Box 6.1

WHAT DOES THE LITERATURE SAY ABOUT LIMITS TO MORTGAGE LENDING STANDARDS?

This box summarises a review by the Banco de España of the literature on the effects of tightening mortgage lending standards using borrower-based measures (BBMs).[1] These measures seek to contain excessive household and corporate debt, as appropriate, and to enhance banks' credit portfolio quality.

The box focuses exclusively on BBMs applied to mortgage lending, a segment that is closely associated with the build-up of systemic risk during expansionary phases of the financial cycle.[2] Since the global financial crisis such measures have become considerably more common, especially in Europe. The main types adopted are caps on mortgage lending ratios – loan-to-value (LTV), loan or debt-to-income (LTI or DTI) and loan or debt service-to-income (LSTI or DSTI) – and maximum repayment terms.

Analyses of the impact of such measures are extremely helpful to assess their potential implications should they be adopted in Spain. This box provides an overview of the results of empirical and theoretical studies on how effective BBMs are in mitigating systemic risks and their side effects.

Empirical studies on mortgage lending standards and default risk

There is extensive empirical literature on the relationship between lending standards and default risk, especially in the US and UK mortgage markets where loan and borrower-level micro data are widely available. These analyses usually assess the probability of default in terms of the LTV ratio and income-based ratios such as DTI/LTI or DSTI/LSTI, considering borrower and lender characteristics.

The initial studies in the literature considered negative equity (when the outstanding mortgage exceeds the value of the property) to be a sufficient condition for default.[3] That is, a loan would default if the LTV ratio exceeded 100% at some point during its lifetime. For this reason, a high LTV ratio at origination would increase the probability of default in the event of a drop in property prices.

However, more recent studies have shown that negative equity is not really a sufficient condition for default as generally there must also be adverse household income events.[4] Indeed, they have found that the combination of a high LTV and a high LSTI ratio significantly heightens the risk of default and that the effect is not linear, but instead increases sharply when certain thresholds are crossed.[5] In this respect, it has been found that simultaneously applying BBMs that limit LTV and income-based ratios enhances their effectiveness.[6]

Other studies that have analysed specific borrower segments have shown that buy-to-let borrowers have a higher probability of default, and that this can increase significantly if they have high LTV ratios. However, this borrower segment appears to be less sensitive to higher DSTI ratios.[7]

Lastly, in a specific study on Spain it was found that LTV ratios were less informative on default than loan-to-price (LTP) ratios during the property boom of the 2000s.[8] This

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1 Adrián Carro, Jorge E. Galán, Enric Martorell and Raquel Vegas. (2025). "A literature review on ex-ante and ex-post analysis of the implications of borrower-based macroprudential measures". Documento Ocasional, 2524, Banco de España.

2 Òscar Jordà, Moritz Schularick and Alan M. Taylor. (2016). "The great mortgaging: housing finance, crises and business cycles". *Economic Policy,* 31, pp. 107-152.

3 Kerry D. Vandell. (1995). "How Ruthless Is Mortgage Default? A Review and Synthesis of the Evidence". *Journal of Housing Research,* 6, pp. 245-264.

4 Kristopher Gerardi, Kyle F. Herkenhoff, Lee E. Ohanian and Paul S. Willen. (2018). "Can't Pay or Won't Pay? Unemployment, Negative Equity, and Strategic Default". *The Review of Financial Studies,* 31(3), pp. 1098-1131.

5 Yongheng Deng, John M. Quigley and Robert Van Order. (2000). "Mortgage Terminations, Heterogeneity and the Exercise of Mortgage Options". *Econometrica,* 68, pp. 275-307; Brent W. Ambrose, Charles A. Capone and Yongheng Deng. (2001). "Optimal Put Exercise: An Empirical Examination of Conditions for Mortgage Foreclosure". *The Journal of Real Estate Finance and Economics,* 23, pp. 213-234; Orla May and Merxe Tudela. (2005). "When is mortgage indebtedness a financial burden to British households? A dynamic probit approach". Working Papers, 277, Bank of England.

6 Andrew Haughwout, Richard Peach and Joseph Tracy. (2008). "Juvenile delinquent mortgages: Bad credit or bad economy?". *Journal of Urban Economics,* 64, pp. 246-257; Hana Hejlová, Libor Holub and Miroslav Plašil. (2021). "Calibration of Borrower-based Macroprudential Measures for Mortgage Exposures: Rigorous Approach and its Application to the Czech Republic". *Prague Economic Papers,* 30(3), pp. 316-335.

