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MACROPRUDENTIAL POLICY DURING COVID-19: THE ROLE OF POLICY SPACE

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ABSTRACT

This paper uses the initial phase of the COVID-19 pandemic to examine how macroprudential frameworks developed over the past decade performed during a period of heightened financial and economic stress. It discusses a new measure of the macroprudential stance that better captures the intensity of different policies across countries and time. Then it shows that macroprudential policy has been used countercyclically—with stances tightened during the 2010's and eased in response to COVID-19 by more than previous risk-off periods. Countries that tightened macroprudential policy more aggressively before COVID, as well as those that eased more during the pandemic, experienced less financial and economic stress. Countries' ability to use macroprudential policy, however, was significantly constrained by the extent of existing "policy space", i.e., by how aggressively policy was tightened before COVID-19. The use of macroprudential tools was not significantly affected by the space available to use other policy tools (such as fiscal policy, monetary policy, FX intervention, and capital flow management measures), and the use of other tools was not significantly affected by the space available to use macroprudential policy. This suggests that although macroprudential tools are being used countercyclically and should therefore help stabilize economies and financial markets, there appears to be an opportunity to better integrate the use of macroprudential tools with other policies in the future.

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I. Introduction

The 2008-2009 Global Financial Crisis (GFC) prompted interest in the use of macroprudential tools to improve the resilience of financial systems and stabilize economies. A growing body of literature is beginning to evaluate how these tools work, if they can accomplish their goals, and if they have been adjusted appropriately. One challenge in evaluating the use of macroprudential policy to date has been the limited incidence of recessions and financial crises in the decade over which these tools have been more widely adopted. The early stages of COVID-19, however, provide an occasion to evaluate how recent adjustments in macroprudential policy performed during a period of heightened financial market stress and a collapse in economic activity. This paper uses this event to explore how countries adjusted macroprudential policy in response to an extreme "risk-off shock", what factors affected the use of macroprudential tools, and whether adjusting macroprudential policy affected the use of other policies. The results highlight the importance of creating "policy space", i.e., of tightening macroprudential policy before a negative shock in order to be able to use the tool when needed.

After the GFC, it was hoped that a more proactive use of macroprudential tools could reduce the buildup of systemic risk over time, mitigate the amplification of shocks across the financial system, and support credit and liquidity during downturns. Certain macroprudential tools would be in place during all phases of the financial cycle in order to ensure sufficient buffers, while other tools could be used countercyclically (tightened during booms and loosened during slowdowns) to stabilize fluctuations in financial flows and real activity. A number of academic papers documented the potential benefits from a more proactive use of macroprudential policy, a literature well summarized in Bianchi and Mendoza (2018), Borio et al. (2020), Brunnermeier et al. (2013), Claessens (2015), Engel (2016), and Galati and Moessner (2018).

As countries around the world have increased their use of macroprudential tools, a rapidly growing body of research has evaluated if these tools have been effective (well summarized in Araujo et al., 2020; Cerutti et al., 2017; and Forbes, 2021). Although this literature is still in its infancy, and there are imposing challenges to empirical analysis, the evidence suggests that these tools have had some success in attaining certain direct goals that tend to decrease vulnerabilities (such as reducing domestic credit growth and bank exposure to foreign currency borrowing), but have been less effective in other areas (such as limiting international capital flows). The evidence on whether macroprudential tools can accomplish their ultimate goals of strengthening the resilience of financial systems to shocks and mitigating amplification effects is

supportive on net, but more tenuous, partly due to the limited business cycle downturns and financial crises since these tools were widely used. Several papers have also argued that although adjustments in macroprudential policy have been positive, implementation has been slow and more limited than would be required to provide meaningful protection (see Edge and Liang, 2017; Forbes, 2021; and Hanson et al., 2011). Moreover, although the direct effects, spillovers and leakages from macroprudential policies suggest they should be coordinated with other policy tools (Agénor and Pereira da Silva, 2018; Bruno et al., 2017; Forbes et al., 2017; and Richter et al., 2019), there is little evidence to date on whether this is occurring.

The sudden and widespread impact of COVID-19 is the first occasion to test whether a decade of general tightening in macroprudential policy provided meaningful protection against an extreme negative shock. Had countries tightened macroprudential policy enough that these tools could be loosened meaningfully? Did the greater use of macroprudential tools mitigate the financial and economic stress from COVID-19—either by reducing the imbalances that could aggravate the shock, or by providing a countercyclical tool that could mitigate the impact? Could the use of macroprudential policy substitute for the use of other policy tools that may not have been available (such as lowering interest rates if the policy rate was already at the effective lower bound)? And did the space to use macroprudential policy to adjust to COVID-19 reduce the need for countries to use other policy tools? This paper provides a first look at these questions during the COVID-19 shock in the first half of 2020.

The paper begins by discussing challenges in measuring macroprudential policy using metrics that are comparable across time and especially across countries. Despite impressive new data sets compiled by several researchers and institutions, capturing different intensities of macroprudential policy continues to be an imposing challenge. To address this challenge, this paper uses several measures of macroprudential policy. First, to capture a country's macroprudential stance before COVID-19, it uses a new index recently developed in Bergant and Forbes (2021) and Chari et al. (2021) that combines three popular macroprudential tools: the Countercyclical Capital Buffer (CCyB), the Loan-to-Value ratio (LTV) and a measure of the FX macroprudential stance. Second, to track recent adjustments to macroprudential policy in response to COVID-19, it uses new data from the IMF Policy Tracker, which records changes in policy (but does not provide details on the types of changes). Finally, it supplements these broader measures of macroprudential policy with more detailed information on one tool, the CCyB, which is consistently measured across countries and available through 2020. The paper then documents the

gradual tightening in different macroprudential measures before COVID-19, followed by a widespread and rapid loosening of these tools as an early part of the response to COVID-19—a much more aggressive use of macroprudential policy than during other "risk-off" periods over the last decade.

The next section of the paper explores the relationship between different measures of "stress" and macroprudential policy. It begins by showing that countries which tightened macroprudential policy more aggressively before COVID-19 tended to have lower levels of financial stress (measured as the increase in CDS spreads or bond yields) and lower levels of economic stress (measured as the reduction in expected GDP growth in 2020) during the COVID-19 shock. Then it shows that countries which experienced heightened levels of market and financial stress also eased macroprudential policy more aggressively in the initial stages of the pandemic. These results are correlations and not formal empirical tests, but they are consistent with the goals and structure of macroprudential policy; strengthening macroprudential policy can reduce the build-up and amplification of risk to make an economy more resilient to shocks, and easing macroprudential policy in response to a shock can alleviate financial and economic stress. All in all, these patterns suggest that macroprudential tools are being used countercyclically and in the direction expected.

The paper then goes a step further to more formally estimate what factors affected the use of macroprudential policy during COVID-19, as well as if the use of macroprudential policy affected the use of other major policy tools. It finds that the most important factor determining whether a country eased macroprudential policy (or just the CCyB) during COVID-19 was if the country had tightened policy (or just the CCyB) more aggressively before the pandemic. Other variables—such as the extent of financial or economic stress, the spread of COVID-19, or a wide range of other country characteristics—were generally not significant in predicting the use of macroprudential policy. Also noteworthy, more space to use other policies—including monetary policy, fiscal policy, FX intervention, and capital flow management policies—did not affect a country's decision to adjust macroprudential policy during COVID-19. Likewise, using macroprudential policy more aggressively (either by tightening more before COVID-19, or easing more in the early stages of the pandemic), did not significantly affect a country's use of other policies (including fiscal policy, various forms of monetary policy, and FX intervention). In other words, there appeared to be little relationship between a country's use of macroprudential policy and its use of other policies, so the space to use any of these other policies did not meaningfully affect the use of macroprudential policy (and vice versa).

These results have a number of important implications. Macroprudential tools appear to have been used as intended—tightened during the risk-on period before COVID-19 and loosened during the risk-off shock of the pandemic. The patterns in the data are consistent with macroprudential policy providing a countercyclical benefit and mitigating economic and financial stress—although this is simply a correlation and could be caused by other factors and differences in country characteristics. Most important, countries were only able to use macroprudential policy aggressively if they had actively tightened policy before the pandemic; this highlights the importance of building policy space to use a range of policy tools (Bergant and Forbes, 2021). The results also suggest, however, that despite increased attention to the interactions between different policies, and especially between monetary and macroprudential policy, there is not yet active coordination of these tools. This may reflect different institutions responsible for the use of different policy tools, or simply that different policies are set with regards to specific goals and do not take into account the spillovers to and interactions with other policy tools.

The remainder of this paper is as follows. Section II discusses our measures of the macroprudential stance and changes in macroprudential policy during COVID-19. Section III documents various correlations between macroprudential policy and economic and financial stress. Section IV is the primary contribution of the paper, documenting the role of pre-existing policy space in determining the use of macroprudential policy during COVID-19, as well as the minimal interactions between macroprudential policy adjustments (and space) and the use of other policies in response to the pandemic. Section V concludes.

