The impact of LTV policy on bank lending: evidence from Thailand[1]

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1. Introduction

The Great Financial Crisis (GFC) in 2008–09 highlighted the importance of safeguarding financial stability and the need to carefully assess and contain systemic risks. At the Bank of Thailand (BOT), financial stability issues have been an integral part of policymaking over the past decade. To increase the resiliency of the financial system and contain the build-up of systemic vulnerabilities, macroprudential policy (MaP) measures have been employed on several occasions. Chief among them are measures on housing credit in the form of loan-to-value (LTV) measures.

The main objective of the LTV measures implemented in Thailand is to ensure that banks are sufficiently prudent in their lending standard to safeguard individual banks' solvency and the stability of the whole financial system. Meanwhile, a potential impact on loan growth can be seen rather as a secondary objective with no explicit policy targets. In 2003, the first measure on LTV ratios was implemented to mitigate a build-up of risks and pre-empt potential speculation in the high-value housing segment, by imposing a strict LTV limit of 70%. Later, in 2009, this measure was relaxed to support a recovery in the property market. Subsequently, LTV tightening measures on low-value mortgage loans were enforced in 2011 and 2013 to signal potential vulnerabilities in these housing segments.

This paper assesses the impact of LTV measures implemented in the housing sector in Thailand in 2009, 2011 and 2013. The analysis will be based on the bank-level and contract-level data provided by all domestic commercial banks in Thailand during the period from Q1 2004 to Q1 2018. We follow the empirical strategy as described in the meta-analysis section introduced in the first paper of this volume, as well as an alternative specification – focusing on the change in the bank loans' LTV distribution – that yields interesting results in the case of Thailand.

The empirical results suggest that the LTV measures were effective in influencing bank risk-taking behaviour, after having controlled for bank and borrower characteristics as well as macroeconomic conditions. Importantly, the effects manifest in terms of a reshaping of the LTV distribution within the loan sector where the LTV measure was applied, while the evidence of an impact on credit growth at the bank level has been muted. The loosening measure in 2009 prompted banks to increase

[1] This country paper draws on our full paper (Tantasith et al (2018)). We would like to thank Piti Disyatat, Sakkapop Panyanukul, Maethinee Hemrit, Atipong Saikaew, Sra Chuenchoksan, Rungporn Roengpitya, participants at the 11th Annual Workshop of the Asian Research Network, Auckland, New Zealand, and participants at the Thai Housing Finance Association's annual workshop for their comments and suggestions. We also thank Leonardo Gambacorta and Ilhyock Shim of the Bank for International Settlements (BIS) for their guidance and support throughout this project. All errors are ours. The views expressed in this paper are those of the authors and do not necessarily represent those of the Bank of Thailand.

the LTV ratio for the targeted loan sector, while the tightening measures taken in 2011 and 2013 led to a more cautious LTV setting, reflecting the tightened credit standard the policy aimed to achieve. In addition, the size of adjustment varies across banks of different attributes, with stronger responses from large and small banks compared with medium-sized banks. The differential response among banks is consistent across the three LTV measures under investigation. Our results overall suggest that certain macroprudential policies can attain a target-specific outcome, but with a differential impact across players. This underlines the need to carefully identify specific areas of risks building up as well as to understand the underlying factors that may give rise to diverging responses in designing a policy measure.

2. Macroprudential policy in Thailand

The MaP measures implemented in Thailand to date have been primarily related to the housing sector. Several MaP measures have been used by the BOT since 2000. Chief among them are LTV measures. In the case of LTV measures, four instances are evident, with varying degrees of restraints and target groups. The first LTV measure was implemented in 2003, when a cap on the LTV ratio of 70% was imposed on high-value mortgages (at and above THB 10 million) as a pre-emptive measure against a potential build-up of risks in the high-end property market. Later, in 2009, the BOT increased the LTV limit of high-value mortgages to 80% and, instead of a strict limit, introduced higher risk-weighted capital charges on high-value mortgages. This measure was intended to provide a further boost to the property market following the GFC after the concern over the property market had already subsided. Following signs of potential speculative activities in the low-value property segment, the higher risk-weighted capital charge on low-value mortgages (below THB 10 million) was implemented in 2011 for high-rise property (eg apartment buildings) and in 2013 for low-rise property (eg houses). The LTV tightening measure on low-rise property was initially scheduled for implementation in January 2012 but later postponed to January 2013 due to severe flooding at end-2011.[2]

