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THE EFFECTS OF COVID-19 SUPPORT MEASURES ON BANK LENDING: LESSONS FROM THE RELEASE OF THE COUNTERCYCLICAL CAPITAL BUFFER AND LOAN GUARANTEE SCHEMES IN HONG KONG

Key points:

- *In response to the economic fallout caused by the COVID-19 pandemic, a wide range of policy measures have been implemented on an almost unprecedented scale in many banking sectors to support stable flows of credit. To what extent bank lending is responsive to the measures, and whether a combination of measures may enhance the overall effectiveness, are important policy questions to be answered.*

- *This study sheds light on these issues by assessing the effects of two major support measures on bank lending in Hong Kong: (i) the release of the Countercyclical Capital Buffer (CCyB) and (ii) the SME Financing Guarantee Scheme (SFGS). As Hong Kong was among the few jurisdictions that released the CCyB requirement during the pandemic, our findings on the former measure provide fresh evidence of the effectiveness of this countercyclical tool.*

- *Our analysis shows that the release of the CCyB supported the provision of credit for those banks with relatively thinner capital buffer than their peers before the pandemic, as it provided more capital headroom to lend. However, there is evidence that the resulting lending may mainly flow to those economic sectors that were not hardest-hit by the pandemic, probably reflecting banks' concerns over the uncertainty of credit risks amid the pandemic.*

- *Nevertheless, our analysis shows that credit flows to hard-hit sectors have been well supported by the SFGS, which played a complementary role to the CCyB release by incentivising bank lending more towards these sectors.*

- *Together, these findings provide important policy implications. Firstly, the release of the CCyB is found to be effective in supporting bank lending in times of stress,*

thus achieving its policy objective as a countercyclical tool. Secondly, Hong Kong's experience highlights the benefit of maintaining an adequate level of releasable capital buffer to withstand unexpected system-wide shocks. This supports the view that there may be a need to set a positive neutral rate of CCyB even in periods without excessive credit growth.

- *Finally, the findings show the complementary roles between broad-based (e.g. CCyB) and targeted measures (e.g. SFGS) in enhancing the overall effectiveness of policy measures, echoing the growing view that a combination of different policy measures should be considered to maintain stable flows of credit in times of stress.*

*Prepared by: Eric Wong, Kelvin Ho, Andrew Wong and Vincent Lo**
Market Research Division, Research Department
Hong Kong Monetary Authority

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1. INTRODUCTION

The threat of COVID-19 and the resulting social distancing and lockdown measures have severely disrupted a wide range of economic activities. In response to such a drastic exogenous shock to the global economy, many countries have implemented an unprecedented package of fiscal and monetary policies to ensure a sustained flow of financing to the real economy. In part reflecting these policy effects, the COVID-19 crisis has not led to a large wave of corporate insolvencies in many jurisdictions (Banerjee et al., 2021). As a whole. while these unprecedented policy measures have so far shown to help limit the economic fallout of the COVID-19 shock, questions remain on how each of these different policy measures implemented across the world affect the lending decisions of financial intermediaries as well as their effectiveness in supporting the provision of credit during the pandemic. A better understanding of these questions could help policymakers to fine-tune the measures to better prepare for another crisis in the future.

Indeed, Hong Kong's experience could shed important light on these issues, particularly on the effectiveness of releasing the Countercyclical Capital Buffer (CCyB) in supporting continued credit growth to the real economy for two reasons. First, Hong Kong was among the few jurisdictions that had built up substantial CCyB before the outbreak of the pandemic, and then released the CCyB requirement after the outbreak. Secondly, among those jurisdictions that released the CCyB requirement, Hong Kong's setting is more conducive to a cleaner empirical identification of the effect of the CCyB release, as most other jurisdictions lowering the CCyB requirements had also simultaneously introduced large-scale quantitative easing programmes (QE) that can substantially influence banks' lending behaviour, thus complicating the identification process.

Apart from assessing the policy effect of the CCyB release, we also examine the policy effects of public sector loan guarantee schemes by focusing on the SME Financing Guarantee Schemes (SFGS) that have been launched in Hong Kong. Since the SFGS is designed to target borrowers that were hit hard by the pandemic (especially SMEs), our results could potentially provide important lessons on whether, and to what extent, targeted public sector guarantee loan schemes can complement broad-based support measures (such as the CCyB release).

By employing a difference-in-differences approach on a panel of domestically incorporated banks in Hong Kong over the period between 2018Q1 and 2021Q3, our analysis uncovers several key findings. First, bank resilience (particularly the capital and liquidity positions of banks) is found to be an important factor that determines the extent of credit supply by banks during the pandemic. Specifically, banks that had relatively thinner capital and liquidity buffers before the pandemic tended to lend less than other banks after the outbreak of the pandemic. Secondly, by exploiting cross-sectional variations in the extent of capital release among banks, we find that the release of the CCyB -- through enhancing the capital headroom and mitigating the capital constraints of banks -- helped support the provision of bank credit to the real economy. By comparing banks' lending responses to different economic sectors, our findings further suggest that banks tended to deploy their extra capital headroom from the release of CCyB to support less risky corporate loans in the post-pandemic period. This probably reflected their credit risk concern on hard-hit borrowers, and also the non-sector specific nature of the CCyB. Lastly, there is evidence to support the SFGS in playing a complementary role to the CCyB release as it incentivises banks to provide credit towards hard-hit borrowers during the pandemic by mitigating the credit risk concern they face.

Our findings together have three policy implications. First, our study offers fresh evidence that bank lending does respond to the release of CCyB in Hong Kong during the pandemic, thus informing the debate on the use of releasable regulatory capital buffers by banks. Secondly, Hong Kong's experience highlights the benefits of maintaining an adequate level of CCyB to withstand unexpected system-wide shocks, supporting the view of setting a positive neutral rate of CCyB even in periods without excessive credit growth. Lastly, the findings show the complementary roles between broad-based (e.g. CCyB) and targeted measures (e.g. SFGS) in enhancing the effectiveness of policy measures, echoing the growing view that a combination of different policy measures should be considered and co-ordinated to ensure a stable supply of bank credit is directed to those in most need during these difficult times.

The rest of this paper is organised as follows. The next section provides a brief overview of the CCyB and SFGS in Hong Kong. A literature review and the potential contribution of this study are in Section 3. The empirical analyses and the key findings are summarised in Section 4. Section 5 concludes.

2. A BRIEF OVERVIEW OF COVID-RELIEF MEASURES

In response to the economic downturn triggered by the COVID-19 pandemic, a host of policy support measures have been introduced by the authorities in Hong Kong with the aim of helping businesses ride through these difficult times. In general, these measures can be broadly categorised into measures that strengthen banks' lending capacity (e.g. release of CCyB, reducing Regulatory Reserves, launching principle payment holiday scheme for existing loans); while another group of measures was to incentivise banks to lend to targeted borrowers (e.g. SMEs that are hard-hit by the pandemic) (e.g. SFGS).[1] In this paper, our analysis will focus on the effects of two major relief measures, namely the release of CCyB and the SFGS implemented during the pandemic. A brief overview of these two measures is provided below.