II. Measuring the Macroprudential Stance across Countries and over Time

One of the biggest challenges for cross-country empirical research on macroprudential policy has been obtaining data that is comparable across countries and time. As countries began to pay more attention to their macroprudential frameworks and adjust macroprudential tools more actively, however, several researchers and institutions have begun to compile cross-country databases tracking macroprudential policy adjustments. The most comprehensive early efforts include: data on seven tools from an IMF survey described in Lim et al. (2011); data on macroprudential tools and capital flow management measures (CFMs) in Asia-Pacific economies in Bruno et al. (2017); detailed data on twelve tools from another IMF survey described in Cerutti et al. (2017); data on housing-sector tools in Shim et al. (2013) and Kuttner

and Shim (2016); data focused on foreign-exchange exposures discussed in Ahnert et al. (2021); and information on governance structures for adjusting macroprudential tools in Edge and Liang (2017). More recently, the BIS and ESRB have compiled information on one widely used macroprudential policy tool—the Countercyclical Capital Buffer (or CCyB). To date, the International Monetary Fund has compiled the most comprehensive time-series database that includes adjustments to a range of macroprudential tools: the Integrated Macroprudential Policy (iMaPP) database, described in Alam et al. (2019). This combines information from a number of pre-existing surveys with a new IMF annual survey and country-specific data to provide detailed information on a range of macroprudential tools for 134 countries from 1990-2018. Most recently, as many countries adjusted policy aggressively in response to the COVID-19 pandemic, several institutions started to track changes in macroprudential regulation in real time, such as the IMF's Policy Tracker (discussed in more detail below).[1]

Despite these impressive efforts toward better measuring and tracking macroprudential policy across countries, the existing data suffers from one imposing challenge: capturing different intensities of macroprudential policy. Most of the data discussed above only tracks if a country changes its policy—not the intensity of any change or the starting point. Further complicating any comparisons, not only have different countries relied on different macroprudential tools, even adjustments in the same tool in two countries could imply very different changes in their overall macroprudential policy stances. More specifically, a given tool could have different binding thresholds in different countries, could be focused on different segments of the financial sector, and could have different effects based on the structure of the financial system and level of enforcement. Something as specific as adding a "limit on FX lending" could be a modest or severe tightening based on the level at which it is set, and it could have very different effects if it is a limit on FX lending relative to a bank's overall loan portfolio, its FX assets, or just with respect to FX mortgage lending. Even more complicated is comparing the magnitudes of changes in different types of tools. For example, how can a change in the CCyB be compared to a change in rules on lending for high LTV mortgages or tighter liquidity regulations on systemically important financial institutions (SIFIs)?

Given these challenges, most empirical studies do not incorporate the intensity of changes in macroprudential policy and instead simply analyze the effects of any tightening in any tool (measured as

[1] For more information, see https://www.imf.org/en/Topics/imf-and-COVID-1919/Policy-Responses-to-COVID-19.

a +1) and the effects of any easing (measured as a -1). This amalgamation of very different macroprudential actions into dummy variables biases studies against finding any effect of macroprudential regulation. Other studies (such as Bergant et al., 2020; and Forbes, 2021) address this challenge by creating measures of the overall macroprudential stance by aggregating changes in macroprudential policies over time. This is an improvement, but is also problematic, as some countries adjust macroprudential policy often but in small increments (such as China), while others adjust policies infrequently but in larger and more meaningful steps. This can also make it difficult to compare the overall intensity of different countries' macroprudential stances across time (as well as across countries).

Therefore, in order to measure differences in macroprudential stances across countries as well as across time, this paper focuses on a new index that attempts to balance the tradeoffs in capturing intensity, comparability across countries and time, and the diversity of macroprudential tools. This new index, which was recently developed in Bergant and Forbes (2021) and Chari et al. (2021), combines three popular macroprudential tools: the CCyB[2], the loan-to-value ratio (LTV) from the iMaPP database[3], and the FX macroprudential stance.[4] All three components of the index are scaled based on their standard deviations and then given equal weight. We focus on these three measures as they incorporate adjustments in three of the most widely used tools and they also target three risk areas that are a focus of macroprudential policy: countercyclical risk in banks, the housing sector, and international exposures (with the latter a particularly important focus of macroprudential policy in many emerging markets). This index also includes the only two measures of intensity that are comparable across countries (the CCyB and LTV ratio). The disadvantages of the index are that it does not incorporate other tools that may be used in certain countries, and it only has limited information on adjustments made in response to COVID-19 (as only the CCyB data extends through 2020).

To better understand how macroprudential policy has changed over time, the upper panel in Figure 1 graphs these three components of our index of macroprudential policy (the CCyB, LTV ratio and FX

[2] Data for changes in the CCyB is from the BIS (available at: www.bis.org/bcbs/ccyb/ and accessed 11/2020) and ESRB (available at www.esrb.europa.eu/national_policy/ccb/html/index.en.html and access 11/2020). The data is cross-checked with data from Chen and Friedrich (2020).

[3] From the iMaPP database described in Alam et al. (2019). We express the LTV ratio as 100-LTV so that a higher value denotes a tighter stance (to correspond with the other indicators).

[4] The FX macroprudential stance is calculated by aggregating the net number of changes in FX-related tools in the iMaPP database since 1990; this includes any changes in macroprudential policy regarding capital requirements on FX-loans; limits on FX lending or rules or recommendations on FX loans; and limits on net or gross open FX positions, limits on FX exposures and FX funding, and currency mismatch regulations.

macroprudential stance) since 2000. It shows that most countries did not start adjusting their CCyBs until after 2013, and accelerated tightening around 2017 until the COVID-19 pandemic. Adjustments in LTV ratios and FX regulations were spread more evenly over time, with the latter being tightened significantly before the GFC. Again, both reached their peak stringency at the end of the sample and there is no cross-country data available yet on how they were adjusted in response to COVID-19. The lower panel of Figure 1 graphs the resulting index of the macroprudential stance from combining these three tools, as well as the range of values in our sample of 74 countries. It shows the slow rate of tightening in macroprudential policy before 2010, and then a gradual tightening in average macroprudential stances up to the pandemic.[5] The panel also captures the range in stances across countries, a variation which grows over time and could be important for empirical analysis of the impact of macroprudential policy during COVID-19 (and which is explored below).

One shortcoming of this macroprudential policy index, however, is the limited information on changes in macroprudential policy in response to COVID-19. Therefore, we supplement the analysis below with a more timely data source: the IMF Policy Tracker. This database catalogues changes in a range of monetary, fiscal and financial policies in response to COVID-19, but has the disadvantage of only recording any macroprudential action in the form of dummy variables, such that it is unable to capture the intensity of any changes or a country's initial policy stance. With that caveat, we measure changes in macroprudential policy after the start of the pandemic with three different variables: 1) a dummy if the country reports any loosening in macroprudential policy in the IMF Policy Tracker; 2) a dummy if the country reports adjusting its counter-cyclical capital buffer (CCyB) in the IMF Policy Tracker; and 3) changes in the CCyB ratio (discussed above).[6]

The resulting changes in macroprudential policy in response to COVID-19 according to these three indicators are shown in Figure 2 and suggest that countries responded to the pandemic with widespread

[5] Data is not available on all components of the index to extend this measure through 2020.

[6] For the CCyB data, the BIS and ESRB do have data updated until 2020 (which we use for adjustments in the pandemic period). There are several countries that report a loosening in countercyclical buffers in the IMF Policy Tracker, but do not show a loosening in the BIS and ESRB data. We check these examples with country specific sources, and in most cases, this reflects countries that reduced some type of buffer on selected institutions, but not a macroprudential CCyB on the entire banking system. For example, the Netherlands reduced a CCyB for selected SIFIs, and by different amounts for each institution. In these cases, we do not adjust the raw data. The only exceptions are for two countries not included in the BIS and ESRB dataset: Morocco (which lowered its CCyB from 2.5% to 2.0%) and Kazakhstan (which lowered its CCyB by 1pp for all institutions, starting from 2% for all institutions, or higher for SIFIs).

loosening of macroprudential policy. A large proportion of countries report loosening macroprudential policy: 72% of advanced economies and 61% of emerging markets. Focusing on just the CCyB, this was loosened in 44% of advanced economies, but only 16% of emerging markets. Many countries (particularly in emerging markets) had not activated the CCyB or had it set at a low level before 2020, such that the average change in the CCyB ratio shown at the right of the graph was fairly small (0.46pp for advanced economies). If you only consider the countries that reported adjustments to their CCyB, however, the loosening in the ratio was fairly aggressive; the average size of loosening was 1.17 pp, ranging from 0.25 pp (for Germany) to 2.50 pp (for Sweden).