Other MaP measures have also been implemented. Among them are maximum credit limits on credit cards and personal loans. Concerns over credit card usage and personal loans, which can have important implications for household debt, as well as industry-wide consumer protection issues prompted the BOT to mandate financial institutions to take borrowers' ability to repay debt into account and tighten related regulations in 2004 and 2005. These regulations include setting a minimum income for credit card holders of at least THB 15,000 per month and a combined credit limit for every credit card provider to five times average monthly income. In addition, the 2004 regulation also stipulated that the minimum monthly payment be raised from 5% to 10%. A similar overall credit limit was also applied to personal loans. Later, in 2017, the BOT tightened the regulations on credit cards and personal loans further

[2] In October 2018, the BOT introduced another LTV measure aiming to enhance financial institutions' credit underwriting standards and to serve as a preventive measure to contain systemic risks after spotting signs of credit standard loosening amidst intensified competition in the mortgage loan market. The measure imposed an LTV cap between 70 and 100% of the collateral value depending on the value of the property and whether the borrower was a first-time home buyer, and also revised a guideline on LTV calculation (see BOT (2019) for more details). However, our study does not cover the impact of this latest round of LTV measures.

due to concerns over potential spillovers from the high level of household debt. Table 1 provides details on the housing-related and consumer credit measures.

Implementation of macroprudential measures in Thailand (2003–17) Table 1

Year	Details
LTV-based measures	
2003	Strict 70% LTV limit on **high-value mortgages** (greater than or equal to THB 10 million).
2009	For **high-value mortgages** (greater than or equal to THB 10 million): LTV limit increased from 70% to 80%, risk-weighted capital charge of 75% for loans with LTV ratio greater than 80% (risk-weighted capital charge of 35% for loans with LTV ratio below or equal to the 80% limit).
2011	For **high-rise property** with a value below or equal to THB 10 million: risk-weighted capital charge of 75% for loans with LTV ratio greater than 90% (risk-weighted charge of 35% otherwise).
2013	For **low-rise property** with a value below or equal to THB 10 million: risk-weighted capital charge of 75% for loans with LTV ratio greater than 95% (risk-weighted charge of 35% otherwise).
2018	Strict LTV limit between 70 and 100% (100% for first-time home buyers) for property valued less than THB 10 million, and between 70 and 80% for property valued higher than THB 10 million.
Non-housing-related measures	
2004	**Credit card measures:** (1) minimum monthly payment increased from 5% to 10%; (2) minimum income of THB 15,000 per month for credit card holders; (3) limit on combined credit line of no greater than five times the borrower's average monthly income; and (4) requiring cancellation of a credit card after three months of non-payment on a positive outstanding balance.
2005	**Personal loan measure:** overall credit limits set to no greater than five times average monthly income.
2017	**Credit card measure:** credit line limit for credit card holders with monthly income lower than THB 50,000 baht lowered from five to 1.5 times average monthly income (if cardholder's monthly income is less than THB 30,000) and to three times monthly income (if cardholder's monthly income is between THB 30,000 and 50,000). **Personal loan measure:** credit line limit for borrowers with monthly income lower than THB 30,000 lowered to 1.5 times average monthly income, with the number of providers not to exceed three companies. **D-SIBs capital surcharge:** adoption of a supervisory framework for D-SIBs, requiring them to maintain an additional 1% of Common Equity Tier 1 above the current minimum requirement (starting at 0.5% in 2019 and increasing to 1% in 2020).

Apart from LTV and consumer credit measures, the BOT has also implemented other forms of MaP.[3] In 2017, the BOT announced the adoption of a supervisory framework for domestic systemically important banks (D-SIBs) – requiring them to maintain an additional 1% of Common Equity Tier 1 above the current minimum requirement. The new requirement will be phased in, starting at 0.5% in 2019 and increasing to 1% in 2020.

