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Mortgage servicing burdens and LTI caps

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Abstract

The Central Bank of Ireland regulates Loan to Income (LTI) ratios. The aim is to strengthen both bank and borrower resilience and to reduce the likelihood and impact of a credit-house price spiral emerging. However, the Central Bank also monitors many other measures of household vulnerability, including mortgage service to income ratios (MSTI). Using Irish micro data, we illustrate that mortgage service burdens vary for similar LTI levels due to underlying differences in origination interest rates and mortgage terms. We highlight the variation in origination servicing burdens through the interest rate cycle even within narrow LTI bands. We also show that servicing burdens on loans above the LTI limits are generally more sensitive to interest rate shocks than those below the limits.

1 Introduction

The Central Bank of Ireland regulates loan to income (LTI) at origination, with a mortgage limit of 3.5 times gross income.¹ However, understanding developments in other measures of household vulnerability and overlap with the regulated measure is important when monitoring household resilience to potential shocks. Loan affordability can be measured on the basis of the monthly serviceability of the mortgage relative to net income (MSTI) as well as on the basis of a gross income multiple (LTI).

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¹See [Central Bank of Ireland, Mortgage Measures](#)

The purpose of this paper is to highlight that origination MSTI varies for similar underlying LTI levels and that this relationship can change through time with the interest rate environment and other financial conditions such as taxation. Therefore, in setting an LTI limit, macroprudential authorities need to remain cognisant that borrower vulnerability may vary with changing financial conditions, including the monetary policy cycle.

Using loan level data on Irish residential mortgages, we focus on the interest rate channel and show how origination mortgage servicing burdens have evolved over time and within narrow LTI bands. We also conduct interest rate sensitivity analysis that allows the macroprudential authority to keep track of potential build-ups in vulnerabilities, notwithstanding the LTI regulations.

Our main findings are as follows. Average originating mortgage service burdens (MSTIs) are much lower than pre-crisis levels in Ireland. To a large extent, this is due to the much lower level of LTI and interest rates now than pre-crisis.

The impact of the sharp drop in interest rates during the crisis can be observed within narrow LTI bands - for example, among loans originated with LTIs between 3.5 and 4.0, the average MSTI fell from roughly a third of net monthly income to a quarter in the space of two years during the rapid monetary easing after 2008.

During the more recent period, mortgage rates have gradually eased while the LTI rules have effectively constrained the upper bound of mortgage service burdens for an average interest rate and an average term. Average MSTIs have been stable therefore, while average LTIs have increased slightly.

We find that while borrowers who exceed the LTI limits tend to have higher mortgage service burdens, the relationship is not one to one: some of these borrowers have lower mortgage service burdens. At the same time, for a small proportion of borrowers, a low LTI level can be associated with a higher mortgage service burden.

Market participants expect monetary policy interest rates to stay low for a long period.² However, it is still worth exploring the resilience of mortgages to interest rate increases (e.g. via rising spreads charged by banks or if fixed rate contracts roll onto higher variable rates). We find that among mortgages originated between 2018 and the first half of 2019, under a 100bps shock, almost 90% of those with an LTI at or below the 3.5 limit would remain below 30% MSTI compared to 65% for mortgages originated above the LTI limit.

By documenting MSTI as well as LTI trends we provide rich evidence on potential vulnerabilities in the financial system and household sector, including loans that are within the LTI limits. This is relevant as any increase in debt servicing burdens could impact upon borrower vulnerability

²See [European Central Bank, Introductory Statement, 24 October 2019](#).

to default, as well as having wider macroeconomic implications via the reallocation of household resources between debt, consumption and savings.

2 Cross-country evidence on usage of LTI and DSTI regulations and related literature

Since the global financial crisis, macroprudential policy usage and analysis of borrower and lender targeted measures has increased. Borrower based LTV and DTI (debt-to-income) limits are used in about 64 per cent and 36 per cent of advanced economies respectively, as of 2017 (ESRB, 2016; [Cerutti et al. \(2017\)](#)).³

Numerous studies provide evidence on the effectiveness of borrower based measures. LTV and DTI caps are found to reduce the pro-cyclicality of credit and leverage ([Lim et al. \(2011\)](#)) and housing credit ([Kuttner and Shim \(2016\)](#); [McDonald \(2018\)](#)).⁴ Other studies provide evidence of the dampening effects of LTV caps on mortgage credit growth, credit appreciation ([Tressel and Zhang \(2016\)](#)), house prices ([Duca et al. \(2011\)](#), [Craig and Hua \(2011\)](#)) and transaction volumes ([Ahuja and Nabar \(2011\)](#)).⁵

The empirical assessment of combinations of borrower-based measures, mainly LTV with income measures (e.g. LTI), provides evidence of their joint effectiveness based on single and cross-country work ([Albacete et al. \(2017\)](#), [Carreras et al. \(2018\)](#), [Dietsch et al. \(2014\)](#), [Kelly et al. \(2018\)](#), [Neagu et al. \(2015\)](#)).