7 Vladimir Lazarov and Marc Hinterschweiger. (2018). "Determinants of distress in the UK owner-occupier and buy-to-let mortgage markets". Staff Working Papers, 760, Bank of England; Robert Kelly and Conor O'Toole. (2018). "Mortgage default, lending conditions and macroprudential policy: Loan-level evidence from UK buy-to-lets". *Journal of Financial Stability,* 36, pp. 322-335.

8 Jorge E. Galán and Matías Lamas. (2025). "Beyond the LTV Ratio: Lending Standards, Regulatory Arbitrage, and Mortgage Default". *Journal of Money, Credit and Banking,* 57, pp. 107-150.

suggests that the LTP ratio should be used to complement the LTV ratio to assess mortgage risk. Specifically, the study found that the probability of default was significantly higher among mortgages with high LTP values.

Various studies have documented unintended consequences that undermine the effectiveness of LTV caps, such as growth in unsecured lending or longer loan maturities, in countries where these measures were not accompanied by others that take these aspects into account.[9] All the above underlines the importance of implementing combined and carefully designed BBMs.

BBMs: macroeconomic and financial impact studies

Another branch of study in the literature has focused on cross-country comparisons, assessing whether, through their impact on macroeconomic and financial aggregates, limits on mortgage lending standards have effectively contained financial stability vulnerabilities.

These studies show that BBMs – and specifically LTV and DSTI caps – effectively reduce excessive growth in lending to households during expansionary phases of the financial cycle, while in crisis periods they have no significant impact.[10] This suggests that these should be structural measures, in place and unchanged throughout the credit cycle. They would then serve as an automatic safeguard against the build-up of risks in expansionary phases and would not entail effective credit restrictions in downturns.

In general, the studies find that DSTI caps tend to contain growth in mortgage lending more effectively than LTV caps. The evidence on how effective they are in smoothing house prices is mixed, but they may be relevant in specific geographical areas, as discussed in more detail below.[11] The studies also show that these effects on credit and house prices are larger when the measures implemented are legally binding (rather than mere recommendations) and that they tend to manifest with some delay, with the maximum effect being observed up to three years after implementation.[12]

In addition, some studies have delved deeper into the impact of BBMs on economic growth, finding that on average the effects are moderate.[13] However, the studies on tail risks (low probability but high intensity adverse economic environments) find that activating BBMs reduces the risks of sharp falls in GDP and credit during financial crisis events.[14]

BBMs: distributional impact studies

Extensive literature has analysed the impact of BBMs on the behaviour of borrowers and financial institutions. These studies use granular loan or borrower-level data that make it possible to identify heterogeneous effects and transmission mechanisms according to the stage of the business cycle or the institutional framework. In this respect, various studies show how BBMs have different effects on mortgage credit and house prices by geographical area within each country and by borrower type.[15]

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9 Nitzan Tzur-Ilan. (2023). "Adjusting to Macroprudential Policies: Loan-to-Value Limits and Housing Choice". *The Review of Financial Studies,* 36, pp. 3999-4044

10 C. Lim, F. Columba, A. Costa, P. Kongsamut, A. Otani, M. Saiyid, T. Wezel and X. Wu. (2011). "Macroprudential Policy: What Instruments and How to Use Them? Lessons from Country Experiences". IMF Working Papers 238. International Monetary Fund; Stijn Claessens, Swati R. Ghosh and Roxana Mihet. (2013). "Macro-prudential policies to mitigate financial system vulnerabilities". *Journal of International Money and Finance,* 39, pp. 153-185. In crisis periods, banks themselves tend to tighten eligibility criteria, applying levels above regulatory limits, so these are not a limiting constraint.

11 Kenneth N. Kuttner and Ilhyock Shim. (2016). "Can non-interest rate policies stabilize housing markets? Evidence from a panel of 57 economies". *Journal of Financial Stability,* 26, pp. 31-44; Eugenio Cerutti, Stijn Claessens and Luc Laeven. (2017). "The use and effectiveness of macroprudential policies: New evidence". *Journal of Financial Stability,* 28, pp. 203-224.

12 Tigran Poghosyan. (2020). "How effective is macroprudential policy? Evidence from lending restriction measures in EU countries". *Journal of Housing Economics,* 49 (101694).