Table 1 provides more country-specific information and puts these adjustments in a historical context; it reports each individual country's adjustments in macroprudential policy (in overall macroprudential policy or just the CCyB) during the COVID-19 window (the first 6 months of 2020), during the Taper Tantrum in 2013, and during the risk-off period around the commodity shock in 2015.[7] Each cell is colored green if the country loosened macroprudential policy, and red if there was no change or a tightening. As shown in the aggregate statistics in Figure 2, a large share of the countries loosened their CCyB and overall macroprudential policies during COVID-19. This was not specific to any region or country group, as the table shows loosenings across advanced economies and emerging markets, as well as all geographical areas in our sample. In fact, 65% percent of the countries loosened macroprudential policy according to the index, and 29% for just the CCyB. In contrast, the right-hand side columns of the table suggests that far fewer countries eased macroprudential policy during the Taper Tantrum and 2015 Commodity Shock; only 7% and 21% of countries eased any macroprudential tool during the two earlier periods, respectively, and none loosened the CCyB. Overall, this comparison underscores the unprecedented wave of macroprudential loosening during COVID-19 across the globe. This widespread easing in macroprudential policy may have reflected the outsized nature of the COVID-19 shock in 2020, but it also may have reflected the increased stringency of macroprudential stances since 2015 that made this type of aggressive easing of policy possible in the first place.

These findings raise a number of questions. Did these adjustments in macroprudential policy provide meaningful support during this period of unprecedented financial and economic stress? What caused

[7] Changes in macroprudential policy are measured using the macroprudential index discussed above, except for the COVID-19 window, which uses the dummy indicator from the IMF policy tracker (as data to construct the macroprudential index is not available). For each episode, data for changes in the CCyB is from the BIS and ESRB.

some countries to loosen macroprudential policy aggressively in response to COVID-19—while others did not adjust their policy stances? These questions are explored in the remainder of this paper

III. Macroprudential Policy and Country-specific Stress during COVID-19

The sharp and sudden impact of COVID-19 in the spring of 2020 provides a unique window to examine the relationship between macroprudential policy and different measures of economic and financial stress. In fact, for many countries it was the first test of how changes in their macroprudential framework would perform during a severe, negative shock. This section explores if countries that had stronger macroprudential buffers before the pandemic fared better during the early stages of COVID-19, as well as if countries that experienced a larger financial or economic shock were more likely to ease their macroprudential buffers.

Macroprudential policies are closely linked to periods of financial and economic stress through several channels. One key goal of tightening macroprudential policy is to prevent the build-up of vulnerabilities in the financial sector that could generate crises, or that could amplify the impact of an initial shock and generate more widespread stress. Working in the other direction, when a financial system is under stress, loosening macroprudential policy could help alleviate pressure in the financial system and mitigate any corresponding contraction in credit and liquidity. Academic research has found some evidence supporting these various links between macroprudential policy, the buildup of risks, and financial stress. For example, several papers show that macroprudential policy tools can affect credit growth, household leverage, house prices and FX exposures—all of which correspond to the buildup of systemic risk (i.e. Ahnert et al., 2021; Alam et al., 2019; Cerutti et al., 2017; Claessens et al., 2013; and Acharya et al., 2021).[8] Belkhir et al. (2020) show that tightening macroprudential policy reduces the probability of a banking crisis, and Bergant et al. (2020) show that a tighter macroprudential stance can significantly dampen the impact of global financial shocks. There is more limited evidence, however, on whether a loosening in macroprudential policy can alleviate financial stress and amplification effects—undoubtedly reflecting the lack of such episodes since macroprudential tools became more widely adopted.

[8] The literature also acknowledges leakages and spillovers from macroprudential policies (e.g. Ahnert et al., 2021; and Aiyar et al., 2014).

The sharp impact of the COVID-19 pandemic on financial markets in March 2020, followed by the realization that the pandemic and associated mobility restrictions would lead to a sharp contraction in economic activity, provides a unique occasion to evaluate the effects of macroprudential policy. More specifically, we focus on two different measures of country-specific "stress" during COVID-19: in terms of financial markets ("financial stress") and real GDP growth ("economic stress"). We measure "financial stress" using sovereign CDS spreads (5-year, US$) from Bloomberg and comparing levels at end-2019 to the country-specific "peak stress" in the first half of 2020.[9] If CDS data is not available, we perform the same calculation using the EMBI+ bond index from JPMorgan. We measure "economic stress" as the change in each country's forecast of 2020 real GDP growth between January and June 2020, according to the IMF's World Economic Outlook updates.[10] In each case, we calculate the measures so that a higher value indicates more "stress" (i.e., greater *increase* in financial market spreads and greater *reduction* in growth, respectively). Appendix Figure A.1. shows the distribution of the "financial stress" and "economic stress" variables, as well as a "health stress" variable used later on in the paper.

Figure 3 shows the simple correlation of each measure of stress with the pre-COVID-19 macroprudential stance (calculated using the index of the CCyB, LTV ratio and FX stance discussed above and shown in the lower panel of Figure 1). The left-hand panel appears to show a negative slope—suggesting that countries with looser macroprudential stances also experienced the highest levels of *financial* stress (as measured by the increase in spreads). Similarly, the right-hand panel also suggests that countries with a looser macroprudential stance experienced higher levels of *economic* stress (as measured by downward revisions in their forecast for 2020 real GDP growth). The pairwise correlations with the pre-COVID-19 macroprudential stance are both negative and significant, at -0.25 and -0.34 for financial and economic stress, respectively. The panels also show, however, that there are some outliers with high levels of stress (especially financial stress), which could be driving these negative and significant correlations. To test for the impact of these outliers, we drop the three highest "stress" values for each graph, and the raw correlations are still significantly negative (at -0.43 and -0.29, respectively).

[9] We use an average of the absolute change and percent change for each country to capture the magnitude of the effect as well as the magnitude relative to the starting level; this avoids overstating the "stress" in advanced economies that have very low CDS spreads such that a small change would imply a huge increase in stress if only focusing on percent changes.

[10] The January 2020 forecast was done at the end of 2019 when the pandemic was believed to be contained to China and not expected to have a meaningful global effect.

Stronger macroprudential policies may not only prevent the build-up of systemic risk, but they can also support the functioning of financial markets and broader economic activity by being loosened when a negative shock affects the economy. Ghosh et al. (2017) show that countries have loosened macroprudential policies in the past in response to global financial shocks. Figure 4 explores if this also occurred during the initial phases of COVID-19 (i.e., the first six months of 2020). In the left-hand panel, the bar graph shows the average financial stress (in blue) and economic stress (in red) depending on whether the country loosened macroprudential policy in the first months of the pandemic or not. The averages of both measures of stress are lower for countries that loosened macroprudential policies. This pattern is also found when we focus on just changes in one macroprudential tool—the CCyB. The right-hand panel of Figure 4 shows a scatter plot of countries' financial stress (in blue) and economic stress (in red) relative to how much they lowered the CCyB in the first half of 2020. There appears to be a slight negative slope for each stress measure, and countries that did not loosen their CCyB had the highest levels of financial and economic stress. The correlations between the stress measures and reductions in the CCyB are clearly negative (at -0.17 and -0.08 for financial and economic stress, respectively), but insignificant.

Although these graphs and the corresponding correlations are clearly not formal empirical tests, the patterns are consistent with the evidence from before COVID-19 and theory on how macroprudential tools should work. The negative correlation between the tightness of the macroprudential stance before COVID-19 and the extent of financial and economic stress experienced during the pandemic are consistent with the hypothesis that strengthening macroprudential policy can reduce the build-up of risk and make an economy more resilient during a crisis. Similarly, the negative correlation between the extent to which countries loosened macroprudential policy (measured broadly or just for the CCyB) during the pandemic and the extent of financial and economic stress are consistent with the hypothesis that loosening macroprudential policies can alleviate stress once a shock hits. It is important to emphasize, however, that this section only shows correlation and not causation; an omitted variable, such as institutional quality, could drive both sets of correlations. In order to better understand these relationships and test these hypotheses more formally, it is necessary to move to the more formal regression analysis in the next section of the paper.

IV. Macroprudential Policy, Policy Space, and Other Policy Choices

This section more formally analyzes the determinants of changes in macroprudential regulation during the early stages of the pandemic, including any interactions between macroprudential regulation and other policies. It draws on the literature examining the determinants of fiscal and monetary policy, which focuses on the role of existing "policy space" to enable a country to use certain tools to respond to negative shocks. Then the section explores how previous macroprudential actions (and the resulting policy space) and other variables affected the use of macroprudential policy during COVID-19. Next, it tests if pre-existing space for other policies affected a country's use of macroprudential tools, and finally whether initial macroprudential space affected the use of other policy tools. To the best of our knowledge, this is the first paper to test for the role of policy space in the use of macroprudential regulation, as well as to understand the use of macroprudential policy during COVID-19.

a. Related Literature

This section builds on a literature that examines the extent to which different policies are used in response to shocks and highlights the importance of policy space. Most of this literature focuses on how fiscal space can constrain the use of fiscal policy. For example, Ghosh et al. (2013) and Kose et al. (2017) discuss different approaches for defining fiscal space, and Auerbach and Gorodnichenko (2017) provide an excellent review of the literature and an analysis of the interaction between fiscal stimulus and fiscal space at different stages of the business cycle. Romer and Romer (2018, 2019) show that having more fiscal and monetary policy space (measured by debt to GDP and if interest rates are above zero, respectively) leads to significantly better economic performance after periods of stress, partly because monetary and fiscal policy can be used more aggressively to support the economy. Romer and Romer (2019) argue that this constraint from fiscal space occurs partly because of the impact on market access, and partly through policymaker decisions (such as the need to abide by EU or IMF conditionality rules). These conclusions agree with Jordà et al. (2016), who analyze a longer period to show that countries with lower debt ratios respond to crises with more aggressive fiscal stimulus (through financial rescues as well as conventional tax cuts and spending increases), leading to smaller output losses. The conclusion from this literature is that maintaining fiscal space during normal times can be a valuable insurance in the sense that it allows stronger responses to financial crises and recessions.