[3] Other regulations that may affect bank lending behaviour include the BOT's requirement in 2012 for commercial banks to provide additional provisioning on higher-risk loans to ensure a sufficient cushion during difficult times.

3. Data and stylised facts

Two main data sets used in the empirical investigation are: 1) banks' balance sheet and loan portfolio data, available from 2004 onwards; and 2) a mortgage loan database (MGL), available from 2007 onwards. Both data sets constitute supervisory data reported to the Bank of Thailand by all Thai commercial banks and subsidiaries and branches of foreign banks operating in Thailand. Due to the limited time coverage, our analysis will only examine the effectiveness of three LTV measures, introduced in 2009, 2011 and 2013 respectively.[4] As a reminder, the 2009 measure was a loosening MaP applied to high-value (**HV**) mortgages (equal to or above THB 10 million), while the 2011 and 2013 measures were tightening MaPs applied to high-rise low-value (**HR-LV**) and low-rise low-value (**LR-LV**) mortgages, respectively.

The combination of bank balance sheet and MGL data enables clear separation of mortgages corresponding to the nature of the LTV measures and allows us to examine the behaviour of different banks. The bank-level balance sheet data offer a comprehensive view of banks' loan portfolios and allow us to explore how different banks' characteristics may influence the *supply* of mortgage loans. The banks are grouped by asset size into large, medium and small, which often also reflect other key characteristics as well as the business model common within each size group.[5] However, this data set — though it can be disaggregated into loan types — may not be granular enough to capture smaller subsections of each type of loan or the demand side of loan characteristics. This is where the second set of data, namely the mortgage loan data (MGL), comes in to fill this gap. The MGL database contains contract-level mortgage loans newly issued in each period with details on the characteristics of mortgage borrowers, loan characteristics and collateral characteristics. MGL, therefore, allows us to explore the specific sectors of loans in line with the policy's target, as well as the factors that may influence the *demand* side of mortgages, including borrowers' occupations and the value and type of properties. More details on the data sources and coverage are provided in Appendix A of our full paper (Tantasith et al (2018)).

Focusing on the data before and after the implementation of the three LTV measures in 2009, 2011 and 2013, some interesting stylised facts emerge. We observe that the implementation of each LTV measure was associated with a change in the distribution of mortgage loans' LTV ratios. The implementation of the LTV measures has a significant impact on the distribution of the LTV ratio at both the contract level (Figure 1) and bank level (Figure 2). Figure 1 shows the contract-level LTV distribution for all new mortgage loans. Following the loosening policy for high-value properties in 2009, the share of loans with an LTV ratio above 70% substantially increased, while the tightening policy for low-value homes (both high-rise and low-rise) in 2011 and 2013 led to a decrease in the LTV distribution above the policy thresholds, ie 90% and 95%, respectively.

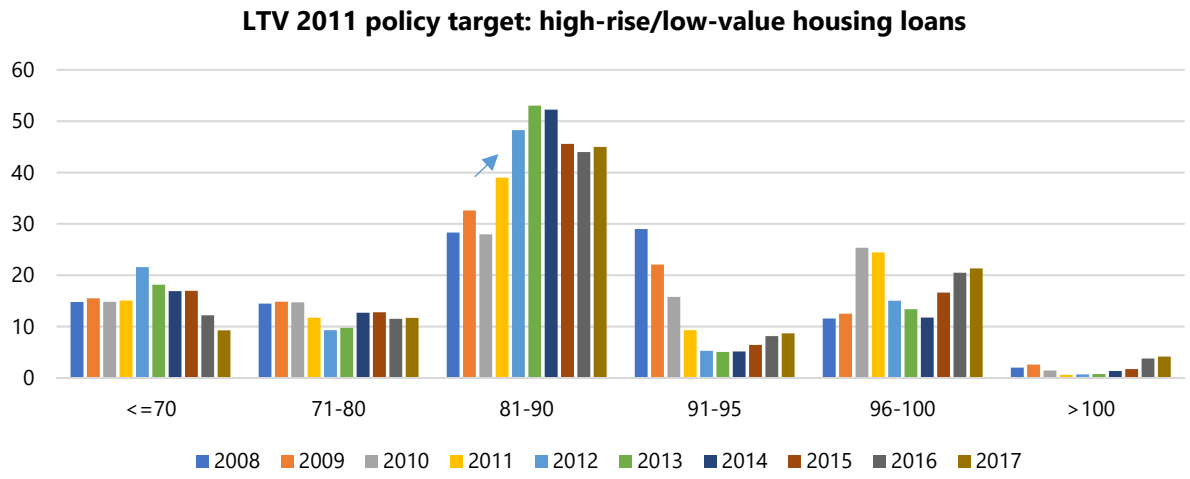
[4] Since the data are only available from 2004 onwards, we cannot test the effects of the 2003 LTV measure and the 2004 credit card measure. Also, the 2017 credit card measure was implemented only recently, hence does not allow enough time lags to systematically evaluate its effects.