1) Countercyclical Capital Buffer (CCyB)

Introduced as a part of the Basel III reform package, the CCyB is a macro-prudential measure that aims at enhancing the resilience of the banking sector against systemic risks.[2] In essence, it is a mechanism to build up an extra layer of Common Equity Tier 1 (CET1) capital buffer among banks on top of the existing capital requirements during the upturn of the credit cycle to mitigate excessive credit growth. During subsequent economic downturns, that extra layer of buffer can be "released" to absorb losses and support the credit supply to the real economy. The CCyB rate is set on a jurisdictional basis which ranges between 0% to 2.5% of a bank's total risk-weighted assets (RWAs). Banks are required to maintain a CCyB buffer according to the jurisdictional CCyB rate to which they have credit exposure.

In response to the deteriorating economic environment in late 2019 and also in view of the outbreak of COVID-19 in early 2020, the Monetary Authority in Hong Kong partially released the CCyB by reducing the Hong Kong jurisdictional CCyB ratio from 2.5% to 2% on 14 October 2019, and to further lower the requirement from 2% to 1% on 16 March 2020. It is estimated that the two rounds of CCyB reductions released up to HK $800 billion of lending capacity.

[1] For details of various support measures, see https://www.hkma.gov.hk/eng/key-functions/banking/banking-regulatory-and-supervisory-regime/riding-out-the-covid-19-challenge/
[2] For technical details regarding Hong Kong jurisdictional CCyB, see https://www.hkma.gov.hk/media/eng/publication-and-research/quarterly-bulletin/qb201409/fa1.pdf

2) The SME Financing Guarantee Scheme (SFGS)

Launched by the government-owned Hong Kong Mortgage Corporation Limited (HKMC), the SFGS is a series of ongoing financing guarantee schemes devoted to assisting SMEs and non-listed companies to obtain credits. An 80% guarantee coverage scheme (SFGS80) was introduced in May 2012 to support credit supply to SMEs. In view of the challenging economic environment, the HKMC launched a 90% guarantee coverage scheme (SFGS90) and a special 100% loan guarantee scheme (SFGS100) in December 2019 and April 2020 respectively. While the SFGS90 was targeted to help less-experienced SMEs obtain financing, the SFGS100 was aimed at directing banks' lending to the hardest-hit SMEs that suffered at least a 30% decline in sales turnover amid the pandemic so that they can cover some of their financial costs, e.g. rents and wages, with the aim of alleviating the cash flow pressure of viable businesses.[3]

As of January 2022, up to 21,400, 5,600 and 47,000 applications for SFGS80, SFGS90, and SFGS100 had been approved, with the aggregate facility amount totaling HK$92 billion, HK$10 billion and HK$82 billion respectively.[4]

3. LITERATURE REVIEW AND CONTRIBUTIONS

Our work is related to a growing literature which examines the effects of various relief measures, in particular the role of release in capital-related measures (e.g. lowering CCyB) and public-sector loan guarantee schemes, on bank lending during the COVID-19 pandemic.

On the effect of changes in capital requirements, there have been extensive studies about the tightening effect of capital requirements. For instance, Bridges et al (2014), based on a sample of UK banks, find that an increase in bank-specific capital requirements reduce loan growth of banks. Aiyar et al

[3] The maximum loan amount is the sum of wages and rents for 18 months or HK$6 million, whichever is the lower.
[4] For the latest SFGS80/90/100 statistics, see https://www.hkmc.com.hk/eng/information_centre/statistics/sme_financing_guarantee_scheme_statistics.html

(2014) further find the extent of the contractionary effect of capital requirement on bank lending is dependent on the exiting level of the capital ratio of banks, based on a similar sample of banks. More recently, Basten and Koch (2015); Auer and Ongena (2019); Behncke (2020), study the effect of the activation of the CCyB on mortgage lending in Switzerland and they broadly find that the activation of the CCyB requirement that targets banks' real estate exposure would exert downward pressure on banks' mortgage lending, and also induce composition changes in banks' loan portfolios towards non-targeted exposures. Despite a vast literature on the effect of a tighter capital requirement, empirical evidence on the effect of a release in capital requirement (particularly the release of CCyB) on bank lending has been relatively limited[5] and is relatively less-explored in the literature, partly due to the few historical episodes of relaxation of capital requirements.

Thus, our study can contribute to this strand of literature in two ways. First, given Hong Kong is among the few jurisdictions[6] that had maintained a positive CCyB rate prior to the onset of the pandemic and subsequently released it during the outbreak, this allows us to explicitly examine the effect of the CCyB release on bank lending based on the sample of banks in Hong Kong. Compared to other jurisdictions that had lowered the CCyB rate, Hong Kong may arguably provide a cleaner empirical setting to evaluate the effect of the release of CCyB because most of the jurisdictions that lowered CCyB requirements had also simultaneously introduced large-scale quantitative easing programmes (QE), which can substantially influence banks' lending behaviours and thus complicate the identification. Secondly, by exploiting the cross-sectional difference in banks' pre-existing capital headroom and bank-specific exposure to CCyB release in our regulatory bank-level data, it enables us to identify whether banks, particularly those that were closer to the regulatory requirement, are willing to use the released capital buffers arising from CCyB to support their lending. These findings would help contribute to the recent discussion in the central banking community regarding the usability and releasability of regulatory capital buffers and, in turn, provide important

[5] Drehmann and Gambacorta (2012) find that CCyB can slow down credit growth during booms while reducing the extent of credit contraction when it is released. However, the study was conducted based on a simulation analysis. BCBS(2021), based on a sample of global banks, also find some preliminary evidence that the release of CCyB can provide a positive effect on bank lending.

[6] According to BCBS(2021), 7 out of 27 Basel member jurisdictions that had a CCyB rate greater than zero prior to the onset of the pandemic had released CCyB in response to the pandemic. These include Belgium, France, Germany, Hong Kong, Ireland, Sweden, Switzerland, and the United Kingdom.

implications to policymakers for formulating more effective capital measures for safeguarding future shocks to the financial market.

On the role of loan guarantee schemes, previous work such as Zecchini and Venture (2009), Bachas, Kim and Yannelis (2021), have found some evidence that public guarantees can increase credit availability to small business. In Hong Kong, Tan et al. (2019) also find that SFGS improved banks' lending to SMEs and likely more than offset the temporal tightening impact of the Basel III capital reform on banks' SME lending. More recent studies such as Falagiarda, Prapiestis and Rancoita (2020), Demmou and Franco (2021), Casanova, Hardy and Onen (2021) have found that these loan guarantee schemes played a key role in supporting stable credit flows to businesses, particularly SMEs during the pandemic. By analysing both the effect of the CCyB release and that of loan guarantee schemes, we may shed light on whether, and to what extent, these two measures can complement each other, which would be an important policy question for future policy decision.

4. Empirical analyses and findings

We start the analysis by identifying balance sheet constraints of banks that have reduced their lending by a larger extent (or increase by a smaller extent) relative to their peers after the outbreak of the pandemic. This identification is important, as it will inform whether those policy measures taken by the HKMA (e.g. release of CCyB) have targeted the pain points of banks in Hong Kong. It also sets the stage for examining the effectiveness of the policy measures in the next sub-section. In the final part of this section, we will examine the effect of the SFGS and assess whether it could serve as an effective complementary support measure in directing bank lending towards hard-hit borrowers.

