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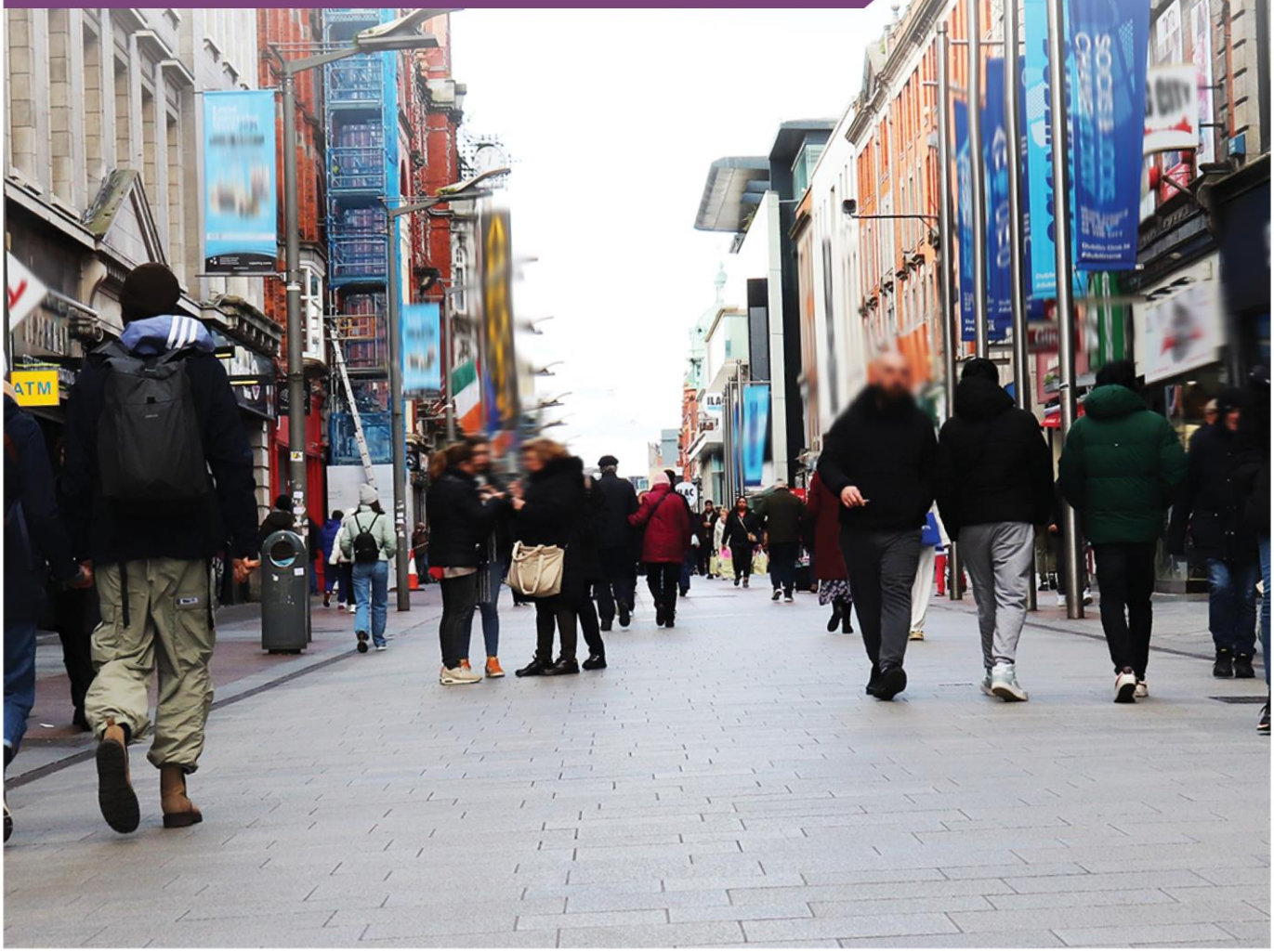

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Borrower-based mortgage measures: lessons from Ireland's experience since 2015

Edward Gaffney, Niamh Hallissey and Fergal McCann [1]

Abstract

We draw lessons from research and analysis into borrower-based mortgage measures in Ireland, using granular and comprehensive micro-data for the Irish mortgage market, and a wide range of empirical identification strategies. We find that lenders maintained credit growth following the introduction of mortgage measures in 2015. Borrowers changed their behaviour, particularly those who were faced with liquidity and leverage constraints. Borrower resilience benefits can already be discerned, but the full benefits would accrue after an adverse economic shock. We discuss the role of housing market conditions in calibration, and the benefits of including non-bank mortgage lenders under the measures. Finally, we propose questions for future research.

1. Introduction

Borrower-based measures (referred to as the "mortgage measures" in Ireland) were introduced in Ireland in 2015, having undergone policy consideration and public consultation during 2014. In this *Article*, we draw lessons from the Irish

[1] Macro-Financial Division (Gaffney and Hallissey) and Research Collaboration Unit (McCann), Central Bank of Ireland. The views expressed in this Article are those of the authors and do not necessarily reflect those of the Central Bank of Ireland. This *Article* is based on a chapter in the forthcoming *Research Handbook of Macroprudential Policy* (Elgar), and we wish to thank the co-editors Prof. David Aikman (NIESR) and Prof. Prasanna Gai (University of Auckland) for their comments in that capacity. We also thank Mark Cassidy and Vasileios Madouros (Central Bank of Ireland), and participants in the Research Handbook of Macroprudential Policy Conference (King's College London) and the Sixth Brunel Banking Conference.

experience based on research and analysis carried out by Central Bank of Ireland staff.

The Central Bank's research into mortgage measures has benefitted from rich granular data that were first collected to aid credit risk assessments and stress testing exercises as part of the external assistance programmes to the Irish sovereign and banking sector in 2011. In its public communications to motivate the introduction of mortgage measures, the Central Bank cited detailed research and analytical work on the link between credit conditions and the crisis experience in Ireland from 2008 to 2013.[2]

For example, Hallissey et al. (2014) used supervisory loan-level data to trace out the evolution of lending at high ratios of loan-to-value (LTV) and loan-to-income (LTI) in the run-up to the 2008 crash, as well as the strong connection between higher LTV and LTI ratios and default rates up to 2013, and the higher Loss Given Default rates associated with higher LTV lending. They also showed that the joint distribution was important, with default rates rising even further among mortgages with both high LTV and high LTI ratios. This research program was an important element of the Central Bank's public engagement on the measures, clearly connecting the empirical evidence with their stated objectives, in particular relating to the safeguarding of the resilience of banks and borrowers.

Research uncovered important distinctions across borrower types, which led directly to a different calibration for First Time Buyer (FTB) mortgages, when compared to Second and Subsequent Buyer (SSB) or Buy to Let (BTL) mortgages. Again through a borrower resilience lens, Kelly et al. (2015) showed that default rates among FTB loans during the crisis were lower than for other groups, even at the same level of originating LTV and LTI. This was indicative of a higher risk profile among movers and BTL investors, which motivated less-strict limits for FTBs.

