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Abstract

We study how banks react to policy announcements during a representative policy cycle involving consultation and publication using a novel dataset on the population of all mortgage transactions and regulatory risk assessments of banks. We demonstrate that banks likely to benefit from lower capital requirements increase the size of this capital relief by permanently investing into low risk assets after the publication of the policy. In contrast, there is no evidence that they already reacted to the early step of the development of the policy, the publication of the consultation paper. We show how these results can be used to estimate a lower bound on the cost of capital for smaller banks, for which such estimates are typically difficult to obtain.

Key words: Bank regulation, mortgage lending, supervisory review process, capital requirements.

JEL classification: G21.

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1.   Introduction

While much is known about the role of forward guidance when communicating monetary policy (McKay et al., 2016; Andrade et al., 2019), there is still a lack of understanding about banks' reactions to anticipated changes in regulation communicated at various stages of the policy cycle. Understanding the exact announcement mechanism is important, as changes in minimum capital requirements affect bank lending (Gropp et al., 2019a) and the real economy (Fraisse et al., 2019). In this paper, we investigate a salient change in policy, which creates an incentive for banks to change their asset composition in order to decrease their capital requirements. We examine whether UK banks react to anticipated reliefs of capital requirements and we analyse to which of the announcements in the policy lifecycle they react and how.

The policy which we examine is aimed at reducing minimum capital requirements for small banks that are considered to be well managed. The reduction is based on the riskiness of their loan portfolios at the time of their supervisory review. In our set-up, we follow announcements of the policy at two steps of the typical policy cycle: (i) issuance of a consultation paper, which solicits industry feedback on the planned policy; and (ii) publication of the final policy in the form of a policy statement. In addition, we explore the role of bilateral communication channels between banks and their appointed supervisors (which are part and parcel of the routine process of supervisory oversight) for the assessed outcomes.

We undertake a difference-in-differences analysis with multiple treatment dates in the spirit of Rodnyansky and Darmouni (2017). We examine whether banks that were reasonably likely to be eligible reacted to these communications, by prepositioning in low risk assets in order to increase their expected capital relief, relative to other banks that were reasonably certain about their ineligibility. We use unique data on the population of all mortgage transactions in the United Kingdom between 2016 and 2019. These come from the FCA's Product Sales Database which is well established in the existing literature (Cloyne et al., 2019). We complement these data with confidential information on banks' regulatory risk scores, the exact dates of their supervisory reviews as well as all the qualitative bilateral communication that took place between supervisors and banks.

Our results suggest that banks likely to receive capital reliefs invest in low risk assets prior to the supervisory review, which implements the policy at the bank. In turn, this prepositioning by banks leads to a reduction in the riskiness of their overall portfolio, which is persistent even after the implementation of the policy.

However, we also find that small banks considered ineligible for capital reliefs under the policy move in the opposite direction. They increase their exposure to riskier mortgages. This suggests that the two sets of banks are close competitors in the mortgage market.

We also find evidence consistent with the idea that banks do not adjust their asset composition in response to the issuance of the consultation paper. They only do so once uncertainty about the implementation of the final policy is resolved following the publication of the policy statement. At the same time, we find evidence that banks' responses depend on the information related to their eligibility for capital relief as received from supervisors through existing bilateral communication channels.

This paper relates to three strands of the literature. First, we contribute to extant work on the announcement effects of bank regulations. The existing literature examines market reactions to new regulation (Bruno et al, 2018; Schäfer et al, 2017). To the best of our knowledge, there is no evidence on how regulated banks react to these announcements. The present paper fills this gap by examining a specific policy which allows regulated banks to take actions, namely to increase exposure to low risk assets, in order to increase the expected reduction in capital requirements.

Second, our paper is related to the literature on regulatory arbitrage and window dressing by banks. This literature has reported strategic underreporting of risk in the trading book (Begley et al, 2017), credit risk in the banking book (Behn et al, 2014) and securitized credit portfolios (Acharya, 2013). Moreover, there is evidence that banks arbitrage increases in capital requirements by applying various regulatory adjustments (Gropp et al., 2019b). The paper closest to ours comes from Abbassi et al. (2018). It shows that, following the announcement of the Asset Quality Review (AQR) in Europe, banks subject to the AQR increased the share of their safe securities. Our analyses complement this paper in several important dimensions: (i) we show that banks also react to anticipated changes in their regulatory capital requirements; (ii) we are able to pinpoint to the effects of the exact timing of the policy cycle (consultation or publication of policy); and (iii) we show that small banks which are typically not subject to the AQR but present in our sample react to the anticipated policy changes.

Last, our results are informative for banks' cost of capital considerations (Kisin and Manela, 2016). For small banks, which are not listed on the stock markets, such estimates typically do not exist. We fill this gap by proposing a conceptual framework which showcases how our estimates can be used to gauge a lower bound of the implied cost of regulatory capital for such banks.

The remainder of the paper proceeds as follows. Section 2 sketches the background of the policy. Section 3 introduces our data and Section 4 our empirical methodology. Section 5 presents the main results and Section 6 lays out an application with respect to the estimation of the shadow cost of capital for small banks. Section 7 concludes.

2. Background on the policy

Under the Basel's Pillar 2 framework,[1] supervisors can impose bank-specific capital requirements in order to capture risks that are not adequately, or not at all, captured under the standard Pillar 1 minimum capital requirements, whereby banks are required to hold capital resources of at least 8% of their risk-weighted assets bases. Credit risk typically represents the main component of banks' risk-weighted assets bases. Banks have two options to calculate risk weights: (i) they can estimate their own risk weights under the internal ratings-based (IRB) modelling approach, which is subject to explicit supervisory approval to ensure the integrity of these internal risk assessments; or (ii) they can adopt the standardised approach (SA) where risk weights are set in a standardised manner, supported by external credit assessments. The latter approach is typically adopted by smaller, less established and sophisticated banks.

In February 2017, the Prudential Regulation Authority (henceforth, the regulator) published a consultation paper proposing refinements to its approach to setting bank specific capital requirements under the Pillar 2 framework.[2] Specifically, the regulator sought to address concerns over higher risk weights under SA compared to those under IRB models. This was especially the case for residential mortgages with low loan-to-value (LTV) ratios where SA risk-weights can be up to seven times higher than under IRB, as shown in Table 1.[3]

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[1] See Basel Committee on Banking Supervision, 'Pillar 2 (Supervisory Review Process)' (January 2001), available at https://www.bis.org/publ/bcbsca08.pdf.

[2] PRA, 'Refining the PRA's Pillar 2A capital framework', February 2017, available at https://www.bankofengland.co.uk/-/media/boe/files/prudential-regulation/consultation-paper/2017/cp317.

[3] Benetton et al. (2020) found that the gap in risk-weights for UK residential mortgages between banks on IRB vs SA allows the former to undercut the latter, and thus pushes the latter to increase their exposure in riskier high LTV segments. These findings corroborated the view that the IRB vs SA gap at low LTV is too wide.

Table 1. IRB vs SA gap in risk weights for residential mortgages

LTV bands	Risk weights under SA	Risk weights under IRB
0% ≤ LTV < 50%	35.0%	5.3%
50% ≤ LTV < 60%	35.0%	9.1%
60% ≤ LTV < 70%	35.0%	11.6%
70% ≤ LTV < 80%	35.0%	16.6%
80% ≤ LTV < 90%	36.0%	22.4%
90% ≤ LTV < 100%	43.0%	33.3%

Note: Risk weights under IRB are average risk weights based on exposure amounts. They are calculated based on expected and unexpected losses.[4]

Under the proposals, the regulator would allow supervisors to exercise judgement and reduce bank specific variable Pillar 2A capital requirements for banks and building societies (henceforth, simply "banks") under the SA where appropriate. In assessing capital needs, supervisors would take into account the greater degree of conservatism that may apply to risk weights derived under the SA (Table 1, column 2) compared to those from IRB models for certain types of exposures, using so-called IRB credit risk benchmarks (Table 1, column 3). These are average risk weights for different types of exposure across banks that use IRB models. The aim of the policy is to address the concern that capital standards are overly prudent for banks using the SA for credit risk exposures. An excessive IRB vs SA gap might disadvantage SA banks in safer low LTV bands, thus inducing them to increase their exposure in riskier high LTV bands.

