Box 4.1

ANALYSIS OF THE GEOGRAPHICAL HETEROGENEITY IN HOUSE PRICE GROWTH OVER THE RECENT PERIOD (2022-25)

This box draws on postcode-level data to examine the empirical relationship between house price growth in Spain in the period 2022-25 and, on the one hand, various socioeconomic factors and, on the other, mortgage loan use and conditions. Compared with more aggregate data, postcode-level data provide a wider range of information to infer whether there is a link between the different variables studied.[1]

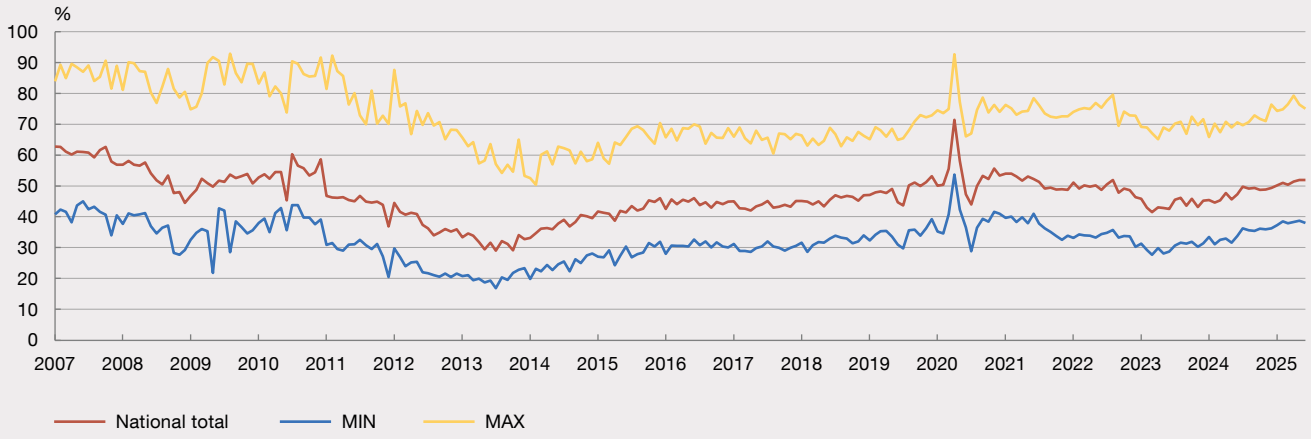
It is particularly useful to assess whether, beyond real factors such as demographic or income growth pressure, a greater or lesser use of mortgage financing and the conditions of such loans could be associated with differences in house price developments. The focus on mortgage loan conditions stems from several stylised facts observed at aggregate level that underscore the importance of this type of credit for the housing market, such as the volume of mortgage-financed house purchases and the positive correlation between average house prices and the average mortgage loan amount.

A substantial percentage of house purchases are made using mortgage loans. According to information from the Spanish Notarial Statistics Centre (CIEN), 51.1% of house purchases in 2025 H1 were financed with mortgages (Chart 1). This figure is, however, below the 61.5% recorded in 2007 (the first year for which data are available) and reflects an increased use of own funds since the global financial crisis. In the recent period, mortgage use has increased since 2023.

There is also significant geographical heterogeneity in the percentage of mortgage-financed house purchases (ranging from 40% to 70% in each region in 2025 H1, for instance), although it has become more uniform since 2007.

As Chart 4.2 in the main text shows, there is notable heterogeneity in the change in house prices per square metre at provincial level, which is also observed at postcode level (ranging from €1,334 to €3,467 at June 2025, for example).[2] Moreover, there is some heterogeneity in terms of lending conditions, such as the loan-to-value (LTV) ratio and the loan service-to-income (LSTI) ratio. Chart 2 shows that, in the period between 2022 Q4-2023 Q1 and 2024 Q4-2025 Q1, the LTV and LSTI distributions by postcode remained relatively stable and showed limited geographical dispersion,

Chart 1
Mortgage-financed house purchases (a)



SOURCE: Colegio del Notariado. Latest observation: June 2025.

a The bands reflect the maximum (MAX) and minimum (MIN) values of the percentage of mortgage-financed house purchases, calculated at each date drawing on the values observed in the different regions.