The international research literature on the effects of borrower-based measures has expanded greatly since the initial design of Ireland's mortgage measures in 2014.[3] Taking the lessons from that literature in the round, policymakers introducing borrower-based measures today would expect some

[2] See Cassidy and Hallissey (2016) for a contemporaneous overview of the introduction of the measures.
[3] For example, Poghosyan (2020) assesses effectiveness of measures across European countries. Richter et al. (2019) quantify the reduction in economic output that arises from a lower maximum LTV ratio. CGFS Study Group (2023) draw lessons from the practical experience of authorities in 14 jurisdictions. Moretti and Riva (2025) assess the role of borrower-based measures in reducing house price growth and household debt across European countries.

or all of the following to occur, on the balance of probabilities, and relative to a counterfactual scenario without policy action: reductions in lending volumes; lowering of house prices; dampening of house price-credit amplification; a reduction in borrower default risk; liquidity constraints for would-be homeowners; altered housing choices, for example with affected borrowers moving to less expensive or less central areas; and overall lower credit provision to more-constrained groups.

Lessons from mortgage measures research and analysis in Ireland since 2015

In this *Article*, we focus on research that has informed the regular monitoring and evaluation of the mortgage measures since their introduction in 2015. The Central Bank carried out an annual review of the calibration and operation of the measures from 2016 to 2021. In 2021-22, the Central Bank conducted a framework review of borrower-based mortgage measures, involving a deeper investigation of the objectives, instrument choices, and calibration strategy behind the measures.[4] Research and analysis influenced these reviews, and provided information to domestic and international audiences about the functioning of the measures, in line with the Central Bank's aim of conducting evidence-based policymaking.[5]

We summarise the key lessons from Ireland's mortgage measures, based on our experience as researchers and practitioners, as follows:

1. **Credit can keep growing: lenders will respond to constraints imposed by borrower-based measures.** Despite limits on highly leveraged mortgages, credit growth continued after the introduction of the measures. Lenders can adjust to the constraints imposed by debt limits, reallocating risk both within and outside the mortgage portfolio.

2. **Borrower-based measures can constrain borrower choices.** Depending on the level of calibration, an LTI limit can also be an effective LTV limit. Where a proportion of lending is allowed above the headline limits, it can alleviate credit constraints. Liquidity constraints are a particularly important consequence of tighter debt limits.

[4] See Central Bank of Ireland (2022b) for the Central Bank framework for the mortgage measures, and Central Bank of Ireland (2022a) for an overview of the feedback received as part of the public consultation for the framework review (CP146).

[5] See Durante and Hallissey (2023) for the country case study for Ireland as part of CGFS Study Group (2023), which provides an earlier overview of some of this research.

3. **There are distributional differences** in how households have adapted to the measures.
4. **Borrower resilience benefits are almost certainly accruing**, but can only be fully measured after adverse economic or financial shocks.
5. **The housing market matters greatly for calibration, but cannot be the subject of policy targets.** The wider housing market context has important implications for calibration of macroprudential mortgage measures. Macroprudential policymakers cannot, and should not, target house prices. The more appropriate policy target for borrower-based measures is the amplification channel between risky lending, expectations and house prices.
6. **Borrower-based measures that cover non-bank mortgage lending provide important benefits**, particularly when cyclical risks are building.

Section 2 describes the six key themes or lessons in greater detail. Section 3 concludes with some open questions for further enquiry.

2. Lessons from research into mortgage measures

Lesson 1: Credit can keep growing; lenders will respond to constraints imposed by borrower-based measures

Borrower-based measures may constrain certain types of lending at high LTV or LTI ratios, depending on the initial calibration relative to prevailing lending standards. This may slow down aggregate credit growth relative to a no-policy counterfactual. However, they need not lead to a reduction in observed credit growth. Ireland's mortgage measures were introduced in 2014, after several years of economic vulnerability and relatively low activity levels in the Irish mortgage market. After 2014, new mortgage originations continued to grow in aggregate, in conformance with the measures. Evidence also suggests that banks are likely to respond to constraints by reallocating credit creation to less-affected market segments, either to portfolios not covered by the debt limits or to borrowers who are less constrained by the regulatory limits.

Lesson 1a. Despite limits on highly leveraged mortgages, credit growth continued after the introduction of the measures

A key insight from international macro-finance research is that, when countries implement macroprudential mortgage measures, credit growth tends to be lower than it would otherwise have been (Araujo et al., 2020). However, this "all else equal" finding does not mean that the introduction of borrower-based measures causes a reduction in lending volumes in any specific example.

The implementation of the measures in Ireland is an important case in point. In Ireland, mortgage measures were introduced while new lending volumes were on an upwards trend, following historically low levels of mortgage activity during the years after the global financial crisis (GFC). Lenders had ample capacity to increase credit supply while maintaining sustainable lending standards. Growing demand for mortgage credit resulted from an ongoing economic recovery, even with new restrictions on LTV and LTI ratios in place.

By contrast to the UK, where the Bank of England explicitly communicated that their mortgage tools were calibrated so as not to be overly-restrictive relative to mortgage market lending conditions at the time of implementation, the newly-introduced LTV and LTI limits did have an impact relative to prevailing new mortgage lending in Ireland in 2014. For example, in Ireland, the maximum LTV ratio available in 2014 was 92%, larger than the regulatory limits of 80% for SSB and a "sliding scale" limit from 80% to 90% for FTBs in place from 2015.[6] Similarly, mortgages exceeding LTI ratios of 4 appear to have been common in Ireland up to 2014, and this level is in excess of the LTI limit of 3.5 in the mortgage measures that took effect in 2015.

Taken together, Acharya et al. (2022) estimate that 43% of mortgage lending in 2014 had an LTV and/or LTI ratio above the relevant mortgage measures limits introduced in 2015. Under the mortgage measures, each lender could continue to originate a certain proportion of its mortgage lending at LTV or LTI levels above the limits. These proportionate limits are termed "allowances". At the time of introduction, a lender could originate up to 20 per cent of new lending above the LTI limit, for example, which introduced an important level of flexibility to the framework.[7]

The implementation of measures just after a low point in the financial cycle meant that mortgage lending continued to grow in the years following introduction of the measures. This is consistent with modelling results from Kelly et al. (2018), who infer from simulations that the cooling effects of the introduction of mortgage measures on credit and house prices would have been much larger if they had been introduced late in the previous financial cycle (around 2007) relative to an earlier point (around 2003).

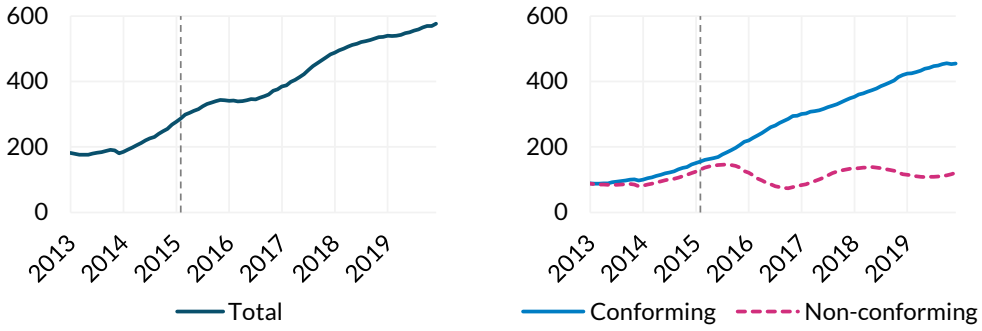
Figure 1 provides empirical evidence of these patterns. We update the analysis of Acharya et al. (2022) using data available between 2016 and 2019. The left

[6] The "sliding scale" LTV limit for FTBs was recalibrated to a flat 90 per cent LTV limit for FTBs from 1 January 2017.
[7] A key principle of the Irish framework for macroprudential mortgage measures is that the measures do not aim to replace lenders' own prudent underwriting criteria.

hand panel shows monthly mortgage origination volumes from 2012 to 2019. The right hand panel shows the volume of lending issued above one or both of the eventual LTV or LTI limits, labelled as "non-conforming" to the limits, and the volume issued below those limits, labelled as "conforming". This comparison highlights the reallocation of lending that occurred, as mortgage lending continued to grow below the new LTI and LTV limits, with non-conforming credit subject to the allowances remaining broadly constant. On aggregate, lending continued to grow.