In October 2017, the regulator finalized this policy by publishing a policy statement, with implementation date of 1 January 2018.[5] This new approach has been implemented as part of the Supervisory Review and Evaluation Process (SREP) reviews under the Pillar 2 framework. Specifically, whilst the largest systemic banks are subject to this review process annually and concomitantly, smaller ones (i.e., those targeted by this policy) are reviewed on a rolling 2 or 3-year cycle (from 2018 to 2020) which is staggered over time. This proportionate

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[4] PRA, 'The PRA's methodologies for setting Pillar 2 capital – Statement of Policy' Updated in February 2020, available at https://www.bankofengland.co.uk/-/media/boe/files/prudential-regulation/statement-of-policy/2020/the-pras-methodologies-for-setting-pillar-2a-capital-update-february-2020.pdf?la=en&hash=4EB02F435F5BF46507222B09F0DE271333A5409E.

[5] PRA, 'Refining the PRA's Pillar 2A capital framework', October 2017, available at www.bankofengland.co.uk/pra/Pages/publications/cp/2017/cp317.aspx.

approach also takes into consideration the limited supervisory resources available to oversee a large population of banks.[6]

Under the SREP framework, banks are required to first undertake an Internal Capital Adequacy Assessment Process (ICAAP) in order to assess on an ongoing basis their own capital adequacy depending on the level and nature of the risks to which they are or might be exposed. The regulator will then review the submitted ICAAP as part of the SREP. This internal assessment (ICAAP) is based on the latest available annualised financial statement data, thus typically at the end of the year that precedes the SREP.

The calculation of the reduction in the Pillar 2A capital framework does not follow mechanically from the comparison with IRB benchmarks. Supervisors maintain full discretion informed by a business model analysis, including consideration of whether the benchmark was representative of bank-specific risk profiles. Banks considered to be relatively low-risk and well managed would be considered eligible for capital reliefs. By contrast, banks that do not ensure a sound management and coverage of its risks, or have concentrated exposures to asset classes for which the regulator does not have sufficient data to produce a reliable IRB benchmark, would be considered ineligible. In addition, the published eligibility criteria of the policy were left relatively flexible to allow scope for supervisory judgment. As a result, banks on the SA faced uncertainty as to whether they were eligible.

In conclusion, one aim of this policy was essentially to incentivise SA banks to rebalance their portfolio from riskier high LTV residential mortgages towards safer low LTV ones. This was deemed to be beneficial not only in terms of competition (by levelling the playing field between IRB and SA banks as demonstrated by Benetton et al. 2020), but also with regards to the safety and soundness of these relatively less sophisticated SA banks.

Given that the calculation of the reduction in capital requirements is based on the portfolio allocation reported by banks as part of their ICAAP preceding the SREP, banks have the opportunity to increase their exposure in low LTV residential mortgages before the actual policy implementation (i.e., "preposition"), in order to increase not only the potential "benefits from the implementation", but also the likelihood of being considered eligible in the first place. This possible change in viewpoint is because the resulting safer portfolio allocation would in turn ameliorate the overall risk profile of the bank in question, which is one of the eligibility criteria outlined in the consultation paper and confirmed in the policy statement.

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[6] It is worth noting that the PRA expects banks to publicly disclose the amount of total capital requirements (given by the sum of P1 and P2 requirements) which apply to them. See PRA, 'The Internal Capital Adequacy Assessment Process (ICAAP) and the Supervisory Review and Evaluation Process (SREP)', March 2019, available at https://www.bankofengland.co.uk/-/media/boe/files/prudential-regulation/supervisory-statement/2019/ss3115-update-march-2019.

For example, the SREP of a bank in May 2019 would have used balance sheet information from its ICAAP based on data dated typically at the end of the previous year. Therefore, the bank had the opportunity to increase its exposure to low LTV mortgages during 2018. In doing so, however, the bank would have to depart from what the bank considers to be the best portfolio allocation given the current capital requirements. Therefore, as lower LTV mortgages are typically priced at lower rates than high LTV mortgages, prepositioning in low LTV mortgages would entail an opportunity cost in adjusting the current allocation to the one that would maximise the expected benefit from the policy implementation given by the probability of being eligible multiplied by the magnitude of capital relief.

3.   Data

3.1.   Bank eligibility criteria

Both the consultation paper and the policy statement highlight criteria, which determine whether a bank is eligible for capital relief under the policy, or not. Specifically, the consultation paper mentions three criteria, which are relevant for banks' eligibility considerations: (i) banks should have a sound management; (ii) they should have a low-risk profile; and (iii) they should have no concentrated exposure to asset classes for which the regulator does not have an IRB benchmark.[7] In addition, banks that use the IRB approach to capitalize credit risk are not eligible. We translate these criteria into metrics that allow us to build a list of banks that are likely consider themselves as eligible.

Criteria 1: sound management

We use the list of banks with a risk management and governance (RM&G) scalar to incorporate these criteria.[8] We think that a bank will consider itself as having a sound management as long as the regulator did not flag its risk management practice as bad. In other words, the baseline assumption of our approach is that all banks have a sound management. Supervisors may flag significantly weak risk management and governance to

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[7] The policy applied to all asset categories that could give rise to a gap in risk weights between SA and IRB, although the by far most prominent one was residential mortgages, which is the focus of our analysis.

[8] Under the European Banking Authority's SREP guidelines, competent authorities should set additional own funds requirements to cover risks posed by RM&G weaknesses where appropriate as an interim measure, while the deficiencies are addressed: see EBA, Guidelines on common procedures and methodologies for the supervisory review and evaluation process (SREP) (EBA/GL/2014/13, December 2014), available at https://eba.europa.eu/sites/default/documents/files/documents/10180/935249/4b842c7e-3294-4947-94cd-ad7f94405d66/EBA-GL-2014-13%20(Guidelines%20on%20SREP%20methodologies%20and%20processes).pdf.

banks whose capital requirements are increased as a result via a RM&G scalar.[9] Hence, we argue that banks that have a RM&G scalar will consider themselves as not eligible to the policy.

Criteria 2: low risk profile

Supervisors rank banks over a cardinal scale on a number of risk drivers (i.e., from low to high risk).[10] Those risk scores are for internal purposes only and, thus, are not communicated to banks. However, banks have regular communication with their supervisors, which culminates in a holistic assessment of their specific risk profile. This feedback can help banks understand how risky they are perceived to be by their supervisors and, thus, whether they are likely to be eligible. The idea is that a bank below a certain threshold should consider itself as being perceived as a low risk bank by its supervisors. Specifically, using risk scores from June 2017, we build two proxies of the true criterion in order to construct the list of eligible banks: (i) no risk score above two thirds of the maximum score; and (ii) an average risk score below less than half of the maximum score.