Which bank balance sheet factors have constrained lending during the pandemic?

We will examine whether the following bank balance sheet factors have constrained bank lending during the post-pandemic period. We conjecture that banks with a lower capital buffer (*Lcapbuffer*), weaker profit (*Lprofit*), and

higher loan share to hard-hit economic sectors[7] (*Hhhloans*) relative to their peers before the outbreak of the pandemic tended to have lower loan growth during the post-pandemic period compared to their peers. Specifically, capital buffer is defined as the excess capital that a bank has maintained over the bank-specific supervisory capital requirements[8], while the loan share to hard-hit economics sectors refers to the share of bank loans that is more likely to be adversely affected by the pandemic. This conjecture can be interpreted as banks that curtail lending more severely than their peers after the outbreak of the pandemic may be due to their concerns about the potential deterioration in the credit risks of loan portfolios. Such concerns may be greater for those banks with weaker credit loss-absorbing capacity (i.e. banks with *Lcapbuffer and Lprofit*) and for those banks with loan portfolios that may be subject to higher credit risks amid the pandemic (i.e. *Hhhloans*). Apart from concerns over a deterioration in credit risks and their loss-absorbing capacity, banks may also reduce their lending because of liquidity constraints. As such, we also posit that banks with a lower liquid asset ratio (*Lliquid*) tend to have lower post-pandemic lending growth relative to their peers.

We adopt the difference-in-differences (DID) approach to examining whether the above balance sheet factors significantly constrained bank lending during the post-pandemic period. The model can be broadly described by the following regression equation:

$$\Delta y_{i,t} = \beta_1 Post_t \times Constrained(k)_i + \gamma_b C_{i,t-1} + FE(i) + FE(t) + \varepsilon_{i,t} \quad (1)$$

where $\Delta y_{i,t}$ is either the quarter-on-quarter growth rate in total lending for the i^{th} bank between quarter t and $t-1$, or the year-on-year growth rate for the i^{th} bank between quarter t and $t-4$. $Post_t$ is a dummy variable separating the pre- and post-pandemic periods, which is defined as one starting from 2019Q4 and zero

[7] Hard-hit economic sectors include wholesale, retail, trading, hotel, transportation, accommodation and food services sectors.

[8] Specifically, capital buffer ratio is calculated as the difference between a bank's CET1 capital ratio and its corresponding supervisory trigger ratio, which includes the CET1 minimum ratio, other buffer requirement ratio and the bank-specific Pillar II supervisory requirement ratio. Banks usually hold excess capital buffers over the requirements to avoid failure in compliance, as a breach in the requirements can lead to costly supervisory consequences to banks, such as dividend pay-out restrictions.

otherwise.[9] $Constrained(k)_i$ is a dummy variable which is defined as one if the average value of a balance sheet factor *k* considered for bank *i* between 18Q3 and 19Q2[10] is below the lower quartile and zero otherwise when *Lcapbuffer, Lprofit,* and *Lliquid* are considered. For *Hhhloans*, $Constrained(k)_i$ is defined in a similar fashion that the value is one for those banks where the average value of this balance sheet factor is larger than, or equal to, the upper quartile and zero otherwise. In addition, we will consider the median value as the threshold for these variables in a similar fashion, as it may inform the prevalence of a balance sheet constraint facing banks. $C_{i,t-1}$ and $FE(i)$ are a vector of lagged bank balance sheet characteristics and bank-fixed effects respectively to control for bank heterogeneity. $C_{i,t-1}$ including *bank size*, *non-performing ratio*, *liquid asset ratio*, *return on assets*, and *loan-to-asset ratio*. $FE(t)$ are time-fixed effects to capture the effects of changes in loan demand and economic environment that are common to all banks over time. $\varepsilon_{i,t}$ is the error term. Detailed definitions and sources of bank balance sheet variables are described in the Annex. The summary statistics of key variables is shown in Annex Table A2.

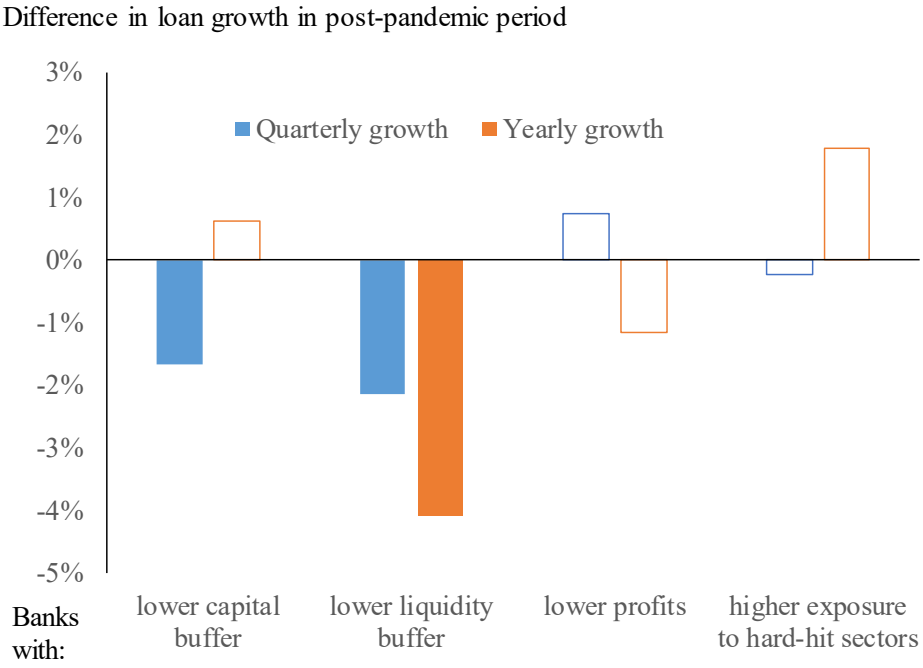
The estimated coefficient of the interaction term between $Post_t$ and $Constrained(k)_i$ (i.e. β_1) is our parameter of interest. By definition, $Constrained(k)_i$ is a dummy variable separating the group of banks that is more constrained by a balance sheet factor *k* (i.e. $Constrained(k)_i$ =1) from the others (i.e. banks with $Constrained(k)_i$=0). So, β_1 reveals whether, and to what extent, lending growth of the group of constrained banks may be statistically different from that of their peers during the post-pandemic period, after controlling for differences in other bank characteristics and other common factors. Given the conjecture we discussed previously, we expect a negative and statistically significant estimate of β_1 if the balance sheet factors discussed indeed weigh on bank lending responses during the pandemic.

