lenders (equation 1). In addition, the bank fixed-effects are also significant in the estimation of the determinants of inflation in appraised home values (equation 4). Al these results taken together suggest that there was systematic differences in the over-appraising practices among lenders. Therefore, some banks had and incentive, more than others, to overvalue the appraised home values used to draw their loan mortgages.

[Insert Table 2 around here]

4.2. Financial constraints and inflated home values

Now, we explore whether financially constrained borrowers are more likely to engage in transactions where the appraised value of the dwelling used to determine the loan amount is inflated. As mentioned in the Introduction, over-appraised home values were used to draw mortgages large enough to allow financially constrained borrowers get access to homeownership. In our case, we estimate an elasticity between the loan amount the overvaluation of 0.21, which is statistically significant, i.e. each additional $100 of over-appraisal generates an additional $20 in the mortgage loan amount (Table 3, column 2).

In order to detect whether more constrained borrowers were more likely to be involved in inflated transactions in the US, Ben-David (2011) relies on the definition of credit-constrained in Hurst and Stafford (2004). They define this type of borrower as the one who has a mortgage with an LTV higher than 80%. The reasoning behind this definition is that more leveraged borrowers are more likely to be involved in inflated transactions because for these borrowers additional mortgage costs as PMI are very high. Therefore, an inflated transaction will draw a mortgage large enough to cover these costs. However, in Spain PMI does not exist, and as explained in section 2, lenders do not need it since they pass all the risk associated with the mortgage contract onto the borrower.

The common practice in Spain is that more credit-constrained households are penalized for being forced to contract home and life insurance from the lender. In Table 3 (column 1), we show the results of a probit model that estimates the determinants of the probability of contracting both home and life insurance.[8] Our results confirm that not only are more leveraged borrowers more likely to be forced to contract home and life insurance (11 percentage points), but also immigrant (7 percentage points) and low income borrowers are. For instance, households reporting to earn more than $2,700 a month are 14 percentage points less likely to contract this type of insurance than households below half these earnings. This result clearly suggests that more credit-constrained households are pushed to buy home and life insurance in order to be granted a mortgage. The inflation of appraised home values is also highly significant in explaining the probability of buying home and life insurance. Borrowers for which appraised home values were inflated by up to 15% with respect to transactions prices are 12 percentage points more likely to contract this type of insurance. The probability of contracting these insurances increases by up to 22 percentage points if the inflation in appraised home values is above 45%. We find this

[8] This information is only available for 2006. Therefore, the sample size in this model is smaller than that in the estimated models in columns (2) and (3).

result to be quite revealing, since it clearly indicates that more constrained households are more likely to be involved in mortgage contracts where the appraised home values used to draw the mortgage are more inflated.

[Insert Table 3 around here]

4.3. Inflated home values and mortgage market structure

In Spain, the mortgage lending market is composed of *conventional banks*, *savings banks* and other mortgage loan brokers that generally act as a "white mark" for some types of loans of the big conventional banks. The latter group constitutes a residual part of the market. With few exceptions, savings banks operate in their regions. Big conventional banks operate nationwide; however, smaller conventional banks might operate exclusively at a regional level. The result of this market structure is that in some of the Spanish regions competition for attracting new mortgage borrowers is remarkably higher than that in other regions. One should expect that this market structure should have an impact on market outcomes. For instance, by using US data, Petersen and Rajan (1995) and Degryse and Ongena (2007) find that interest rates are higher in more competitive markets. Alesina et al. (2013) observe the same in Italy. This result is explained by the fact that in more competitive markets lenders have lower incentives to acquire information about their potential borrowers and therefore lenders tend to consider them to be potentially risky.

Our conjecture is that if inflated home values are used to draw larger mortgages to help credit-constrained borrowers access mortgage loans, then in more competitive markets inflated transactions should be more frequent. Moreover, the size of home values inflation should be greater, since this will allow banks to be more competitive in order to attract new potential borrowers who are financially constrained. Following the references

listed in the previous paragraph, in order to test for this, we resort to the Herfindahl–Hirschman Index (HHI)[9] computed by region, as a proxy for the level of competition in regional mortgage markets. Then, we estimate the following linear equation:

$$\frac{A_{it}^{*}}{P_{it}} = X_{it}\beta + HHI_{rt}\delta + R_r\gamma + T_t\pi + u_b + \varepsilon_{it}\,. \qquad (5)$$