13 Björn Richter, Moritz Schularick and Ilhyock Shim. (2019). "The costs of macroprudential policy". *Journal of International Economics,* 118, pp. 263-282; Zohair Alam, Adrian Alter, Jesse Eiseman, Gaston Gelos, Heedon Kang, Machiko Narita, Erlend Nier and Naixi Wang. (2024). "Digging Deeper—Evidence on the Effects of Macroprudential Policies from a New Database". *Journal of Money, Credit and Banking,* 57, pp. 1135-1166. These studies find that a 10 percentage point (pp) reduction in the LTV ratio can slow credit growth by up to 6 pp over a four-year horizon.

14 Michal Franta and Leonardo Gambacorta. (2020). "On the effects of macroprudential policies on Growth-at-Risk". Economics Letters, 196 (109501); Jorge E. Galán (2024). "The benefits are at the tail: Uncovering the impact of macroprudential policy on growth-at-risk". *Journal of Financial Stability,* 74 (100831); Jorge E. Galán. (2025). "Macroprudential policy and the tail risk of credit growth". Documentos de Trabajo, 2509, Banco de España.

15 Jed Armstrong, Hayden Skilling and Fang Yao. (2019). "Loan-to-value ratio restrictions and house prices: Micro evidence from New Zealand". *Journal of Housing Economics,* 44, pp. 88-98.

- In **Ireland,** for example, it was found that introducing LTV and LTI caps gave rise to an increase in the saving rate and a reallocation of mortgage credit towards higher-income borrowers and borrowers in rural areas. Moreover, at the banks most affected by the limits, it led to portfolio shifts towards assets that were not subject to the regulations, such as securities and corporate credit.[16]

- In the **Netherlands,** studies showed that setting LTV caps reduced mortgage borrowing, house prices and default rates, especially among low-income borrowers. Although household liquidity decreased in the short term, owing to the initial increase in the housing cost burden, in the medium term households experiencing income loss benefited from lower default rates.[17]

- In the **United Kingdom** it was found that capping the LTI ratio cut lending to low-income borrowers and cooled house price growth in areas where banks were granting high-LTI loans. In addition, lower-income borrowers had lower default rates, which suggests a benefit in terms of their resilience to adverse events.[18]

- In **Denmark,** studies showed that tighter LTV ratios had a positive impact on financial stability, without significantly affecting housing affordability for households in the medium to long term.[19] Even so, in the short term, activating these measures can entail adjustment costs and can temporarily limit access to house purchase, while households accumulate the additional savings needed to make their purchase and the policy activation feeds through to lower prices.[20]

Theoretical models of BBMs and their macroeconomic impact

Recent literature has developed various macroeconomic models to analyse how BBMs affect credit dynamics, housing markets and macroeconomic stability. They are mostly theoretical general or partial equilibrium models, some of which allow for modelling of heterogeneous household behaviour.

Several of these studies have indicated that when LTV limits are eased house prices rise sharply, as the real estate risk premium declines, and that this effect is amplified in markets with little housing tenure mobility. These studies suggest that there is a feedback loop between looser LTV ratios and house prices, leading to higher prices and riskier credit conditions.

In this respect it has been found that, as looser LTV ratios drive up house prices, they also push up households' DTI ratios, and hence their DSTI ratios, with adverse effects on consumption (excluding housing expenditure) in the short term on account of the higher debt burden.[21] In the medium term, this higher borrowing would also limit household consumption in the event of a negative income shock. Accordingly, combined BBMs that limit the level of debt would have positive effects, reducing the volatility of consumption over the cycle.[22]

Some studies have also identified benefits of BBMs as a complement to bank capital measures. While capital requirements chiefly enhance banks' resilience, BBMs

16 Viral V. Acharya, Katharina Bergant, Matteo Crosignani, Tim Eisert and Fergal McCann. (2022). "The Anatomy of the Transmission of Macroprudential Policies", *The Journal of Finance,* 77(5), pp. 2533-2575.

17 Sjoerd van Bekkum, Marc Gabarro, Rustom M. Irani and José-Luis Peydró. (2024). "The real effects of borrower-based macroprudential policy: Evidence from administrative household-level data". *Journal of Monetary Economics,* 147 (103574).