Credit growth continued after the introduction of the measures

Figure 1: Monthly mortgage origination volumes, 2013 to 2019
Millions of euro



Source: Central Bank of Ireland loan-level data.

Notes: 12-month rolling average of the euro value of mortgage issuance for house purchase. "Conforming" mortgages are below the LTV and LTI ratio limits under the 2017-22 calibration of mortgage measures. Vertical dotted line signifies introduction of mortgage measures.

Lesson 1b: Lenders adjust to the constraints imposed by borrower-based measures, reallocating risk both within and outside the mortgage portfolio

After a macroprudential intervention such as that in the Irish mortgage market in 2015, lenders may face constraints on their preferred allocation of risk. A constrained firm with mobile capital may respond by lending more in some other market segment that is not affected by the regulation. In addition, competitors who are not covered by the regulation (e.g. due to the regulation affecting a specific entity type or jurisdiction) may step into the breach and fill unmet credit demand.

This type of response by lenders to constraints imposed by regulation is referred to in different circles as either "regulatory arbitrage", "leakage" or "spillovers". Previous research has focussed on the cross-border reallocation of lending (Houston et al., 2012) or risk-taking (Ongena et al., 2013) across borders by global banks in response to tightening of prudential regulation in one location; or substitution towards lending by unregulated foreign bank

branches or non-banks when tightened capital regulation is imposed on banks (Aiyar et al., 2014; Irani et al., 2021). Other studies highlight that banks engineer changes to their internal models that facilitate more lending through lighter capital charges (Behn et al., 2022). The long-term reallocation of bank credit creation towards mortgage lending (Jordà et al., 2016) has been postulated by many to owe to a large degree to the favourable risk-weight treatment of mortgages introduced in the Basel I regime. Taken in its totality, this research suggests that, where banks are willing to lend, regulatory restrictions in one segment will lead to reallocation to another, while in markets where banks are restricted from lending, non-banks will step into the breach, at least partially.

In Ireland, Central Bank researchers have studied a range of responses of lending supply to the introduction of the mortgage measures. Focussing on cross-border spillovers, McCann and O'Toole (2019) studied the relative risk profile of UK and Irish mortgage lending among the group of Irish lenders present in both markets on either side of the 2015 policy introduction. The study uncovers mild evidence of risk spillovers, with the LTV profile of affected banks' UK lending become higher-risk relative to their lending in Ireland and relative to competitor UK banks unaffected by the intervention in Ireland.

Acharya et al. (2022) also study cross-sector or cross-product spillovers from the 2015 policy introduction. Banks that are more affected by the policy are shown to have higher lending volumes at lower interest rates to higher-risk SME and corporate borrowers once the policy is implemented, again indicative of risk-shifting in response to constraints on their mortgage lending. Similar findings are found among higher-yielding securities holdings.

Within the mortgage market itself, the research has also uncovered evidence of reallocation. Studying the immediate reaction in the first two years after the policy was introduced, Acharya et al. (2022) find that lending volumes in aggregate reallocated from low- to high-income borrowers, and from urban to rural counties. These patterns are explained formally by the ex-ante exposure of banks: in markets where there was less "slack" after policy introduction (i.e. those with ex-ante higher LTV and LTI lending), lending growth after policy introduction was weakest. These findings are consistent with those of Peydró et al. (2024), who study the UK mortgage debt limits.

Lesson 2: Borrower-based measures can constrain borrower choices

Borrower-based measures, by their nature, aim to impose constraints on some prospective borrowers, with the degree of constraint depending on the level of the calibration. A regular concern raised in public discussion about macroprudential policies relates to their potential to distort households' housing outcomes relative to their underlying demand, particularly among households trying to purchase a home for the first time.

Market functioning and the profile of borrowers accessing the mortgage market have been key questions in the research agenda of the Central Bank. Gaffney and Kinghan (2021) highlight that the share of the potential homeowner population in Ireland that drew down an FTB mortgage continued to grow in each year from 2015 to 2019, a finding that suggests that the measures have not precluded growth in aggregate participation of new entrants to the housing market.

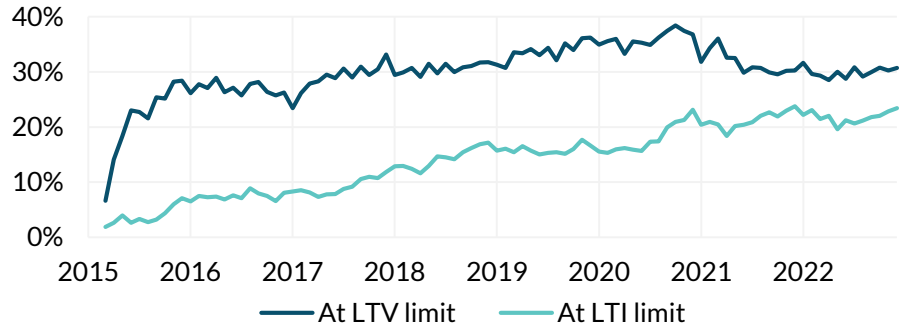
Despite the aggregate growth of transactions and market entry, we can nonetheless identify ways in which borrowers changed their behaviour in response to the measures over time, in a manner consistent with a growing level of constraint or "bindingness" being experienced. The fact that the LTI limit in particular became increasingly binding was due primarily to growing structural challenges in the Irish housing market. Weak supply and rising costs caused a secular increase in the house price to income (HPI) ratio, a process that began during the recovery from the GFC.

Evidence that mortgage measures affected borrower behaviour can be seen in the increase in the share of borrowers selecting mortgage loan amounts that were either at or very close to the LTI limit (Gaffney, 2019). The share of borrowers transacting at LTI ratios between 3.45 and 3.5 was less than 2% between 2001 and 2014, but increased to 4% by late 2015, and reached 18% in 2019.

Figure 2, drawn from Gaffney and Kinghan (2021), shows that the share of lending at the LTV and LTI limits grew steadily following the introduction of mortgage measures in 2015 until late 2020. The pattern is particularly striking in the case of the LTI limit, where the share rose continually over the period from 2015. This strongly suggests a growing tendency among borrowers and lenders to choose smaller loans than they would have drawn down in the absence of the measures.

The share of mortgages at the LTI limit increased steadily from 2015 to 2022

Figure 2: Shares of owner-occupier mortgages issued at the LTV and LTI limits



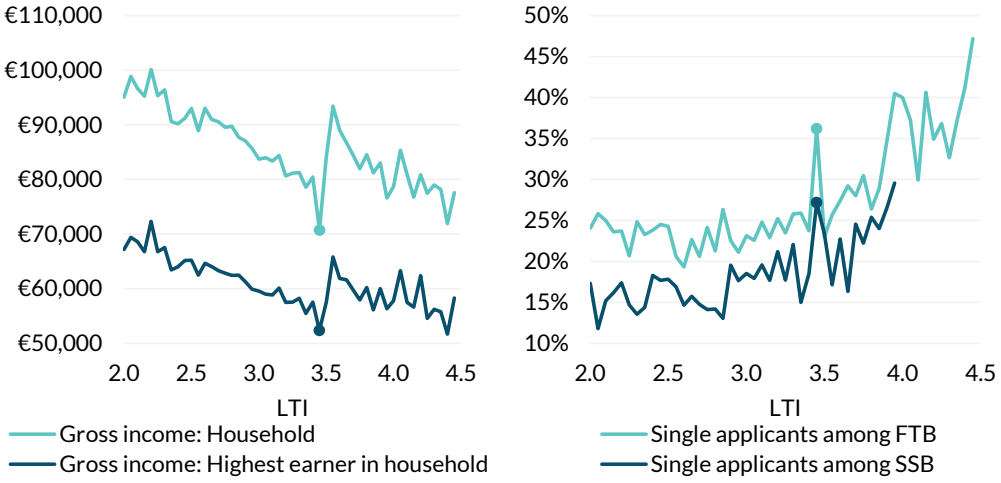
Source: Gaffney and Kinghan (2021), updated using Central Bank of Ireland data.