where A_{it}^{*} are the appraised home values used to draw the mortgage, P_{it} are transaction prices, X_{it} are a set borrower and dwelling characteristics, R_r are region dummies, T_t are year dummies, u_b are bank fixed-effects and HHI_{rt} is a measure of the index for region *r* in year *t*. As the index takes higher values for higher levels of market concentration, our hypothesis will be confirmed if in equation (5) we obtain $\hat{\delta} < 0$. In order to assess the robustness of the estimated coefficient for δ, we introduce each set of variables sequentially. The results are shown in Table 4.

The basic model (column 1) only considers the HHI jointly with the time and region dummies. The second specification and third specification (columns 2 and 3) add to the basic model bank dummies and borrower characteristics, respectively. Finally, in column 4 we include the set of dwelling characteristics. In all models, the parameter associated with the HHI turns out to be negative and statistically significant at the 1% level. This result is very robust, since after including each set of controls the coefficient associated with the HHI suffers little variation and is highly significant. As we hypothesize, this result suggests that when competition among lenders is higher, lenders tend to inflate home values more in order to attract new potential borrowers who are credit-constrained.

[9] The HHI is computed as $H = \sum_{i=1}^{N} s_i^2$, where s_i is the market share of firm *i* in the market and *N* is the number of firms. In our case *i* are banks operating in each of the 17 Spanish regions.

[Insert Table 4 around here]

4.4. Inflated appraised home values and mortgage costs

In this section, we test whether borrowers engaged in mortgage contracts with inflated home values pay larger annual mortgage interest rates. Our hypothesis is that if lenders inflate appraised home values in mortgage contracts where the borrower is financially constrained, then in this type of contract the annual mortgage interest rate should be higher since lenders are aware that the probability of default is higher.

The price of a mortgage in Spain is made up of the *annual interest rate* (AIR) and the *opening fee*, which generally is a percentage (on average 0.91% in our sample) of the total loan amount and is paid to the lending institution when the mortgage contract is signed. The AIR comprises a *benchmark interest rate* (BIR) and the *annual differential interest rate* (ADIR). For a mortgage indexed to 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 appear. In Spain, the two main BIRs used by lenders are the reference interest for mortgage loans (hereafter RIML) and the Euribor. The latter is the interest rate at which banks pertaining to the Eurozone borrow money and it is determined by the European Central Bank.

The Euribor is the most commonly used type of BIR. Statistics produced by the National Statistics Bureau (*INE*) reveal that in 2005 almost 80% of the mortgages were priced by using the Euribor, while only 9% used the RIML and the remaining 11% used other types of BIRs. Indeed, our sample reproduces these figures. During our sample period, 84% of the mortgages in our data were priced by using the Euribor, while the

remaining 16% were priced by using the RIML and other types of BIRs. Since any other type of BIR out of the Euribor constitutes a residual part of the market, in this subsection we focus on those mortgages priced with the Euribor.

The results of this test are reported in Table 5. We observe that inflation in appraised home values has a positive and statistically significant impact on both the ADIR (column 1) and the opening fee (column 2). For instance, for a borrower who is granted a mortgage to buy a property which is over-appraised by 30% (average value in our sample), the average ADIR is 0.13 (0.3 x 0.435) percentage points higher than for a borrower that buys a property that is not overvalued. Taking into account that the average ADIR in our sample is 0.92, this constitutes an ADIR that is 14.3% higher than the average ADIR. One might think that 0.13 additional percentage points in the ADIR is negligible; however, this is not so. For instance, for a mortgage of $231,000 to be paid back in 35 years, this constitutes and additional cost of $6,500. Analogously, this borrower would also pay an opening fee that is 0.022 (0.3 x 0.074) percentage points higher than the average opening fee (0.91).