18 José-Luis Peydró, Francesc Rodriguez-Tous, Jagdish Tripathy and Arzu Uluc. (2024). "Macroprudential Policy, Mortgage Cycles, and Distributional Effects: Evidence from the United Kingdom". *The Review of Financial Studies,* 37(3), pp. 727-760.

19 Graeme Cokayne, Eddie Gerba, Andreas Kuchler and Rasmus P. Roulund. (2024). ""Thank me later": Why is (macro)prudence desirable?". *Journal of Financial Stability,* 71 (101227).

20 Anthony A. Defusco, Stephanie Johnson and John Mondragon. (2020). "Regulating Household Leverage". The Review of Economic Studies, 87(2), pp. 914-958; Daniel Abreu, Sónia Félix, Vitor Oliveira and Fátima Silva. (2024). "The impact of a macroprudential borrower-based measure on households' leverage and housing choices". *Journal of Housing Economics,* 64 (101995); Francesco G. Caloia (2024). "Borrower-based measures, house prices and household debt". *Journal of International Money and Finance,* 143 (103051); Martin Hodula, Martin Melecký, Lukáš Pfeifer and Milan Szabo. (2023). "Cooling the mortgage loan market: The effect of borrower-based limits on new mortgage lending". *Journal of International Money and Finance,* 132 (102808).

21 Marcus M. Ingholt. (2022). "Multiple Credit Constraints and Time-Varying Macroeconomic Dynamics". *Journal of Economic Dynamics and Control,* 143 (104504).

22 Andrea Ferrero, Richard Harrison and Benjamin Nelson. (2024). "House Price Dynamics, Optimal LTV Limits and the Liquidity Trap". *The Review of Economic Studies,* 91(2), pp. 940-971; Graeme Cokayne, Eddie Gerba, Andreas Kuchler and Rasmus P. Roulund. (2024). ""Thank me later": Why is (macro)prudence desirable?". *Journal of Financial Stability,* 71 (101227).

improve households' resilience. Specifically, a combination of structural BBMs with time-variant capital measures (such as countercyclical buffers) would have positive effects on financial stability.[23]

Another branch of this literature has studied how these measures interact with monetary policy, finding that they are complementary. Specifically, these studies find that DSTI caps help contain the negative effects of monetary policy tightening on households' debt servicing.[24] They also highlight that LTV caps reduce household indebtedness, thereby helping to stabilise credit cycles, which is not achieved by monetary policy alone.[25]

Some models enable analysis of the distributional effects of BBMs. Some of these studies find that LTV and LTI caps curb house price growth but push up rentals, negatively affecting young people and middle-income households, although these groups would benefit from smaller declines in consumption during crisis periods.[26] When these models have been applied to Spain, it has been found that very loose pre-crisis mortgage lending conditions, followed by an abrupt shift during a crisis, are correlated with lower housing affordability and lower consumption among young borrowers.[27] In this setting, BBMs would help mitigate the negative effects of a crisis on vulnerable groups.

Lastly, recent literature has used agent-based models (ABMs) to make detailed simulations of the impact of BBMs on mortgage and housing markets. These models simulate the behaviour of individual agents (such as households, banks or firms), accurately adapting to their real distributions and incorporating realistic lifecycle, rental market and buy-to-let dynamics.

Studies conducted for various countries have shown that BBMs reduce debt, credit risk and the probability of default, although the impact is greater on first-time buyers and they can have indirect effects on the rental market. The literature also stresses the importance of BBMs being calibrated to consider the joint distribution of risks and the interaction between measures.[28]

Evidence on BBMs: main conclusions

The literature reviewed provides evidence of BBMs' effectiveness in mitigating systemic risks stemming from household over-indebtedness and property market imbalances. The empirical studies show that stricter lending standards (especially LTV and DSTI caps) significantly reduce the probability of default, dampen credit growth in expansionary phases and strengthen the resilience of the financial system. They also show that a combination of BBMs applied simultaneously is more effective and reduces any unintended consequences of the measures.

Moreover, the theoretical models available show that BBMs help stabilise credit cycles, reduce the probability of crisis and mitigate negative effects on well-being, especially during economic and financial downturns. However, they also warn of redistributive effects relating to reallocation of credit to less restricted borrowers and rent increases (Figure 1).

All the above demonstrates how effective these measures are under certain circumstances, although the available evidence is heterogeneous. It also suggests that they be applied flexibly and be continuously assessed using granular data and advanced models. According to the previous studies analysed, this would maximise their effectiveness and minimise their costs.

