

THE MACROECONOMIC EFFECTS OF LTV AND LTI RATIOS IN IRELAND

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1. Introduction

In 2015 the Central Bank of Ireland introduced the maximum loan-to-value (LTV) and maximum loan-to-income (LTI) requirements for new residential mortgage lending (Cassidy and Hallissey 2016). The objectives of these measures are to increase the resilience of the banking and household sectors to shocks in the property market and to reduce the risk of future bank credit and house price spirals.

We examine the effects of the introduction of these measures using the Central Bank of Ireland Dynamic Stochastic General Equilibrium (DSGE) model. The advantage of a DSGE model is that it is, at least in principle, micro-founded, so that it can take into account the change in the behaviour of households induced by the introduction of macroprudential policies (is not subject to the Lucas Critique).

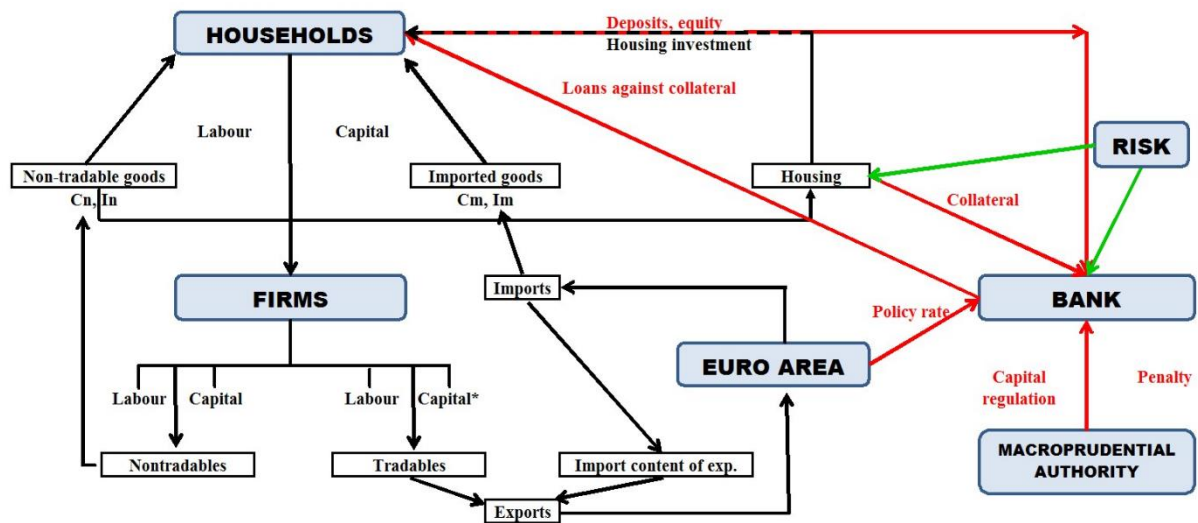
The main finding of this paper is that despite some contractionary effects, there is a significant reduction in leverage both in the short run and in the long run, resulting from lower indebtedness of households, banks, and the economy as a whole.

2. Model summary

The majority of the model is identical to the small open economy model of the Irish economy developed by Clancy and Merola (2014) and extended by Lozej, Onorante, and Rannenberg (2017). To this framework, we add several features to the model. First, we endogenise the housing supply by assuming that residential investment is subject to quadratic adjustment costs and consists of non-tradable goods only. The structure of the model is shown in Figure 1.

* Central Bank of Ireland. The views expressed here are those of the authors and do not represent the views of the Central Bank of Ireland or of the Eurosystem. We are grateful to Martin O'Brien, Fergal McCann, Yvonne McCarthy, Gabriel Fagan, Reamonn Lydon, Luca Onorante, Gerard O'Reilly and Conor O'Toole for comments and suggestions.

Figure 1: Structure of the model



Second, we create a role for the LTV and LTI regulation by assuming that households wish to stay away from the regulatory maximum, for instance to avoid the effort of applying for an exemption, for fear of the legal consequences of misreporting the financial situation to the bank, etc. Since the regulation applies only to new loans, we assume that households care about the weighted average difference, at origination, between the actual and the regulatory LTV across the stock of outstanding loans. (See Lozej and Rannenberg 2017 for derivations.)²