More recently, several papers have focused on the role of policy space in areas other than fiscal policy and the interaction between policy space and the use of different policy tools. For example, as interest rates have fallen near zero in many countries, there has been increased attention to the limited space available for conventional monetary policy and the potential for unconventional tools to provide additional stimulus (Bernanke, 2020). There has also been increased attention to how limited policy space for one tool could affect the use of other policy tools. For example, when monetary policy is constrained by the lower bound, and especially if the efficacy of unconventional monetary policy tools is uncertain, this could provide a greater justification to use countercyclical fiscal policy (Eggertsson, 2011; Woodford, 2011; Drautzburg and Uhlig, 2015; and Furman and Summers, 2020). Related research also shows how monetary policy that affects borrowing costs will affect fiscal space and a country's ability to use fiscal stimulus (Aizenman et al., 2019; and Auerbach and Gorodnichenko, 2017). Bartsch et al. (2020) provide an overview of these issues around the optimal mix of countercyclical fiscal and monetary policy, highlighting how the debate has changed with policy rates near their effective lower bounds in many countries.

Finally, related research also explores the interactions between the use of macroprudential and monetary policy—including through international spillovers. More specifically, as macroprudential policy has become more widely used, countries that are concerned about overheating in certain sectors (such as the housing market), could tighten macroprudential policy to address these concerns directly and thereby provide monetary policy with greater flexibility to focus on its inflation (and if relevant employment) mandate.[11] Central banks that do not have the institutional framework to use macroprudential tools may need to raise interest rates sooner during recoveries to address growing financial risks. Overall, the literature agrees that monetary and macroprudential policies should not be separated (Adrian and Liang, 2018), but also emphasizes that we do not yet have a clear sense of the trade-offs (Martin et al., 2021). One of the few papers to attempt to better understand these tradeoffs is Richter et al. (2019), which evaluates how changes in LTV ratios affect output and inflation—and thereby optimal monetary policy. From an international viewpoint, there is also evidence that macroprudential policy can provide a buffer against the impact of changes in monetary policy abroad. In other words, macroprudential tools could provide greater monetary policy independence so that countries are not forced to adjust monetary policy

[11] For a discussion of the interaction between monetary and macroprudential policies in the UK, see Kohn (2017), and for a model of how macroprudential and monetary policy can complement each other, see Caballero and Simsek (2019). The IMF's integrated policy framework (as in Basu et al., 2020) provides policy recommendations based on a theoretical model of the interaction of monetary policy and macroprudential taxes on housing.

in ways that exacerbate the adverse effects of changes in global financial conditions on the domestic economy (as shown in Bergant et al., 2020; and Aizenman et al., 2017).[12]

b. Macroprudential Policy and Macroprudential Policy Space

In order to more formally test the factors determining a country's use of macroprudential policy ($\Delta MP_{i,t}$) during COVID-19, we build on our hypotheses in the previous section and estimate the following empirical specification:

$$\Delta MP_{i,t} = \beta \cdot PS_{i,t-1} + \gamma \cdot ST_{i,t} + \delta \cdot CC_{i,t-1} + \varepsilon_{i,t}, \qquad (1)$$

for each country *i* over the pandemic window *t* (the first six months of 2020). The first explanatory variable ($PS_{i,t-1}$) measures available policy space at end-2019 before COVID-19 (initially just for macroprudential policy, and in later tests for other policy tools). The second set of variables ($ST_{i,t}$) measures the "stress" to the economy during the initial stage of the pandemic, and the third set of variables ($CC_{i,t-1}$) is additional controls at end-2019 (or the latest date before that if end-2019 data is not available). Equation (1) is estimated as a probit when $\Delta MP_{i,t}$ is a dummy variable indicating any change in macroprudential policy, and is estimated using OLS when $\Delta MP_{i,t}$ is a quantitative value. All regressions include robust standard errors.

More specifically, we focus on changes in macroprudential policy during COVID-19 using three measures: a dummy indicating whether the country changed macroprudential policy; a dummy indicating whether the country loosened the CCyB; and the magnitude of the change in the CCyB (in percentage points). The dummy variables are from the IMF Policy Tracker and information on the CCyB from the BIS and ESRB, as discussed in Section II. In our initial regressions, *Policy Space* ($PS_{i,t-1}$) is measured using the latest data available for our index of the macroprudential stance (described in Section II) before 2020, which is comprised of three popular macroprudential tools (the level of the CCyB, the level of the LTV, and an index of FX regulations). For the regressions predicting changes in the value of the CCyB, however, the stance is

[12] This literature builds on evidence that many emerging markets – even if they have flexible exchange rates – tend to increase their policy rates in response to monetary tightening in the US even after controlling for inflation dynamics (Obstfeld et al., 2005; Aizenman et al., 2016; Aizenman et al., 2017; Han and Wei, 2018; Cavallino and Sandri, 2020; and Bhattarai et al., 2020). There is also an extensive literature on how changes in macroprudential policy generate spillovers to other countries (Agénor et al., 2017; Agénor and Pereira da Silva, 2019; Avdjiev et al., 2016; Buch and Goldberg, 2017; and Forbes, 2021) and how regulations can interact with monetary policy to aggravate these spillovers (Forbes et al., 2017).

measured by the initial level of the CCyB (at end-2019). To measure country-specific stress (ST) we use three measures: "financial stress" and "economic stress" (both described in Section II), as well as "health stress". The latter is measured as the number of reported cases of COVID-19 per 1000 people from Oxford's Coronavirus Government Response Tracker (OxCGRT). In each case, a higher value indicates more "stress" (i.e., greater increase in financial market spreads, greater reduction in growth, or greater incidence of COVID-19 cases).

The final set of variables (CC_i) controls for other country characteristics from before the spread of COVID-19. Given the limited degrees of freedom in this cross-section analysis, we only include six controls for our baseline: a dummy variable equal to one for countries with a fixed exchange rate (based on the classification in Ilzetzki et al., 2019[13]); another dummy for emerging markets (based on IMF definitions); the ICRG index of institutional quality (from the Worldwide Governance Indicators); a measure of trade openness (exports plus imports as a share of GDP, from the IMF); exposure to commodity prices[14]; country credit rating (calculated as a numerical index based on Fitch country ratings); and the log of income per capita (from the IMF's World Economic Outlook database). Our final dataset includes 75 countries, of which 37 are advanced economies and 38 emerging markets.

Table 2 shows results predicting changes in our three measures of macroprudential policy during COVID-19 as function of macroprudential policy space, the three stress measures, and other country characteristics. The one consistently significant coefficient is for pre-existing policy space. Countries with a tighter macroprudential stance before the pandemic, whether measured by the broad index of the macroprudential stance or the level of the CCyB, were significantly more likely to ease macroprudential policy during the initial stages of the COVID-19 pandemic. Moreover, columns (9)-(12) suggest that not only were countries with more space more likely to ease, but they lowered their CCyB by significantly more than countries which started with a lower CCyB. In some sense, these results are not surprising. Countries that had <u>not</u> tightened macroprudential policy more aggressively (or previously raised the CCyB above zero), would have had less ability to ease regulations (including lowering the CCyB). The magnitude of the coefficients, however, suggests that the effects of creating policy space, even through a modest

[13] The data ends in 2016, and we assume the exchange rate regime has not changed through 2019. We define a fixed exchange rate regime using the "coarse classifications" and define countries as fixed if they have a moving band that is narrower than or equal to +/- 2% (classification #11) or anything more restrictive.

[14] Exposure to commodity prices is measured as the volatility in the commodity terms-of-trade index from 2008 to 2018, based on the data in Gruss and Kebhaj (2019).

tightening of policy before a shock, can be important. The coefficients suggest that a one percentage point tightening in the macroprudential policy index before COVID-19, would increase the probability of easing macroprudential policy at the start of the pandemic by 2.2%. Therefore, an increase of one standard deviation in the macroprudential space before COVID-19 would correspond to an increase in the probability of loosening macroprudential measures during the pandemic by 30.3%. Columns (9)-(12) suggest that for every 1.00pp higher CCyB buffer as of end-2019, countries lowered the buffer by 0.68-0.69pp.