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23 L. Herrera. (2025). "Building up financial resilience: The role of borrower-based macroprudential policies". Documentos de Trabajo, Banco de España, forthcoming.

24 Daniel Greenwald. (2018). "The Mortgage Credit Channel of Macroeconomic Transmission". Research Paper 5184, MIT Sloan School of Management.

25 Sami Alpanda and Sarah Zubairy. (2017). "Addressing household indebtedness: Monetary, fiscal or macroprudential policy?". *European Economic Review,* 92, 47-73; Jiaqian Chen, Daria Finocchiaro, Jesper Lindé and Karl Walentin. (2023). "The costs of macroprudential deleveraging in a liquidity trap". *Review of Economic Dynamics,* 51, pp. 991-1011

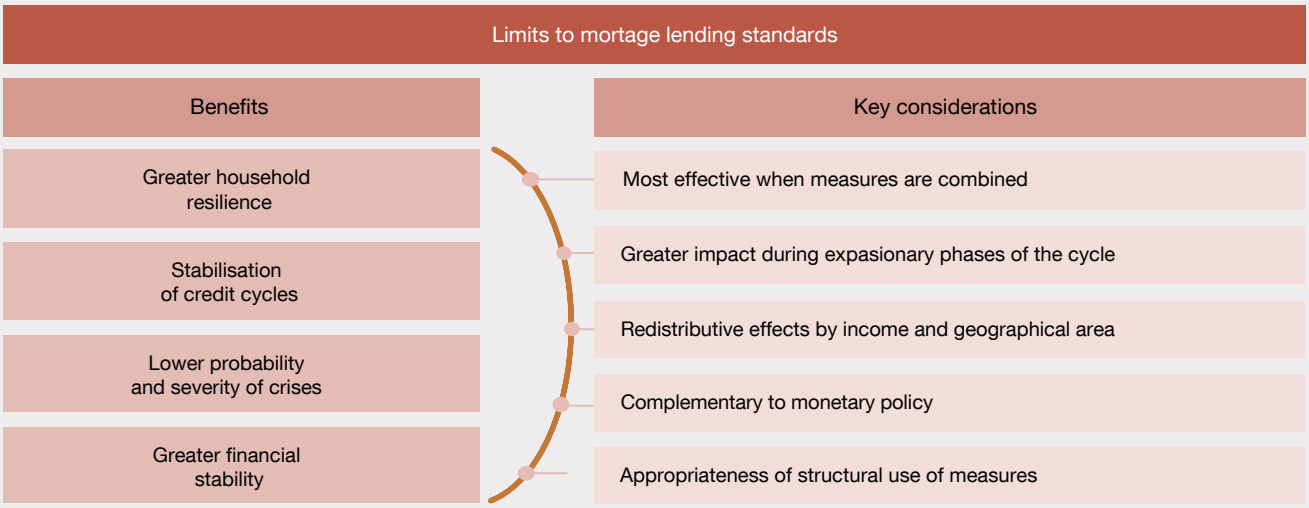
26 Juan Castellanos, Gonzalo Paz-Pardo and Andrew Hannon. (2024). "The aggregate and distributional implications of credit shocks on housing and rental markets". ECB Working Paper, 2977, European Central Bank.

27 Clodomiro Ferreira, Julio Gálvez and Myroslav Pidkuyko. (2024). "Housing tenure, consumption and household debt: life-cycle dynamics during a housing bust in Spain". Documentos de Trabajo, 2424, Banco de España.

28 Rafa Baptista, J. Doyne Farmer, Marc Hinterschweiger, Katie Low, Daniel Tang and Arzu Uluc. (2016). "Macroprudential policy in an agent-based model of the UK housing market". Staff Working Papers, 619, Bank of England; Adrian Carro. (2023). "Taming the housing roller coaster: The impact of macroprudential policy on the house price cycle". *Journal of Economic Dynamics and Control,* 156 (104753).

In any event, although the existing literature is a very useful guide, no generally accepted and integrated framework has been identified for conducting a comprehensive cost-benefit analysis of these measures, particularly their general equilibrium effects on the economy. Moreover, any potential application in Spain requires additional studies, such as those under way at the Banco de España, including in their assessment Spain's structural characteristics and economic juncture.

Figure 1
Benefits of BBMs and key considerations in the literature



SOURCE: Devised by authors drawing on the literature reviewed.