However, it is important to point out that the estimate of β_1 tends to be biased towards finding no balance sheet constraint spuriously. The bias comes from the fact that most policy measures to support bank lending were also implemented right after the outbreak of the pandemic, and their potential policy

[9] The standalone $Post_t$ and $Constrained(k)_i$ variables are absorbed by bank and time fixed effects respectively.
[10] We define the constrained group of banks using information prior to the pandemic, to alleviate problem of capturing impacts of any potential cofounding factors on bank characteristics during the same event.

effects on lending have not been identified separately in the regression equation (which will be discussed in the next sub-section). If the policy effect on lending is significantly positive and stronger for balance sheet constrained banks, the policy effect will be absorbed by the interaction term between $Post_t$ and $Constrained(k)_i$, and hence the value of β_1 estimate tends to be less negative than the actual value of β_1. Given the direction of the bias, a negative and statistically significant estimate of β_1 may be taken as strong evidence that the balance sheet factor under consideration did constrain bank lending during the post-pandemic period.

Chart 1: Estimated difference in loan growth between constrained and unconstrained banks in the post-pandemic period (based on the lower/higher quartile as threshold)



Notes:

1. Each bar essentially shows the estimate of β_1 which captures the estimated average loan growth of constrained banks subject to the specific balance sheet factor considered minus the estimated average loan growth of other unconstrained banks in the post-pandemic period.
2. Lower quartile value is used as the threshold for determining banks with lower capital buffer, liquidity buffer and profitability prior the pandemic respectively, while the upper quartile is used as the threshold when banks' exposure to hard-hit sectors is considered.
3. Statistically significant (at 10% or below levels) results are shown in solid colours, while statistically insignificant results are shown in empty bars.

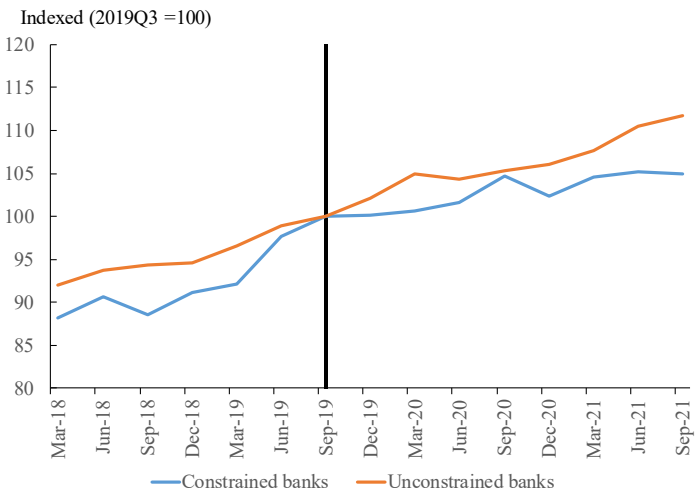
Source: HKMA staff estimates.

Chart 1 presents our baseline estimation results, which consider either the lower or upper quartile as the threshold, depending on the balance sheet factors as discussed before. The estimation results using the median as the threshold are presented in Chart A1 in the Annex. The estimation results for quarterly and yearly loan change are presented separately in blue and orange bars in Chart 1 respectively. Key findings are summarised by the following three points:

1. **Banks with relatively lower loss absorbing capacity, as measured by a lower capital buffer (*Lcapbuffer*) than their peers before the outbreak of the pandemic tend to have lower lending growth relative to other banks in the post-pandemic period.** Focusing on the quarterly loan growth estimates in Chart 1 (i.e. blue bars), banks with *Lcapbuffer* are estimated to have a lower quarterly growth rate of loans by 1.6 percentage points in the post-pandemic period compared to that of other banks, with the estimates being statistically significant at conventional confidence levels. This finding is also consistent with our observation of the loan volume for the two groups of banks (Panel A of Chart 2) that relative to their peers, banks with a thinner capital buffer prior to the pandemic outbreak, on aggregate, recorded lower total loan growth after the outbreak, despite the fact that the release of the CCyB may have supported their lending to some extent (which will be studied later). The statistical results, however, do not carry over when the yearly growth rate of loans is considered (i.e. orange bars). Nevertheless, more robust evidence is found when the median is considered as the threshold (see Chart A1), because the estimates show a lower capital buffer constrained bank lending during the post-pandemic period, regardless of whether a quarterly or yearly growth rate is considered.

Chart 2: Average lending trend between constrained and unconstrained banks during the pre- and post-pandemic period

Panel A: Capital-constrained vs. unconstrained banks



Panel B: Liquidity constrained vs. unconstrained banks

Note: We index each banks' loan volume using 2019Q3 as the base (i.e. 2019Q3 = 100 for each bank). We then calculate the individual banks' loan volume across time and take simple average value separately for the constrained and the unconstrained groups of banks. In panel A, banks are classified in the constrained group if their average capital buffer ratio between 2018Q3-19Q2 is below the lower quartile. Likewise in panel B, banks are classified in the constrained group if their average liquid asset ratio between 18Q3-19Q2 is below the lower quartile.

2. **We also found evidence that banks with weaker liquidity positions than their peers, as measured by the liquid asset ratio, tend to have lower lending growth during the pandemic.** As shown in Chart 1, the coefficient estimates of *Post*Lliquid* for a quarterly and yearly growth rate of loans are found to be negative and statistically significant. These estimates indicate that a quarterly (yearly) growth rate of loans were, on average, lowered by 2.2 (4.1) percentage points in the post-pandemic period among those banks with lower liquidity. The observation as shown in panel B of Chart 2 is also in line with the estimation results.[11]

3. **Profitability, as measured by banks' return-on-assets, and banks' exposure to the hard-hit sector do not appear to differentiate bank's lending responses during the pandemic.** We don't find any

[11] However, both the signs and the statistical significances of the corresponding coefficient in Chart A1 are notably weakened when we consider the median threshold. This may indicate that the liquidity constraint may not be prevalent among the banks.

statistically significant coefficients for β_1 , when considering profitability and the share of hard-hit loans as balance sheet constraints.

Taken together, the analysis found that those banks with a relatively lower capital buffer and lower liquid asset ratio than their peers before the pandemic may be subject to higher lending constraints during the post-pandemic period relative to other banks.

Assessing the effectiveness of CCyB release in supporting bank lending

In this part, we attempt to answer a follow-up question: Whether, and to what extent, the release of the CCyB in Hong Kong, which is intended to enhance banks' lending capacity, can mitigate the two balance sheet constraints of banks that we identified in the previous subsection.

Before discussing the empirical analysis, we first briefly explain why, theoretically, the release of the CCyB may help banks mitigate the two constraints identified. **In essence, the release of the CCyB shifted a particular amount of capital sitting in banks' balance sheets from being a "regulatory capital requirement" to capital headroom that banks can dip into with no regulatory consequences** (Saporta, 2021). **The direct effect of the release of the CCyB on banks is that it reduces the risk of falling below regulatory capital requirements which may result in dividends distribution restrictions in the future.** This should particularly address the concerns of those banks with a relatively thin capital buffer before entering the pandemic, and therefore supporting the continued provision of credit by these banks. The extra capital headroom from the CCyB release may also have a positive effect on banks' liquidity position. In general, investors and credit rating agencies will take a negative view on a bank if its capital ratio falls below the regulatory requirements and thus triggering dividends distribution restrictions. Such a bank could face higher funding costs as demanded by investors, especially if no other bank in the peer group is also subject to these distribution restrictions. In this sense, the release of the CCyB, which reduces the risk of falling below the regulatory capital requirements, may help improve banks' liquidity constraints; although it is not the primary policy objective, and the policy effect on liquidity is transmitted in an indirect way.