Both proxies rely on the idea that the safest banks know they are considered as relatively low risk. However, the first proxy is more precise and demanding for banks to be able to infer their eligibility, in the sense that they need to have received supervisory feedback focussed on specific issues. Supervisors provide formal and informal communication to banks that would have helped them understand if were eligible or not. To examine if banks with a high risk score are indeed likely to know about it, we also reviewed a sample of formal letters which supervisors sent to banks at the end of their SREP. We then checked if the tone of the letter regarding a specific risk changes once supervisors have given a high score in a specific risk area. We then compared the tone of these letters with letters from banks that are considered low risk on this specific area. We found that letters to banks with a high risk score do tend to clearly signal supervisors' concerns about this specific risk.[11] Accordingly, we take some

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[9] For more details on this supervisory approach, see PRA, Assessing capital adequacy under Pillar 2, Policy Statement (PS17/15, July 2015), available at https://www.bankofengland.co.uk/-/media/boe/files/prudential-regulation/policy-statement/2015/ps1715update.pdf?la=en&hash=6ADA6A6C146FD095999E25E78A6A52605D4EA77B.

[10] For more details on the internal risk scoring methodology, see PRA, The Prudential Regulation Authority's approach to banking supervision (October 2018), Chapter 3, available at https://www.bankofengland.co.uk/-/media/boe/files/prudential-regulation/approach/banking-approach-2018.pdf; and also Bholat et al. (2017).

[11] Table A1 in the Annex illustrates these differences in wording. Banks with low risk scores tend to have a more positive tone (suggesting ways to improve), while banks with high risk scores have a more direct tone in their letter, pointing out the area they must improve upon. See Bholat et al. (2017) for a more in-depth analysis of the semantic content of those supervisory letters.

comfort from this anecdotal evidence that banks actually knew indirectly about their supervisory risk profile. We also keep the other approach based on low average risk score as an alternative proxy for robustness analysis.

Criteria 3: exposure to assets with no IRB benchmark

We do not capture explicitly this criterion in our analysis, as we restrict our analysis to banks that only have some material exposures to residential mortgages. The consultation paper includes a list of asset classes of credit risk IRB benchmarks. We focus our analysis on residential mortgages, which are differentiated by LTV. We do this for two reasons: first, residential mortgages constitute the most material asset class for the majority of retail banks; second, it is the asset class for which the gap in risk weights between the SA and the IRB approach is the widest.

Criteria 4: no IRB modelling

We restrict our sample to banks using the SA. The target of the policy is to reduce the gap in risk weights between banks using SA and banks using IRB models. Banks that have an IRB licence could be eligible for the policy if they use the SA for a fraction of their portfolio. However, it is unlikely that banks with an IRB licence use SA for their mortgage portfolio given that risk weights are notably higher under SA. Therefore, we consider that banks that have an IRB licence (at the entity level or at the group level) always use the IRB approach for their mortgage portfolio and will not deem themselves eligible. In addition, we also exclude these IRB banks from the control group of ineligible firms. This is because, compared to the type of banks likely to be eligible, banks using IRB models tend to be very large and with a significant competitive advantage in terms of cost of funding.[12] Therefore, for the sake of comparability, we restrict both our treatment and control groups to banks under SA.

Table 2 summarizes the eligibility criteria set out in the consultation paper and implemented with the policy statement, and how we take them into account in our analyses. Out of 47 banks in our sample, we classify 30 as being eligible based on our first approach to proxy for the risk profile of banks, while only 18 satisfied the alternative approach based on the average risk score criterion. That is to say, thanks to the type of precise feedback provided by supervisors to firms through bilateral communication channels we consider that a majority of small banks could expect to be deemed eligible for capital relief under the policy proposal.

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[12] See, e.g., Financial Conduct Authority (FCA), 'Strategic Review of Retail Banking Business Models', December 2018, available at https://www.fca.org.uk/publication/multi-firm-reviews/strategic-review-retail-banking-business-models-final-report.pdf.

Table 2. Eligibility criteria – Consultation paper

Eligibility criteria from CP	Our proxy
Sound management	Banks with an RM&G scalar are not eligible
Low risk profile	Bank with no risk score above two-thirds of the maximum score are eligible (alternative criterion: an average of risk score below less than half of the maximum score).
No concentrated exposure to assets w/o benchmark	We restrict our analysis to banks with substantial mortgage exposure as a robustness test
Using the Standardized Approach	Banks using the internal ratings-based (IRB) approach are not eligible

We complement this information with the exact date of the supervisory review (SREP) for each of the banks we include in our sample. In Table 3, we show that 13 banks had their SREP in 2018, of which 11 were deemed eligible (under the criterion that the bank has no risk score above two-thirds of the maximum score);[13] 13 banks had their SREP in 2019, with 9 eligible: and 21 had their SREP in 2020, with 10 eligible.

In our empirical analyses, we focus on the sample of 13 banks which had their SREP in 2019, and not on the previous and subsequent cohorts. Regarding the cohort of banks with a SREP in 2018, the publication of the policy statement in Q4 2017 was too late for them to properly preposition by the end the same year (i.e., the cut-off date for the collection of annual data to be used in the ICAAP submission). While they could have speculatively reacted to the publication of the consultation paper in February that year, we find that this was not the case. In addition, there are extremely two ineligible banks for the control group, as shown in Table 3. This might invalidate any inference from our analyses. Regarding the cohort of banks with a SREP in 2020, they had more than two years to preposition by the end of 2019. There are two major confounding factors complicating the identification of prepositioning for the 2020 cohort during 2019: (i) the implementation of structural separation ("ring-fencing") in January 2019, which allegedly triggered an intensification of competition among large IRB banks, especially in residential mortgages (see Chavaz and Elliott, 2020); and (ii) the expiry in January 2019 of credit facilities for residential mortgages under Bank of England's Funding for Lending scheme, which was aimed at lowering banks' cost of funding. In contrast, the cohort of banks with a SREP in 2019 had limited time to react to the publication of the policy statement

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[13] Table A2 the Annex provides the equivalent table under the alternative criterion.

by the end of 2018, which allows a sharper identification of the prepositioning effect under our difference-in-differences approach.

Table 3. Number of banks by SREP year and eligibility

SREP	Eligible	Not eligible	Total
2018	11	2	13
2019	9	4	13
2020	10	11	21
Total	30	17	47

Note: This table shows the number of banks by SREP year and eligibility.

In addition, we complement this information on bank eligibility with data on further bank characteristics. In Table 4, we compare the characteristics of 2019 SREP banks deemed eligible relative to banks classified as ineligible based on key bank characteristics following Gropp et al (2019a). The two sets of banks are very similar in terms of the average LTV of mortgages originated in 2016, before the publication of the consultation paper. Moreover, they are similar in terms of importance of the mortgage portfolio relative to total assets and reliance on deposits as the main source of funding. However, ineligible banks tend to be smaller on average and slightly better capitalised.

Table 4. Differences in bank characteristics in 2016

Variable	Eligible	Not eligible	Difference
LTV	55.37	56.21	-0.84
Mortgage / Total assets	0.79	0.75	0.05
Deposits / Total assets	0.75	0.70	0.05
CET1 / Risk weighted assets	0.18	0.23	-0.05
Total assets (in million £)	1,671	1,100	571

Note: This table shows mean differences of key bank characteristics as of 2016 of banks, which had their SREP in 2019 by eligibility (below two-thirds criterion). LTV is the average LTV of the flow of new mortgages in 2016. LTV is winsorized at 1% and 99% to account for outliers. We get the data on LTV from the Product Sales Database (see below for more information) and collect data manually from banks' reports for all other variables. We lack data on Mortgage / Total assets for four banks, one of which is ineligible.

