THE DETERMINATION OF BANK INTEREST RATE MARGINS - IS THERE A ROLE FOR MACROPRUDENTIAL POLICY?

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Introduction

- The bank interest rate margin is a key aspect of the transmission mechanism of macroeconomic policy. The relation of monetary policy to margins is well known, but there are to our knowledge no extant papers on the effects of macroprudential policy.
- We estimate effects of macroprudential policies on bank interest margins for up to 3,723 banks from 35 advanced countries over 1990-2018.
- The main finding is that loan demand- and supply-targeted macroprudential policies have a negative short-run impact on the margin, while capital-based measures do not affect the margin.
- This is consistent with the suggestion that loan demand/ supply measures should have more impact on loan volumes and margins than capital measures. The latter are primarily aimed at ensuring that banks can cope in the event of a systemic crisis, not at altering portfolio decisions on earning assets and hence should have more limited impact on interest margins.

- An intermediate position is found for liquidity policies which are found to have a positive short run effect on margins. These do affect the asset portfolio while also being largely to ensure resilience rather than acting counter cyclically.
- Meanwhile, long run effects from all types of policy are typically zero or small, suggestive of countervailing action by banks.
- There are significant interactions between macroprudential and monetary policy for some individual instruments, meaning that they may either complement or offset monetary policy's effects on margins.
- These results are of considerable relevance to policymakers, regulators and bank managers, not least when monetary policies are tightened to reduce inflationary pressures.

Literature

- Our work brings together two fields of work, namely the effects of macroprudential policy (from which we draw potential effects on the margin) and the determination of the bank margin.

The effects of macroprudential policies

- Empirical evidence suggests macroprudential policy is effective in reducing the build-up of financial system imbalances. Most papers till recently focused on macro data for measures such as credit growth, house prices and the credit-to-GDP gap, as for example in Akinci and Olmstead-Rumsey (2018), Carreras et al (2018) and Cerutti et al (2017).
- Recent work on micro data has found an effect of macroprudential policy in reducing credit growth (Claessens et al (2013), Andries et al (2022)), particularly borrower-related instruments and in the short run.

- Macroprudential policy also is effective in reducing bank risk according toa global micro studies such as Altunbas et al (2018), especially small and poorly capitalised banks – a similar result for bank profitability was found by Davis et al (2022)
- Gaganis et al (2020) found that found that corporate governance conditions the effect of macroprudential policy on risk-taking
- Meuleman and Vander Vennet (2020) found macroprudential policies reduce the component of systemic risk related to individual European bank risk, but the component related to risks arising from systemic linkages is aggravated by some policies. It was suggested that some retail banks may be incentivised to undertake activities with a lower regulatory burden, which may entail offsetting increased risk-taking
- Chan et al (2022) found for East Asian banks that the interactions between competition and macroprudential measures often showed a lesser response to such measures in terms of risk reduction for banks with more market power. They suggested that this links in turn to ability of such banks to undertake risk-shifting in response to macroprudential policy.

Potential effects of macroprudential policies on the margin

- In general, we anticipate that in line with results above of reduced risk and lower credit growth, the margin will shrink when macroprudential policy is tightened.
- We suggest that loan demand/ supply measures should have more impact on loan volumes and margins than capital measures and general/liquidity measures. The latter are primarily aimed at ensuring that banks can cope in the event of a systemic crisis by build-up of resilience, not at altering portfolio decisions on earning assets, and hence should have more limited impact on interest margins. Looking at categories one by one:
  - Loan demand-targeted policies such as the loan-to-value ratio limits and debt-to-income ratio limits might be expected to reduce the margin. This is because high LTV/DSTI loans whose volume is reduced would tend to have higher interest rates than other assets, thus entailing a reduction in risk and a narrowing of the margin.