[Insert Table 5 around here]

6. Conclusions

One of the common practices in the mortgage market in Spain during the period of the housing boom consisted of inflating the appraised home values used to draw a mortgage. In Spain, lenders promoted this practice in order to give financially constrained households access to a mortgage loan. In this paper, we provide empirical evidence of this. The incentive for lenders was to open the market to credit-constrained borrowers. This

allows the lender not only to expand the mortgage market, but also to take advantage by charging higher mortgage costs to these borrowers. Asymmetries in favor of lenders in the risk sharing of mortgage contracts and the existence of a "non-declared" subprime market may explain why lenders were involve in such a risky transactions. However, we also resort to the "irrational exuberance" explanation. Although this explanation is rather speculative, there is consensus in Spain that irrationality of both homebuyers and lenders was also driving this behavior. In the context of an economic and housing boom, lenders saw the mortgage market as an easy way to expand and inflate benefits. The euphoria made that lenders were not capable to anticipate the economic downturn we are suffering in Spain nowadays.

In order to test for the existence of lenders' incentives in inflation in appraised home values, we estimate the determinants of appraised home values by using two appraisals: one provided by lenders, which is the one used to draw the mortgage, and one provided by the real estate agents in charge of selling the dwelling. Our results indicate that lenders' fixed-effects were statistically significant for the first, but not for the second.

For credit-constrained borrowers, inflating home values is the only way they can become homeowners. Our empirical analysis allows us to draw the following conclusions. First, the LTV decreases as inflation in appraised home values increases. This circumstance raises the probability of being granted a mortgage and makes a risky mortgage look apparently less risky to the eyes of the controller (Central Bank of Spain). Second, home values inflation can be used to draw a loan mortgage amount high enough to avoid a downpayment and cover other additional costs that financially constrained borrowers would not be able to face otherwise. Third, borrowers involved in mortgages drawn with higher inflated home values were also more likely to buy home and life insurance from their lender and were charged a higher mortgage interest rate and fees. The latter evidence

clearly indicates that banks profited from a more strengthened bargaining position with respect to credit-constrained borrowers.

This paper contributes to the understanding of how inflation in appraised home values exacerbated the bubble in the Spanish housing market and its consequences. On the one hand, there cannot be any doubt that this predatory behavior is responsible for the epidemic of foreclosures we are experiencing after the bursting of the housing bubble. Most financially constrained borrowers who were then granted a mortgage are nowadays mortgage defaulters. According to the "Association of Mortgage Victims",[10] since 2008 more than 400,000 households have lost their dwellings because of their inability to meet mortgage payments. On the other hand, in Spain official home price indexes are constructed by using these inflated appraised home values, which biases the price perception of outside observers. This also causes future home market prices to be biased upwards. In addition, after the bursting of the housing bubble, the balance sheets of Spanish banks were full of mortgages owned by bankrupt borrowers and dwellings, whose market price was remarkably lower than the corresponding mortgage. This circumstance, among others, was one determinant that forced the Spanish government to inject more than 340,000 million USD to avoid the collapse of the banking industry. This injection of public money has triggered the rise in Spain of the public debt and deficit.

[10] This association was created in 2009 not only to help the victims of forecloses, but also for lobbying for the change of the mortgage laws in order to prevent future foreclosures.

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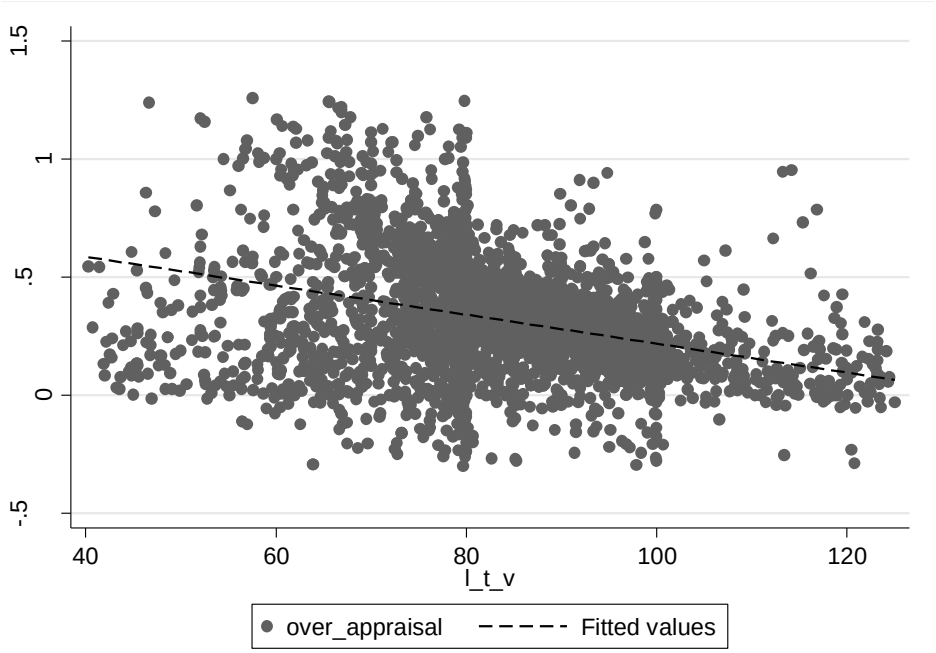
Figure 1: Appraised value-selling price ratio vs. LTV