Notes: The shares of total euro value of mortgage issuance to owner-occupiers in-scope of mortgage measures between March 2015 and December 2022. "At LTV limit": at the relevant LTV limit based on buyer type, year of issuance and (between 2015 and 2016) property value, or with a LTV ratio below but within 1% of that limit. "At LTI limit": between 3.45 and 3.5 LTI.

Growth in borrowing at the LTI limit was driven by constrained households. Gaffney (2019) shows that borrowers at the limit were more likely to be single and lower-income, relative to what would be expected from the correlation of these variables with the overall LTI distribution (Figure 3). There is a clear discontinuity at 3.5, suggesting that the LTI limit constrains the borrowing choices of particular cohorts who would otherwise have been expected to draw down larger loans.

Borrowers transacting at the LTI limit were more likely to have lower household incomes than other borrowers in 2018-19

Figure 3: Average incomes and single/joint applicant shares among mortgage borrowers, by LTI band, 2018-19



Source: Gaffney (2019).

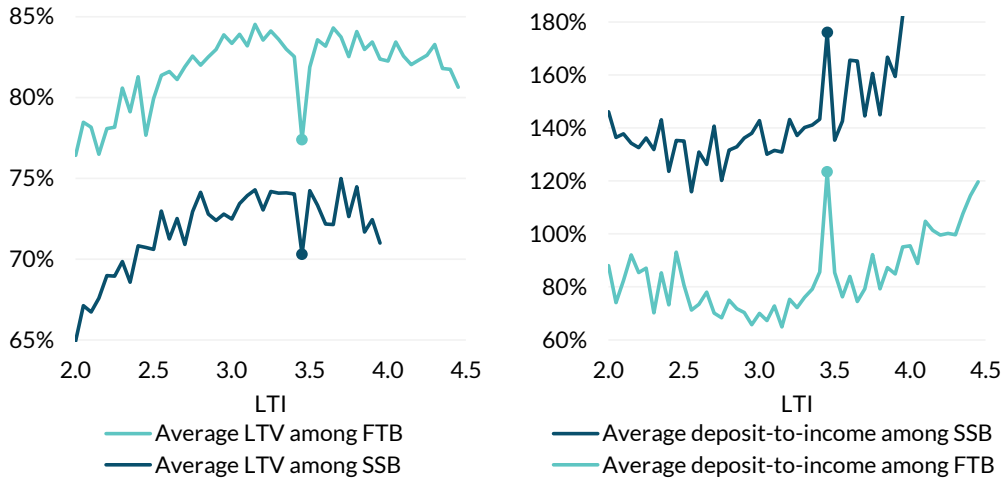
Notes: Based on home loan mortgage issuance between January 2018 and June 2019. Each point depicts a band of LTI ratios of width 0.05. The large dots highlight borrowers with LTI ratios above 3.45 and either at or below 3.5. SSB series is omitted above 4 LTI due to low frequency in data.

Lesson 2a: Depending on the level of calibration, an LTI limit can also be an effective LTV limit

An LTI limit creates a fixed borrowing amount available to households relative to income. In order to comply with a binding LTI limit, borrowers may need to pledge a significantly larger downpayment than would be required based on the stated macroprudential LTV limit alone. Research by Gaffney (2019) demonstrates that borrowers at the LTI limit commit larger downpayments, relative to property value and household income, than less-constrained borrowers at other LTI ratios. Figure 4 shows the average LTV and deposit-to-income ratio across the LTI distribution. The influence of the LTI limit on leverage is particularly visible among FTB borrowers, who typically have no prior housing equity. Borrowers at the LTI limit have much lower LTV ratios than those with slightly lower or higher LTI ratios, and post much larger downpayments relative to income.

Borrowers transacting at the LTI limit were more likely to have large deposits relative to property value and income in 2018-19

Figure 4: Average LTV and deposit-to-income ratios among mortgage borrowers, by LTI band, 2018-19



Source: Gaffney (2019).

Notes: Based on home loan mortgage issuance between January 2018 and June 2019. Each point depicts a band of LTI ratios of width 0.05. The large dots highlight borrowers with LTI ratios above 3.45 and either at or below 3.5. SSB series is omitted above 4 LTI due to low frequency in data.

There is tentative evidence that larger downpayments are primarily driven by "non-earned" assets, such as gifts from family or friends. This again suggests that households at the limit are different: if they are to purchase their desired home, they must draw on greater resources than other borrowers. A corollary of this finding is that households who cannot provide large downpayments

(relative to their income) are more likely to be excluded from access to the market – something that is difficult to show conclusively, based on the data available to researchers in Ireland.

Lesson 2b: Where a proportion of lending is allowed above the headline limits, it can alleviate credit constraints

Allowances to lend above LTV and/or LTI limits have been an important part of Ireland's mortgage measures since their introduction in 2015. Examples of groups of borrowers who have been more likely to receive mortgages with allowances include workers with particularly strong longer-term prospects of income growth, households in areas close to urban centres with high HPI ratios, and households with high levels of residual take-home pay.[8]

The allocation of allowances has been studied in detail in Ireland. The research suggests that allowances facilitate mortgage lending to households and to market segments where the headline limits would tightly bind. The most prominent example is the over-weighting of mortgages for properties in Dublin among allowance lending. This reflects high HPI ratios in the capital, which induce many borrowers to seek higher LTI ratios. For example, in 2022, 25% of FTB lending without an LTI allowance was in Dublin, compared to 57% of FTB lending with an LTI allowance.[9] The difference is even greater in the SSB market, at 33% and 71%, respectively. Kinghan and McCann (2019) have showed that, conditional on location, lower and middle-income borrowers were more likely to use allowances, as were younger and single borrowers – reflective of correlation of these household characteristics with LTV and LTI ratios in general.

Lesson 2c: Liquidity constraints are a particularly important consequence of tighter debt limits

As a result of the mortgage measures, some borrowers have had to post larger downpayments on property purchases. Immediately prior to the mortgage measures, the lowest downpayment requirement available in the market was 8% for home loan mortgages. This increased to between 10% and 20% as a result of the LTV limit in the mortgage measures, depending on the borrower

[8] Take-home pay is an important part of lenders' internal credit risk assessments in Ireland, but is not accounted for directly in the Irish macroprudential framework, as LTI ratios are calculated based on gross, pre-tax pay.
[9] The Central Bank has published summaries of granular mortgage origination data, collected to assess compliance with the mortgage measures, at: https://www.centralbank.ie/financial-system/financial-stability/macro-prudential-policy/mortgage-measures/new-mortgage-lending-data

type and property price.[10] In addition, for some borrowers, the LTI limit has also indirectly increased downpayment ratios, as outlined in Lesson 2a. We refer to challenges faced, or opportunity costs incurred, by households when trying to accumulate larger downpayments to fund house purchases as "liquidity constraints".