- Loan-supply targeted measures such as limits on growth of total or foreign loans would also be likely to trigger negative effects on the margin as banks' portfolios would shift relatively to lower risk assets such as liquid assets which have lower returns. Loan-to-deposit limits might narrow the margin if banks are obliged to pay more for deposits than for non-deposit liabilities.
- Capital-based measures requiring banks to hold more capital will affect the liability side of the balance sheet, requiring more capital relative to deposits and other liabilities. The cost of capital in dividends is not a part of the calculation of margins. Indirect effects may be seen, however. They may induce banks to raise balance sheet risk to regain previous levels of profitability and obtain sufficient reserves to build up resilience. Similar effects may arise from advance provisioning requirements. On the other hand, higher risk-adjusted capital requirements might tend to shrink margins as banks shift into lower-weighted assets in response.
- General supply-based measures such as reserve requirement ratios and liquid asset requirements oblige banks to hold more low-return assets than they would otherwise. However, assuming the bank's risk appetite is unchanged, this may induce an offsetting rise in risk in the rest of the asset portfolio. Furthermore, these policies tend to be directed at resilience (as for capital-based measures) and not counter cyclical policy (as for loan demand/supply targeted measures).

  - Overall summary measures of macroprudential policy might accompany a fall in the margin if the overall aim of reducing high-margin lending growth is achieved, as the existing papers outlined above suggest. But if there are offsetting results for the different types of measure as outlined about, the effect could be zero.

- All of these policies might have differing short and long run effects parallel with those for monetary policy outlined below, with a short run adjustment phase and a long run equilibrium effect, both of which we estimate in this paper. Given scope for banks to adjust their strategies in response to macroprudential policies in line with their risk appetite, we would expect the long run effects to be smaller and often negligible or of opposite sign to the short run effects.

- For example, loan growth limits may reduce household lending if that is their focus, but may raise corporate lending and securities holdings (Acharya et al 2020). A further effect may be to shift financial activities outside regulatory parameters (Cizel et al 2016) such as to shadow banks, which banks may nonetheless finance, and increase high-margin cross-border lending activity by domestic or foreign banks (Aiyar et al 2014; Cerutti et al 2017).
- Building on the above, we outline two hypotheses for testing:
  - Hypothesis 1: Loan-targeted policies will have more impact on margins that general, liquidity or capital requirements.
  - Hypothesis 2: Due to countervailing policy shifts by banks, macroprudential policies will have a lesser effect on margins in the long run than in the short run.

Determinants of the bank interest margin

- The baseline for our work is Alessandri and Nelson (2015) who estimated determinants of the margin for a sample of 44 UK bank groups with quarterly data from 1992-2009. Independent variables were the current level and difference of the short rate and the yield curve, also bank leverage, balance-sheet growth and GDP growth together with a profit-volatility measure and sector concentration.
- They found levels of the short rate and the slope of the yield curve are positively related to the margin, while differences (level or lag) are significant and negative. This was suggested to show repricing frictions for banks in the short term which are eliminated in the long term.
- Borio et al (2017) found similar results for global banks. They allowed for non-linearities in the relation of interest rates to bank profitability by means of squared terms for both short rates and the yield curve. Again, the short rate and yield curve slope had a positive effect, while each of the quadratic terms were negative, implying a disproportionate effect on the margin when rates are low.

- Alessandri and Nelson (2015) and Borio et al (2017) suggest the following reasons for their results for interest rate effects on the margin
- The negative short term effect and positive long term may relate to repricing frictions for banks in the short term which are eliminated in the long term.
- The link of the short rate to the margin may be partly related to the “retail deposits endowment effect” which is linked to imperfect adjustment of deposit rates, which benefits banks when inflation and hence short rates are high, but limits profitability when they are low.
- There may also be quantity effects on the margin when rates rise, which are negative if loans are more price elastic than deposits.
- Changes in the yield curve slope may also have quantity effects via the volume of fixed rate mortgages.