3.2. Mortgage transactions

For each of the 13 banks with a SREP in 2019 we match mortgage transactions of all mortgages granted from 2016 Q2 until 2019 Q4. These data come from FCA's Product Sales Database. In this data set, we observe new mortgages and mortgages refinanced with a new bank ("switchers"). It includes the exact quarter of each of these transactions as well as further mortgage and borrower characteristics. Table 5 shows these characteristics in our sample. We exclude the two quarters of the publication of the consultation paper and policy statement as these quarters are not clearly attributable to the time before publication or after. Our final sample consists of 56,960 mortgage transactions. Most importantly for our analyses, our sample includes the loan-to-value ratio, LTV, of each mortgage which is 67% on average (Table 5, column 1, row 1).[14] We use this variable to create a dummy variable denoting whether a mortgage is below a certain LTV threshold or not. We adopt the convention of classifying mortgages with an LTV below 80% as being at low LTV. Below this threshold, IRB risk weights are less than half the corresponding ones under SA (Table 1, rows 1 to 4), thus entailing a material disadvantage for banks using SA. Slightly less than 59% of all mortgage transactions display a LTV of less than 80% (Table 5, column 1, row 2). We also adopt two alternative, more conservative thresholds: (i) LTV below 60%, which identifies the lowest pricing band conventionally used by banks (i.e., to qualify for the lowest available rates); and (ii) LTV below 50%, where the gap in risk weights is at its widest (Table 1, row 1). About 34%

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[14] The distribution of LTV is winsorized at 1% and 99% to account for outliers.

of all mortgages show LTVs of below 60% (Table 5, column 1, row 3), and approximately 26% have an LTV below 50% (Table 5, column 1, row 4).

The Product Sales Database also provides a set of other important mortgage contract terms. With regard to the purpose of the mortgage transaction, on average about one quarter of all mortgage transactions are made by home movers, 30% by first time buyers and 43% of all mortgages are taken by refinancers (Table 5, column 1). The vast majority of mortgages in our sample are priced at a fixed rate (86% - Table 5, column 1, penultimate row), with the remaining being on some form of adjustable interest rate. Finally, with respect to the length of the initial incentive period,[15] 42% of all mortgage transactions are 2 years or shorter (Table 5, column 1, last row).

Table 5. Summary statistics

	Mean	St.Dev.	Min	Max	Observations
LTV					
LTV	66.53	24.77	6.24	95.00	56,960
LTV (<80%)	0.59	0.49	0	1	56,960
LTV (<60%)	0.34	0.47	0	1	56,960
LTV (<50%)	0.26	0.44	0	1	56,960
Mortgage type					
Home mover	0.24	0.43	0	1	56,960
First time buyer	0.30	0.46	0	1	56,960
Refinancing	0.43	0.49	0	1	56,960
Mortgage rate					
Fixed rate	0.86	0.34	0	1	56,960
Incentive period (<=2 years)	0.42	0.49	0	1	56,960

Note: This table shows the summary statistics of the variables displayed in the regression tables. The sample includes observations between 2016 Q2 until 2019 Q4. LTV is winsorized at 1% and 99% to account for outliers.

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[15] In the United Kingdom, mortgages are on a teaser rate, which typically lasts 2 years. After this period, the mortgage rate reverts to a relatively higher standard variable rate (SVR).

4.   Empirical strategy

Our empirical strategy follows Rodnyansky and Darmouni (2017). They use a difference-in-differences setup with three treatment dates to examine the effects of quantitative easing on bank lending behaviour. In our main specification, we estimate the following regression model using OLS.

$$Low\ LTV_{i,b,t} = \beta_1\ x\ Eligible_b\ x\ Post\ PS_t + \beta_2\ x\ Eligible_b\ x\ Post\ CP_t + \beta_3\ x\ Post\ PS_t$$
$$+ \beta_4\ x\ Post\ CP_t + \gamma_b + X_{i,b,t} + \varepsilon_{i,b,t}$$

where $Low\ LTV_{i,b,t}$ is an indicator of whether the mortgage *i* by bank *b* at point in quarter *t* has a loan to value ratio of less than 80% (zero otherwise). In different specifications, we use alternative thresholds and contrast them with a continuous measure of LTV. The comparison with a continuous measure of LTV is especially relevant from a policy evaluation perspective, in that it would be an unintended policy consequence if eligible banks increased their exposure at very high LTV (i.e., where interest rates are higher) to compensate for the increase at low LTV (i.e., polarised portfolio allocation), which might leave the average LTV unchanged. Therefore, the result desired from a policy perspective would be an increase at low LTV alongside a reduction in the continuous measure of LTV.

$Post\ CP_t$ is a time dummy variable which indicates whether the mortgage transaction was done in the quarters following the consultation paper publication, i.e., in 2017 Q2 or later (zero otherwise). $Post\ PS_t$ is an indicator of whether the mortgage transaction was done in the quarters after the policy statement publication, i.e., in 2018 Q1 or later (zero otherwise). The coefficient of this variable can be interpreted as the marginal effect of the publication of the policy statement net of the effect of the publication of the consultation paper. We exclude the quarters of the two treatment dates, consultation paper (2017 Q1) and policy statement (2017 Q4) as these quarters include both days before the publications as well as days after the publications. We interact the time dummy variables with $Eligible_b$ which indicates whether bank *b* was deemed eligible, using our no-risk-score-above-two-thirds criterion in our baseline analyses. γ_b is the vector of bank fixed effects which controls for time-invariant bank characteristics. This dummy variable absorbs the main effect of $Eligible_b$ which does not appear in our regression equation. $X_{i,b,t}$ is a vector of contract characteristics of mortgage transaction *i* (incentive period as well as the type of the interest rate, i.e., fixed rate). It also includes dummy variables to account for the geographic variation in the 12 UK regions included in our sample.

We cluster standard errors at the bank level. Our sample includes observations in the four years from 2016 Q3 until 2019 Q4. Hence, our estimated coefficients for the consultation paper ($Post\ CP_t$) and its interaction with $Eligible_b$ can be interpreted as the treatment effects relative to the pre-event period from 2016 Q3 until 2016 Q4. Similarly, our estimated coefficients of policy statement ($Post\ PS_t$) and its interaction with $Eligible_b$ can be interpreted as additional treatment effects relative to the effect of the consultation paper.

Similar to Rodnyansky and Darmouni (2017), we then go on to estimate the effect of each of the time quarters included in our sample relative to 2016 Q3. Undertaking these quarter-by-quarter analyses is relevant for two reasons: (i) it allows us to examine the persistence of the effects over time; and (ii) it allows us to examine the validity of the parallel trends assumption of our difference-in-difference design (i.e., we can examine whether banks had started prepositioning before the publication of the consultation paper). The first reason is important from a policy evaluation perspective, in that a reversal of the prepositioning effect after the date relevant to the submission of the ICAAP (i.e., at the end of 2018) would raise suspicions of "window-dressing". By contrast, the persistency of the prepositioning effect would be in line with the aim of the policy. Regarding the second reason, there might be a pre-existing trend in our data with eligible banks investing in low LTV mortgages prior to the announcement of the policy. This would invalidate the parallel trends assumption in our difference-in-differences design. Formally, we estimate the following regression model using OLS.

$$Low\ LTV_{i,b,t} = \sum_{t=-1}^{T} \beta_t\ x\ Eligible_b\ x\ Time_t + \sum_{t=-1}^{T} \gamma_t\ x\ Time_t + \gamma_b + X_{i,b,t} + \varepsilon_{i,b,t}$$

where $Time_t$ is an indicator of whether the observation is in quarter *t* (zero otherwise). For example, $Time_{t-1}$ indicates whether the mortgage transaction was done in 2016 Q4, the quarter before the publication of the consultation paper (zero otherwise). In the absence of prepositioning before the publication of the consultation paper, we expect the estimate of β_{-1} not to be statistically significantly different from zero. If it was negative, there might be evidence of prepositioning. Compared to the previous regression equation, we now include the quarters of the two treatment dates, consultation paper (2017 Q1) and policy statement (2017 Q4). All coefficients are estimated relative to 2016 Q3. We chose this quarter as the baseline it allows us to estimate the effect of the last quarter before the publication, 2016 Q4.