Liquidity constraints are more difficult to identify in the data than one might expect at first glance. Observed choices about downpayment and LTV ratios are not necessarily a useful measure of liquidity constraints. For example, borrowers choosing the highest possible LTV ratio may not necessarily be liquidity constrained – rather, they may be expressing a preference for higher leverage and the retention of cash for consumption or precautionary reasons. It is even more challenging to demonstrate the marginal contribution of mortgage measures to liquidity constraints, which would vary depending on the risk tolerance of the lender.

Measuring the reaction to unexpected policy changes offers a more promising avenue for the identification of the existence of liquidity constraints. Researchers at the Central Bank have studied two such changes since the introduction of the mortgage measures, when specific groups of borrowers had the opportunity to alter their choices across cash downpayments, loan amounts, and purchased home prices. In both cases, when presented with the opportunity to increase leverage or reduce the amount of own-funds posted as a downpayment, borrowers in Ireland have primarily responded by retaining more of their own liquid resources, and did not use the opportunity to purchase more expensive properties.

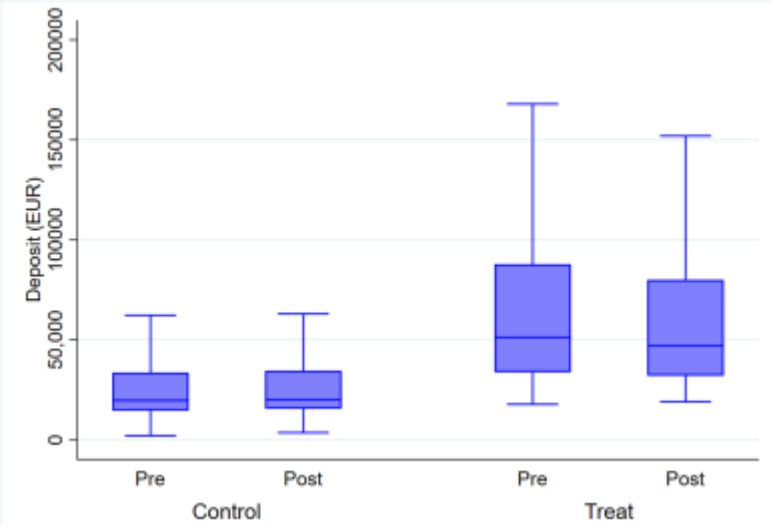
McCann and Singh (2023) uncover these "liquidity retention" behaviours by conducting an event study of enhancements in the size of Ireland's "Help to Buy" housing subsidy for FTB borrowers. Help to Buy was first introduced in 2016. In 2020, an enhancement increased the maximum subsidy amount by 50%. The authors study whether borrowers altered out-of-pocket downpayment, loan size, LTV ratio or purchase price after the enhancement, relative to a control group. The study concludes that the largest response is a reduction in out-of-pocket downpayment, indicating a strong preference to retain liquidity. As an alternative response, these borrowers could have continued to post a similar amount of own-cash downpayment, and boosted it with the enhanced subsidy, to purchase more expensive property. The results are shown to be robust across the income distribution of borrowers.

[10] By contrast, during the mid-2000s, downpayment requirements between 5% and 8% were common, and a small number of borrowers made no downpayment at all.

McCann and Durante (2022) study the increase in LTV limits for a group of FTB borrowers in 2017. Affected borrowers overwhelmingly moved to borrow at the new LTV limit of 90% in response to the loosening. Causal inference is facilitated by the existence of a control group of FTBs who were unaffected by the policy change. Again, the authors study whether this change was driven by a lowering of the downpayment amount, a change in the loan size, or an increase in the property price. As in the previous study, the principal response by affected borrowers was to reduce downpayments, indicating more cash retention, rather than to purchase more expensive properties. The authors conduct tests to show that the result is not explained by the continued applicability of the LTI limit, which may have disrupted borrowers in leveraging up to purchase more expensive homes, bolstering the case that liquidity constraints are an important feature in borrowers' response to policy changes. The key mechanism is visualised in Figure 5, where downpayments fall among treated borrowers, but do not change on either side of the policy change for the control group (i.e. those accessing less expensive properties).

FTB borrowers who could access a higher LTV ratio in 2017 responded by reducing downpayments

Figure 5: The changing downpayment distribution of FTB borrowers, before and after the loosening of the LTV limit for some borrowers in 2017



Source: McCann and Durante (2022).

Notes: Based on home loan mortgage issuance to FTB borrowers for home purchase between February 2015 and December 2016 ("Pre") and between January 2017 and December 2018 ("Post").

Lesson 3: There are distributional differences in how households have adapted to the measures

Borrower-based measures do not have the same impact on all households. Like other changes in banks' credit supply, borrower-based measures are likely to constrain prospective borrowers with lower income or wealth more directly, by limiting their capacity to take on relatively large amounts of debt. These effects can be particularly visible in cases where house prices are high relative to incomes, as is the case in Dublin and many other cities globally. These effects were part of the motivation for the inclusion of allowances in the Central Bank's mortgage measures framework, to allow flexibility to lenders to lend above the limits in creditworthy cases, according to their own lending standards. In Ireland, lower-income households responded to the initial policy tightening by buying less-expensive properties, whereas higher-income households responded to tighter LTV requirements by posting larger downpayments and maintaining their purchasing power in the housing market.

The income and wealth profiles of borrowers determine their available responses to mortgage measures, and research would be expected to point to different responses across households depending on their financial circumstances. In Ireland, Kinghan et al. (2022) conducted an event study of the introduction of the mortgage measures. They exploit the differential treatment in the FTB market in 2015, whereby lower-priced properties had a flat LTV limit of 90%, whereas higher priced properties had a "sliding scale" imposing tighter LTV limits on more expensive properties. Using quasi-experimental techniques, they show that large reductions in LTV ratios were observed in the treated group of more expensive properties. Importantly from a distributional perspective, they also uncover differences across the income distribution. Higher-income borrowers respond to tighter LTV limits by maintaining the value of property purchased, and meeting the tighter LTV limit through increases in downpayment values. Lower-income borrowers, presumably without access to the same resources, comply with the tighter LTV limit by reducing the purchase price of the property.

These findings are consistent with previous literature on the effect of credit conditions more generally – typically, when banks have a greater risk tolerance, often coinciding with easier financing conditions, lower income households disproportionally access additional credit. Analogously, a period of tightening credit appetite, whether driven by banks' responses to shocks or through regulatory policies, is typically associated with a disproportionate reduction in access to credit among lower-income households. Given these findings, changes in credit allocation dynamics, whether due to policy

intervention or not, have intrinsic distributional consequences. Lydon and McCann (2017) show that participation in the mortgage market across the Irish income distribution had followed exactly this pattern in the two decades preceding the introduction of the mortgage measures, with growing participation of lower-income households in the run-up to the GFC, followed by a reduction during the post-2009 period of balance sheet impairment among Irish banks.

Even in the absence of strong evidence on "extensive margin" changes in the profile of borrowers accessing the market, the aforementioned findings of Gaffney (2019), that those constrained at the LTI limit of 3.5 are systematically different on a number of dimensions to other borrowers, suggests the measures have had differing impacts that lead to different responses among lower-income and single-borrower households.