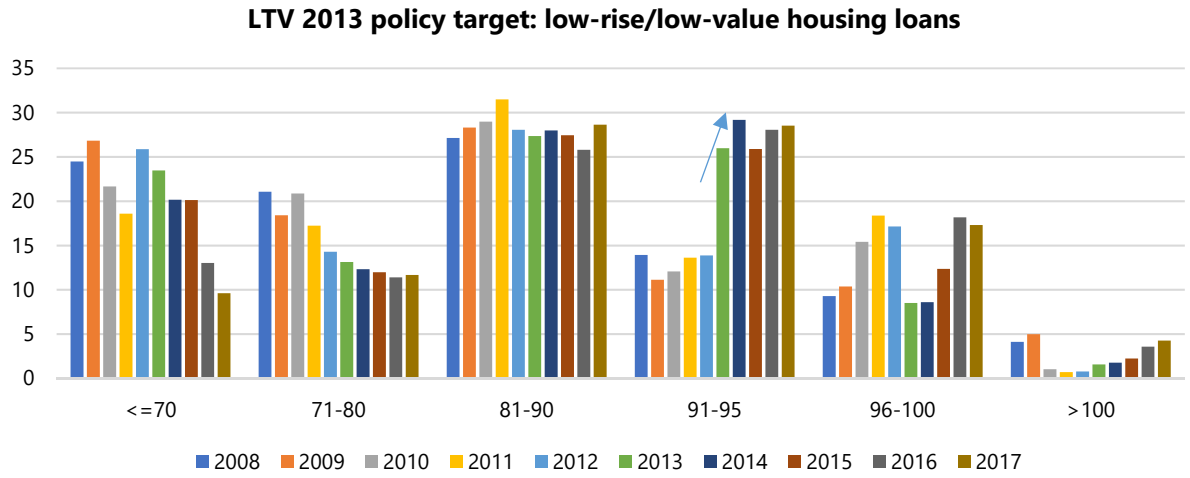
[5] There are a total of 19 banks in our sample, comprising five large banks, three medium-sized banks and 11 small banks including foreign subsidiaries. The top five banks by asset size command more than 70% of the total loan market in the Thai economy, reflecting a high degree of concentration in the Thai loan market and the high market power of the large banks. Small banks typically focus on niche markets and have a relatively small housing loan share. Descriptive statistics on bank balance sheet characteristics by bank size group can be found in Appendix A3 of Tantasith et al (2018).