1 For instance, population growth within a province typically exerts uneven pressure across the geographical areas designated by postcodes, or lending conditions may vary across postcodes due to different supply or demand-side factors. Analysis at loan and/or borrower level would provide additional information that could improve statistical identification and inference. The analysis at postcode level presented in this box is an intermediate step within a broader work programme.

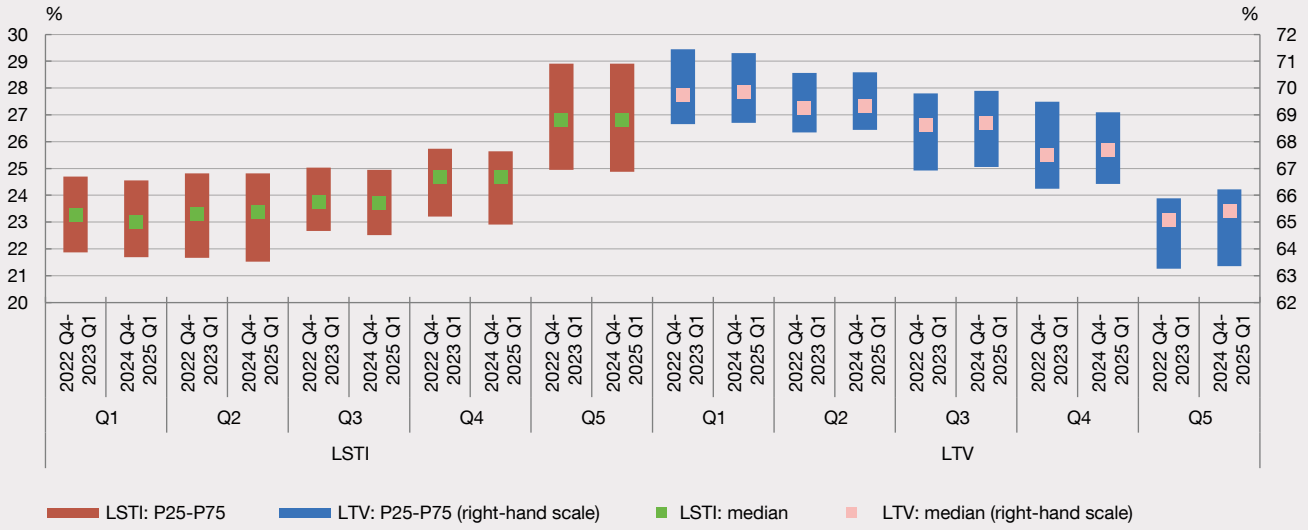
2 Nominal prices are deflated using the provincial consumer price index and expressed per square metre of living space.

with median values ranging between 23 percentage points (pp) and 27 pp (LSTI) and 65 pp and 70 pp (LTV). The most notable differences are in high-income postcodes, which present lower LTV values and higher LSTI values. This has a mixed effect on risk-taking, as borrowers in these postcodes assume a larger debt service burden, but the risk is mitigated by the higher value of the collateral.

The relationship, at postcode level, between the recent change in house prices and lending conditions and various socioeconomic factors is analysed below. For this purpose, a regression-based econometric analysis has been conducted.

The sample contains information on house purchases, mortgage loans and socioeconomic variables at postcode level for two periods: 2022 Q4-2023 Q1 and 2024 Q4-2025 Q1.[3] To obtain a homogeneous sample and ensure comparability between the two periods, only purchases involving similar types of housing are used.[4] The dependent variable used is the rate of change in the real average purchase price per square metre in the postcode between the two periods considered. The explanatory financial variables include: (1) the proportion of mortgage-financed house purchases; (2) the LSTI ratio; and (3) the loan-to-price (LTP) or LTV ratio, whichever is higher.[5] Both the initial level of these

Chart 2
Change in mortgage loan conditions between 2022 Q4-2023 Q1 and 2024 Q4-2025 Q1 by postcode income level (a) (b) (c)



SOURCES: Banco de España, Colegio de Registradores and INE. Latest observation: June 2025.

a The LSTI ratio for each mortgage is estimated as the ratio of the total annual cost of servicing the mortgage loan (including principal and interest payments), calculated according to the terms of the loan agreement (time remaining to maturity, outstanding principal, interest rate type and interest rate spread), to the household's net annual income. For more details, see note A2.4.1.3 in Annex 2.
b The LTV ratio is the amount of the mortgage principal relative to the appraisal value of the property at the time of purchase, based on Association of Registrars information.
c The interquartile range of the LTV and LSTI ratios corresponds to the difference between the mean of the first quartile and the mean of the third quartile of the LTV and LSTI ratio distribution by postcode. The median is also calculated by aggregating data at postcode level. These calculations are replicated for different postcode groups by income quintile (from Q1 to Q5).