5. Results

5.1. Main result

In Table 6, we examine whether banks preposition in low LTV after the two event dates, i.e., the publication of the consultation paper in February 2017 and the publication of the policy statement in October 2017. This table shows the results of a linear regression model outlined above. In columns 1-2, the dependent variable is the propensity of banks granting a low LTV mortgage with a LTV of less than 80% (conditional on granting a mortgage). In columns 3-4, we show the effects on a continuous measure of LTV (again conditional on granting a mortgage). Explanatory variables are indicators of bank eligibility (using the below-two-thirds criterion) as well two time dummy variables, which correspond to the event periods.

The prepositioning effect is very pronounced in the aftermath of the publication of the policy statement. In fact, following the publication of the policy statement, eligible banks increased their propensity of investing in a low LTV mortgage (<80%) by 33.6 percentage points relative to ineligible banks (column 1). This estimated effect decreases slightly to 21.4 percentage points once we control for mortgage characteristics but it remains statistically significant at all conventional significance levels (column 2). Results in columns 3-4 suggest that not only the share of low LTV mortgages increased but also the overall LTV composition of new mortgages decreased. That is, banks did not offset lending into low LTV mortgages by simultaneously increasing the share of lending to very high LTV borrowers. In fact, following the publication of the policy statement eligible banks decreased the average LTV of new mortgages by 14.5 percentage points relative to ineligible banks (column 3). This estimated effect decreases slightly to 9.8 percentage points once we control for mortgage characteristics but it remains statistically significant at all conventional significance levels (column 4). This result is consistent with the aim of the policy as eligible banks also materially reduced the LTV level across their residential mortgage books.

15

Table 6. Prepositioning into low LTV

Dependent variable	LTV (<80%)		LTV	
	(1)	(2)	(3)	(4)
Eligible x Post (PS)	0.336***	0.214***	-14.452***	-9.784***
	(0.114)	(0.071)	(4.922)	(3.589)
Eligible x Post (CP)	-0.095	-0.002	0.003	-2.100
	(0.115)	(0.075)	(6.666)	(6.196)
Post (PS)	-0.205*	-0.135**	7.892*	5.248**
	(0.108)	(0.062)	(4.386)	(2.513)
Post (CP)	0.057	-0.009	1.494	2.619
	(0.091)	(0.052)	(4.987)	(4.810)
Bank FE	YES	YES	YES	YES
Regional FE	YES	YES	YES	YES
Control variables	NO	YES	NO	YES
Observations	56,960	56,960	56,960	56,960
Number of banks	13	13	13	13
Eligible banks	9	9	9	9
Mean of dep. Variable	0.591	0.591	66.531	66.531
Clustered S.E.	YES	YES	YES	YES
Method	OLS	OLS	OLS	OLS

Note: This table shows the results of a linear regression model estimated using OLS on the mortgage transaction level. In columns 1 & 2, the dependent variable is the propensity of granting a low LTV loan below 80%. In columns 3 & 4, the dependent variable is the continuous variable, LTV. In all columns, this table shows the results for banks that had their SREP in 2019. Explanatory variables are a time dummy variable (i.e., to signal if the transaction occurred after the CP and after the PS).as well as its interaction with bank eligibility (below two-thirds criterion). All regressions include bank FE which absorb the main effect of bank eligibility. We also control for contract and regional control variables. Standard errors are clustered on the bank level. ***, **, * denote statistical significance at the 0.01, 0.05 and 0.10-level respectively.

In contrast, there is no detectable effect whatsoever in response to the publication of the consultation paper in February 2017. This is somewhat remarkable as it was very likely that the policy proposal consulted upon was going to be ultimately confirmed and thus implemented in January 2018. This is because the UK regulator had already signalled in 2016 its commitment to reduce the IRB vs SA gap in risk weights for residential mortgages by reviewing the methodology for setting P2A capital requirements.[16] Therefore, this finding

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[16] See Sam Woods (Deputy Governor, Prudential Regulation and Chief Executive Officer, Prudential Regulation Authority), The revolution is over. Long live the revolution!, Speech at the City Banquet, Mansion House, London, 28 October 2016, p. 8, available at http://www.bankofengland.co.uk/publications/Documents/speeches/2016/speech933.pdf ("I have long been troubled, as I know have members of the Treasury Committee, by the gap in risk-weights for low-LTV mortgages between banks who use models to calculate them and (typically smaller) banks who use a standardised, and therefore relatively crude, weighting provided by regulators. Now of course the leverage ratio is an essential

provides a strong indication that regulated banks will wait for the finalisation of the policy before reacting to it, no matter how well anticipated the policy in question may be and having been clear to them that there was going to be very little time left to preposition after the publication of the consultation paper.

The prepositioning effect in response to the publication of the policy statement is remarkable in light of the opposite effect for the (non-interacted) *Post (PS)* variable, indicating that ineligible banks to some extent withdrew from low LTV segments whilst eligible banks moved in. This opposite effect suggests that ineligible banks might have been induced to increase their overall LTV levels, possibly in response to even higher competition in the low LTV segment market coming from eligible banks.[17]

5.2. Persistency of effects

We then go on to analyse the persistence of the effects over time and examine the validity of the parallel trends assumption of our difference-in-difference design. For that, we estimate the effect of each of the time quarters included in our sample relative to 2016 Q3, in the spirit of Rodnyansky and Darmouni (2017).

In Figure 1a, we display the estimated quarterly coefficients (and 90% confidence bounds) where LTV (<80%) is our dependent variable. The estimated coefficient in the quarter 2016 Q4 is close to zero and statistically insignificant at all conventional significance levels. We conclude that there is no evidence that eligible banks prepositioned in the quarter before the publication of the consultation paper.
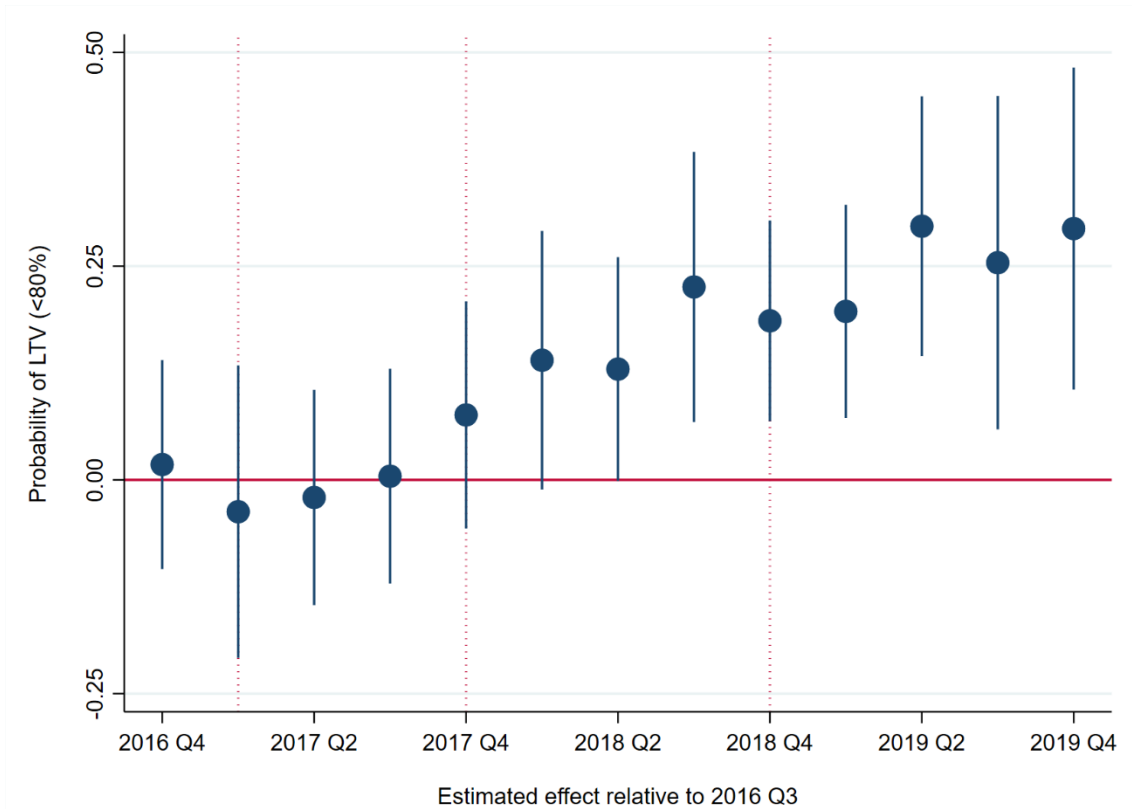
In line with our previous results, we do not see evidence of prepositioning in the quarters following the publication of the consultation paper in 2017 Q1. Yet, banks start prepositioning in the quarter following the publication of the policy statement, 2018 Q1. Interestingly, the effects seem to be persistent over time. This is important evidence from a policy evaluation perspective, as the persistency of prepositioning is in line with the intention of the policy. By