Choice of instrument varies across countries. Binding non-harmonised regulation of LTI is in place in Norway, Ireland, Slovakia and the UK, whereas DSTI limits are currently active in Cyprus, Estonia, Hungary, Lithuania, Poland, Portugal, Romania, Slovakia and Slovenia.

The measures are tailored to the specific characteristics of the national economies. They often operate in conjunction with other macroprudential policies addressing residential real estate (RRE) vulnerabilities, e.g. risk-weights, Loan-To-Value measures or amortisation requirements. They may vary with divergence in the availability of data to calibrate measures

³The usage of “macroprudential measures” has been wide-spread across Central, Eastern, and Southeastern European countries for the last decade; the usage of the measures for these countries was motivated by the need to manage national credit and housing cycles or by the harmonisation of banking regulation that accompanied EU accession or EU membership ([Vandenbussche et al. \(2015\)](#), [Galati and Moessner \(2018\)](#)).

⁴[McDonald \(2018\)](#) finds that tightening LTV and DTI ratios tends to be more effective than loosening them, and tightening measures have greater impact when credit is expanding quickly and when house prices are high relative to income ([Cassidy and Hallissey \(2016\)](#)).

⁵[Ahuja and Nabar \(2011\)](#) and [Igan and Kang \(2011\)](#) find that tighter caps curb expectations on house price increases and, consequently, property activity, or rather, transaction volumes.

and different country-specific risk-factors (e.g. a DTI rather than LTI limit might be essential if consumer credit represents a significant share of household debt). Calibration of LTI and MSTI (or DTI and DSTI) limits varies widely across countries (see Figure 1). For instance, limits on DSTI of between 45 and 50 percent of net income apply in the Czech Republic, Estonia and Portugal but definitions and allowances differ in each country.

3 Data

In this work, LTI is calculated as the ratio of the mortgage loan to borrowers' gross annual income at origination whereas MSTI is calculated as the ratio of the mortgage instalment to borrowers' estimated net annual income at origination.⁶ Throughout the analysis mortgage service burdens refer to origination features of newly issued mortgages.⁷ The only exception is where we test the interest rate sensitivity of mortgage servicing burdens in section 5.

Our dataset consists of micro data for the Irish residential mortgage market covering the time period between 2003 and 2019. We combine two data sources.⁸ The first one is the Central Bank of Ireland's Loan Level Data (LLD). The lenders who submit this data account for roughly ninety per cent of the Irish residential mortgage market. The data have been explained in detail by Kennedy and McIndoe-Calder (2012) and used subsequently in a number of mortgage default analyses (Kelly, 2011; Lydon and McCarthy, 2013; McCarthy, 2014; Kelly et al., 2014).

The second source is loan-by-loan data from financial institutions submitted to the Central Bank of Ireland in a return to monitor compliance with the mortgage Regulations ("SI 47 Monitoring Template"). This return is only required of those financial institutions that advance at least €50 million of new mortgage lending in a six month period (January to June or July to December). Both datasets include both borrower-level and loan-level information, e.g. age, borrower status (FTB, SSB, BTL), loan size, deposit etc. .

The LTI regulations apply to new private dwelling home (PDH) lending and exclude mortgage switchers without an increase in loan value and buy-to-let (BTL) investors. We therefore exclude BTL mortgages and switchers from our sample. We also exclude top-ups as we are mainly interested in newly originated loans.⁹ We only consider banks that have submitted

⁶We apply tax rates and social insurance contributions to the gross income measure contained in the dataset.

⁷Current' mortgage service burdens generally differ from origination MSTI as both income and loan value may change after origination due to income growth, unemployment shocks, amortisation etc.

⁸The data from the LLD dataset cover the time period between 2003 and 2014 whereas the information derived from the Monitoring Templates data covers the years between 2015 and 2019 half one, the years after the introduction of the Macroprudential regulations.