For the empirical analysis, we first discuss the identification problem arising from the fact that the period of releasing CCyB almost coincided with the pandemic period. In the empirical model specified by Equation (1), the policy effect of releasing CCyB has been absorbed by the interaction term between $Post_t$ and $Constrained(k)_i$ (i.e. β_1). The estimated β_1 can only reveal the combined effect of (i) the balance sheet constraint k, and (ii) the policy effect of releasing CCyB on bank lending during the pandemic.

To disentangle the two effects empirically, we adopt a similar empirical approach by Saporta (2021) to modify our model. Basically, this approach tries to identify the effect of CCyB release by exploiting cross-section variations in the pass-through to a change in the CCyB rate in Hong Kong among banks. Specifically, under the CCyB framework, the extent of capital release to a bank from lowering the CCyB rate in a particular jurisdiction is calculated based on the bank's credit exposure to that jurisdiction, which is measured by the aggregate risk-weighted amount for its private sector credit exposures in that jurisdiction. Therefore, when the CCyB rate was lowered in Hong Kong, a bank with a higher share of credit exposure to Hong Kong over its total credit exposure to all jurisdictions had a larger reduction in the capital requirements than its peers.[12]

To exploit the cross-sectional variations in the pass-through of the CCyB release to capital headroom among the banks, we define a $HKRWAshare_{i,19Q3}$, as the share of bank i's Hong Kong risk-weighted assets (RWA) for private sector credit exposures over its total credit RWA to all jurisdictions as of 2019Q3 (i.e. before the release of CCyB in Hong Kong). By definition, a larger value of $HKRWAshare_{i,19Q3}$ indicates a higher pass through of the release of CCyB to bank's capital headroom , and thus a stronger effect on lending capacity. We then modify our model by adding this variable as follows:

[12] In principle, there is also a need to consider the jurisdictional CCyB change in other major jurisdictions that banks are exposed to relative to that in Hong Kong at the same time. Among other jurisdictions that locally incorporated licensed banks in Hong Kong have significant exposures with, there have been no change in their jurisdictional CCyB rates, or the change had not been as substantial as that in Hong Kong during the studied period.

$$\Delta y_{i,t} = \beta_1 Post_t \times Constrained(k)_i + \beta_2 Post_t \times HKRWAshare_{i,19Q3} + \beta_3 Post_t \times Constrained(k)_i \times HKRWAshare_{i,19Q3} + \gamma_b C_{i,t-1} + FE(i) + FE(t) + \varepsilon_{i,t} \quad (2)$$

Our coefficient of interests are β_2 and β_3, as they shed light on the effectiveness of the CCyB release in supporting bank lending. If the release of CCyB has a significant intended policy effect, banks that are more exposed to the release of CCyB tend to lend more than others in the post-pandemic period, implying a positive estimated β_2. A positive estimate of β_3 is expected if the policy effect is stronger for those banks that are more subject to balance sheet constraints.

Given that the policy objective of releasing the HK CCyB is to support the domestic real economy, our analysis then focuses on the policy effects on domestic lending to non-financial sectors (henceforth referred to as domestic loans), and that on corporate loans, which accounted for the lion's share of domestic lending.

We first examine the policy effect on mitigating the lending constraint for those banks with a relatively low capital buffer (i.e. considering k = *Lcapbuffer*). Table 1 reports the estimation results for the model specified by Equation (2) using yearly and quarterly growth rates of loans (in Panels A and B respectively) with the lower quartile being the threshold when defining $Constrained(k)_i$. When comparing the estimation results between Panels A and B in Table 1, one clear observation is that while the sign of the estimated coefficients of interest are broadly consistent, only those in Panel A (i.e. analysing yearly growth of loans) are statistically significant. The much weaker statistical results in Panel B may be due partly to the fact that quarter-to-quarter changes in loans may be more volatile and subject to more statistical noise. Our discussion will mainly focus on those in Panel A of Table 1.[13]

[13] We also repeat the same estimation by considering the median as the threshold when defining $Constrained(k)_i$. Since the results are broadly similar with Table 1, we omit the discussion here. The results are available upon request.

Table 1: Estimation results on the effectiveness of CCyB release for capital-constrained and unconstrained banks (using the lower quartile as threshold)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Panel A: Yearly growth				Panel B: Quarterly			
	Domestic loans	Corporate loans	Non-hard-hit sectors	Hard-hit sectors	Domestic loans	Corporate loans	Non-hard-hit sectors	Hard-hit sectors
Post * Lcapbuffer (β_1)	-0.0467	-0.4129**	-0.4397**	-0.0797	-0.0093	-0.0435	-0.0627	0.0677
	(0.0953)	(0.1759)	(0.1706)	(0.3913)	(0.0524)	(0.1021)	(0.1105)	(0.1805)
Post * hkrwa (β_2)	0.1252*	-0.0007	0.1790	-0.3447**	0.0622*	0.0420	0.1091*	-0.0797
	(0.0705)	(0.1106)	(0.1338)	(0.1472)	(0.0323)	(0.0497)	(0.0617)	(0.0801)
Post *hkrwa* Lcapbuffer (β_3)	0.0830	0.5756**	0.6274***	0.1080	0.0033	0.0561	0.0755	-0.0862
	(0.1241)	(0.2265)	(0.2216)	(0.4930)	(0.0668)	(0.1285)	(0.1405)	(0.2224)
Bank Controls	Y	Y	Y	Y	Y	Y	Y	Y
Bank fixed effect	Y	Y	Y	Y	Y	Y	Y	Y
Time fixed effect	Y	Y	Y	Y	Y	Y	Y	Y
Obs	255	255	255	255	255	255	255	255
R^2	0.3797	0.3706	0.4129	0.3051	0.2025	0.1199	0.1538	0.0943

Note: Robust standard errors are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

The key findings of the estimation results in Panel A of Table 1 are summarised below:

1. **Focusing on domestic lending (Columns 1 and 5), there is evidence the release of the CCyB has a significant policy effect, as banks that are more exposed to the release of CCyB, as measured by $HKRWAshare_{i,19Q3}$ tend to provide more domestic loans than their peers in the post-pandemic period.** This can be seen by noting the positive and significant estimates of β_2 in Panels A and B.

2. However, we do not find significant evidence that capital constrained banks (i.e. banks with *Lcapbuffer* =1) are more exposed to the release of CCyB than other banks when considering domestic lending in the post-pandemic period. Specifically, while β_3 is estimated with an expected sign (i.e. positive), the estimates are found to be statistically insignificant in both Panels A and B (see Columns 1 and 5). As discussed below, we attribute this finding to that capital constrained banks respond significantly to the release of CCyB, but their loan portfolio adjustments more towards less risky loans may lead to a less notable impact on the overall domestic loans.