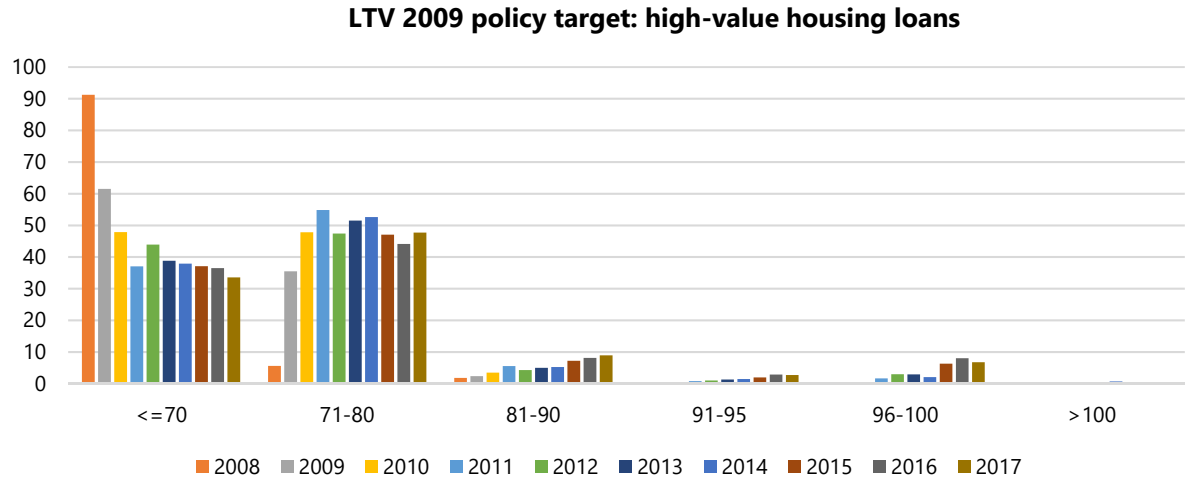
Distribution of the LTV ratio (share of housing loans by level of LTV ratio)

In per cent

Figure 1







Source: Bank of Thailand, authors' calculation

Average bank-level share of new loans above the LTV threshold in each period, by loan amount and by number of contracts

Figure 2

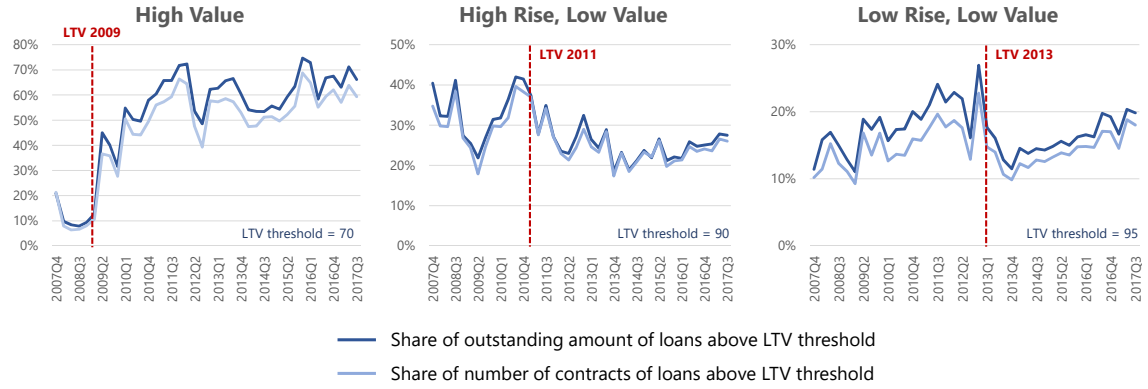


Figure 2 constructs the average bank-level share of new loans by loan amount and by number of contracts above LTV thresholds in each period. The fact that average bank-level shares of loans above the policy thresholds increased after the policy loosening in 2009, and decreased after the policy tightening of 2011 and 2013, provides preliminary evidence of policy effectiveness.

4. Empirical strategy

We perform regression analyses to assess the impact of Thailand's LTV policies following the common empirical methodology.[6] The second set of regression analyses then tests whether the implementation of LTV policies has induced a shift in the composition of loans below and above the policy thresholds. Details on regression specifications are as follows.

4.1 Bank-level loan growth regressions

Here we briefly explain Thailand-specific variables included in the standard regressions. In addition to the standard macroeconomic control variables, we include dummy variables for the 2009 GFC and for the 2011 nationwide floods to allow for a temporary shift in bank lending behaviour induced by the aggregate shocks to the economy.

For this exercise, we employ the bank-level loan data extracted from bank balance sheet information. One advantage of using this data set is that – unlike the contract-level MGL data, which reports only the amount of housing loans for *new* contracts made within a period (ie flow variable) – the bank balance sheet data report the outstanding amount of each type of loan in each period (ie stock variable) that can be used to compute loan growth. A key disadvantage of this data set, however, is that we observe only *total* housing loans held by each bank, and cannot separate them into the specific type corresponding to the LTV targeted housing sector.