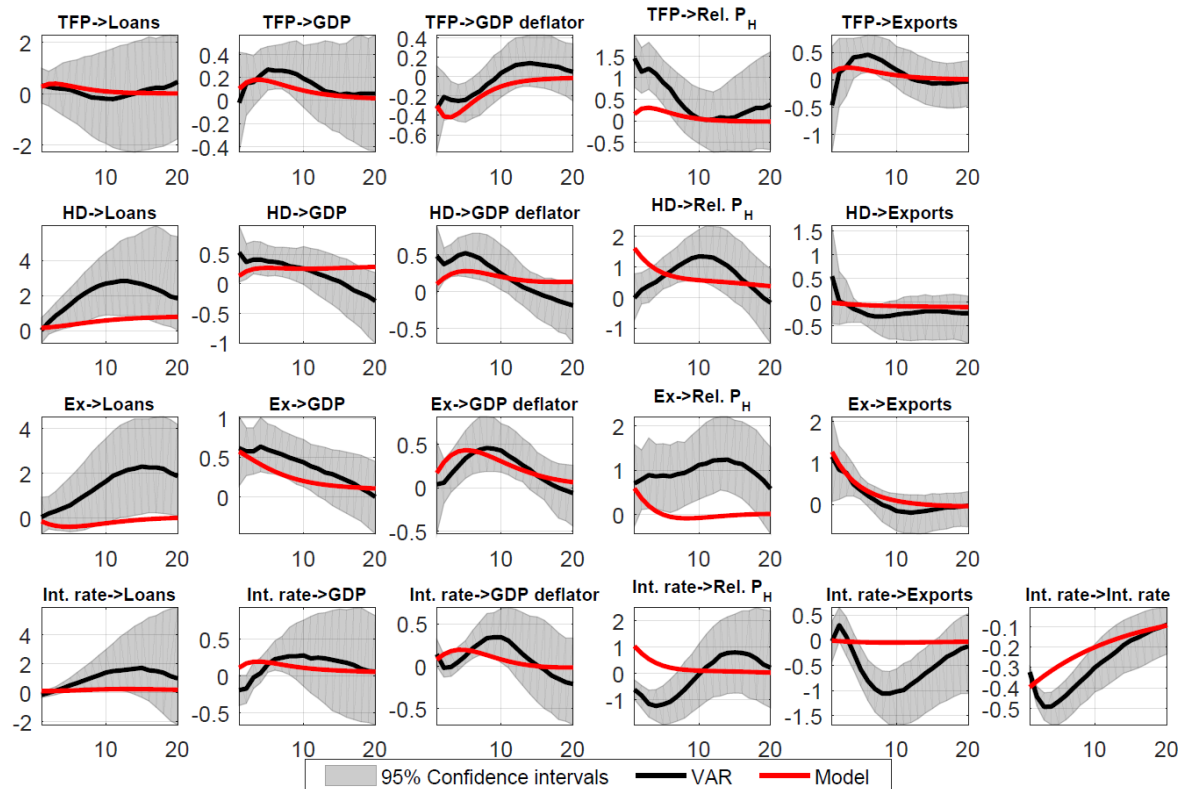
These assumptions imply that a change in regulation affects the households' incentive to borrow, as only a fraction of loans matures each quarter and, when rolled over, becomes subject to the regulation. We calibrate the fraction of maturing loans to match the average maturity of outstanding loans from loan-level data. The key parameters of the model have been estimated by matching the impulse response functions from an identified VAR model (Figure 2) and are reported in Table 1.

Table 1. Calibration

Parameter	Symbol	Value
Habit formation	χ	0.83
Housing demand elasticity	ν	1
Investment-adj. cost (housing)	$\xi_{I,H}$	12.2
Investment-adj. cost (non-residential)	ξ_I	3.0
Wage-adjustment cost	ξ_W	2000
Export-price-adj. cost	ξ_{XP}	160.6
Non-tradable goods-adj. cost	ξ_N	50
Non-tradable goods indexation	ω_{PN}	0

² See Beneš et al. (2016) for an example how LTV affects cyclical behaviour of the economy.

Figure 2: Impulse-response matching



Notes to Figure 2: All variables are in percent deviations from the initial value (or the steady state), except rates and ratios, which are in percentage points. Rates are annualised.