3. For corporate loans, the estimation results (in Column 2) show strong evidence that (i) **banks with a thinner capital buffer than their peers before the pandemic tend to have lower growth in domestic corporate**

loans then other banks in the post-pandemic period (i.e. negative and significant estimated β_1). And, more importantly, that (ii) **the release of CCyB does help these banks mitigate the capital constraints to support their provision of loans to domestic corporates** (i.e. positive and significant estimated β_3). The statistical significance of the estimates, however, does not carry over when quarterly growth of corporate loans is considered (See Column 6 in Panel B).

4. **Within corporate loans, we find evidence that capital constrained banks tend to deploy their extra capital headroom from the release of CCyB to support less risky corporate loans in the post-pandemic period.** Columns 3 and 4 in Panel A show the relevant results. For corporate loans to non-hard-hit sectors (i.e. Column 3), the estimation results basically mirror the same message as the results for domestic corporate loans (as discussed in point (3) above), with both the estimated value and statistical significance of β_3 pointing to a stronger policy effect in supporting capital constrained banks' corporate loans to non-hard hit sectors. By contrast, the estimation results in Column 4 suggest that capital constrained banks' loans to hard-hit economic sectors were not significantly responsive to the CCyB release relative to other banks.

We also examine the hypothesis that the release of the CCyB may help mitigate lending constraints for those banks with relatively low liquidity before the pandemic (i.e. considering $k = Lliquid$) and present the results in Table 2. Although there is some tentative evidence to suggest the release of CCyB could help mitigate the liquidity constraints of banks when considering the yearly growth of domestic loans (Column 1 in Table 2), the empirical results are mostly statistically insignificant for quarterly growth and also for corporate loans, including their breakdowns.[14] These findings suggest that the CCyB release may not have played a significant role in mitigating the liquidity constraints of banks during the pandemic.

[14] Additionally, even weaker statistical evidence is found when considering the median value of the threshold for defining $Constrained(k)_i$. Results are available upon request.

Table 2: Estimation results on the effectiveness of CCyB release for liquidity-constrained and unconstrained banks (using the lower quartile as threshold)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Panel A: Yearly growth				Panel B: Quarterly			
	Domestic loans	Corporate loans	Non-hard-hit sectors	Hard-hit sectors	Domestic loans	Corporate loans	Non-hard-hit sectors	Hard-hit sectors
Post * Lliquid (β_1)	-0.2509**	0.0692	0.2263	-0.2623	-0.0206	-0.0291	0.0090	-0.0392
	(0.1093)	(0.1614)	(0.1801)	(0.3132)	(0.0586)	(0.1027)	(0.1210)	(0.1593)
Post * hkrwa (β_2)	0.0735	0.2109*	0.4463***	-0.3845	0.0606	0.0527	0.1411*	-0.1272
	(0.0714)	(0.1231)	(0.1284)	(0.2604)	(0.0370)	(0.0704)	(0.0754)	(0.1313)
Post *hkrwa* Lliquid (β_3)	0.3215**	-0.0904	-0.2823	0.3072	0.0127	0.0202	-0.0247	0.0189
	(0.1561)	(0.2128)	(0.2468)	(0.4052)	(0.0781)	(0.1356)	(0.1626)	(0.2151)
Bank Controls	Y	Y	Y	Y	Y	Y	Y	Y
Bank fixed effect	Y	Y	Y	Y	Y	Y	Y	Y
Time fixed effect	Y	Y	Y	Y	Y	Y	Y	Y
Obs	255	255	255	255	255	255	255	255
R^2	0.3903	0.3485	0.3971	0.3083	0.2053	0.1220	0.1528	0.0969

Note: Robust standard errors are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Assessing the effectiveness of the SFGS to incentivise bank lending

In this part, we examine the role of the SFGS in incentivising bank lending in Hong Kong during the pandemic. We attempt to answer one key question: whether the SFGS supports bank lending to hard-hit economic sectors. The answer is important for two reasons. First, it can shed light on the effectiveness of the measure given that the design is more targeted towards hard-hit corporates. Secondly, it sheds light on whether the SFGS can complement the CCyB release given that empirical findings in the previous part show that the latter may not produce a significant policy effect on corporate loans to hard-hit economic sectors.

As mentioned in the overview section, the 90% guarantee coverage scheme (SFGS90) and the special 100% loan guarantee scheme (SFGS100) were introduced by the HKMC in December 2019 and April 2020 respectively,[15] with the aim of providing additional financing support to alleviate the cash flow

[15] Given the more favourable terms for SFGS100 than SFGS90, it has attracted more positive responses from firms. Indeed, a majority of the approved SFGS loans have been granted under the SFGS100, while only a modest number of loans have been approved under SFGS90 during the pandemic periods. Although it is empirically difficult to disentangle the effect of SFGS100 and SFGS90, our empirical analysis should be more relevant for the effect of SFGS100 given that it has the lion's share of new SFGS loans granted under SFGS100. In the following, we will interchange the use of the terms SFGS and SFGS100.

pressure and financial burden of firms (particularly SMEs) that were adversely affected by the pandemic. These schemes involve the provision of government guarantees to the approved credit facilities, thereby mitigating credit risks faced by the lending banks, depending on the guarantee coverage. As the SFGS significantly reduces the credit risk of loans to hard-hit borrowers, banks should have a stronger incentive to lend to these firms.

With the policy design of the SFGS, we are interested to evaluate whether the SFGS has helped incentivise banks to support lending to hard-hit borrowers as intended. Intuitively, due to its mitigating effect on credit risk, banks that were more exposed to SFGS (*H_SFGS*) should have greater incentives to lend more towards borrowers in the hard-hit sectors than other banks during the post-pandemic period. As such, a DID analysis (similar to that employed in equation (1)), which compares the lending response between a group of banks that were more exposed to the SFGS and other less exposed banks during pre- and post-pandemic periods, should enable us to shed light on the effect of SFGS empirically. More specifically, the following DID regression is employed:

$$\Delta y_{i,t} = \beta_1 Post_t \times H\_SFGS_i + \gamma_b C_{i,t-1} + FE(i) + FE(t) + \varepsilon_{i,t} \quad (3)$$

where $\Delta y_{i,t}$ is quarterly loan growth or year-on-year loan growth for lending to hard-hit sectors. In addition, the supply of non-guaranteed loans to hard-hit sectors will be examined for completeness.[16] H_SFGS_i is a dummy variable which is defined as one if the share of new SFGS loans approved to the outstanding amount of corporate loans for bank i as of 2020Q2 (i.e. when the SFGS100 scheme was first launched) is larger than or equal to the upper quartile and zero otherwise. For other control variables, they remain the same as those used in previous sections. Again, our parameter of interest is β_1, which reveals the cross-sectional effect of SFGS on changes in banks' credit supply to hard-hit sectors in the post-pandemic period. The estimation results are presented in Table 3.

[16] The non-guaranteed loan amount is calculated by subtracting the outstanding loan amount to hard-hit sectors by the cumulative amount of approved SFGS loan facilities to borrowers that were operating in the hard-hit sectors.