Interaction of monetary and macroprudential policies

- Our work also casts light on a further field of work, namely the interaction of macroprudential policy with a range of other policies, especially monetary policy. It does, however, differ markedly in approach from the bulk of the work to date in this area which tends to use theoretical or calibrated models of the wider economy rather than empirical estimation.
- Such effects could be complementary (as, for example, in N'Diaye 2009) or potentially conflicting (Agur and Demertzis 2015) : In the conflicting cases, policymakers may have to determine which policy is more effective in achieving the financial and economic objective of policy makers at the time.
- Our work casts further light on the potential for complementarity or conflict specifically in respect of the bank margin. In this overall context, the strong appetite by policy makers for the development and incorporation of macroprudential policy in the regulatory framework and its relationship with monetary policy makes its impact all the more important to evaluate.

Methodology and data

- Our baseline model, following Alessandri and Nelson (2015) is as follows:
- $NIM_{jt} = \alpha_{it} + ß_1 NIM_{it-1} + ß_2 CBR_{jt} + ß_3 DCBR_{jt} + ß_4 DCBR_{jt-1} + ß_5 YC_{jt} + ß_6 DYC_{jt} + ß_7 DYC_{jt-1} + ß_8 Internal_{it-1} + ß_9 Industry_{jt-1} + ß_{10} Macro_{jt} + \varepsilon_{it}$
- Where NIM is the margin of net interest/average assets, CBR is the central bank rate and YC is the yield curve (10 year bond yield less CBR)
- To this we add a set of internal bank, industry and macroeconomic variables for suitable control. Bank data are from Fitch-Connect and macro data from the IMF and OECD. Data cover advanced countries since they have 10 year bond yield data.
- We then add macroprudential policy variables one by one in difference and level form to capture short and long run effects
- $NIM_{jt} = \alpha_{it} + ß_1 NIM_{it-1} + ß_2 CBR_{jt} + ß_3 DCBR_{jt} + ß_4 DCBR_{jt-1} + ß_5 YC_{jt} + ß_6 DYC_{jt} + ß_7 DYC_{jt-1} + ß_8 Internal_{jt-1} + ß_9 Industry_{jt-1} + ß_{10} Macro_{jt} + ß_{11} MPP_{jt} + ß_{12} DMPP_{jt} + ß_{13} DMPP_{jt-1} + \varepsilon_{it}$

- Testing in this framework of effects of macroprudential policies used the 2020 version of the IMF's integrated Macroprudential Policy (IMAPP) Database, originally constructed by Alam et al (2019). This dataset of macroprudential instruments covers 135 countries monthly over 1990 to 2018 (IMF 2020). There are 6 summary instruments derived from 17 individual instruments, which show policy changes (DMPP). We have cumulated these effects also to show the macroprudential policy stance (MPP).
- Finally we allow for interactions of monetary and macroprudential policies with leveraged terms
- $NIM_{it} = \alpha_{it} + \beta_1 NIM_{it-1} + \beta_2 CBR_{jt} + \beta_3 DCBR_{jt} + \beta_4 DCBR_{jt-1} + \beta_5 YC_{jt} + \beta_6 DYC_{jt} + \beta_7 DYC_{jt-1} + \beta_8 Internal_{it-1} + \beta_9 Industry_{jt-1} + \beta_{10} Macro_{jt} + \beta_{11} MPP_{jt} + \beta_{12} DMPP_{jt} + \beta_{13} DMPP_{jt-1} + \beta_{14} MPP_{jt} * CBR_{jt} + \beta_{15} DMPP_{jt} * DCBR_{jt} + \beta_{16} DMPP_{jt-1} * DCBR_{jt-1} + \varepsilon_{it}$

- All variables except BCRISIS and MPP are winsorized at 99%.
- Annual data are used in line with the frequency of the banking data.
- Bank level variables are lagged to reduce risk of endogeneity. The policy variables are entered as a current level as well as current and first lag difference, on the argument that policy is unlikely to be affected by performance of an individual bank.
- The Hausman test suggested a bank fixed effects model is appropriate, time fixed effects were also significant.
- We cluster standard errors at a country level, given the policy variables of interest are on the country level, as in Altunbas et al (2018).
- Accordingly, estimation is by panel OLS with country-clustered standard errors and bank and time fixed effects, and we used cluster-robust standard errors. One of the robustness checks shows results using bank-level clustering.