⁹Rerunning the analysis to include these loans does not change the results in any meaningful way.

this data consistently throughout the period under consideration (three banks), leaving us with a sample of just over 300,000 observations.¹⁰

4 MSTI evolution over time and overlap with LTI

We first consider the evolution of mortgage service burdens and loan-to-income ratios over time for Private Dwelling Homes (PDH).

MSTI peaks in 2008 and decreases afterwards (Figure 2). The distribution also varies over time. The drop after 2008 largely reflects the sharp reduction in LTI as well as interest rates during the crisis. Among borrowers in the top 10 per cent of the distribution, MSTI reached a level of over 40% in 2008 but has stabilised at around 30% since 2015.

Since the introduction of the borrower-based measures, while MSTI has been stable, average LTI has increased slightly (Figure 3), moving closer to the limits introduced by the macroprudential regulation.¹¹ The main reason behind this divergence appears to be the gradual reduction in mortgage rates in recent years; the pass-through of monetary policy rates to lending rates impacts debt payments relative to income whereas it does not affect measures like the loan-to-income ratio.¹²

Next we consider the variation in MSTI across time within LTI bands. By doing so we seek to understand variation in repayment burdens across the cycle that is consistent with steady LTI levels and the LTI limits.

Figure 4 shows that lending in higher LTI bands is generally associated with higher average MSTIs. However, borrowers with an LTI close to, but below, the limits introduced in 2015 (i.e. 3 to 3.5), carry a mortgage-service burden which is, on average, only slightly lower than that of borrowers with allowances just above the LTI limit (i.e. 3.5 to 4.0). These borrowers also have slightly shorter loan terms, on average, than those above the LTI limits (Figure 5).¹³

¹⁰As with all analysis using loan level data, survival bias can arise (i.e. lower value loans may have been repaid and fall out of the data from earlier years).

¹¹[New Mortgage Lending - Data and Commentary](#).

¹²As per Fahy et al. 2018, the pass through relationship between the SVR and the policy rate in the Irish market is quite complex. A number of studies (Goggin et al. (2012) and McQuinn and Morley (2015)) conclude that the monetary policy transmission mechanism, i.e. the extent to which European policy rates influence domestic mortgage rates, broke down in the aftermath of the financial crisis. The reasons for this are primarily concerned with the many legacy issues arising in the Irish banking sector after the financial crisis.

¹³The LTI rules have broader aims including strengthening borrower resilience to shocks (such as income and house price shocks) and reducing the likelihood and impact of a credit-house price spiral emerging.

The chart also illustrates the range of MSTI variation we can expect through the interest rate cycle even within narrow LTI bands. For instance, among loans originated with LTIs between 3.5 and 4.0, the average MSTI fell from 32% to 24% in the space of two years during the rapid monetary easing after 2008. The average loan term was relatively flat for this group during that same time period (Figure 5).

Average loan terms increased more generally in Ireland in the run-up to the crisis before falling in subsequent years (the 'overall' line in Figure 5). Since the introduction of the mortgage Regulations in 2015, average term is flat to lower across most LTI bands albeit increasing marginally for the group with LTIs above 4.0 in the last year or so.

Table 1 provides another way of looking at the interaction between MSTI and LTI bands, focusing on the distribution of MSTIs per LTI band. The table considers mortgages originated between 2018 and the first half of 2019.

The first thing to notice is that the vast majority have a MSTI lower than 0.30 (i.e. 30 per cent of net income) in 2018/19. What the table generally illustrates is that while borrowers who exceed the LTI limits tend to have higher mortgage service burdens, the relationship is not one to one: some of these borrowers have lower mortgage service burdens and this may relate to choice (bank or borrower) around interest rates and term. At the same time, for a small proportion of borrowers, a low LTI band can be associated with a higher mortgage service burden.

Among loans originated in 2018/19, 27% of those above the LTI limit had a mortgage service burden of over 30%. For loans with LTIs below 3 the vast majority have MSTIs below 20%. For loans with an LTI ratio close to but below the limits (3.0 to 3.5) 8% had a mortgage service ratio of above 30%. This latter group of borrowers is small, accounting for around 2.69% of total loans. These loans have shorter average loan term (26 years vs. 31 for other loans), higher borrower age (37 vs. 33 years old on average) and a larger share of SSBs (39 per cent vs. 18 per cent). This could reflect both borrower and bank choice: for example, older borrowers with other wealth and savings choosing a shorter loan term. Overall, the LTI policy framework appears to capture the bulk of risks given the small share of these borrowers, the fact that they are more likely to have a higher stock of savings (because of their age) and the fact that they are less sensitive to interest rates (because of lower terms).