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complement to the risk-weighted framework which mitigates the effect of such disparities. Nevertheless they still bother me both in light of our secondary competition objective, given the risk of an un-level playing field, but importantly also in light of our safety and soundness objective because of the economic incentive it provides for standardised banks to concentrate on higher-LTV lending. […] I intend that we will bring forward proposals under our Pillar 2 regime which should also reduce the risk that our capital standards are overly prudent for smaller banks using the standardised approach to credit risk to calculate their requirements – essentially by looking at capital requirements in the round rather than assuming that a simple "sum of the parts" approach will necessarily deliver the right answer.")

[17] It is worth pointing out that the two key determinants of ineligibility are supervisory concerns in terms of governance and riskiness of the business model.

contrast, a reversal of the prepositioning effect after the date relevant to the submission of the ICAAP (i.e., end of 2018) would raise suspicions of 'window-dressing' by banks.
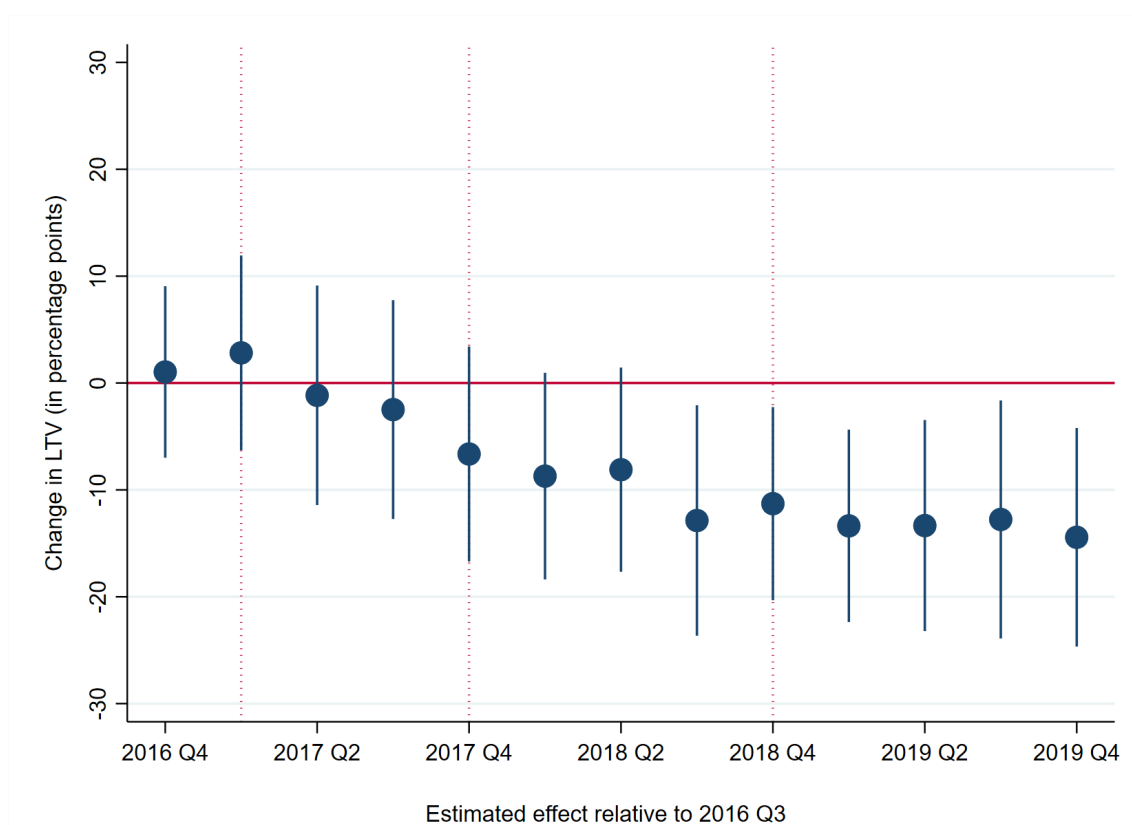
Figure 1a. Prepositioning into low LTV (<80%)

Note: Figure 1a shows the results of a linear regression model estimated using OLS on the mortgage transaction level. The dependent variable is the propensity of granting a low LTV loan below 80%. The coefficients displayed are the time dummy variables interacted with bank eligibility (below two thirds criterion). The first dotted, vertical line relates to the quarter of the publication of the CP, 2017 Q1. The second dotted, vertical line relates to the quarter of the publication of the PS, 2017 Q4. The third dotted, vertical line relates to the last quarter of the year before firms had their SREP assessments, 2018 Q4. The horizontal line illustrates no effect relative to 2016 Q3. Standard errors are clustered on the bank level. It shows 90% confidence intervals.

In Figure 1b, we then replicate our analyses on the estimated quarterly coefficients where the continuous measure, LTV, is our dependent variable. Again, the estimated coefficient in the quarter 2016 Q4 is close to zero and statistically insignificant at all conventional significance levels. This confirms that there is no evidence of a violation of the parallel trends assumption. Moreover, the estimated effects are persistent over time. That is, the overall LTV composition of new mortgage lending decreased permanently following the publication of the policy statement.

Figure 1b. Prepositioning into LTV (continuous measure) (SREP 2019)

Note: Figure 1b shows the results of a linear regression model estimated using OLS on the mortgage transaction level. The dependent variable is the continuous variable, LTV. The coefficients displayed are the time dummy variables interacted with bank eligibility (below two thirds). The first dotted, vertical line relates to the quarter of the publication of the CP, 2017 Q1. The second dotted, vertical line relates to the quarter of the publication of the PS, 2017 Q4. The third dotted, vertical line relates to the last quarter of the year before firms had their SREP assessments, 2018 Q4. The horizontal line illustrates no effect relative to 2016 Q3. Standard errors are clustered on the bank level. It shows 90% confidence intervals.