[6] For the detailed specification, refer to the article by Cantú et al in this volume.

4.2 Bank-level threshold effects of LTV measures

Next we study the impact of macroprudential policy in terms of changes in the distribution of new loans around the LTV threshold. As motivated by what we observe in the data section, we test whether a change in the LTV measure has effectively influenced a shift in the LTV composition of new loans around the policy threshold value. The specification is essentially the same as equation (1) in the BIS protocol except that the dependent variable is now the share of bank loans (in the targeted housing sector) above the threshold specific to each macroprudential measure:

$$\Delta Share\ above\ threshold_{bt} = const + \sum_{j=1}^{k} \gamma_j \Delta Share\ above\ threshold_{bt-j} + \sum_{j=0}^{k} \beta_j \Delta MaP\_LTV_{t-j} + \theta Controls_{bt} + \varepsilon_{bt}$$

where the dependent variable is the quarterly change in the proportion of new housing loans (that bank *b* extends to borrowers at time *t*) that are above the LTV threshold. The policy variable ΔMaP_LTV_{t-j} indicates a change in the LTV limit. The bank-level MGL data are used for this exercise, with the housing loan portfolio being divided into three main types of mortgages according to the property type: high-value (HV) for the 2019 LTV measure, high-rise/low-value (HR-LV) for the 2011 LTV measure, and low-rise/low-value (LR-LV) for the 2013 LTV measure. We evaluate the effectiveness of each LTV policy separately, focusing on the targeted housing sector before and after the implementation of the policy. If a particular LTV policy is effective, tightening (easing) in the policy stance should result in β_j being statistically significantly negative (positive). This would imply that banks adjusted the targeted loan portfolio by reducing the share of loans above the given LTV threshold, which was the intention of the LTV measure.

5. Discussion of results

Overall, we find that in the case of Thailand, the impact of past macroprudential policy on loan growth appears to have been muted. As shown in Table 2, we cannot detect a statistically significant impact of macroprudential measures on credit growth at the bank level. The sum of the coefficients on the four lags of MaP index ($\sum_{j=0}^{k} \beta_j \Delta MaP_{t-j}$) in the case of consumer loans is found to be positive, which is counterintuitive. This possibly reflects the fact that the periods when macroprudential policy was tightened were usually associated with high rates of loan growth in Thailand.

Interestingly, we find evidence that banks adjusted the LTV distribution of newly issued loans up to four quarters after the LTV measures were introduced. For brevity, we present here the results from the alternative specification only for the 2011 LTV measure.[7] As shown in Table 3 (first column), the share of new loans with LTV above 90% decreased by 13 percentage points, 12 percentage points and 9 percentage points respectively in the quarters after the 2011 measure became effective. Similar results were observed in the case of the LTV measures taken in 2009 and 2013. This suggests that banks responded to the LTV measures by reshaping the LTV distribution rather than by changing the rate of loan growth. This could possibly be due to the fact that most banks set their loan growth targets on a yearly basis, and they might

[7] Refer to the full paper (Tantasith et al (2018)) for all other results, including an investigation on heterogeneous responses by different types of banks.

choose to stick with predetermined targets even in the presence of changes in macroprudential policy. Another likely explanation is that due to data limitations, we only observe credit growth at the bank level for total housing loans. Banks might change the composition of loans across the housing loan subsectors, away from the LTV-targeted loans. But this cannot be detected as the data structure does not allow for a calculation of credit growth for each housing loan subsector. As the impact on credit growth remains inconclusive, this leaves room for future research.