Table 3: Estimation results on the effect of SFGS on banks' lending towards hard-hit sectors

	(1)	(2)	(3)	(4)	(5)	(6)
	Loans to hard-hit sectors (HH loans)			Non-guaranteed loans to hard-hit sectors (NG_HH loans)		
Variables	Quarterly Growth	Year-on-year growth	HH loans / Corp loans	Quarterly Growth	Year-on-year growth	NG_HH loans / Corp loans
Post * H_SFGS_i (β_1)	0.0050	0.0802**	0.0171***	-0.0045	0.0545	0.0059
	(0.0213)	(0.0397)	(0.0066)	(0.0220)	(0.0404)	(0.0066)
Bank Controls	Y	Y	Y	Y	Y	Y
Bank fixed effect	Y	Y	Y	Y	Y	Y
Time fixed effect	Y	Y	Y	Y	Y	Y
Obs	255	255	255	255	255	255
R2	0.0876	0.3047	0.9380	0.0802	0.2903	0.9330

Note: Robust standard errors are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

There is evidence to suggest the introduction of SFGS100 plays a key role in supporting bank lending towards hard-hit sectors in the post-pandemic period. As shown in column 2 of Table 3, banks that were more exposed to the SFGS tend to attain a higher year-on-year growth for loans to hard-hit sectors by 8 percentage points than other banks in the post-pandemic periods, though the statistical significance weakens when we consider the quarterly loan growth (in column 1). Consistent with the above finding on yearly loan growth, the share of hard-hit loans to total corporate loans of more SFGS exposed banks is estimated to increase by around 1.7 percentage points relative to that of other banks (column 3), with the estimate being statistically significant.

Another key finding is that the positive lending responses to hard-hit sectors appeared to be driven primarily by the portion of SFGS guaranteed loans, as we do not find any statistically significant difference in loan growth for the non-guaranteed portion of loans between banks that were more exposed to SFGS and those that were less exposed (see columns 4 to 6). This is consistent with the view that banks were wary about the future credit risks of those borrowers in the hard-hit sectors, which made them more cautious when considering lending to these borrowers without the backing of any public sector guarantees in the post-pandemic periods.

Taking these results together, the SFGS plays a significant role in incentivising banks to lend more towards hard-hit borrowers during the

pandemic by mitigating the credit risk concern faced by exposed banks, which has been a key factor determining their lending supply to hard-hit borrowers amid the deteriorating business environment.

5. CONCLUSION

Based on a panel of domestically incorporated banks in Hong Kong, this paper aims to assess the effects of the release of the CCyB and the SFGS in supporting bank lending during the COVID-19 pandemic. Our analysis finds strong evidence that the release of CCyB, which enhances the capital headroom and mitigates the capital constraints of banks, helps support continued provision of bank credit to the real economy during the pandemic. However, banks are found to deploy their extra capital headroom from the release of CCyB to support mainly less risky corporate loans, probably reflecting uncertainties over the credit risk of borrowers from hard-hit economic sectors and also the non-sector specific nature of the CCyB. Nevertheless, credit flows to hard-hit sectors is found to be well supported by the SFGS, which is consistent with the design of this measure.

Together, these findings offer some key insights for future policy discussions. First, while the release of the CCyB requirements is found to be an effective countercyclical tool to help maintain stable provision of credit during the economic downturn, the pre-requisite condition for deploying this tool is crucially dependent on the availability of buffers that were built up in the past. Due to the fact the COVID-19 pandemic was an exogenous system-wide shock, unrelated to the preceding credit cycle, jurisdictions without experiencing any excessive credit cycle prior to the outbreak may not have built up any releasable CCyB when the pandemic hit. The findings of this study inform the debate on whether a positive neutral rate of CCyB should be considered during normal periods, without excessive credit booms, so that policymakers can have more flexibility in their toolkits to respond to different types of shocks to the financial system in the future.

In addition, our study reflects that public sector loan guarantee schemes can potentially play a complementary role to the release of CCyB by incentivising bank lending more towards hard-hit sectors. These findings echo the growing view that a combination of different policy measures should be

considered and co-ordinated to ensure a stable supply of credit is also directed to those who are most in need during a crisis. As a result, further research in a broader context, including the complementarity of the micro- and macro-prudential policy measures, and the interaction with fiscal and monetary policy measures could offer valuable insights on how to maximise the effectiveness of relief measures in response to the next crisis.

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Annex: Data description, summary statistics and additional regression results

Bank-level data for estimations in this study are primarily obtained from regulatory banking returns filed with the HKMA by banks in Hong Kong.[17] More detailed definitions of these variables are presented in Annex Table A1.

Our outcome variables comprised various types of bank-level lending variables,[18] such as total bank lending, domestic non-financial corporate lending, public sector-guaranteed lending, etc. Within corporate lending, we consider lending towards economic sector that were hard hit by the pandemic and also those loans to non-hard-hit sectors. More specifically, domestic non-financial corporate lending is the sum of loan for uses in Hong Kong and trade financing, excluding household loans, individual business loan and loans for uses by all kinds of financial institutions. Loans to hard-hit sectors are defined as the sum of loan and advances under "Transport and transport equipment", "Hotels, boarding houses & catering", "Wholesale and retail trade" and "Trading financing" sectors. As studied in Box 4 of the September 2020 Issue of the HKMA's *Half-yearly Monetary and Financial Stability Report* (HKMA 2020), these sectors were severely hit by the pandemic in experiencing substantial revenue losses.

Other bank control variables used in estimations (i.e. $C_{i,t-1}$) include bank size (measured by the natural logarithm of total assets), loan-to-asset ratio, ratio of liquid assets to total assets, non-performing loan ratio[19] and return on assets. In line with existing literature, these variables are commonly employed for controlling bank heterogeneity.

Another dataset we have employed is the loan facility-level data under the SME Financing Guarantee Schemes. These confidential data are provided by the HMKC Insurance Limited (HKMCI), a wholly-owned subsidiary of the Hong Kong Mortgage Corporation Limited. As the designated manager of the guarantee schemes since 2012, the HKMCI collects information of approved SFGS applications about the loan facility limit amounts, lender names, industry of borrowers and starting and expiry dates of the facility offered from scheme-participating banks. Based on the loan-level data, we construct the new loan amount approved by banks under the SFGS programme, and the

[17] These bank balance sheet variables are sourced from various regulatory returns, including the *return of assets and liabilities*, *return of capital adequacy ratio*, *quarterly analysis of loans and advances and provisions, quarterly reporting on the countercyclical capital buffer (CCyB)* and *return of current year's profit and loss account*.

[18] Unless otherwise specified, lending always refers to loan amount offered by the banks' Hong Kong office only.

[19] Measured by the ratio of classified loans to total loans. Classified loans are those loans graded as "sub-standard", "doubtful" or "loss".

total outstanding amount of facility committed by banks under the programmes for the quarters.

Table A2 shows the descriptive statistics of the bank-level variables. The dataset for estimations is a panel of 17 locally incorporated licensed banks in Hong Kong, covering the period from 2018Q1 to 2021Q3. Their total loan amount accounts for 61% of total lending and 72% of domestic lending in the Hong Kong banking sector at the end of September 2021. Thus, our sample should be representative of the overall lending condition of the domestic banking sector. Within these 17 local banks, all of them have participated in at least one of the three SFGS programmes, and 15 of them are also participating-banks in the Special 100% SFGS programme.