Source: own elaboration based on own data

Figure 2: Distribution of over-appraisal values

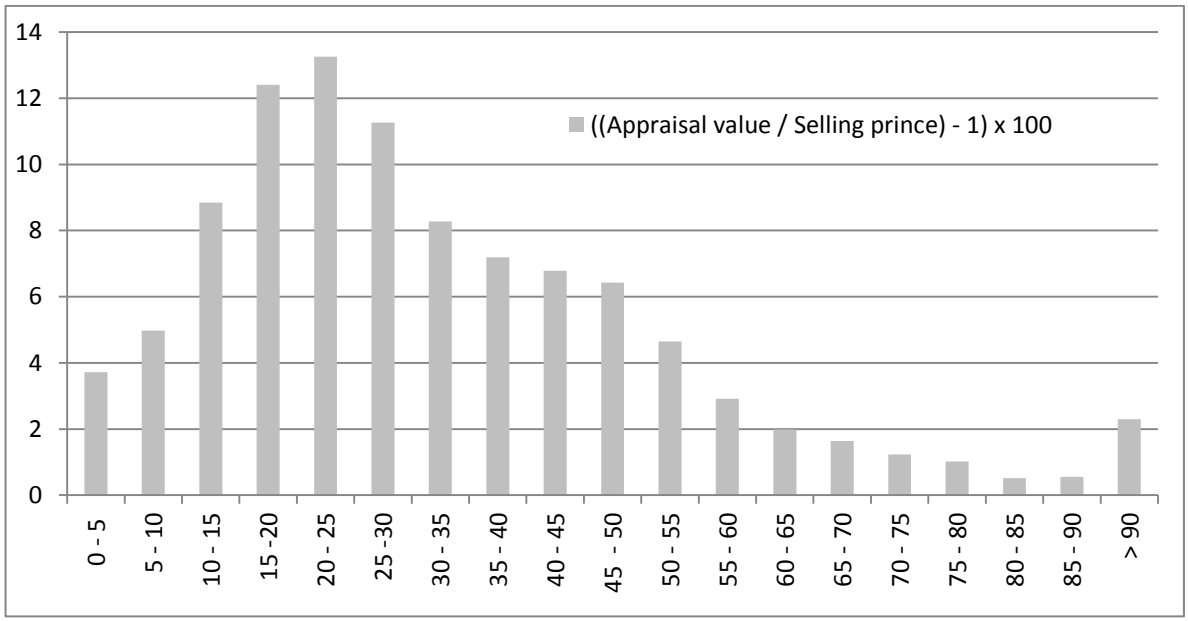


Figure 3a: Cummulative distribution LTV

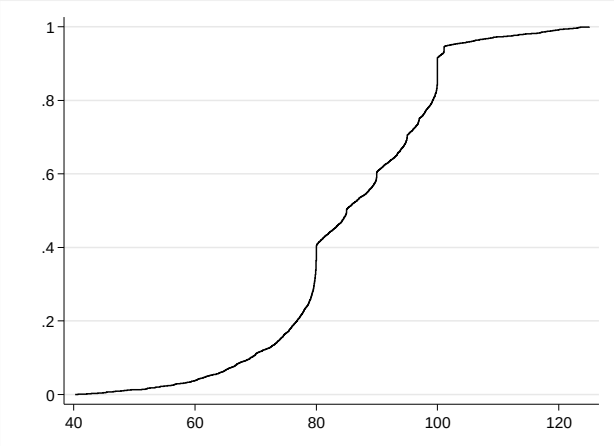


Figure 3b: Cummulative distribution LTP

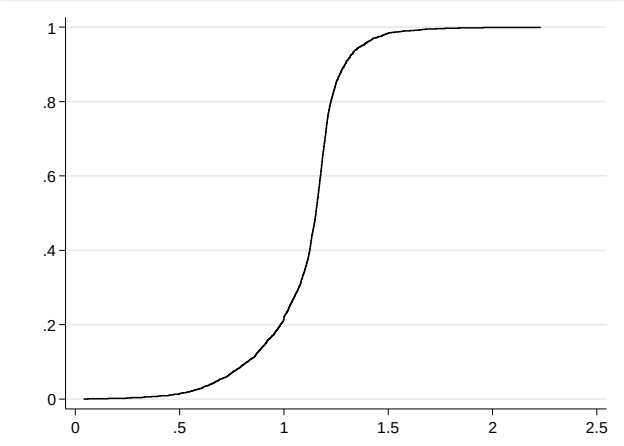


Table1: Summary statistics

	N	Mean	S.D.
Mortgage, home prices and values			
Appraisal value (AP)	4,437	$266,565	84,113
Selling price (SP)	4,437	$210,028	73,224
List price (LP)	4,436	$213,497	80,544
((AP/SP)-1) x 100	4,437	30.509	22.276
Mortgage loan amount	4,437	$229,691	81,180
Loan-to-value (LTV)	4,437	85.871	13.869
Loan-to-selling price (LTP)	4,437	111.117	19.540
Annual interest rate	4,290	3.640	0.819
Borrower characteristics			
Immigrant	4,435	0.345	0.475
Primary education	3,724	0.557	0.423
Secondary education	3,724	0.329	0.470
University education	3,724	0.113	0.317
Clerical	4,106	0.028	0.310
Managerial	4,106	0.019	0.138
Other	4,106	0.106	0.307
White collar	4,106	0.406	0.491
Blue collar	4,106	0.440	0.496
Indefinite contract	4,437	0.548	0.498
Monthly net earnings	4,437	$2,143	802
Dwelling characteristics			
Surface	4,437	88.666	1,300.712
Age of the dwelling	4,320	35.144	19.001
Floor #	4,043	2.696	2.097
Street view	4,108	0.864	0.343
# of floors in the building	4,359	4.739	2.559
# of dwellings in the building	4,280	17.465	15.059
Quality (good/bad)	4,150	0.785	0.411
# of bathrooms	4,417	0.880	0.550
Parking space	4,384	0.093	0.315
Isolated kitchen	4,366	0.952	0.214
Elevator	4,308	0.320	0.467
Year			
2005	4,437	0.457	0.498
2006	4,437	0.227	0.419
2007	4,437	0.129	0.335
2008	4,437	0.057	0.231
2009	4,437	0.041	0.199