5.3. Robustness

We subject our analysis to two robustness checks. First, Table 7 replicates the main result under the alternative eligibility criterion that a bank is eligible if it has an average risk score less than half of the maximum risk score.[18] Whilst both the prepositioning effect and the reduction of the overall LTV level are still present, they are significantly smaller and less precisely estimated than under our preferred eligibility criterion in our main analyses. We take this as evidence that those banks classified as eligible using the preferred criterion but no longer classified as eligible using the alternative criterion were confident about being in scope of the policy. This in turn suggests that they may have benefited from insights received from supervisors as part of the feedback received through bilateral communication channels. Supervisors confirmed to us that, as part of their routine conversations with supervised banks,

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[18] It is worth reminding that the number of banks deemed eligible falls from 9 to 4 under this alternative selection criterion (Table A2, column 1, row 2).

specific concerns are raised when there are particular aspects of a bank's business model that warrant heightened supervisory oversight. As explained in Section 3.1, to further corroborate this presumption, we also reviewed the text of a sample of formal letters sent to banks at the end of their SREP and we found anecdotal evidence that this was indeed the case. Therefore, bilateral communications between supervisors and banks, both formal and informal, helped the banks to better infer whether they were eligible.

Table 7. Prepositioning into low LTV (alternative eligibility criterion)

Dependent variable	LTV (<80%)		LTV	
	(1)	(2)	(3)	(4)
Eligible (avg. risk) x Post (PS)	0.187	0.135*	-8.671*	-6.665*
	(0.124)	(0.070)	(5.050)	(3.436)
Eligible (avg. risk) x Post (CP)	-0.117	-0.040	4.508	2.502
	(0.116)	(0.075)	(6.926)	(5.109)
Post (PS)	-0.056	-0.042	1.579	1.093
	(0.115)	(0.065)	(4.620)	(2.833)
Post (CP)	0.040	0.009	-0.088	0.134
	(0.073)	(0.031)	(3.527)	(2.701)
Bank FE	YES	YES	YES	YES
Regional FE	YES	YES	YES	YES
Control variables	NO	YES	NO	YES
Observations	56,960	56,960	56,960	56,960
Number of banks	13	13	13	13
Eligible banks	5	5	5	5
Mean of dep. variable	0.591	0.591	66.531	66.531
Clustered S.E.	YES	YES	YES	YES
Method	OLS	OLS	OLS	OLS

Note: This table shows the results of a linear regression model estimated using OLS on the mortgage transaction level. In columns 1 & 2, the dependent variable is the propensity of granting a low LTV loan below 80%. In columns 3 & 4, the dependent variable is the continuous variable, LTV. In all columns, this table shows the results for banks that had their SREP in 2019. Explanatory variables are a time dummy variable as well as its interaction with bank eligibility (below less than half). All regressions include bank FE which absorb the main effect of bank eligibility. We also control for contract and regional control variables. Standard errors are clustered on the bank level. ***, **, * denote statistical significance at the 0.01, 0.05 and 0.10-level respectively.

Second, Table 8 shows the results under two smaller thresholds for low LTV, 50% and 60%. Again, the prepositioning effect is still present, albeit lower in size, the more so the lower is the corresponding threshold. This confirms that banks that prepositioned did so across the entire spectrum of low LTV bands where a gap in risk weights between SA and IRB exists.

Table 8. Prepositioning into low LTV (alternative low LTV thresholds)

Dependent variable	LTV (<50%)		LTV (<60%)	
	(1)	(2)	(3)	(4)
Eligible x Post (PS)	0.160**	0.123**	0.244***	0.188**
	(0.064)	(0.055)	(0.090)	(0.073)
Eligible x Post (CP)	0.051	0.044	-0.017	-0.009
	(0.099)	(0.095)	(0.116)	(0.110)
Post (PS)	-0.086	-0.065*	-0.147*	-0.116*
	(0.056)	(0.039)	(0.084)	(0.059)
Post (CP)	-0.064	-0.049	-0.005	-0.004
	(0.080)	(0.082)	(0.095)	(0.095)
Bank FE	YES	YES	YES	YES
Regional FE	YES	YES	YES	YES
Control variables	NO	YES	NO	YES
Observations	56,960	56,960	56,960	56,960
Number of banks	13	13	13	13
Eligible banks	9	9	9	9
Mean of dep. variable	0.257	0.257	0.343	0.343
Clustered S.E.	YES	YES	YES	YES
Method	OLS	OLS	OLS	OLS

Note: This table shows the results of a linear regression model estimated using OLS on the mortgage transaction level. In columns 1 & 2, the dependent variable is the propensity of granting a low LTV loan below 50%. In columns 3 & 4, the dependent variable is the propensity of granting a low LTV loan below 60%. In all columns, this table shows the results for banks that had their SREP in 2019. Explanatory variables are a time dummy variable as well as its interaction with bank eligibility. All regressions include bank FE which absorb the main effect of bank eligibility. We also control for contract and regional control variables. Standard errors are clustered on the bank level. ***, **, * denote statistical significance at the 0.01, 0.05 and 0.10-level respectively.

6.   Application: Estimating the shadow cost of capital for small banks

This section discusses how our estimates of the adjustment in the portfolio allocation ahead of the SREP can be used to quantify a lower bound of the shadow cost of small banks' regulatory equity capital. This is because the portfolio adjustment thereof is costly in that it entails a departure from what must have been considered to be the optimal portfolio allocation under the existing regulatory treatment. Accordingly, the cost of prepositioning must be lower than the benefits from the expected capital relief that can be accrued by the bank from the next supervisory review onward. Regarding the latter, the determining factor is the cost of equity capital, which is typically unobservable for small and unsophisticated banks targeted

by this policy. Therefore, the (observable) cost of prepositioning provides an estimate for the minimum (unobservable) cost of equity capital faced by these opaque banks.

In the following exposition, we assume that the balance sheet size is not constant. Banks can increase their lending by raising more liabilities (i.e., typically in the form of retail deposits). However, banks are not able to increase equity resources at their discretion. This entails that, when they are bound by regulatory capital requirements, an expansion of the balance sheet is only possible in response to a reduction in capital requirements (i.e., thanks to the capital relief). In this respect, under the SA the risk weight for low LTV residential mortgages is slightly lower than the one at high LTV: $RW_{SA}^H > RW_{SA}^L$. This means that for any unit of lending at high LTV, they can invest $\frac{RW_{SA}^H}{RW_{SA}^L} > 1$ units at low LTV.

An eligible bank incurs the cost of propositioning in the initial period, i.e., the announcement of the policy but before its SREP. It is equal to the opportunity cost of investing in a high risk asset (relative to a low risk asset). Opportunity costs come from a lower return for low LTV mortgages (i.e., $r_L < r_H$). This, however, is partly offset by a slightly higher nominal amount as the risk weight for low LTV mortgages is lower (i.e., $RW_{SA}^L < RW_{SA}^H$). Accordingly, the cost of prepositioning can be formulated as follows:

$$Cost\,of\,prepositioning = \Delta\theta_l\left(r_H * \frac{RW_{SA}^L}{RW_{SA}^H} - r_L\right)$$

where $\Delta\theta_l$ is the degree of prepositioning (i.e., the change in the share of lending to low risk assets), r_H is the return on high risk assets and r_L is the return on low risk assets. We assume that banks that preposition by expanding their exposure at low LTV maintain that allocation until the following supervisory review (i.e., in line with the aim of the policy).

Banks benefit from a capital relief at the time of the supervisory review which happens after the announcement of the policy. From capital budgeting purposes, we assume that banks can reinvest the extra amount of equity resources at the corresponding cost of equity capital r_E until the following supervisory review. Therefore, both the cost of prepositioning and the expected benefits from it are subject to the same timeframe corresponding to the 3-year SREP cycle. This simplifies the analysis in that we can ignore discounting on both sides. Therefore, we arrive at the following inequality:[19]

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[19] This approach rest on the underlying simplifying assumption that banks are monoline mortgage banks, i.e., they only invest in mortgage loans.

$$\Delta\theta_l \left(r_H * \frac{RW_{SA}^L}{RW_{SA}^H} - r_L \right) \leq E[Capital\ relief] * r_E$$

Numerical example

In this subsection, we provide a numerical example of the cost of capital calculation. To derive both the ratio $\frac{RW_{SA}^L}{RW_{SA}^H}$ and the expected capital relief we rely on the table published by the regulator comparison risk weights between SA and IRB, as shown in Table 1.