5 Potential Vulnerabilities

In this section, we conduct interest rate sensitivity analysis for mortgage servicing burdens, focusing in particular on new lending above the LTI limits.

The central expectation among market participants is that monetary policy interest rates will stay low for a long period. Nonetheless, borrower servicing burdens could increase if banks increase the spreads they charge on variable rate loans or as mortgage fixation periods expire and borrowers roll to potentially higher variable rates. Even if these changes are not associated with additional defaults, they may have macroeconomic implications by allocating resources towards debt service, at the expense of either consumption or savings (non-housing related).

At the borrower level, the literature has established a relation between higher interest rates on loans, i.e. higher repayments, and the likelihood of entering arrears or spending less on other commodities (Byrne et al. (2017), Abel and Fuster (2018), Fuster and Willen (2017), Di Maggio et al. (2017)). In all these cases higher repayments are shown to potentially damage the aggregate economy.

Borrowers on floating rate mortgages are sensitive to potential interest rate shocks, whereas those on fixed rate loans are protected from interest rate changes until the end of the fixation period. In Ireland, as at June 2019, around two thirds of the PDH mortgage stock was on a floating rate (variable, tracker or up to one year fixed rate).¹⁴ While fixed rate mortgages have increased to almost four-fifths of new lending (June 2019), these products are fixed for relatively short terms (generally 5 years or less).¹⁵

To reflect this higher sensitivity to interest rate shocks, the simulations that follow apply shocks to both new loans originated on variable rates and products that are fixed for only one year (i.e. floating rate). Incomes are assumed to remain constant. Table 2 illustrates the percentage of loans originated in 2018/19 where the MSTI lies above 30 per cent after applying progressive interest rate shocks to floating rate loans. The first row is as a percentage of floating rate loans and the second row as a percentage of all newly-issued loans (all fixed and floating rate loans).

Under a 200 basis point increase, just over a third of floating rate loans and almost a fifth of all loans would face a MSTI of over 30 per cent. This compares with 72 per cent and 69 per cent respectively in 2007/08. Given the slope of the yield curve, our analysis suggests that the potential for large volumes of loans to transition into this “higher burden” group is relatively limited in the coming years.

The approach in Table 2 does not tell us how far mortgage service burdens extend beyond 30 per cent or distinguish between loans above and below the LTI limits. Figure 6 and Figure 7 plot the distribution of mortgage service burdens, after applying progressive interest rate shocks to floating rate loans, split by whether the LTIs are “at or below” the limits, or above

¹⁴See [Central Bank of Ireland, Private Household Credit and Deposits](#).

¹⁵See [Household Credit Market Report 2019](#).

them. The sides of the box identify the *25th* and *75th* percentile of the distribution whereas the box mid-line identifies the median (whiskers identify adjacent values). For loans at or below the LTI limits, even after a 200 basis point shock, the *75th* percentile remains at 0.27. Whereas for loans within the allowance group, a shock of 100 basis points would shift the *75th* percentile to around 0.32 and a shock of 200 basis points would shift the *75th* percentile to around 0.34. These shocks are extreme relative to market expectations for euro area interest rates in the coming years, however, within the group above an LTI of 3.5, debt service will require close monitoring. Some of these borrowers may also roll from cheaper fixed rates to higher variable rates once their fixation periods expire.

Overall, these results suggest limited consequences from a wider financial stability perspective. They point to the benefits of ongoing monitoring of mortgage service in addition to the LTI regulations, which guard against broader factors including borrower vulnerability to income and house price shocks.

6 Conclusion

We provide a first analysis of the variation of mortgage service to income ratios (MSTI) across the interest rate cycle and within tight LTI bands. We illustrate that the MSTI/LTI relationship is not one for one, reflecting the differences in interest rates and loan term embedded in the calculation of MSTI.

We find that average MSTIs have been stable in Ireland in recent years, partly reflecting lower interest rates, while average LTIs have risen slightly as the macroprudential measures have become more binding.