3. Simulation design

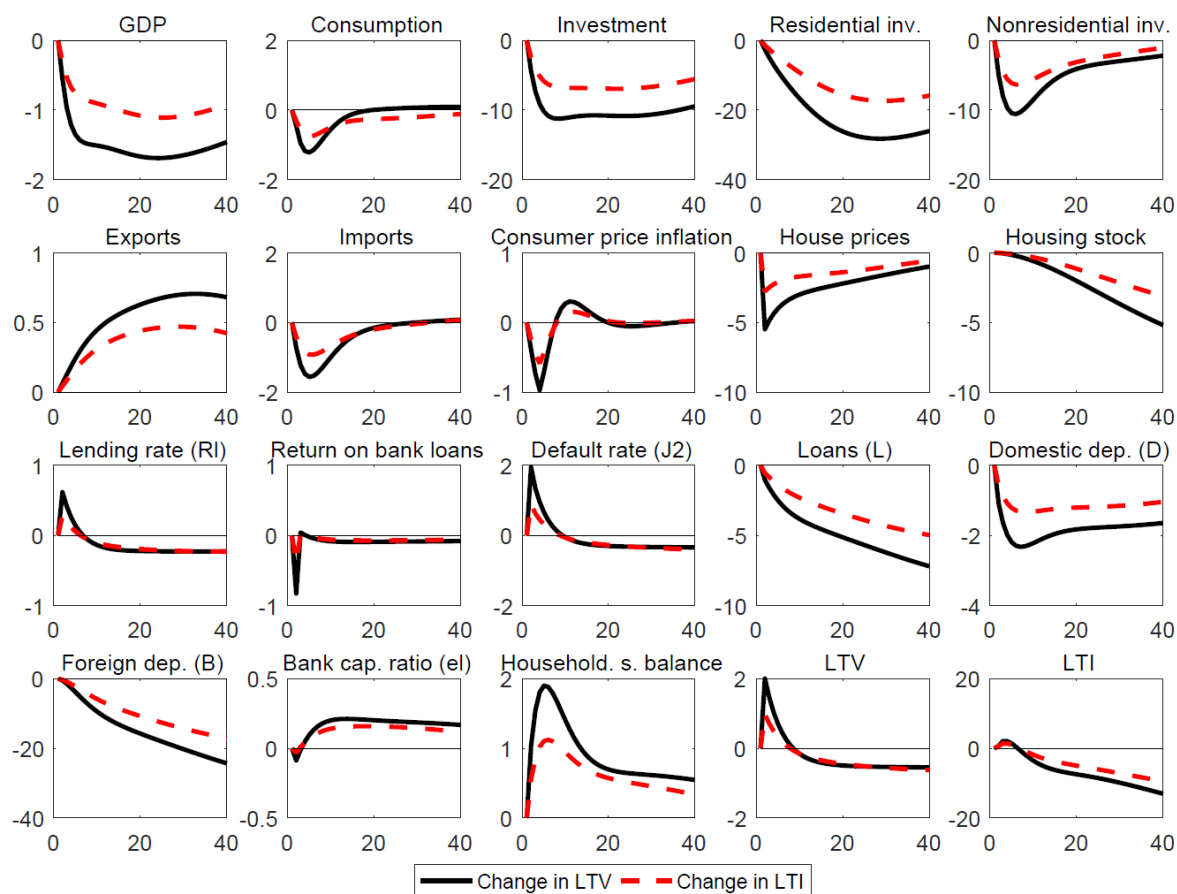
We simulate the introduction of the macroprudential regulation as a reduction in the maximum LTV ratio. Suppose the initial LTV ratio, LTV_0 , is set to be equal to the pre-regulation steady state, which does not bind. If the new, post-regulation, LTV is LTV_{NEW} , then we set $LTV_{NEW} - LTV_0 = 0.63$ p.p., which is computed from loan-level data as the difference between the median LTV at origination in 2015 and 2014 (i.e. before and after the introduction of the regulation). The assumption is that the 2015 decline in the LTV at origination was driven only by regulation.³ Note that once all loans have been rolled over, the average LTV has also declined by approximately 0.63 p.p. For comparison, we also investigate the alternative approach of capturing the regulation as a decline in the maximum LTI, LTI_t , where $LTI_{NEW} - LTI_0$ is calibrated in order to achieve the same effect on the average LTV as in the simulation where we reduce LTV.

³ All data are for in-scope loans for all borrowers, and for 2015, they are after the measures were introduced. The decline in the mean (0.41 p.p.) is not materially different from the median.

4. LTV and LTI reduction

Figure 3 shows the short and medium-run effects on the Irish economy of the regulatory LTV and LTI reductions and Table 2 shows the long-run effects.

Figure 3: Reduction in LTV and LTI



Notes to Figure 3: All variables are in percent deviations from the initial steady state, except rates and ratios, which are in percentage points. Rates are annualised.

A reduction in the regulatory LTV implies that households get closer to the regulatory constraint and therefore prefer to deleverage. They do so by paying down debt, reducing consumption and investment, which increases savings (household sectoral balance), and their demand for housing, which initially lowers house prices and thus residential investment.⁴ The effect on residential investment and house prices is in line with the BVAR estimates of Cussen, O'Brien, Onorante and O'Reilly (2015). The decline in domestic demand initially reduces imports and wages, implying that exports increase and the trade balance improves.