3 The base period selected (2022 Q4-2023 Q1) averts any potential atypical effects associated with the recovery following the COVID-19 pandemic.
4 Flats bought on the open market, with a surface area of between 40 and 150 m^2, yielding a sample of 301,741 transactions. The sample is restricted to postcodes with over 30 house purchases in each of the two periods, so as to consider sufficiently deep local markets. The final sample contains 1,083 postcodes. In the regression estimates, observations are weighted by the number of purchases in the first period.
5 In addition to avoiding collinearity problems, the inclusion of the LTV or LTP ratio, whichever is higher, makes it possible to capture the larger associated credit risk, through the inclusion of the appraisal value or the purchase price, whichever is lower. A loan-to-income (LTI) ratio variable was also considered but, due to its high correlation (above 90%) with the LSTI ratio, it did not contribute any significant additional information.

Box 4.1

ANALYSIS OF THE GEOGRAPHICAL HETEROGENEITY IN HOUSE PRICE GROWTH OVER THE RECENT PERIOD (2022-25) (cont'd)

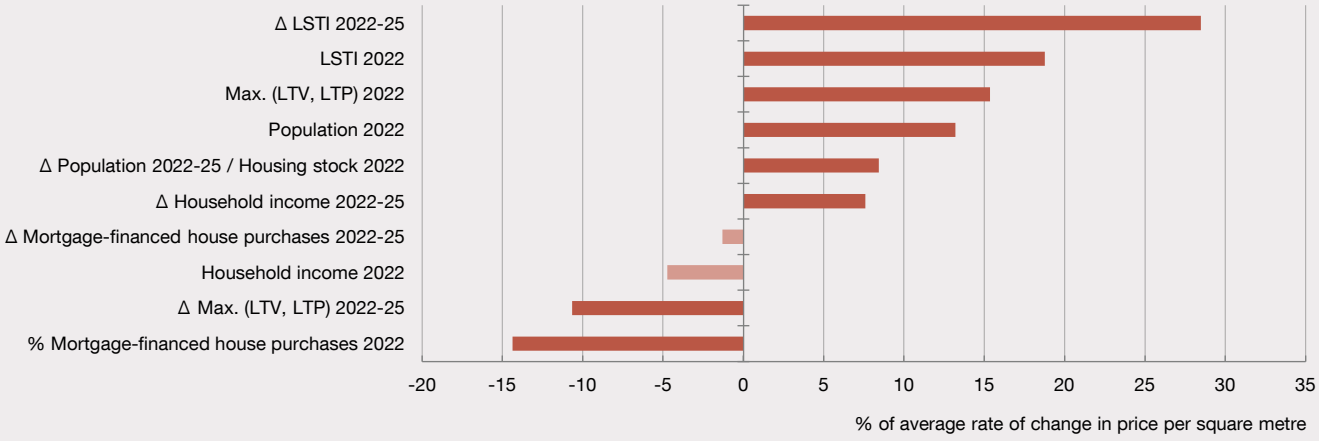
variables and the rate of change between the two periods are incorporated.

In addition, various demographic and income characteristics are used as control variables to measure the pressures of real factors on supply and demand. Specifically, population and average income per postcode (initial value and change between the periods) and the ratio of population change to the initial housing stock in the corresponding municipality are considered. This latter variable is particularly important as a proxy of demand-side pressure vis-à-vis the initial housing supply available.

Based on the results of the econometric analysis, the financial variables show a significant correlation with the increase in prices at postcode level, once demographic and income factors have been considered (Chart 3). House price growth has tended to be higher in those postcodes with mortgages that on average had a higher initial level or larger increase in the LSTI ratio, or a higher initial LTV or LTP ratio. However, a rise in the LTV or LTP ratio tends to be correlated with smaller house price increases. This suggests that, once the other lending conditions are factored in, average mortgage amounts were unable to grow at the same pace in the postcodes with higher price growth.[6] In any event, the larger-scale effects appear to be associated with the LSTI ratio and its increase in the sample period, such that looser lending conditions overall would be associated with greater price growth.