Moreover, the significant role of pre-existing macroprudential policy space stands in sharp contrast to the general insignificance of most of the other coefficients in Table 2. The extent of stress—whether in financial markets, the decline in GDP growth, or spread of COVID-19—has no significant effect on a country's decision to adjust macroprudential policy after controlling for the extent of macroprudential space. Most other country characteristics are also not consistently significant at the 5% level. The only exception is that countries which are more sensitive to commodity price movements made fewer changes in their CCyBs—although this undoubtedly reflects the fact that most commodity-reliant countries had not previously raised their CCyB. There is also some evidence (albeit only significant the 10% level in some specifications), that countries with fixed exchange rates were more likely to loosen macroprudential policy during COVID-19, and emerging markets and countries that were more open to trade were less likely to adjust macroprudential policies.

c. Macroprudential Policy and Other Policy Space

If pre-existing macroprudential policy space was the most important determinant of whether countries adjusted macroprudential policy in response to the pandemic, did the policy space for other variables also matter? More specifically, if countries were constrained in their ability to use other policy responses to COVID-19, would they be more likely to adjust macroprudential policy? As discussed above, could adjustments in macroprudential policy partially substitute for adjustments in monetary policy when monetary policy is constrained by policy rates being near the lower bound? To test for the role of "other policy space" in the use of macroprudential policy, we estimate a variant of equation (1), now by adding controls for "other policy space" ($OPS_{i,t-1}$), i.e., for other policy tools in addition to the amount of space for macroprudential policy.

$$\Delta MP_{i,t} = \beta \cdot PS_{i,t-1} + \alpha \cdot OPS_{i,t-1} + \gamma \cdot ST_{i,t} + \delta \cdot CC_{i,t-1} + \varepsilon_{i,t}, \quad (2)$$

We focus on the space for four other policies: fiscal, monetary, FX intervention and capital controls. To control for the amount of fiscal policy space, we use general government gross debt to GDP from the World Bank[15] and to control for the amount of monetary policy space, we use the central bank policy rate.[16] To control for the amount of space for FX intervention and capital controls, we use the ratio of FX reserves to GDP (from the IMF) and an index of controls on capital inflows or outflows from Fernandez et al. (2016).[17]

Table 3 reports results when we estimate equation (2) and continue to control for macroprudential policy space (using the same measures as above), but also control for fiscal and monetary policy space, for FX and capital control space, and then for the space of all four additional policies simultaneously. The first row shows that the results on the importance of macroprudential policy space still hold; countries that had tightened macroprudential policy more aggressively before COVID-19 were significantly more likely to ease macroprudential policy (by each measure) when the pandemic began. In most cases, however, the space available to use other policies had no significant relationship with a country's decision to ease macroprudential policy. The only exception (significant at least at the 5% level) is the policy space for FX intervention. Countries that had larger FX reserves (relative to GDP) reduced their CCyBs by less. This could reflect that countries that are more vulnerable to exchange rates movements and thereby accumulate larger reserve buffers are also less likely to ease macroprudential buffers during a shock, or it could reflect that more of the EMs that accumulate FX reserve buffers are also less likely to have raised (or even instituted) a CCyB before the pandemic. Perhaps most noteworthy, there is no evidence that countries relied more heavily on adjustments to macroprudential policy when they had less space to use other policy tools.

[15] Romer and Romer (2019) argue that debt-to-GDP ratios are a useful measure of fiscal policy space as they are slow moving and less cyclically sensitive (as compared to measures such as budget balances or financing costs) and they capture past policy decisions and "more long-run features of a country's policymaking process". The World Bank data is available at: https://www.worldbank.org/en/research/brief/fiscal-space.

[16] Data from Haver Analytics for most countries, and from the official central bank website for Costa Rica and from the BIS for China. We have also repeated the analysis using the shadow interest rate based on Krippner (2015) instead of the policy interest rate, with no meaningful impact on the results.

[17] Updated as of June 2019, with data through 2017. We use the 2017 value as the pre-COVID-19 level.

d. Macroprudential Policy Space and Other Policy Choices

Even if the space available to use other policy tools did not affect a country's decision to adjust macroprudential policy during the early stages of COVID-19, did the ability to adjust macroprudential policy affect countries' decisions to use other policies? As an initial look, Figure 5 graphs the relationship between countries' use of other policies in the early stages of COVID-19 and the stringency of their macroprudential policy stance before the pandemic. We focus on four policies: fiscal policy, conventional monetary policy (changes in the policy rate), and unconventional monetary policy through asset purchases and the activation of swap lines (defined in more detail below). The raw correlations in the figure show a mixed picture. There is a slightly negative correlation between the macroprudential stance before COVID-19 and the use of fiscal policy and conventional monetary policy. In other words, countries with tighter macroprudential policy before the pandemic conducted less expansionary fiscal policy and decreased their policy rate less, consistent with the hypothesis that countries with more space to adjust macroprudential policy did not need to adjust other policies as aggressively in response to COVID-19. On the other hand, the lower two panels of Figure 5 show that this relationship reverses for unconventional monetary policy; countries with a tighter macroprudential stance before the pandemic conducted more asset purchases and might have been slightly more likely to activate swap lines with a foreign central bank. All of these graphs are just raw correlations, however, and do not control for country characteristics and other omitted variables that could explain these different patterns. For example, countries that tightened macroprudential policy more before COVID-19 also tended to be advanced economies and had lower interest rates before the pandemic, and thereby had less space to adjust policy interest rates in response to COVID-19.

In order to better understand these relationships, it is necessary to control for other country characteristics, including the space available to use other policies that could act as a substitute or complement to macroprudential policy. To test this, we estimate an equation similar to equation (2), now focusing on the determinants of "Other Policies" ($\Delta OP_{i,t}$) instead of macroprudential policy ($\Delta MP_{i,t}$), and still including a control for existing space for macroprudential policy ($PS_{i,t-1}$), existing space for other policies ($OPS_{i,t-1}$), and the full set of controls for different measures of "stress" and other country characteristics:

$$\Delta OP_{i,t} = \beta \cdot PS_{i,t-1} + \alpha \cdot OPS_{i,t-1} + \gamma \cdot ST_{i,t} + \delta \cdot CC_{i,t-1} + \varepsilon_{i,t}. \quad (3)$$

More specifically, $(\Delta OP_{i,t})$ is the adjustment to fiscal policy, monetary policy (changes in conventional or unconventional policy), or FX intervention during the first six months of 2020. (We do not report results for adjustments in capital controls as so few countries adjusted these controls that there are not sufficient observations for estimation.) Fiscal policy is the change in the 2020 fiscal balance in response to COVID-19 (as a share of GDP), as measured in June 2020 relative to end-2019, and thereby measures additional fiscal support relative to what was planned at end-2019.[18] This includes both "above-the-line" and "below-the-line" spending. Monetary policy is measured using three measures: the change in the central bank's policy rate (from Haver Analytics); the size of the country's asset purchase program relative to GDP over this period (from central bank websites and Fratto et al., 2021); or whether the country activated a swap line with another country (from the IMF Policy Tracker). Finally, FX intervention is measured as a dummy equal to 1 if the country reports using FX reserves in the IMF's Policy Tracker (which could imply purchases or sales of FX reserves). For each policy response, we also control for the policy space ($OPS_{i,t-1}$) for the relevant action using the measures discussed above: fiscal policy space is measured using general government gross debt to GDP; monetary policy space is the central bank policy rate, and FX intervention policy space is the ratio of FX reserves to GDP. Macroprudential policy space ($PS_{i,t-1}$) continues to be measured by the level of the macroprudential policy index at end-2019.

The results from estimating equation (3) are reported in Table 4.[19] The top row suggests that macroprudential policy space had no significant effect on the use of fiscal policy, monetary policy (through adjustments to policy rates, QE or swap lines), or FX intervention during the early stages of the pandemic. This suggests that even if countries had previously tightened macroprudential policy (and therefore had space to use this tool), this did not meaningfully affect their use of other policies.

Also noteworthy is the second row in the table, which reports the role of *Other Policy Space ($OPS_{i,t-1}$).* As found for macroprudential policy, the use of policies can be significantly affected by the space available for that policy. For adjustments to the policy interest rate and FX intervention, the positive coefficients agree with those for macroprudential policy; countries with more policy space were more likely to use the given policy. More specifically, countries with a higher level of the policy interest rate and larger FX

[18] From the Fiscal Monitor Database of Country Fiscal Measures in Response to the COVID-19 Pandemic, with data through June 12.