Variables

Abbreviation	Mean	Median	Max	Min	Std. Dev.	Obs
NIM (%)	**2.570**	**2.030**	**26.458**	**-1.990**	**2.620**	**50516**
LNSIZE (log)	**21.804**	**21.818**	**27.117**	**16.054**	**2.252**	**55143**
LEV	0.109	0.074	0.900	0.002	0.134	54888
CRISK	0.876	0.360	18.752	-3.150	2.040	45430
LRISK	**0.636**	**0.702**	**0.992**	**0.001**	**0.290**	**49857**
COSTINC (%)	63.678	62.510	241.794	0.706	29.273	55140
DIVSIF	0.325	0.283	1.268	-0.542	0.288	53973
LINDEX	0.206	0.212	0.645	-0.962	0.187	46059
BCRISIS	0.113	0.000	1.000	0.000	0.316	108953
GDPG (%)	2.457	2.420	11.467	-8.669	2.635	108333
INFL (%)	**3.056**	**2.098**	**376.746**	**-0.923**	**13.344**	**108577**
CBR (%)	**3.549**	**2.792**	**29.350**	**-0.267**	**3.424**	**100872**
YC (%)	**1.250**	**1.241**	**7.155**	**-4.809**	**1.388**	**91618**

Note: the **variables in bold** are those that enter the parsimonious baseline equation, where NIM is the net interest margin as a proportion of average assets, LNSIZE is the logarithm of total assets, , LRISK is liquidity/contractual risk, (deposits/total liabilities), CBR is the central bank policy rate (%) and YC is the 10-year bond yield less CBR (%).

Baseline

Dependent variable	NIM
NIM (-1)	0.63*** (12.3)
LNSIZE(-1)	-0.0743*** (3.2)
LRISK(-1)	0.347** (2.6)
INFL	0.0302** (2.2)
CBR	0.0289** (2.8)
DCBR	0.00821 (0.5)
DCBR(-1)	-0.0436** (2.2)
YC	0.0406** (2.1)
DYC	-0.00823 (0.5)
DYC(-1)	-0.0725*** (3.6)
R-squared	0.868
R-squared (adj.)	0.856
Standard error	0.77
Periods included	27
Cross sections included	2878
Observations	35400

Macro prudential policy effects

Coefficient for	MPP	DMPP	DMPP(-1)
Summary macroprudential Instruments			
MAPP-INDEX	-0.00463 (0.8)	-0.00742 (0.9)	-0.00428 (0.9)
LOAN-TARGETED	-0.00431 (0.5)	-0.0287*** (3.0)	0.00032 (0.1)
DEMAND	0.00704 (0.6)	-0.0416*** (3.9)	-0.00864 (0.3)
SUPPLY-ALL	-0.0089 (1.3)	0.00357 (0.4)	-0.00536 (0.4)
SUPPLY-LOANS	-0.0213* (1.7)	-0.0317 (1.6)	0.00847 (0.3)
SUPPLY-GENERAL	-0.0153 (0.9)	0.0259** (2.1)	-0.0192 (1.3)
SUPPLY-CAPITAL	-0.0017 (0.2)	0.00885 (0.8)	-0.0102 (0.5)
Individual macroprudential Instruments			
Capital based measures			
Countercyclical buffer	-0.0489** (2.6)	0.0198 (0.8)	0.0347 (1.3)
Conservation buffer	-0.0298 (1.3)	0.0163 (0.7)	-0.00101 (0.1)
Capital requirements	0.00594 (0.4)	0.00479 (0.3)	0.00567 (0.2)
Leverage requirements	-0.0246 (0.4)	0.0542 (1.4)	-0.059 (1.6)
Loan-supply targeted measures			
Provisioning requirements	-0.0487 (1.5)	-0.0679 (1.3)	0.0532 (1.1)
Credit growth limits	0.344 (1.6)	-0.609*** (3.2)	-0.375 *** (4.4)
Loan restrictions	-0.0392 (0.9)	-0.0356 (0.9)	0.0264 (0.7)
Limits on Foreign Currency Loans	-0.01 (1.4)	0.0294 (1.3)	-0.0166 (0.6)
Loan to deposit limits	-0.00862 (0.2)	-0.398*** (12.9)	-0.157*** (3.1)
Demand targeted measures			
Loan to value limits	-0.00525 (0.3)	-0.051*** (3.2)	0.00783 (0.2)
Debt to income limits	0.0515** (2.2)	-0.0726*** (4.5)	-0.0652 (1.6)
General measures			
Levy/Tax on Financial Institutions	0.0252 (0.9)	-0.00704 (0.2)	0.00001 (0.1)
Liquidity measures	-0.0257 (0.9)	-0.00262 (0.5)	-0.023 (0.5)
Limits on FX operations	0.198***(16.2)	-0.00854 (0.4)	0.00203 (0.2)
Reserve requirements	-0.0121 (0.7)	0.0476*** (3.9)	-0.0195 (1.1)
SIFI surcharges	-0.0581 (1.5)	0.004 (0.1)	0.0546 (1.4)
Other macroprudential measures	0.0044 (0.3)	-0.0118 (0.4)	-0.012 (0.6)