In addition, the estimation also indicates that the proportion of mortgage-financed house purchases at the start of the period studied was negatively correlated with the increase in house prices, while the change in this variable between the two periods did not play a significant role. This would point to greater relative demand-side pressure on prices from buyers with sufficient financial resources to buy a property without a mortgage.

Chart 3
Change in house prices per square metre estimated by the model in response to increases in different explanatory variables (a)



SOURCE: Banco de España calculations, drawing on Colegio de Registradores and INE data.

a The chart depicts the estimated rate of change in house prices per square metre following an interquartile (25th to 75th percentile) increase in the distribution of each explanatory variable. The value of each bar is obtained by multiplying the interquartile range of each variable by the variable's estimated coefficient in the linear regression that includes all the explanatory variables presented in the chart. The final result is expressed as a percentage of the average rate of change in the price per square metre observed in the sample. The analysis is performed at postcode level in the period using the change in prices between 2022 Q4-2023 Q1 and 2024 Q4-2025 Q1. The symbol Δ indicates rate of change. The darker bars denote variables whose regression coefficients are significant at a 5% confidence level. The standard errors of the regression are corrected for heteroscedasticity.

6 This would be attributable to either supply or demand-side factors, which require a more complex analysis to be individually identified. Nevertheless, it would suggest that certain indebtedness limits have been reached and that borrowers need higher initial savings relative to the property's value.

Box 4.1

ANALYSIS OF THE GEOGRAPHICAL HETEROGENEITY IN HOUSE PRICE GROWTH OVER THE RECENT PERIOD (2022-25) (cont'd)

Table 1
Increase in house prices per square metre estimated by the model for different postcode groups, by increase in the population relative to housing stock and by increase in the LSTI ratio (a)

%

		Δ LSTI 2022-25				
		Q1	Q2	Q3	Q4	Q5
Δ Population 2022-25 / Housing stock 2022	Q1	11.4	10.5	11.0	11.3	12.6
	Q2	11.5	11.7	12.1	12.3	13.0
	Q3	12.3	12.4	12.2	13.3	14.0
	Q4	12.2	12.7	13.2	13.6	14.8
	Q5	14.6	13.5	15.7	14.4	16.5

SOURCE: Banco de España calculations, drawing on Colegio de Registradores and INE data.

a The table depicts the increase in house prices per square estimated by the model by quintile of the distribution of the increase in the population relative to the initial housing stock and of the increase in the LSTI ratio between 2022 Q4-2023 Q1 and 2024 Q4-2025 Q1. The values are obtained drawing on the coefficients of a multivariate regression that includes the variables indicated as well as other demographic and financial variables. The estimated increases are obtained using the average of all the explanatory variables within each sub-sample formed by the intersection of each quintile. The symbol Δ indicates rate of change.

Turning to the demographic variables, the findings are consistent with the assumption that income and population growth exert upward pressure on house prices. Furthermore, an exploratory analysis suggests that demographic dynamics (such as population growth relative to the initial housing stock) are associated with larger house price rises. House price increases also appear to be stronger in postcodes with a sharper rise in the LSTI ratio (Table 1).[7]

Overall, these findings point to the existence of a relationship between mortgage loan conditions and house prices. More generally, the analysis underscores the importance of adopting a multi-factor approach (which incorporates both real and financial variables) and using granular data to characterise changes in house prices.

When interpreting the findings, it should be borne in mind that the analysis presented here does not include an estimation of causal effects. That is to say, it is not certain that modifying an explanatory variable in the future will yield the same change as that observed in the sample period (for example, a change in the LSTI ratio or population growth would not necessarily have the same quantitative effects as those measured in the period 2022-25). To deepen its analysis of the relationship between lending conditions and the housing market, the Banco de España is developing a broader work programme, as described in Section 6.3 of this report.

7 The analysis of the relationship between each variable and the change in house prices (Chart 3) assumes that the other model variables remain constant. It should, however, be borne in mind that postcodes with very different characteristics, for example in terms of demographic developments, may also show marked differences in other model variables that, when taken together, influence the effect estimated.