[19] For the regressions predicting the use of fiscal policy, we exclude Japan. Japan is such a larger outlier that it can influence the significance of estimates and generate results that are not robust to minor changes; see Bergant and Forbes (2021) for more details on the impact of this outlier.

reserves (relative to GDP) were more likely to lower interest rates or use some type of FX intervention in the early stages of the pandemic, respectively. Also not surprising is the negative coefficient on QE; countries with more policy space (as measured by a higher policy rate) were less likely to use QE (although the coefficient is not significant). More surprising is the negative coefficient on the role of fiscal space for the use of fiscal stimulus; this suggests that countries with higher debt ratios did not use significantly less fiscal stimulus in response to COVID-19. This agrees with results in Bergant and Forbes (2021) that fiscal space did not seem to constrain a country's ability to respond to the negative shock of COVID-19 with a large fiscal stimulus. This is a change from research examining earlier time periods, which has traditionally found that fiscal space is an important constraint on a country's ability to respond to negative shocks (as shown in Romer and Romer, 2018 and 2019).

This series of results suggests that although policy space for a given policy tool is often important for the use of that tool—especially for macroprudential policy, adjusting policy interest rates, and FX intervention—the policy space for other tools is generally not a significant determinant. Countries were more likely to ease macroprudential policy in response to COVID-19 if they had previously tightened macroprudential policy more aggressively, but their decision was not significantly affected by their ability to use other tools. Similarly, although the use of other tools (such as monetary and FX policy) was significantly affected by whether a country had previously created space to use that tool, the use of these other tools (as well as fiscal policy) in response to COVID-19 was not affected by whether macroprudential policy had previously been tightened to create space to use this regulatory tool. Although economic models suggest that the ability to use one type of tool could affect the optimal use of other policy tools, these spillovers and interactions do not appear to have been powerful during the initial phases of COVID-19 and the use of these different tools does not appear to have been coordinated.

V. Conclusions and Implications for Global Spillovers

Although many countries have been using macroprudential policy more actively since the GFC, the economic and financial dislocation created by COVID-19 provided the first global shock to test how these new macroprudential tools and broader frameworks would perform under a period of severe stress. Although the pandemic is far from over, the initial evidence suggests that the macroprudential frameworks developed over the last decade are largely working as expected. Banks, which have been the

primary focus of most macroprudential regulations, not only withstood this severe shock, but did not amplify the shock to other segments of the economy as occurred during the GFC.[20] Moreover, this paper shows that countries have been using macroprudential policy countercyclically, tightening policy during the recovery period starting in the mid-2010s, and then easing macroprudential policy aggressively in response to COVID-19. The empirical analysis suggests that countries which had created more macroprudential policy space (by tightening more aggressively before COVID-19), were also able to ease more aggressively in response to the pandemic. Creating macroprudential policy space in advance was important in order to be able to use this tool actively during a severe negative shock.

The evidence also suggests, however, that having the space to use macroprudential policy more actively is not yet affecting the use of other policy tools, and that having the space to use other policy tools is not yet meaningfully affecting the use of macroprudential policy. More specifically, countries that had more space to support their economies through fiscal policy, interest rates, FX intervention or capital controls did use macroprudential policy in a significantly different way during COVID-19 (even controlling for different degrees of macroprudential space). Similarly, countries which had greater space to adjust macroprudential policy did not meaningfully change their use of policy interest rates, quantitative easing, FX intervention, fiscal policy or FX swaps. This suggests that macroprudential policy is not yet being actively used as a substitute or complement to these other tools, and there may be opportunities to better coordinate the use of these tools in the future.[21] For example, as shown in Bergant and Forbes (2021), policy space is an important determinant of the use of a number of these policy tools. If countries were limited in their ability to build policy space in the use of certain tools (such as by raising policy interest rates), could they partially compensate for this by putting more emphasis on creating macroprudential policy space, and then adjusting macroprudential policy instead of other policies that are more constrained?

Finally, although this paper provides evidence on the use of macroprudential tools during COVID-19 and the potential spillovers to the use of other policy tools, it does not address the spillovers from

[20] Of course, this is with the important caveat that banks also received substantial support through liquidity programs, subsidized lending programs, and reductions in interest rates in most economies—all of which would further stabilize banks and reduce any amplification effects. See English et al. (2021).

[21] Bruno et al. (2017) go one step further to discuss challenges when monetary and macroprudential policies are working in opposite directions—such as when one of these tools provides an incentive for economic agents to borrow more, while the other tool simultaneously provides an incentive to borrow less.

macroprudential policy to the non-bank financial system and to other economies.[22] There is increasing evidence that macroprudential policies can help strengthen domestic banking systems, but create externalities to other financial entities and spillovers to other countries (as discussed in other papers in this conference).[23] The shifting of financial risks, liquidity and exposure from the banking sector to the non-bank financial sector likely contributed to the market instability that occurred in March 2020, which in turn prompted widespread easing in macroprudential policy. On the other hand, if tighter macroprudential regulations improved the resilience of domestic financial systems to the COVID-19 shock, this should also have had positive spillovers to the broader domestic economy as well as to other countries. These multifaceted interactions and spillovers should all be considered when adjusting macroprudential policy—as well as the importance of policy space as highlighted throughout this paper.

[22] For evidence on the international spillovers of macroprudential policies, see Agénor et al. (2017), Agénor and Pereira da Silva (2019), Ahnert et al. (2021), Aiyar et al. (2014), Avdjiev et al. (2016), Buch and Goldberg (2017), Forbes (2021) and Reinhardt and Sowerbutts (2015).

[23] For evidence on the spillovers to non-bank financial entities, see Chari et al. (2021) and Forbes (2021). Also see Bertaut et al. (2021) for evidence from the mutual fund sector on how vulnerabilities in the non-bank financial sector can amplify the impact of global shocks.