RW_{SA}^L is equal to 35%. To calculate RW_{SA}^H we simply take the average of the SA risk weights for the four LTV bands above 60%, which results in an average risk weight of 37.25% and a ratio of 0.94.[20]

Regarding the expected capital relief, we rely on an indication provided by the regulator in its 2018 Annual Competition Report that "on average, we anticipate these [banks]' minimum capital requirements will reduce by 10%–15%."[21] Assuming a Total Capital Requirement of 10% and a risk-weighted assets density of 36.5%,[22] the expected capital relief is 0.36%-0.55% of total assets, which is directly comparable with the cost of prepositioning, also expressed as a % figure out of total assets.

For illustrative purposes, we assume that a "Bank A" has the following return on assets $r_H = 3.6\%$ and $r_L = 3.1\%$. Its expected capital relief is 0.50% and its degree of prepositioning is 12%. This would yield a lower bound of the cost of capital r_E of 6.8%:

$$r_E \geq \frac{12\% * \left(3.6\% * \frac{35\%}{37.25\%} - 3.1\% \right)}{0.50\%} = 6.8\%$$

Estimates of bank-specific lower bound of capital cost

We go on to estimate the bank-specific cost of capital. To do so, we estimate the degree of prepositioning bank-by-bank relative to all banks in the control group. We use the 60% LTV threshold, given that this LTV band combines both a wide IRB vs SA gap (i.e., expected

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[20] We ignore the residual band with $LTV \geq 100\%$ as it was immaterial in terms of new mortgage origination during the relevant period.
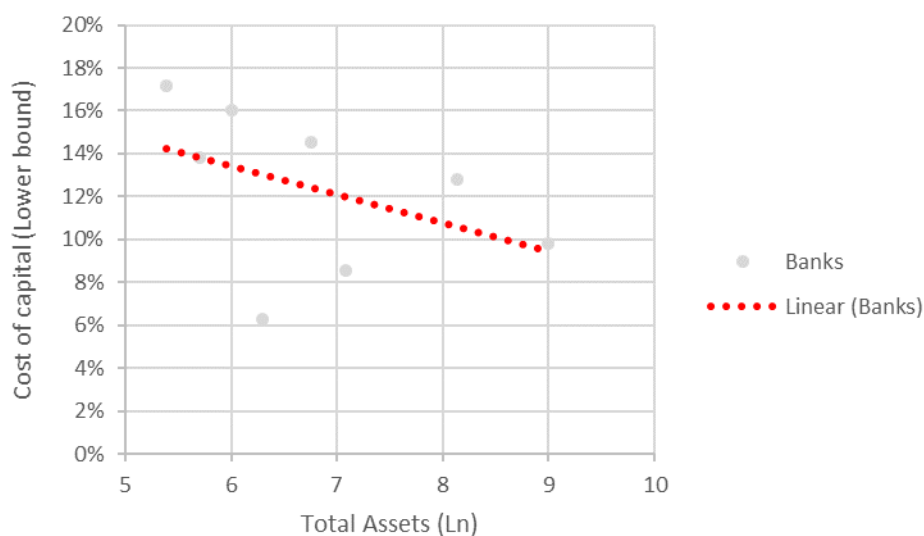
[21] See PRA, 2018 Annual Competition Report, June 2018, p. 33, available at https://www.bankofengland.co.uk/-/media/boe/files/annual-report/2018/pra-2018.pdf?la=en&hash=929BC2A486101460E1A371FF96F0DC73B424BF0F.

[22] This figure is the average of the SA risk weights across the 6 LTV bands as shown in Table 9. This approach is in line with the assumption that the relevant banks are monoline mortgage banks.

benefits) and the largest differential in interest rates (i.e., profit sacrifice). We observe that the degree of prepositioning ranges from 8% to 22%, being 16% on average, after excluding one outlier with no prepositioning at all. Similarly, we obtain bank-specific estimates of capital reliefs from internal policy impact assessments ahead of the publication of the policy statement. They range from 0% of total assets to 0.9% of total assets. To proxy the return on high LTV and low LTV mortgages, we use the average rates of 2-year fixed mortgages in the year 2016 below LTV 60% and at least 60%.

Figure 2 shows that bank-by-bank estimates of the lower bound of the shadow cost of capital based on the corresponding total asset size. It can be seen that these shadow costs differ substantially across banks ranging from 6% to 17% being about 12% on average. These estimates tend to be above those for larger banks.[23] The downward slope with respect to bank size suggest the cost of capital is negatively correlated with bank size, in our sample of relatively small banks.

Figure 2. Shadow cost of capital of eligible banks (lower bound)

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[23] For example, the latest survey by the European Banking Authority estimates banks' cost of equity to be in the range of 8%-10%: see European Banking Authority, Risk Assessment Questionnaire – Summary of the Results, June 2019, available at https://eba.europa.eu/sites/default/documents/files/documents/10180/2854739/916f8c4b-7099-4aba-ac1f-882cfd4c3583/RAQ%20Booklet%20Spring%202019.pdf.

7.   Conclusions

We study a salient change in policy which creates an incentive for banks to change their asset composition in order to benefit from a reduction of their capital requirements. We examine whether banks react to anticipated reliefs of capital requirements and to which of the announcements in the policy lifecycle they react.

Using a novel dataset on the population of all residential mortgages and supervisory risk scores, we demonstrate that banks likely to receive capital relief increase their benefit by investing into low risk assets (i.e., low LTV mortgages) following the publication of the policy itself, rather than earlier at the consultation stage. We also provide indicative evidence that the bilateral communication between regulated banks and their supervisors allowed the former to better gauge whether they were likely to be in scope of, and thus benefit from, the policy in question.

From a policy evaluation perspective, we find that not only the initial response of eligible banks, increasing their exposure to lower risk assets, goes in the direction intended by the policy, but also the response persists beyond its implementation. Such persistence rules out opportunistic gaming that would have been problematic from a prudential perspective. However, we also detect the opposite effect for ineligible banks, that is, reducing their exposure to lower risk assets.

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Annex

Table A1. Examples of wording in supervisory review letters

Low risk

- It would be helpful in future iterations of its ICAAP if the bank explained how this figure, and the calibration of the trigger for action, were arrived at.

- We encourage the bank to consider how the risk function will develop to provide proactive challenge and take full ownership of the bank's risk framework.

- The bank's credit risk appetite should be better articulated.

Medium risk

- Further evolution of MI is however required, with appropriate commentary to facilitate Board discussion.

- Progress has been made on the development of the Risk Management Framework (RMF). (…) The bank recognised that while the new RMF is materially embedded, it cannot be fully so until all the new executive hires are in place and the ongoing cultural changes embedded.

- Whilst the continued commitment of the NEDs has been critical in achieving progress, we believe that this arrangement is likely to be unsustainable in the medium to longer term and that it may – if continued – compromise their independence.

- We ask that the scope of their remit is widened to include a review of bank's pricing model, in addition to other financial models too in line with good practice and governance.

High risk

- The focus of our supervisory strategy for the next twelve months will therefore continue to be the bank's development of a long term strategy to accrete capital resources and the ongoing management of the risks of its loan book.

- We would therefore ask you to review your approach to hedging FX risk as a matter of urgency and provide us with the output of your analysis by the end of October.

Table A2. Number of banks by SREP year and eligibility (average risk)

SREP	Eligible (avg. risk)	Not eligible	Total
earlier	8	5	13
2019	4	9	13
2020	6	15	21
Total	18	29	47

Note: This table shows the number of banks by SREP year and eligibility.