Interactions with monetary policy – summary instruments

Coefficient on	MPP	DMPP	DMPP(-1)	MPP*CBR	DMPP*DCBR	DMPP(-1)*DCBR(-1)
MAPP-INDEX	-0.00557 (1.0)	-0.0055 (0.6)	-0.0071 (0.5)	0.00199 (0.8)	-0.00944** (2.0)	-0.00364 (0.3)
LOAN-TARGETED	-0.00369 (0.3)	-0.03*** (2.9)	-0.00638 (0.3)	0.00025 (0.3)	-0.00434 (0.4)	-0.018 (1.1)
DEMAND	0.00949 (0.7)	-0.0461*** (4.1)	-0.0204 (0.7)	0.00271 (0.3)	-0.0192 (0.9)	-0.0852*** (3.8)
SUPPLY-ALL	-0.01 (1.4)	0.00967 (0.8)	-0.00232 (0.2)	0.00209 (0.7)	0.0203*** (2.9)	0.0116 (1.0)
SUPPLY-LOANS	-0.0218* (1.7)	-0.0309 (1.4)	0.0148 (0.4)	-0.0016 (0.1)	0.00216 (0.1)	0.0096 (0.4)
SUPPLY-GENERAL	-0.0238 (1.4)	0.0456** (2.4)	-0.00415 (0.2)	0.00337 (0.9)	0.0353** (2.5)	0.0175 (1.3)
SUPPLY-CAPITAL	-0.00204 (0,2)	0.00663 (0.5)	-0.0141 (0.7)	0.0079 (1.3)	0.0352 (1.6)	0.00424 (0.1)

Notes: MAPP-INDEX is the sum-total of the 17 instruments; LOAN-TARGETED is the sum of the "Demand" and the "Supply-loans" instruments; DEMAND is the sum of loan to value limits and debt to income limits; SUPPLY-ALL is the sum total of all instruments except those in DEMAND; SUPPLY-LOANS is the sum of provisioning requirements, credit growth limits, loan restrictions limits to the loan to deposit ratio, and limits to foreign currency loans; SUPPLY-GENERAL is the sum of reserve requirements, liquidity requirements, and limits to FX positions; SUPPLY-CAPITAL is the sum of leverage, countercyclical buffers, conservation buffers, and capital requirements.