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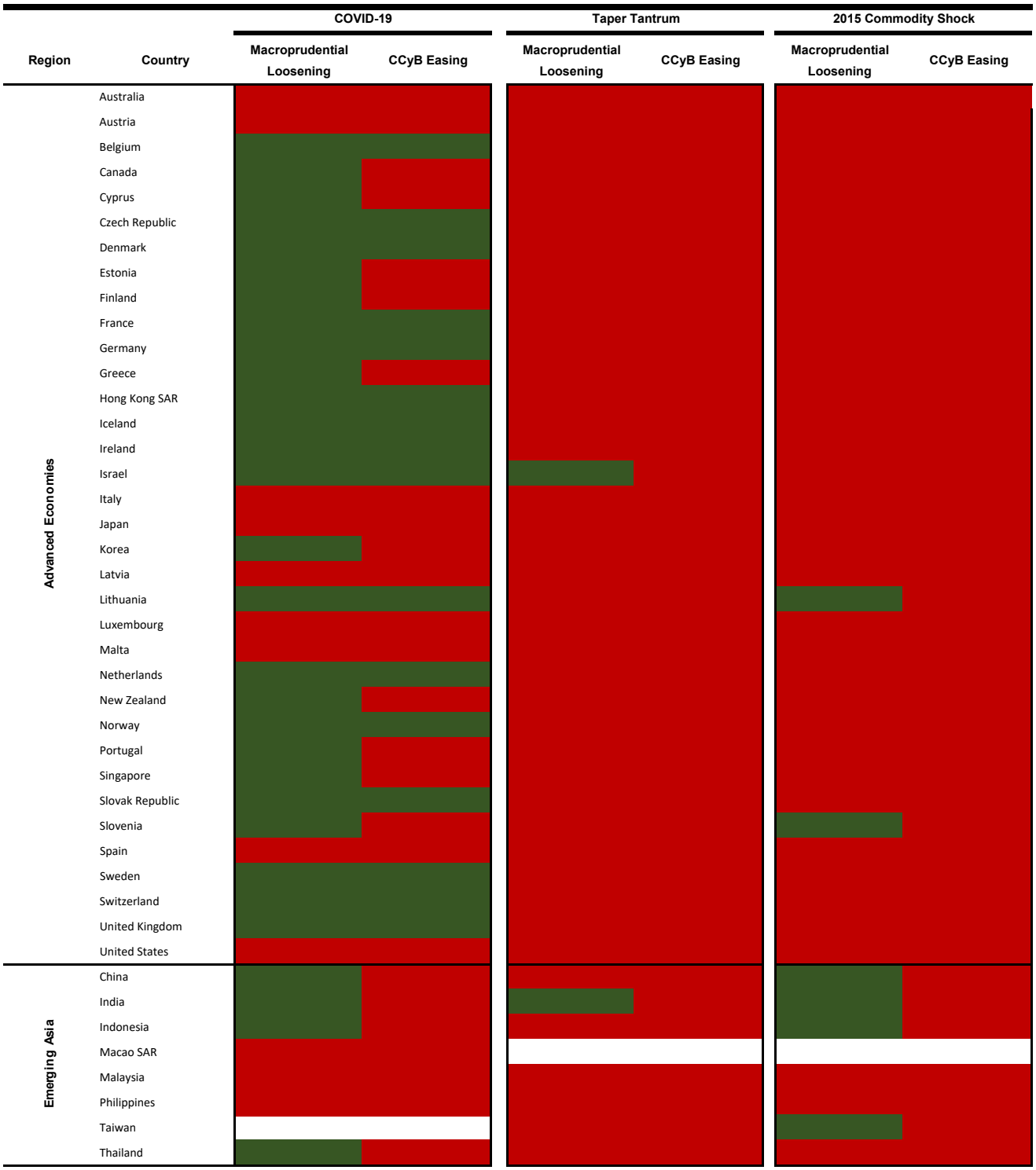
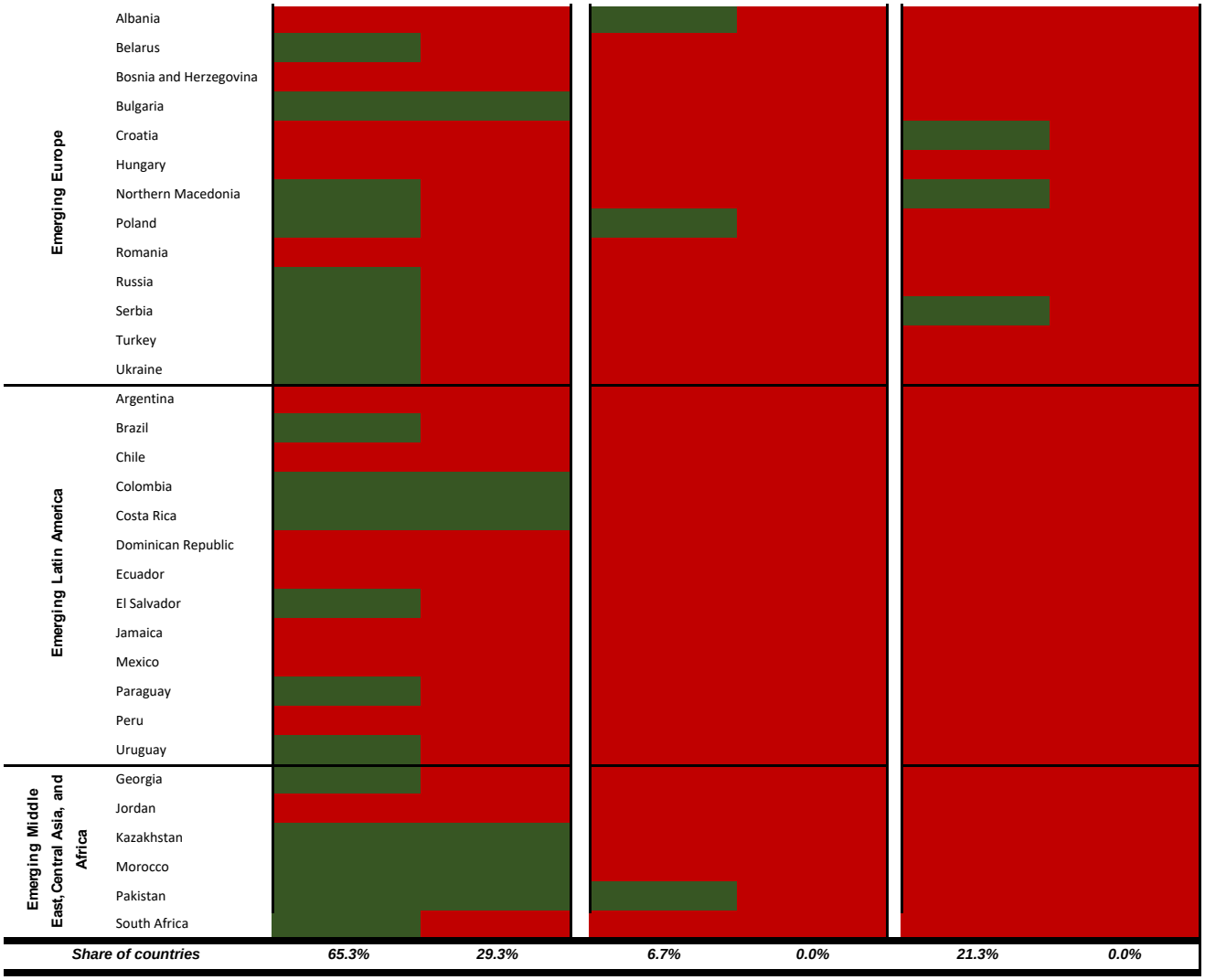
Table 1

Individual Macroprudential Actions During Three Risk-off Periods





Loosening
No Loosening
Data Unavailable

Note: COVID-19 shock defined as the first half of 202

Source: IMF Policy Tracker for COVID-19; Based on data from Alam et al. (2019) and the macroprudential index discussed above for previous periods.

Table 2
Macroprudential Policy and Macroprudential Policy Space

	Loosen Macroprudential Policy (dummy)				Loosen CCyB (dummy)				Loosen CCyB (pp change)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Macropudential Policy Space												
MP Index or	6.899***	5.677***	5.810***	6.678***	4.559***	3.728**	4.562***	4.727***	0.677***	0.674***	0.685***	0.685***
CCyB Level	(1.989)	(1.921)	(1.960)	(2.246)	(1.221)	(1.568)	(1.585)	(1.537)	(0.0959)	(0.0939)	(0.0854)	(0.0858)
Stress Variables												
Financial		-0.0953	-0.160	-0.133		-0.340*	-0.148	-0.116		-0.00213	-0.00107	-0.00106
		(0.0605)	(0.115)	(0.114)		(0.201)	(0.297)	(0.277)		(0.00170)	(0.00367)	(0.00370)
Economic		-0.0184	-0.0198	-0.0731		0.0426	0.0226	0.00663		-0.00327	-0.0194	-0.0204
		(0.0676)	(0.0705)	(0.0718)		(0.0922)	(0.0935)	(0.0999)		(0.0136)	(0.0154)	(0.0151)
Health		-0.0292	-0.0250	0.0109		0.0241	0.0127	0.0260		0.0262*	0.0225*	0.0231*
		(0.0615)	(0.0596)	(0.0620)		(0.0586)	(0.0644)	(0.0708)		(0.0156)	(0.0120)	(0.0123)
Other Country Characteristics												
Fixed ER			0.232	0.0925			0.791*	0.754*			0.112	0.111
dummy			(0.441)	(0.426)			(0.449)	(0.451)			(0.0724)	(0.0735)
Institutional			-0.0491	-0.0166			-0.0638	-0.0515			0.00461	0.00476
quality			(0.0636)	(0.0673)			(0.0671)	(0.0642)			(0.00917)	(0.00902)
Trade			0.0128	0.0429			-0.247	-0.265			-0.111*	-0.111*
openness			(0.399)	(0.438)			(0.341)	(0.343)			(0.0617)	(0.0617)
Commodity			-0.0768	-0.126			-0.00391	-0.0167			-0.0532**	-0.0535**
dependence			(0.135)	(0.121)			(0.134)	(0.140)			(0.0239)	(0.0244)
Credit			-0.00765	-0.0512			0.0731	0.0543			-0.0190	-0.0194
rating			(0.0848)	(0.0878)			(0.0942)	(0.0957)			(0.0136)	(0.0133)
Income per			0.218	-0.538			0.386	0.168			0.135*	0.127
capita (log)			(0.402)	(0.653)			(0.368)	(0.504)			(0.0774)	(0.0959)
EM dummy				-1.686*				-0.545				-0.0189
				(0.876)				(0.812)				(0.103)
Observations	***73***	***69***	***67***	***67***	***73***	***69***	***67***	***67***	***70***	***65***	***63***	***63***
Adj. R-squared	***0.213***	***0.230***	***0.258***	***0.307***	***0.170***	***0.212***	***0.253***	***0.259***	***0.798***	***0.804***	***0.832***	***0.829***

Notes: Policy space measured by the macroprudential index described in Section II, except for the regressions in columns (9)-(12) where it is measured by the level of the CCyB. Columns (1)-(8) estimated using a probit and columns (9)-(12) using OLS. All regressions include robust standard errors. See text for variable definitions. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Table 3
Macroprudential Policy and Other Policy Space