⁴ Lower house prices reduce the value of the collateral, which temporarily increases LTV and the default probability.

Because household consumption and investment decline relative to income, household loans decline as well. In the very short run, there is less need for housing purchases, which also contributes to the reduction in borrowing. As a result, loans decrease more than deposits. Lower household borrowing implies that banks' funding requirements decline. In turn, because all borrowing from abroad goes through the banking sector, the economy's foreign debt declines.

The measures permanently reduce the lending rate for two reasons. First, lower household borrowing lowers the share of nonperforming loans and therefore bank losses. Second, because banks deleverage, the bank capital ratio is higher, which lowers the risk and expected costs of undercapitalisation. Banks pass these savings to households by lowering the lending rate.

Once the deleveraging process is complete, consumption, and investment gradually recover. A lower long-run foreign debt burden and thus lower debt service allows a lower trade surplus, which enables somewhat higher domestic consumption (Table 2). Higher household consumption reduces labour supply, which increases the real wage and makes new houses more costly to produce, while it also increases housing demand. Hence in the long run, residential investment and house prices both increase.⁵

Table 2. Long-run effects of LTV/LTI reduction relative to the initial steady-state

Long-run effects on variable (in %)	LTV	LTI
GDP	-0.24	-0.14
Consumption	0.89	0.52
Residential investment	-0.69	-3.66
Non-residential investment	0.02	-0.12
Housing stock	-0.69	-3.66
House prices	0.19	0.10
Household borrowing	-8.14	-5.00
Foreign-debt-to-GDP ratio (in p.p.)	-29.56	-18.21
Lending rate	-0.18	-0.18
Household default rate (annualised)	-0.42	-0.63

The effect of reducing the regulatory LTI ratio is qualitatively similar. Quantitatively, residential investment and housing stock decline by more than with the LTV reduction. The reason is that when the LTV is reduced, holding more housing helps to meet the regulatory requirement (holding more housing reduces LTV), while this is not the case for the LTI reduction (Figure 3).⁶

⁵ The model likely overstates short run costs and understates long run benefits. Because households own the non-residential capital stock, non-residential investment is directly negatively affected by the measure. Furthermore, the feedback of foreign debt to the risk premium is calibrated to be small, so that benefits from foreign debt reduction are small.

⁶ Quantitative, but not qualitative, results depend to some extent on the elasticity of housing in the utility function. With higher housing elasticity of substitution, long-run results for LTV and LTI are more aligned.

5. Conclusion

The paper shows that the introduction of regulatory ceilings on LTV and LTI ratios in Ireland has somewhat dampened the economic activity in the short and medium run, but has benefits in the long run. Some of those benefits - lower household debt, bankruptcy risk and borrowing rates, as well as lower foreign debt - are realised after a period of about five years, while the others take longer. The deleveraging of the economy as a whole and the associated reduction in foreign debt and the interest rate burden creates space for an increase in consumption in the long run. The regulatory measures do lead to a decrease in housing investment and the stock of housing in the long run, especially when LTI is reduced. However, these negative effects are largely offset by the increase in consumption, so that long-run effects on GDP are small.

References

- Beneš, J, D Laxton and J Mongardini (2016). "Mitigating the Deadly Embrace in Financial Cycles: Countercyclical Buffers and Loan-to-Value Limits." IMF Working Paper WP/16/87.
- Cassidy, M and N Hallissey (2016). "The Introduction of Macroprudential Measures for the Irish Mortgage Market." *Economic and Social Review* 47 (2): 271–297.
- Clancy, D and R Merola (2014). "The Effect of Macroprudential Policy on Endogenous Credit Cycle." Central Bank of Ireland Research Technical Paper, 15/RT/14.
- Cussen, M, M O'Brien, L Onorante and G O'Reilly (2015). "Assessing the Impact of Macroprudential Measures." Central Bank of Ireland Economic Letter, 3 (2015).
- Keenan, E, C Kinghan, Y McCarthy and C O'Toole (2016). "Macroprudential Measures and Irish Mortgage Lending: A Review of Recent Data." Central Bank of Ireland Economic Letter, 3 (2016).
- Lozej, M, L Onorante and A Rannenberg (2017). "Countercyclical Capital Regulation in a Small Open Economy DSGE Model." Central Bank of Ireland Research Technical Paper, 03/RT/17.
- Lozej, M and A Rannenberg (2017). "The Macroeconomic Effects of the Regulatory LTV and LTI Ratios in the Central Bank of Ireland's DSGE Model." Central Bank of Ireland Economic Letter, 4 (2017).