The increasing average age of FTB borrowers in Ireland since 2009, including during the mortgage measures period, may suggest further distributional impacts relating to challenges among younger households in entering the housing market (Gaffney and Kinghan, 2021). However, inference is problematic due to strong confounding factors that tend to have reduced the proportionate share of younger cohorts in overall housing transactions: the aging population, general housing affordability challenges, the legacy of weak mortgage and housing market functioning in the years immediately following the GFC, which led to pent-up demand for housing among relatively older cohorts, and a wider set of socioeconomic changes towards longer duration of education, later family formation, and more precarious working contracts.

Lesson 4: Borrower resilience benefits are almost certainly accruing, but can only be fully measured after adverse economic or financial shocks

The resilience benefits of mortgage debt limits are easier to measure during times when borrowers' financial capacity is under stress. Nevertheless, even after a period of high economic growth in Ireland, there are signs that borrower resilience has improved compared to a counterfactual with no mortgage measures. Evidence from the COVID-19 pandemic response in Ireland suggests that debt limits caused borrowers to rely less on post-hoc financial supports, in particular mortgage payment breaks.

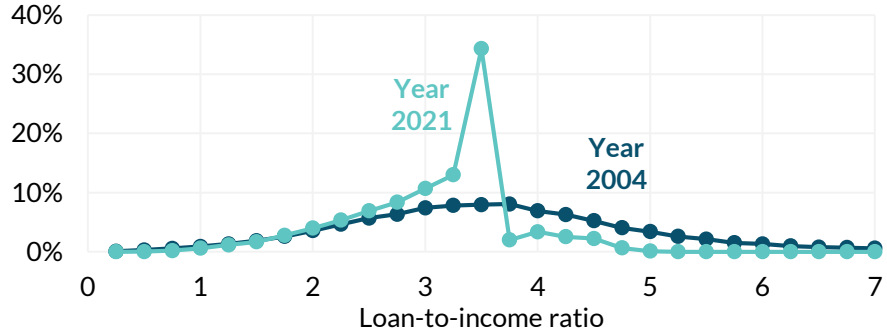
The Irish economy has been in a period of sustained growth since the introduction of the mortgage measures in 2015. Unemployment has been on a downward trajectory and in recent years has been close to or below 4%, while

mortgage arrears and non-performing loans at retail banks have fallen steadily throughout the lifetime of the policy. In such a setting, without widespread income shocks, it is difficult to scientifically assess the resilience benefits of macroprudential debt limits. Such an assessment would require the observance of borrower transitions into financial distress in the presence of a shock, and an appropriate counterfactual distress rate for a similar shock, in the absence of debt limits. As is often the case in macroeconomic policy analysis, such experimental settings are hard to come by.

In the absence of widespread shocks and counterfactuals, one can monitor the distribution of new lending for hints as to the improved borrower resilience that owes to the mortgage measures. Figure 6 shows the distribution of LTI ratios on new loans in 2021, compared to new lending during 2004, when aggregate HPI ratios were similar but prior to the mortgage measures. If one adopts simplifying assumptions in order to treat the 2004 distribution as a counterfactual, the resilience benefits of the measures are clear: lending that would, in the absence of the measures, have happened at LTI levels between 3.5 and 5.5 has mostly occurred at an LTI of exactly 3.5. All else equal, these lower originating LTIs should improve borrowers' resilience amid adverse shocks to repayment capacity.

One in three borrowers accessed LTI ratios between 3.25 and 3.5 in 2021

Figure 6: Distributions of LTI ratios on new mortgage issued in 2004 and 2021



Source: Central Bank of Ireland (2022b).

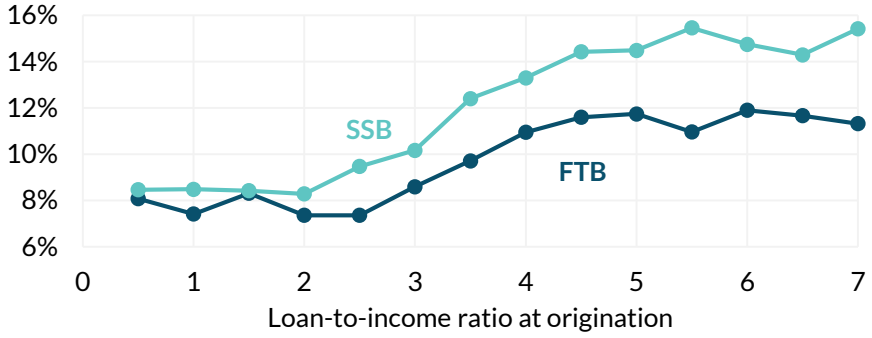
Notes: Based on home loan mortgage issuance during 2004 and 2021. Percentage of loans at each point of the LTI distribution; each point depicts a band of LTI ratios of width 0.25.

While mortgage arrears and defaults have been low and steadily falling since the mortgage measures were introduced, the COVID-19 pandemic does offer a test of the resilience benefits of the mortgage measures. Gaffney and Greaney (2020) study the take-up of mortgage moratoria, which began in April 2020, and which allowed no-questions-asked payment breaks of three months, later extended to six months. Figure 7 shows that utilisation rates of payment

breaks by June 2020 were rising in conjunction with originated LTI ratios. This was also true within the loan cohorts originated before and after the mortgage measures in 2015, and suggests that those taking on larger debts relative to their income were those who needed payment support most acutely once this income shock hit.[11]

Mortgages originated at higher LTI ratios were more likely to take payment breaks after the onset of the COVID-19 pandemic

Figure 7: Share of mortgages taking COVID-19 payment breaks in March-May 2020, by originated LTI ratio



Source: Gaffney and Greaney (2020).

Notes: Outstanding home loan mortgages as at June 2020. Each point depicts a band of LTI ratios of width 0.5.

Although the correlation is strong, it cannot be shown conclusively that higher indebtedness led to greater demand for payment relief, because borrowers with higher pre-existing sensitivity to income shocks, or other characteristics associated with greater credit risk, may also have been those most likely to choose larger loans relative to income at the time of origination. Gupta and Hansman (2022) estimate that about half the correlation between leverage and mortgage default is caused by the leverage burden itself, while the other half is explained by these adverse selection effects.

Lesson 5: The housing market matters greatly for calibration, but cannot be the subject of policy targets

Mortgage measures cannot control house prices, which are driven by a range of demographic, institutional and broader economic factors. However, the structural increase of house prices relative to incomes has had an important bearing on the degree to which mortgage measures in Ireland affected mortgage borrowers since 2015. This increase over time in the ”bindingness” of policy, in the context of increased resilience in the system since the

[11] For a discussion of the economics of debt relief in response to the pandemic, see Gaffney et al. (2021).

introduction of the measures, was reflected in the Central Bank's policy changes in 2022. By contrast, borrower-based measures can more directly target and affect the feedback mechanism between risky lending, expectations, and house price formation, and there is evidence that these channels have been substantially weakened in Ireland since 2015.