Interactions with monetary policy – individua instruments

Coefficient on	MPP	DMPP	DMPP(-1)	MPP*CBR	DMPP*DCBR	DMPP(-1)*DCBR(-1)
Capital based measures						
Countercyclical buffer	-0.0549*** (2.9)	0.0231 (0.9)	0.0369 (1.4)	0.0277** (2.1)	0.0237 (0.4)	0.0205 (0.2)
Conservation buffer	-0.0356 (1.4)	0.0255 (1.0)	-0.0106 (0.3)	0.0179 (1.0)	0.0935 (0.7)	-0.0365 (0.3)
Capital requirements	0.00336 (0.2)	0.000534 ().1)	0.00354 (0.1)	0.00632 (0.7)	0.038 (1.4)	0.00617 (0,2)
Leverage requirements	-0.035 (0.7)	0.0475 (1.0)	-0.0066 (0.1)	0.0219 (0.6)	-0.0907 (0.7)	0.965*** (4.8)
Loan-supply targeted measures						
Provisioning requirements	-0.0604* (1.7)	-0.0698 (1.4)	0.0263 (0.9)	0.027*** (3.7)	0.0109 (0.6)	0.0419* (1.8)
Credit growth limits	Na	na	na	na	na	na
Loan restrictions	-0.0154 (0.4)	-0.0455 (1.0)	0.0185 (0.5)	-0.0296** (2.3)	-0.00188 (0.1)	-0.00206 (0.1)
Limits on Foreign Currency Loans	-0.0101 (1.3)	-0.0279 (1.0)	-0.121*** (3.5)	0.0267* (2.0)	-0.07 (0.8)	-0.25*** (8.1)
Loan to deposit limits	Na	na	na	na	na	na
Demand Targeted measures						
Loan to value limits	0.0015 (0.1)	-0.0608*** (3.3)	-0.014 (0.3)	0.0024 (0.2)	-0.0249 (1.0)	-0.0879*** (3.5)
Debt to income limits	0.0559** (2.0)	-0.0757*** (4.5)	-0.0633 (1.4)	-0.0043 (0.4)	0.0533 (0.6)	-0.0163 (0.3)
General measures						
Levy/tax on fin instits	0.0234 (0.4)	-0.0228 (0.6)	0.0251 (0.4)	0.0086 (0.2)	-0.0669 (0.9)	0.102 (0.8)
Liquidity measures	-0.0209 (0.7)	-0.00132 (0.1)	-0.0353 (0.7)	0.0488 (1.5)	0.0479 (1.4)	0.0145 (0.4)
Limits on FX operations	0.569*** (19.9)	-0.0188 (0.9)	0.0115 (1.0)	-0.198*** (12.7)	0.0433 (1.0)	-0.111*** (3.3)
Reserve requirements	-0.0206 (1.1)	0.0989*** (3.2)	0.0256 (0.7)	0.0004 (0.1)	0.0554*** (2.8)	0.0261 (1.4)
SIFI surcharges	-0.0689 (1.5	0.0103 (0.4)	0.0623 (1.4)	0.0217 (0.9)	0.175 (1.4)	0.0073 (0.1)
Other macroprudential	0.00059 (0.1)	-0.0111 (0.4)	-0.0177 (0.8)	0.0136 (0.8)	-0.0124 (0.3)	-0.0325 (0.7)

Variation in effects at constant interest rates

	Initial effect of macroprudential policy: at different interest rates			Cumulative effect of macroprudential policy: at different interest rates		
	CBR=0.50%	**CBR=3%**	**CBR=6%**	**CBR=0.50%**	**CBR=3%**	**CBR=6%**
Summary macroprudential Instruments						
MAPP-INDEX	0.000	0.000	0.000	0.000	0.000	0.000
LOAN-TARGETED	-0.03	-0.03	-0.03	0.000	0.000	0.000
DEMAND	-0.0461	-0.0461	-0.0461	0.000	0.000	0.000
SUPPLY-LOANS	-0.218	-0.218	-0.218	-0.583	-0.583	-0.583
SUPPLY-GENERAL	0.0456	0.0456	0.0456	0.000	0.000	0.000
SUPPLY-CAPITAL	0.000	0.000	0.000	0.000	0.000	0.000
Individual macroprudential Instruments						
Capital based measures						
Countercyclical buffer	-0.041	0.028	0.111	-0.110	0.075	0.298
Loan-supply targeted measures						
Provisioning requirements	-0.047	0.021	0.102	-0.125	0.055	0.272
Loan restrictions	-0.014	-0.089	-0.178	-0.040	-0.237	-0.475
Limits on Foreign Currency Loans	-0.108	0.109	0.187	0.036	0.214	0.428
Demand-targeted measures						
Loan to value limits	-0.061	-0.061	-0.061	0.000	0.000	0.000
Debt to income limits	-0.02	-0.02	-0.02	0.149	0.149	0.149
General measures						
Limits on FX operations	0.47	-0.025	-0.619	1.257	-0.067	-1.655
Reserve requirements	0.099	0.099	0.099	0.000	0.000	0.000