In the context of Thailand, an important question remains whether it is the "actual rule" of the measures or the "signalling" element of the policy that is the main factor driving changes in banks' LTV setting decisions. Since the past LTV measures in the case of Thailand did not apply a strict limit, the policy rule can influence banks' lending only through an increase in capital costs. Whether this capital surcharge creates a burden on banks to the extent that it materially changes their lending decisions remains debatable. As shown in Figure 3, the levels of capital that Thai banks of all sizes maintain have been consistently and considerably above the minimum levels required by the capital requirement threshold of 8.5%. Under the LTV measures' risk-weighted rule, banks might become more cautious in setting the LTV ratio to retain the same capital position. Alternatively, since the measures did not impose a strict limit and since the capital ratio is apparently not a binding constraint for most banks in Thailand, banks may feel no need to adjust the LTV standard, especially if competition in the housing loan market is fierce and they wish to maintain their market share in such conditions. Meanwhile, the signal that the BOT sends to banks about concerns over the real estate sector can be an important factor in their lending decisions. Through public statements and moral suasion, the BOT has established various platforms to communicate with banks should there be specific loan sectors warranting close monitoring. If the signalling channel works effectively, banks will change their risk assessment, leading to adjustment in their lending behaviour even without hard policy rules. The answer to the question of which mechanism has actually led banks to adjust their lending behaviour would ultimately depend on the assessment of the policy impact on bank costs, the optimal levels of capital, and banks' risk-taking attitude, which may in turn depend on the level of market competition as well as the effectiveness of the central bank's moral suasion.

Effects of MaP measures on consumer loans

Table 2

	Dependent variable: quarterly change in outstanding consumer loans ($\Delta \log Loans$)					
	(1)			(2)		
	Coeff		Std err	Coeff		Std err
$\sum_{i-1}^{4} \Delta \log Loans_{t-j}$	0.528	***	0.046	–0.036	***	0.009
SIZE $_{t-1}$	–0.036	***	0.009	–0.176		0.098
LIQ $_{t-1}$	–0.190	*	0.090	–0.420	***	0.103
CAP $_{t-1}$	–0.428	***	0.102	–0.030		0.027
DEP $_{t-1}$	–0.029		0.025	0.528	***	0.046
$\sum_{j=0}^{4} \Delta MaP_{t-j}$	0.023		0.019	0.163		0.142
$\sum_{j=0}^{4} \Delta MaP_{t-j}$ x $SIZE_{t-1}$				–0.011		0.012
$\sum_{j=0}^{4} \Delta MaP_{t-j}$ x CAP_{t-1}				–0.251		0.439
$\sum_{j=0}^{4} \Delta MaP_{t-j}$ x LIQ_{t-1}				–0.010		0.321
$\sum_{j=0}^{4} \Delta MaP_{t-j}$ x DEP_{t-1}				–0.046		0.126
Macroeconomic controls	Yes			Yes		
Policy controls	Yes			Yes		
Fixed effect	Yes			Yes		
Sample period	Q1 2004 – Q1 2018			Q1 2004 – Q1 2018		
Banks	17 (domestic)			17 (domestic)		
Observations	766			766		
Overall R-squared	0.179			0.195		
Within R-squared	0.303			0.341		
Between R-squared	0.216			0.200		

The symbols *, ** and *** represent significance levels of 10%, 5% and 1%, respectively.

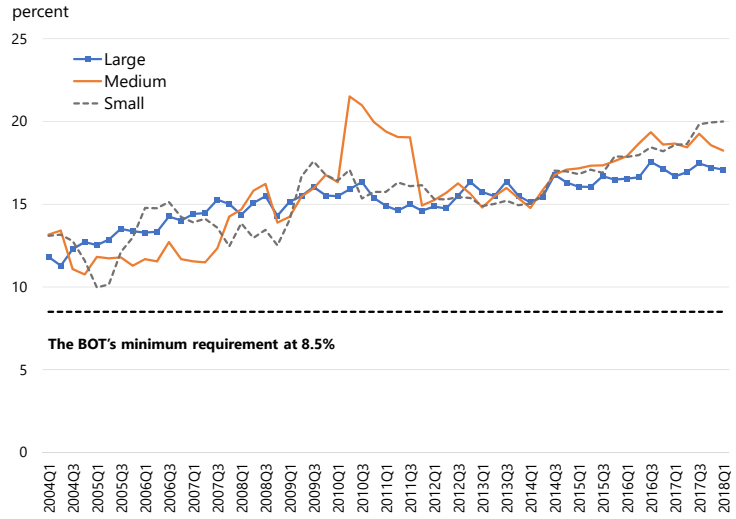
Effects of 2011 LTV policies on the LTV distribution of HR-LV loans