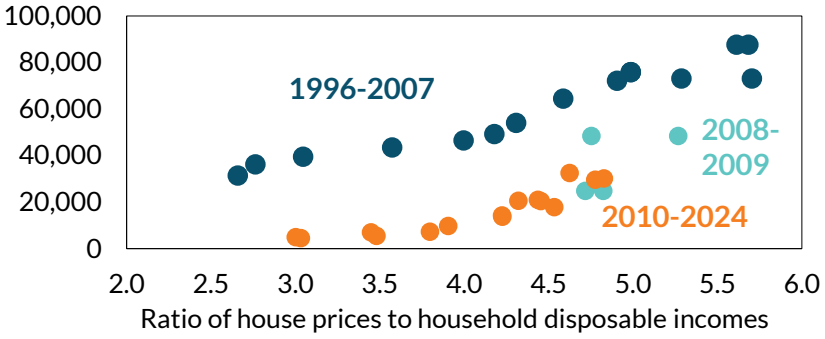
Lesson 5a: The wider housing market context has important implications for calibration of macroprudential mortgage measures

Given the importance of non-financial factors (government policies, regulatory issues, supply-side impediments to construction, demographics) in determining housing and mortgage market equilibrium, the calibration and communication of mortgage measures must reflect conditions in the housing market. The wider housing market context formed a key backdrop to the Central Bank's mortgage measures framework review in 2021-22 (Central Bank of Ireland, 2022b).

Changes in the housing supply environment have been a predominant focus of much internal research by the Central Bank, as well as external research commissioned to better understand the wider context in which the mortgage measures are calibrated. Kennedy and Myers (2019) highlighted a general reduction in new housing supply in Ireland after the 2000s. The latest available update of the analysis is shown in Figure 8.

During the 2010s and 2020s, fewer dwellings have been completed per year than during the 2000s, for a given house price-to-income ratio

Figure 8: Estimated dwelling completions and house price-to-income ratios, 1996-2024



Source: Kennedy and Myers (2019), updated to 2024 based on internal Central Bank calculations.

Notes: The horizontal axis depicts the estimated ratio of average house prices to household disposable incomes. The vertical axis depicts estimated housing units completed per year, based on electricity connections net of average non-dwelling completion connections. House price series are taken from PTSB/ESRI (1996-2009) and CSO (2005-2024); both estimates are included where they overlap in 2005-2009.

For a given level of HPI, fewer houses were being delivered after 2013 compared to the period before 2008. Coupled with strong growth in demand owing to demographic changes, this caused average affordability of housing (both rented and owned) to become more stretched, when comparing rents and house prices to average incomes. Lyons and Günnewig-Mönert (2024) formally investigated the evolution of housing supply elasticity in Ireland and found that the price elasticity of supply remained relatively stable through time, and that the rapid increase in construction costs net of tax that were experienced after the GFC was a key contributory factor to weaker supply of property during the lifetime of the mortgage measures.

When considering the costs imposed by the mortgage measures, the Central Bank's mortgage measures framework focuses both on temporary macroeconomic costs outlined in Aikman et al. (2021), including liquidity constraints, weaker consumption of moving-related goods, fewer transactions and employment in the housing market, and less equity-related borrowing for consumption, as well as longer-term costs related to access to wealth accumulation through housing and the cost of housing over the lifecycle due to reduced homeownership (Central Bank of Ireland, 2022b). This analytical framework allowed the Central Bank to conclude in late 2022 that, given the policy space afforded by the increase in resilience of borrowers and lenders since the introduction of the measures, an increase in the LTI limit could offset some of the costs of the mortgage measures, in particular relating to access to the housing market for FTBs and transaction levels within the housing market. This is particularly true when market-wide HPI ratios are rising for structural, long-term reasons that are unlikely to unwind, meaning that a fixed LTI ratio is becoming more binding over time.

Lesson 5b: Macroprudential policymakers cannot, and should not, target house prices

House prices result from a complex combination of a wide variety of economic, demographic, financial, and public policy forces. While mortgage measures will exert influence on house prices through direct borrower payment capacity channels as well as through dampening expectations, it is beyond the reach of such tools to control the path for house prices or steer them towards a particular target. In the Irish example, despite the existence of the mortgage measures, which undoubtedly cooled house price growth when compared to a counterfactual without macroprudential intervention, house prices still grew in nominal terms by 64% from 2015 to 2022, leading to an increase in average HPI ratios from 3.8 to 4.4. A wide range of demand-side and supply-side forces

exerted influence on house prices during this period, including factors on which mortgage measures have little to no effect.

Lesson 5c: The more appropriate policy target for macroprudential mortgage measures is the amplification channel between risky lending, expectations and house prices.

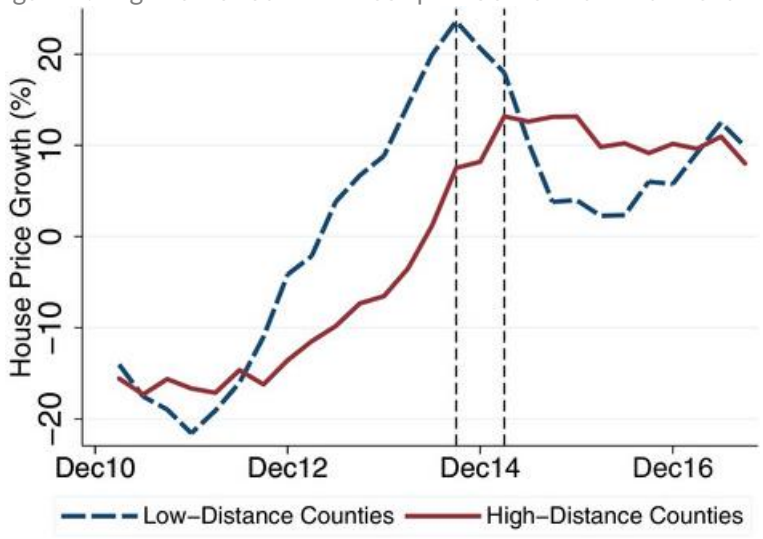
As mentioned above, the mortgage measures coincided with a period of long-running structural increases in house prices relative to incomes in Ireland. However, the aim of Ireland's mortgage measures is not to control house prices, but rather to impede a potential damaging and self-reinforcing relationship (a "spiral") between mortgage credit and house prices, such as that which played a central role in the GFC.

A range of evidence suggests that house price growth would have been stronger and more closely correlated with loosening credit conditions in the absence of the measures, even though counterfactuals are difficult to construct and the range of uncertainty is wide. Various time series approaches from Central Bank economists and researchers at Ireland's Economic and Social Research Institute suggest that house prices would have been significantly higher relative to incomes in the absence of the mortgage measures. Macro-financial modelling of the Irish economy finds that the calibration of LTV and LTI limits probably contributed to lower house prices in both the short- and long-term, by changing the affordability and leverage constraints on demand for new mortgages (McInerney, 2020).

Acharya et al. (2022) exploit regional variation in house prices after 2015 to reinforce the point. Markets with pre-debt-limit credit conditions closer to the limits imposed in 2015 (those with less "slack" or "distance" to respond to the tightening limit) experienced a stronger cooling in house price growth after 2015, relative to the control group of less-affected local markets (Figure 9).

Mortgage measures had a stronger effect on regional housing markets with credit conditions closer to the limits after 2015

Figure 9: Regional variation in house prices around the introduction of mortgage measures



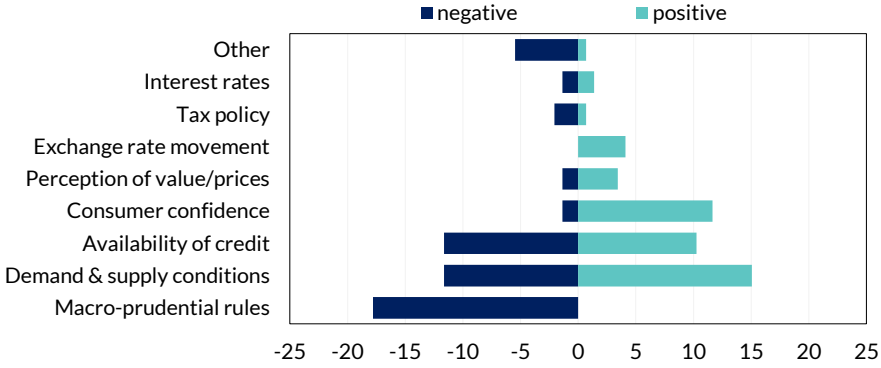
Source: Acharya et al. (2022), based on Central Bank of Ireland and Daft.ie data.