Considering the interaction between LTI and MSTI, our findings suggest that under the new macroprudential regime, by complying with the LTI rule and taking an average term and an average interest rate, most borrowers are well below a 30 per cent MSTI threshold. There is only a small group of households with LTIs below the macroprudential limits but with MSTIs above 30 per cent. These borrowers tend to be older with shorter mortgage terms. Given the small share of these borrowers, the fact that they are more likely to have a higher stock of savings (because of their age) and the fact that they are less sensitive to interest rates (because of lower terms), this group does not appear to present wider financial stability risks.

While interest rates look set to remain low for a long period, we examine whether in principle certain cohorts of borrowers (such as those above the LTI limits) could be more vulnerable to potential increases in mortgage service burdens, notwithstanding the LTI regulations. Our results suggest that most borrowers' mortgage service burden would remain below 30

per cent after a shock of 100 basis points on interest rates but the group with allowances above the LTI limits would appear to require the most careful monitoring.

Overall, our findings illustrate that where a macroprudential authority sets an LTI limit, it needs to be cognisant of variations in borrower vulnerability that arise due to changes in interest rates and the monetary policy environment even if it never directly regulates MSTI. Our work therefore points to the benefits of monitoring additional indicators of household indebtedness in addition to the chosen macroprudential policy measure.

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Figures and Tables

Figure 1: Borrower-based macroprudential measures

(a)

Instrument type	Cyprus	Czech Republic	Estonia	Hungary	Ireland	Lithuania
LTI / DTI		9 on net DTI			3.5 on gross LTI	
MSTI / DSTI	80% "net disposable income", 65% for FX loans.	45% net annual income	50% net income, calculated using higher of loan contract rate +2% or annual rate of 6%	25%-60%, varies by currency, interest rate fixation period and borrower income		40% net income, allowances apply

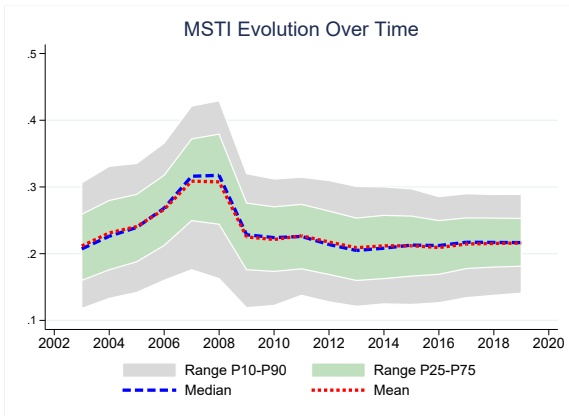
(b)

Instrument type	Norway	Portugal	Romania	Slovakia	Slovenia	United Kingdom
LTI / DTI	5 on gross DTI			8 on net disposable income based DTI 8		4.5 on gross LTI
MSTI / DSTI		50%, allowances apply	fx, interest rate and income risk rules for consumer loans	80% of disposable income assuming 2% rate increase	50% on monthly income <=€1,700 and 67% on any income exceeding EUR 1,700 (per borrower)	

Source: ESRB overview of macroprudential measures database and authors calculations on a best-effort basis. For full details see: https://www.esrb.europa.eu/national_policy/other/html/index.en.html, LTI or DTI - Loan-to-Income or Debt-to-Income.

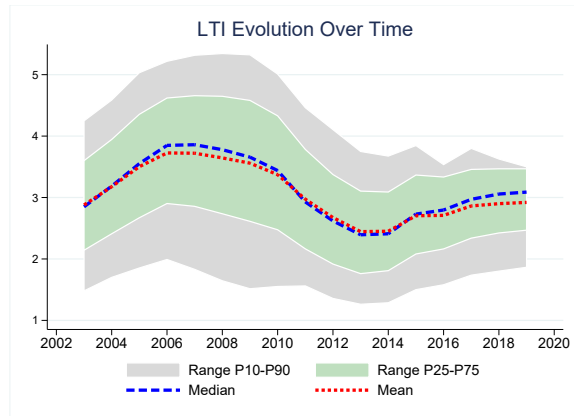
Allowances or exemptions apply in some countries and circumstances.