Table 3

	Dependent variable: quarterly change in share of loans with LTV above 90% (Δ share)					
	(1)			(2)		
	Coeff		Std err	Coeff		Std err
Δ share_LTV_above90 $_{t-1}$	–0.146	**	0.055	–0.142	*	0.056
Δ share_LTV_above90 $_{t-2}$	–0.142	**	0.054	–0.154	**	0.055
Δ share_LTV_above90 $_{t-3}$	0.072		0.051	0.049		0.051
Δ share_LTV_above90 $_{t-4}$	0.000		0.043	–0.002		0.044
Δ MAP_LTV_2011 $_{t}$	–13.456	***	3.545	–12.499	*	5.453
Δ MAP_LTV_2011 $_{t-1}$	–12.975	***	3.539	–14.343	**	5.522
Δ MAP_LTV_2011 $_{t-2}$	–9.444	**	3.313	–23.652	***	6.357
Δ MAP_LTV_2011 $_{t-3}$	–1.263		3.515	3.722		6.505
Δ MAP_LTV_2011 $_{t-4}$	–6.434		3.974	–12.808		6.798
LARGE	0.714		1.178	0.497		1.268
MEDIUM	2.351		1.322	1.357		1.397
Δ MAP_LTV_2011 $_{t}$ x LARGE				–4.119		6.698
Δ MAP_LTV_2011 $_{t}$ x MEDIUM				4.426		8.047
Δ MAP_LTV_2011 $_{t-1}$ x LARGE				1.186		6.419
Δ MAP_LTV_2011 $_{t-1}$ x MEDIUM				4.258		8.050
Δ MAP_LTV_2011 $_{t-2}$ x LARGE				14.824	*	7.347
Δ MAP_LTV_2011 $_{t-2}$ x MEDIUM				26.845	**	8.771
Δ MAP_LTV_2011 $_{t-3}$ x LARGE				–7.985		7.381
Δ MAP_LTV_2011 $_{t-3}$ x MEDIUM				–4.002		8.880
Δ MAP_LTV_2011 $_{t-4}$ x LARGE				5.815		7.391
Δ MAP_LTV_2011 $_{t-4}$ x MEDIUM				13.316		8.866
Macroeconomic controls	Yes			Yes		
Policy controls	Yes			Yes		
Fixed effect	No			No		
Sample period	Q4 2007 – Q3 2017			Q4 2007 – Q3 2017		
Banks	18 (domestic)			18 (domestic)		
Observations	326			326		
Overall R-squared	0.145			0.184		
Within R-squared	0.137			0.177		
Between R-squared	0.354			0.397		

The symbols *, ** and *** represent significance levels of 10%, 5% and 1%, respectively.
The results are robust to inclusion of a fixed effect.

Capital position of Thai banks (BIS ratio) Figure 3



Since 2004, Thai banks have been required to maintain the BIS ratio above 8.5%, higher than the minimum requirement of 8%. The jump in the BIS ratio of medium-sized banks in 2010 is due to a bank merger.

Source: Bank of Thailand.

6. Conclusion

This paper assesses the impact of macroprudential policy implemented in Thailand. Given the data available, we study the impact of the LTV measures introduced in 2009, 2011 and 2013. The ultimate goal of the LTV measures is to improve financial resilience by ensuring that banks maintain sufficiently prudent lending standards, while the impact on credit growth is considered a secondary objective. The three LTV measures targeted different segments of the property market using different features, varying from a strict cap to risk-weighted capital charges.

On the whole, both the stylised facts and the results from regressions confirm the influence of the LTV measures on banks' lending behaviour. However, in the case of Thailand the effect is not manifested in changes to the pace of credit growth at the bank level, but rather in the LTV distribution of newly issued loans. Following the LTV measures, banks responded by adjusting their LTV setting consistent with the policy's objective. The loosening measure in 2009 prompted banks to increase the LTV ratio for the targeted loan sector, while the tightening measures in 2011 and 2013 led to a more cautious LTV setting, reflecting the tightened credit standards the policy aimed to achieve.

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