Notes: The graph shows the evolution of annual house price growth between January 2011 and June 2017 for "low-distance" and "high-distance" counties, grouped based on whether they are below or above the median across counties. Distance is defined as the gap between LTV and LTI ratios in 2014 and the limits imposed by the Central Bank in 2015. Vertical dashed lines indicate the first public discussion about the limits and their implementation date.

Finally, surveys of property market professionals provide evidence that, when the measures were introduced in 2015, they had an immediate cooling effect on house price expectations (Figure 10). Given the role of expectations and exuberance in housing booms, these are particularly important mechanisms through which mortgage measures act to stabilise the housing and credit cycle and mitigate GFC-type boom-bust episodes over the long run. The conceptual framework adopted during the framework review and outlined in Aikman et al. (2021) also highlights the importance of system-wide, long-term stabilisation of the housing and mortgage markets as being the most salient macro-financial benefit of having mortgage measures in place.

Mortgage measures had a cooling effect on house price expectations

Figure 10: Drivers of property market expectations in Ireland in 2015



Source: Central Bank of Ireland & SCSI survey of property professionals, 2015 Q1.

Notes: Chart summarises 146 factor responses from 72 respondents. The horizontal axis depicts the percentage of respondents who named a factor as having an impact on the property market during the following 12 months, broken down into negative (left-hand side) and positive (right-hand side) impacts.

Lesson 6: Borrower-based measures that cover non-bank mortgage lending provide important benefits, particularly when cyclical risks are building

Non-bank lenders have played an increasingly important role in Ireland and many economies since the global financial crisis. There is evidence from global literature that they can amplify risk-taking cycles when financial conditions are accommodative.

In Ireland, several non-bank lenders entered the mortgage market during the late 2010s, and gained substantial market share at low interest rates, particularly in 2021 and 2022. The comprehensive nature of the mortgage measures in Ireland ensured that these lenders could not also avail of riskier LTI and LTV ratios as a further margin for competition, ensuring the maintenance of sustainable lending standards across the mortgage market.

The Central Bank implemented mortgage measures as a regulation which applied to all *regulated financial services providers*, including non-bank lenders.[12] Non-bank lenders played a small role in the mortgage market prior to the introduction of the measures, generally specialising in niche segments not widely served by the main retail banks, such as life loans, sub-prime lending and large-value residential investment.

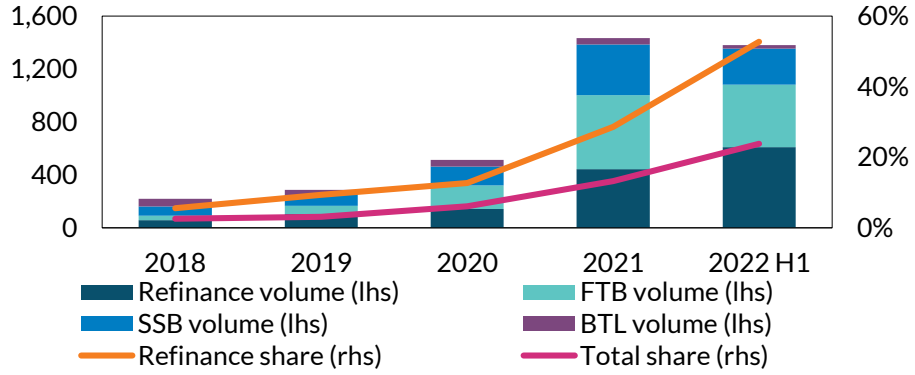
However, following a global trend, non-bank lenders expanded their share of new mortgage lending in Ireland during the period of quantitative easing and

[12] See *Central Bank (Supervision and Enforcement) Act 2013 (Section 48(1)) (Housing Loan Requirements) Regulations 2022 (S.I. No. 546 of 2022)* for the most recent regulations.

low interest rates globally. In particular, in the late 2010s, non-banks began to offer competitive pricing in mainstream mortgage market segments, such as loans to owner-occupiers for home purchase and switcher refinance (Gaffney et al., 2022). Figure 11 shows the pace of growth of non-bank lenders' market shares, particularly in the refinancing segment, where their rates were most competitive prior to the change in the monetary policy environment.

Non-banks grew mortgage market share in Ireland, particularly in the mortgage refinance segment

Figure 11: Share and lending volume of non-banks in new mortgage issuance, by segment, 2018 (full year) to 2022 H1
Millions of euro



Source: Central Bank of Ireland *Financial Stability Review* 2022:II.

Notes: Market segments FTB, SSB and BTL cover property purchases. Refinance covers borrowers who switch lenders without purchasing another property. Statistics for 2018-2021 cover the full year, while the statistic for 2022 H1 covers the first six months of the year only.

A growing body of research suggests that non-banks are important in driving the financial cycle, as their lending shares fell sharply during the GFC and Covid-19 pandemic and rose during cyclical upswings (Fleckenstein et al., 2021), and that they fill unmet credit demand that emerges when banks' credit supply is reduced (Gopal and Schnabl, 2022; Irani et al., 2021; McCann et al., 2023).

By covering all lenders offering mortgages, Ireland's mortgage measures arguably prevented the emergence of harmful competition based on excessively loose lending standards from non-banks. Counterfactually, based on the evidence in the literature, non-bank lenders may have offered LTV and LTI ratios above norms in the Irish mortgage market to gain market share while funding costs were low, an approach not available under Ireland's mortgage measures. This pattern also exhibits an important complementarity between macroprudential and monetary policies: while the latter facilitates easy financing in an attempt to stimulate economic activity, the former can act to

ensure that tail outcomes are avoided during the build-up phase when financing conditions are particularly loose.

3. Conclusion and questions for future research

Ireland's experience shows the value to policymakers of comprehensive granular data covering the markets for which they have responsibility. More detailed data enable a detailed and nuanced evaluation of the costs and benefits of policy actions. The research has used empirical identification strategies that are not feasible in overall cross-country comparisons, providing insights across the distribution of households and exploring channels that are unavailable in cross-country studies. For example, granular data allow a better description of the nature of downpayment constraints and their interaction with LTI limits, the variation in how different borrower groups respond to debt limits, and the increasingly binding nature of mortgage measures during a period of structurally-increasing HPI ratios.

The lessons learned from Ireland's mortgage measures prompt us to consider aspects which remain open for future research and consideration.

First, research could improve the measurement and communication of resilience benefits of mortgage measures throughout the economic cycle, especially at times when we cannot observe the aftermath of an adverse shock. During the past decade, economic stress has been lower among Irish mortgage borrowers compared to the period immediately after the GFC, which has made it more challenging to measure resilience benefits using empirical evidence.

Second, research is still far from being able to measure the costs and benefits of different policy options in a unified framework with a common unit of measurement. Progress towards this goal would improve the characterisation of aggregate benefits and costs, especially in the presence of the different impacts across groups in society and at various times in the economic cycle.

Third, further research could assist policymakers in designing a clearly-understood strategy for the calibration of measures, to explain when and why policymakers would vary these structural features of the mortgage market.

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