Table A1: Definition of variables

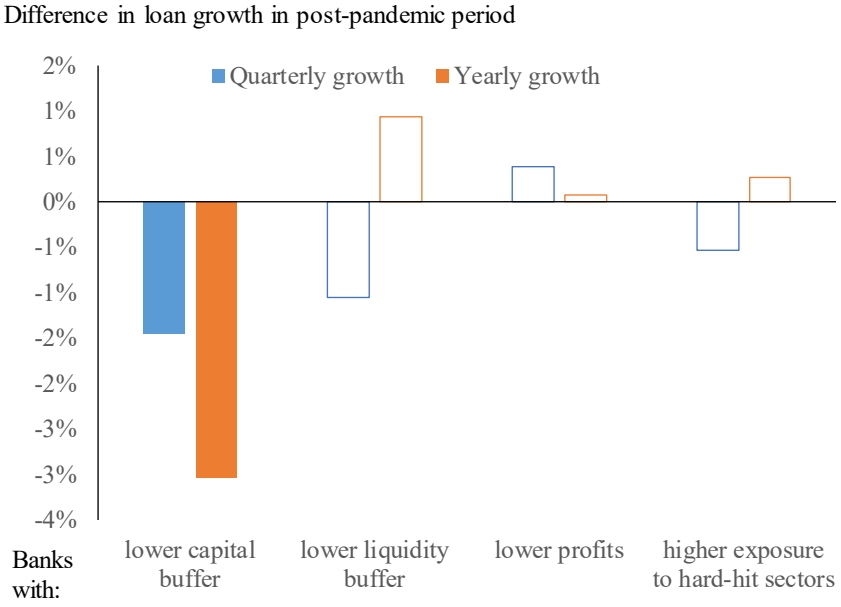
Variables	Definition
Outcome variables	
Total loans	Banks' total loans under their Hong Kong office
Domestic loans	Banks' loan for use in Hong Kong and trade financing, excluding loans for use in financial sector corporates
Corporates loans	Banks' loan for use in Hong Kong and trade financing, excluding loans for use in financial sector corporates and household loan
Loans to hard-hit sectors	Banks' non-financial corporate lending for use in "Hotel, boarding room & catering", "transportation", "wholesale and retail" and "trade financing".
Loans to non-hard-hit sectors	Banks' other non-financial corporate lending outside of the above 4 economic sectors.
Household loans	Banks' lending for households and individuals within loans for use in Hong Kong
Non-guaranteed loans to hard-hit sectors	Bank's loans to hard-hit sectors minus cumulative amount of SFGS facility committed by banks for the 4 hard-hit sectors.
Control variables	
Bank size	The natural logarithm of banks' total asset, as defined by their total assets minus government certificate of indebtedness for notes issued.
Non-performing loan ratio	Ratio of banks' "substandard" plus "doubtful" plus "loss" loans over total loans under the bank's Hong Kong office
Liquid asset ratio	Ratio of bank's liquid asset holding over non-financial sector liability, as defined by the sum of (Cash + Due from Exchange Fund + Government bills, notes and bonds) over sum of (Capital and reserves + Qualifying capital instruments + Other capital-type instruments + 0.95* Deposits from customers + NCDs issued-later than 1 year)
Returns-on-assets	Ratio of annualised Profit/(loss) before tax over total asset under the banks' Hong Kong office
Loan to asset ratio	Ratio of banks total loan over total asset.

Exposure Variables	
Average capital buffer ratio (18Q3 – 19Q2)	Average ratio of bank's Common Equity Tier 1 Capital ratio minus the supervisory triggering ratio level between 2018Q3 and 2019Q2
Average liquid asset ratio (18Q3 – 19Q2)	Average of bank's liquid asset ratio level between 2018Q3 and 2019Q2
Average hard-hit loan share (18Q3 -19Q2)	Average of banks' loans to hard-hit sectors over total loans between 2018Q3 and 2019Q2
Average ROA (18Q3-19Q2)	Average of banks' ROA between 2018Q3 and 2019Q2
Average loan loss provision coverage (18Q3-19Q2)	Average of specific provision amount over total classified loan amount between 2018Q3 and 2019Q2
Exposure to CCyB release (19Q3)	The share of banks' Hong Kong risk-weighted assets (RWA) for private sector credit exposures over its total credit RWA to all jurisdictions as of 2019Q3
Exposure to SFGS (20Q2)	The share of new SFGS loans approved to the outstanding amount of corporate loans for bank as of 2020Q2

Table A2: Summary statistics

	N	mean	sd	p25	p50	p75
Dependent variables						
Quarterly growth						
Total loans	255	0.014	0.03	-0.006	0.013	0.031
Domestic non-financial loans	255	0.01	0.031	-0.01	0.008	0.03
Domestic non-financial corporate loan	255	0.006	0.049	-0.016	0.005	0.033
Loans to non-hard-hit sectors	255	0.01	0.058	-0.022	0.01	0.043
Loans to hard-hit sectors	255	-0.001	0.08	-0.037	-0.002	0.037
Non-guaranteed loans to hard-hit sectors	255	-0.004	0.083	-0.044	-0.006	0.035
Household loans	255	0.017	0.033	-0.001	0.014	0.031
Yearly growth						
Total loans	255	0.063	0.074	0.014	0.061	0.097
Domestic non-financial loans	255	0.044	0.071	-0.008	0.044	0.087
Domestic non-financial corporate loan	255	0.024	0.1	-0.037	0.031	0.08
Loans to non-hard-hit sectors	255	0.038	0.117	-0.035	0.035	0.111
Loans to hard-hit sectors	255	-0.011	0.168	-0.084	-0.012	0.075
Non-guaranteed loans to hard-hit sectors	255	-0.02	0.173	-0.102	-0.022	0.074
Household loans	255	0.074	0.115	0.007	0.058	0.127
Control variables (lagged one period)						
Bank size	255	26.683	1.198	25.905	26.549	27.453
Non-performing loan ratio	255	0.006	0.004	0.002	0.004	0.008
Liquid asset ratio	255	0.12	0.061	0.074	0.098	0.152
Return on assets	255	1.112	0.367	0.886	1.103	1.337
Loan-to-asset ratio	255	0.493	0.089	0.45	0.499	0.56

Chart A1: Estimated difference in loan growth between constrained and unconstrained banks in the post-pandemic period (based on median as threshold)



Notes:

1. Each bar essentially shows the estimate of β_1 which captures the estimated average loan growth of constrained banks subject to the specific balance sheet factor considered minus the estimated average loan growth of other unconstrained banks in the post-pandemic period.
2. Median is used as the threshold for determining banks with lower capital buffer, liquidity buffer, profitability, and higher exposure to hard-hit sectors prior the pandemic respectively.
3. Statistically significant (at 10% or below levels) results are shown in solid colours, while statistically insignificant results are shown in empty bars.

Source: HKMA staff estimates.