2010	4,437	0.057	0.219

Table 2: Estimates of equation (1), (3) and (4).

	List price (A*) (Equation 3)	Lender Appraisal (A) (Equation 1)	(A/A*) (Equation 4)
log(surface)	-0.673***	-0.679***	0.0118
	(0.0133)	(0.0129)	(0.0126)
Age dwelling	-0.00694***	-0.00266***	0.00174***
	(0.000638)	(0.000576)	(0.000561)
Age dwelling sq.	3.36e-05***	1.92e-05***	-9.16e-06**
	(4.53e-06)	(4.18e-06)	(4.08e-06)
Floor	-0.00484**	0.00137	0.00226
	(0.00210)	(0.00205)	(0.00200)
Exterior view	0.0477***	-0.000216	-0.0194*
	(0.0120)	(0.0111)	(0.0109)
Height of the building	-0.00371	-0.00494**	-0.00273
	(0.00265)	(0.00247)	(0.00241)
Number dwellings building	-0.000315	-0.000107	-0.000219
	(0.000382)	(0.000338)	(0.000329)
Good state of conservation	0.0278**	-0.0285**	-0.0477***
	(0.0116)	(0.0112)	(0.0109)
Number of bathrooms	0.0615***	0.0511***	-0.0109
	(0.00949)	(0.00906)	(0.00884)
Parking space	0.0492***	0.0374***	-0.0169
	(0.0140)	(0.0131)	(0.0128)
Separate kitchen	0.0179	0.0224	0.0118
	(0.0193)	(0.0178)	(0.0173)
Elevator	0.121***	0.126***	-0.00751
	(0.0117)	(0.0108)	(0.0105)
Constant	9.578***	10.87***	1.239***
	(0.283)	(0.0626)	(0.0611)
City dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Real estate officer dummies	Yes	No	No
Observations	2,552	3,076	3,076
R-squared	0.906	0.782	0.238
F-Test (μ_b =0)	1.31	4.05***	8.05***
Prob F-test (μ_b =0)	0.152	0.000	0.000
Number of bank_num	23	23	23

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

Table 3: Estimates of the home values inflation as a determinant of the probability of contracting life and home insurance (probit), loan amount (OLS) and the LTV (OLS).