Figure 2 | Origination MSTI evolution



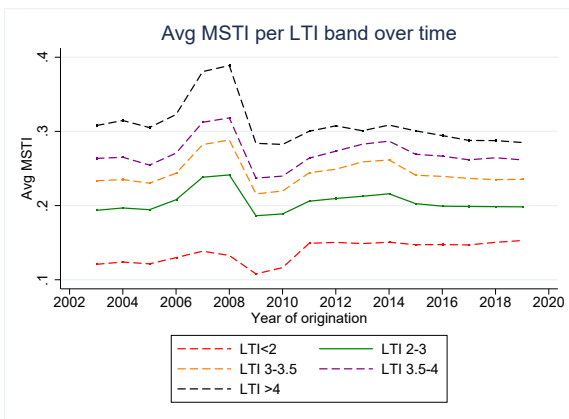
Source: Central Bank of Ireland, MTD data.

Figure 3 | Origination LTI evolution



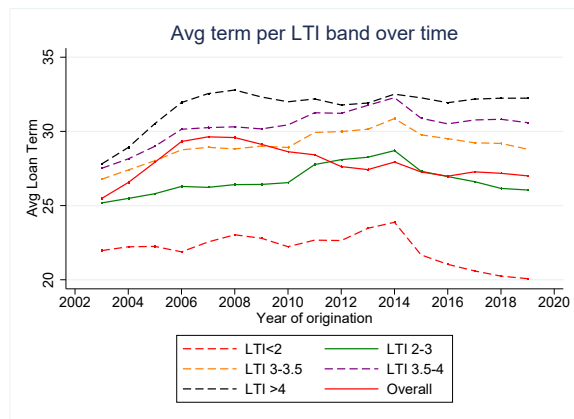
Source: Central Bank of Ireland, MTD data.

Figure 4 | Avg. Origination MSTI per LTI bands across years



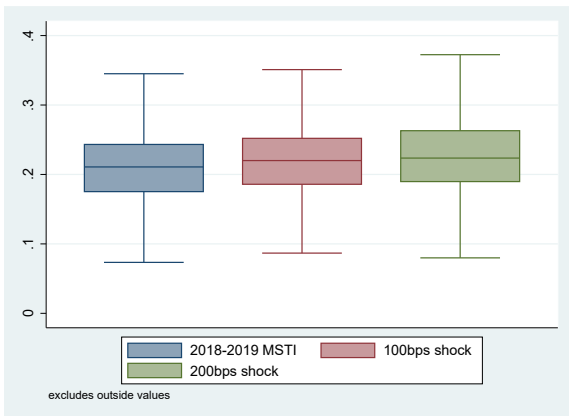
Source: Central Bank of Ireland, MTD data.

Figure 5 | Avg. Loan Term per LTI bands across years



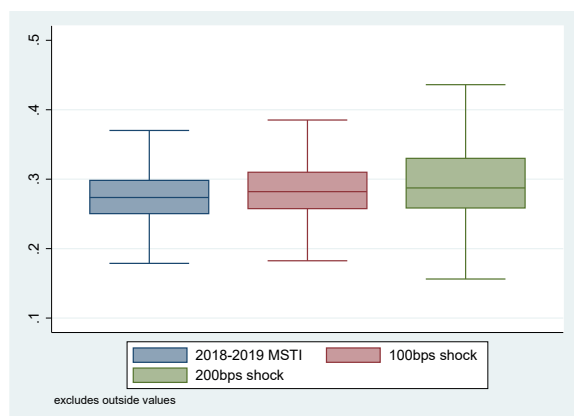
Source: Central Bank of Ireland, MTD data.

Figure 6 | MSTI distribution; all loans, floating rate loans shocked. LTI ≤ 3.5.



Source: Central Bank of Ireland, MTD data.

Figure 7 | MSTI distribution; all loans, floating rate loans shocked. LTI > 3.5.



Source: Central Bank of Ireland, MTD data.

Table 1 | Origination LTI MSTI Matrix 2018-2019H1 based on bands, percentages

	LTI < 3	LTI ≥ 3 to ≤ 3.5	LTI > 3.5	Total
msti < .2	63.52	16.14	3.20	36.98
msti ≥ .2 to ≤ .3	33.29	76.50	73.16	55.91
msti > .3	3.19	7.36	23.64	7.11
Total	100	100	100	100

Source: Central Bank of Ireland, MTD.

Table 2 | Percentage of loans with MSTI >0.3 for progressive interest rate shocks, 2018 and 2019H1

	current	1%	2%
Perc. Variable & 1 yr fixed	9.2	22.2	36.8
Perc. all loans	8.2	10.23	14.4

Source: Central Bank of Ireland, MTD.