Robustness checks

- We ran robustness checks to assess whether the results are stable to changes in variable definitions, sample or specification.
  - central bank policy rate replaced by the three-month interbank rate
  - country-level clustering replaced with bank-level clustering
  - each of the current-period policy variables instrumented prior to estimation by two lags of itself
- Results were broadly similar, especially for the summary variables.
- We contend that the robustness checks tend to underpin the validity of the baseline results

Summary of findings

1. Certain macroprudential policies do have an impact on banks' net interest margins. The main effect is a negative impact on the margin in the short run from demand-based policies, namely loan-to-value limits and debt-service-to-income limits, and also supply-loan based policies such as controls on credit growth, foreign currency lending and loan to deposit ratios.

2. No effects are found from capital-based policies and a positive one from general policies (driven by reserve requirements). We contend that these policies are primarily aimed at ensuring that banks can cope in the event of a systemic crisis by build-up of resilience, not at altering portfolio decisions on earning assets and hence should have more limited impact on interest margins. These are broadly in line with Hypothesis 1.

3. No long run effects are found for the summary measures of policy, apart from a weak negative effect from loan-supply targeted policies, although some are found for individual instruments. This is suggestive of countervailing action by banks against any short run impact on margins from macroprudential policies. This is in line with Hypothesis 2.

4. There are significant interactions with monetary policy, as shown when macroprudential policy is leveraged in combination with the difference and level of the interest rate.

5. Short-run interaction effects are detected for a number of macroprudential policies, so that we see negative interaction terms in differences for the MAPP index of all policies and demand measures, zero for capital-based and positive for supply-all and supply-general. Accordingly the first group should be chosen in the short run in order to accentuate effect on margins of a monetary tightening, the second is neutral while the third will help to alleviate its effects on bank margins.

6. While effects of summary measures do not vary across interest rate levels, the effect for several individual instruments varies across levels of interest rates. Negative short run effects are most common at low interest rates, while long run effects are both less frequent and on balance zero or positive, notably at higher interest rates.

7. Robustness checks underpin the validity of the baseline results.

Conclusion

- We suggest that the most important contributions of this study are the differential effects on the margin of different types of macroprudential policies, the different short and long run effects of macroprudential policies, and the monetary/macroprudential policy interactions on the margin. These have not been tested in the literature to date.
- Results have important implications for policymakers seeking to assess the overall policy stance, not least when monetary policies are tightened to reduce inflationary pressures
  - if both monetary and loan supply/demand focused macroprudential policies are tightened together, banks will have less net interest income from which to accumulate capital
  - these effects are mitigated if capital-based or general policies are tightened along with monetary policy.
  - in the long-term, stringent monetary policies will tend to expand the margin while there is no offsetting effect from macroprudential polices except in the case of loan-supply based policies.

- Results also relevant for bank management,
  - short run challenge to profitability from a tightening of macroprudential policy, especially if it is combined with a tightening of monetary policy.
  - possible incentive to expand non-interest activity so that related income can compensate from loss of net interest income.
  - results suggest that in the longer term managers are able to compensate for any initial impact of macroprudential policy on margins, which may however entail a shift to a higher-risk portfolio.
- Further research
  - investigate interest rate and macroprudential effects on margins in emerging market economies
  - assess role of macroprudential policies on other components of overall profitability, notably non-interest income. Is a negative impact of macroprudential policy on the margin offset by banks seeking higher non-interest income via fees and trading income, and what is the consequent impact on banking sector risk?

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