	(1) P(life & home insurance)	(2) Ln(loan amount)
Ln(A*/P)		0.215***
		(0.0288)
[(A*/P) – 1] x 100		
Base: [(A*/A) – 1]<0		
0<[(A*/P) – 1]<0.15	0.118	
	(0.0831)	
0.15<[(A*/P) – 1]<0.30	0.151*	
	(0.0823)	
[(A*/P) – 1]>0.30	0.217***	
	(0.0801)	
Spaniard	-0.0704*	-0.0597***
	(0.0386)	(0.0109)
$1,360<NMI<$2,040	-0.0728	0.0135
	(0.0595)	(0.0135)
$2,040<NMI<$2,720	-0.154**	0.0309**
	(0.0642)	(0.0149)
NMI>$2,720	-0.143**	0.0477***
	(0.0716)	(0.0162)
LTV>80%	0.110**	
	(0.0448)	
Constant		8.728***
		(0.249)
Observations	982	2,787
R-squared		0.720

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; A: Appraisal value used to draw the mortgage; P: Transaction price; NMI: Net monthly income; in all columns reported values are marginal effects.

This information is only available for year 2006. Therefore, the sample size in this model is smaller than in the estimated models in column (2) and (3).

Table 4: OLS estimation of the determinants of appraisal home values inflation (equation 7)

	(1)	(2)	(3)	(4)
HHI	-0.0721***	-0.0693***	-0.0708***	-0.0754***
	(0.00903)	(0.00974)	(0.00974)	(0.00988)
Constant	0.334***	0.344***	0.378***	0.392***
	(0.0188)	(0.0222)	(0.0302)	(0.0529)
Year dummies	Yes	Yes	Yes	Yes
Region dummies	Yes	Yes	Yes	Yes
Bank dummies	No	Yes	Yes	Yes
Borrower characteristics	No	No	Yes	Yes
Dwelling characteristics	No	No	No	Yes
Observations	2,787	2,787	2,787	2,787
R-squared	0.138	0.198	0.206	0.229

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

Table 5: OLS estimates of the mortgage costs

	ADIR	**Opening fee**
Appraisal inflation (A*/P)	0.435***	0.0744***
	(0.146)	(0.03)
Spaniard	-0.185**	-0.0911***
	(0.0751)	(0.0165)
Secondary education	-0.0147	0.00918
	(0.0693)	(0.0152)
University education	-0.0546	-0.0886***
	(0.0900)	(0.0224)
Self-employee	-0.476	-0.126*
	(0.321)	(0.0697)
Indefinite	0.00438	-0.00903
	(0.0656)	(0.0144)
Without labor contract	0.492**	0.0238
	(0.220)	(0.0484)
Blue collar	0.0433	0.00908
	(0.0681)	(0.0150)
Managerial	-0.227	-0.0838*
	(0.217)	(0.0478)
Other	-0.0522	0.00576
	(0.109)	(0.0239)
Net monthly income	-0.000382*	-6.73e-06
	(0.000208)	(1.15e-05)
Net monthly income sq.	1.13e-07**	
	(5.10e-08)	
Mortgage loan amount	3.97e-07	-4.19e-07***
	(6.88e-07)	(1.51e-07)
80%<LTV<85%	0.0923	0.0141
	(0.101)	(0.0223)
85%<LTV<95%	0.143	0.0371*
	(0.0881)	(0.0194)
LTV>95%	0.314***	0.0514**
	(0.0931)	(0.0205)
Constant	0.804**	0.118*
	(0.366)	(0.0700)
Region dummies	Yes	Yes
Year dummies	Yes	Yes
Bank dummies	Yes	Yes
Observations	3,079	3,083
R-squared	0.169	0.668

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