	Loosen Macroprudential Policy (dummy)			Loosen CCyB (dummy)			Loosen CCyB (pp change)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Policy Space									
MP Index or	5.514**	5.153**	4.950**	4.258**	4.261**	4.084**	0.675***	0.727***	0.714***
CCyB Level	(2.202)	(2.137)	(2.410)	(1.673)	(1.660)	(1.744)	(0.0938)	(0.0885)	(0.0984)
Fiscal	0.00136		0.00198	0.00575		0.00456	0.000952		0.00114
Space	(0.00506)		(0.00533)	(0.00659)		(0.00655)	(0.00103)		(0.00121)
Monetary	0.0453		0.112*	-0.0150		-0.0134	-0.00148		0.000131
Space	(0.0545)		(0.0646)	(0.0936)		(0.108)	(0.00251)		(0.00267)
FX Reserves		0.0104	0.00978		0.00880	0.00973		-0.00233**	-0.00256*
Space		(0.00842)	(0.00897)		(0.0100)	(0.0102)		(0.00111)	(0.00132)
Capital Control		0.805	1.656*		-0.890	-1.082		0.157	0.202*
Space		(0.896)	(1.003)		(0.681)	(0.765)		(0.117)	(0.105)
Stress Variables									
Financial	-0.302	-0.288	-0.563**	-0.144	-0.186	-0.168	-0.00190	0.00281	0.00268
	(0.224)	(0.323)	(0.253)	(0.307)	(0.323)	(0.334)	(0.00375)	(0.00277)	(0.00289)
Economic	-0.0152	0.0265	0.0466	0.0204	0.00950	0.00170	-0.0189	-0.0176	-0.0145
	(0.0731)	(0.0780)	(0.0833)	(0.0875)	(0.0956)	(0.0876)	(0.0141)	(0.0169)	(0.0150)
Health	-0.0199	-0.0531	-0.0410	0.0154	0.0220	0.0154	0.0203	0.0232*	0.0216
	(0.0626)	(0.0607)	(0.0629)	(0.0573)	(0.0665)	(0.0594)	(0.0123)	(0.0132)	(0.0139)
Other Country Characteristics									
Fixed ER	0.220	0.405	0.612	0.854*	0.840*	0.927*	0.108	0.0795	0.0692
dummy	(0.449)	(0.478)	(0.523)	(0.476)	(0.466)	(0.493)	(0.0789)	(0.0624)	(0.0694)
Institutional	-0.0466	-0.0565	-0.0306	-0.0744	-0.0795	-0.0937	0.00363	0.00923	0.00927
quality	(0.0715)	(0.0725)	(0.0862)	(0.0663)	(0.0665)	(0.0773)	(0.0111)	(0.00767)	(0.00964)
Trade	-0.0250	-0.313	-0.508	-0.301	-0.408	-0.474	-0.129*	-0.0334	-0.0405
openness	(0.431)	(0.520)	(0.582)	(0.336)	(0.454)	(0.458)	(0.0696)	(0.0462)	(0.0587)
Commodity	-0.0560	0.0894	0.105	0.00952	-0.00366	-0.00108	-0.0526**	-0.0770***	-0.0772***
dependence	(0.144)	(0.182)	(0.181)	(0.132)	(0.141)	(0.146)	(0.0256)	(0.0255)	(0.0267)
Credit	0.00514	-0.0335	-0.0486	0.0469	0.0802	0.0570	-0.0251	-0.0197	-0.0231
rating	(0.0910)	(0.0940)	(0.101)	(0.101)	(0.0982)	(0.0998)	(0.0183)	(0.0146)	(0.0196)
Income per	0.251	0.518	0.832	0.550	0.274	0.427	0.175*	0.128	0.170
capita (log)	(0.455)	(0.469)	(0.536)	(0.413)	(0.389)	(0.442)	(0.103)	(0.0814)	(0.107)
Observations	***65***	***60***	***58***	***65***	***60***	***58***	***61***	***56***	***54***
Adj. R-squared	***0.281***	***0.273***	***0.325***	***0.259***	***0.255***	***0.269***	***0.828***	***0.871***	***0.870***

Notes: Macroprudential policy space measured by the macroprudential index described in Section II, except for the regressions in columns (7)-(9), where it is measured by the level of the CCyB. Columns (1)-(6) estimated using a probit and columns (7)-(9) using OLS. All regressions include robust standard errors. See text for variable definitions. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

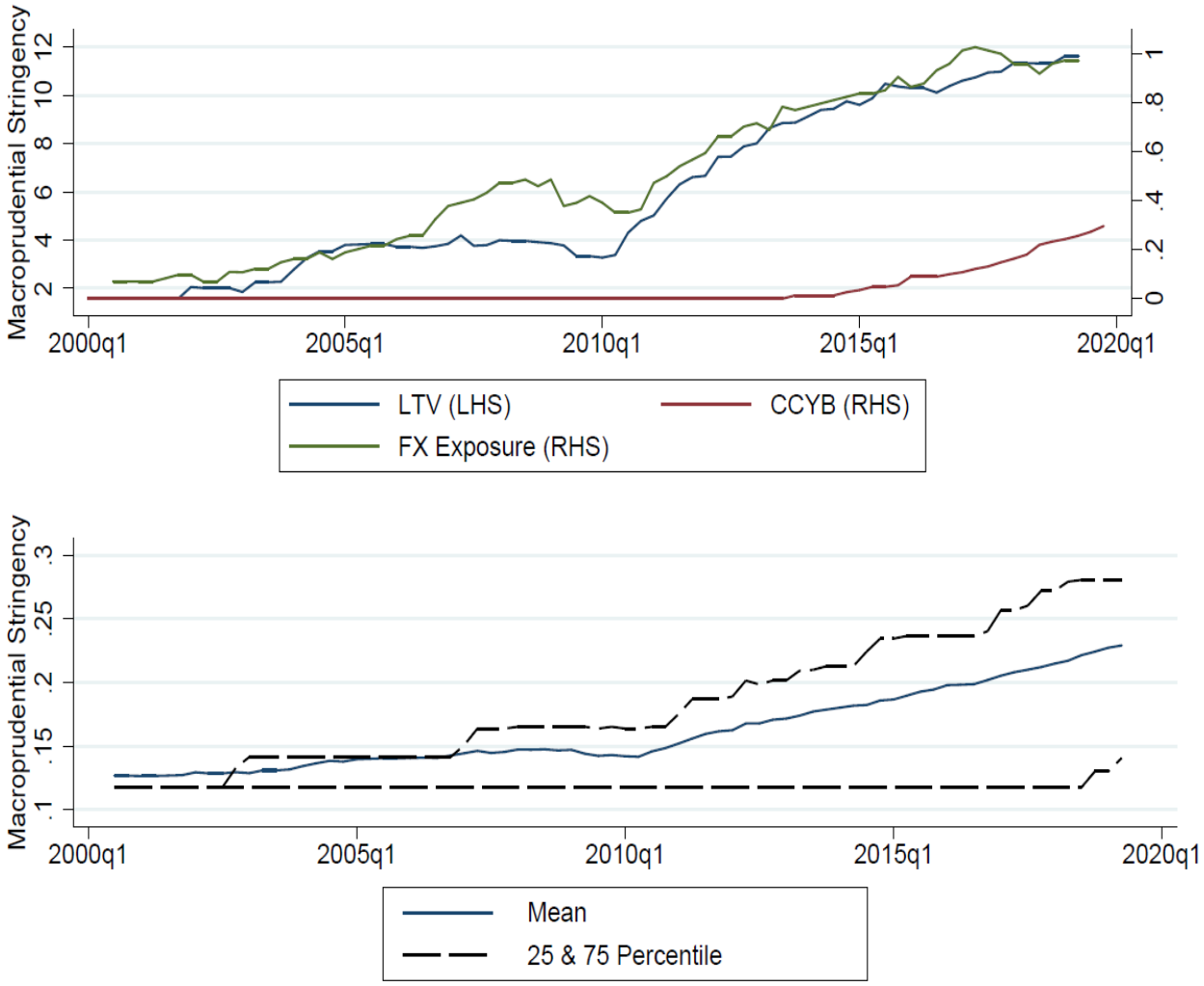
Table 4
Macroprudential Policy Space and Other Policy Tools

		Monetary Stimulus			FX Intervention
	Fiscal Stimulus	Policy Rate	QE	Swaps	(dummy)
	(1)	(2)	(3)	(4)	(5)
Policy Space					
MP Index	-0.463	-1.311	3.279	-0.485	2.600
	(10.66)	(0.999)	(5.290)	(0.459)	(2.450)
Other Policy	-0.0789	0.387***	-0.288	0.0360	0.0544***
Space	(0.0500)	(0.0983)	(0.218)	(0.0311)	(0.0134)
Stress Variables					
Financial	-0.598	-0.0140	-0.135	0.0341***	-0.184**
	(0.575)	(0.0199)	(0.0873)	(0.0121)	(0.0925)
Economic	0.790	0.0880	0.429	-0.0481	0.0821
	(0.471)	(0.0848)	(0.301)	(0.0385)	(0.0894)
Health	-0.119	3.78e-05	-0.212	2.19e-05	0.0831
	(0.331)	(0.0505)	(0.243)	(0.0371)	(0.0713)
Other Country Characteristics					
Fixed ER	0.475	0.465	-2.471	0.105	0.104
dummy	(3.121)	(0.435)	(1.716)	(0.199)	(0.602)
Institutional	0.553	0.00153	-0.0719	0.0105	-0.184**
quality	(0.392)	(0.0547)	(0.257)	(0.0272)	(0.0923)
Trade	-1.626	0.0479	-1.468**	0.0615	-2.312***
openness	(2.369)	(0.233)	(0.721)	(0.112)	(0.730)
Commodity	-0.0813	-0.126	-0.109	-0.0764**	-0.0700
dependence	(0.450)	(0.140)	(0.259)	(0.0316)	(0.175)
Credit	-0.781	0.0229	-0.0889	-0.00608	-0.249*
rating	(0.837)	(0.0734)	(0.247)	(0.0431)	(0.131)
Income per	3.466	0.114	1.706	0.276	0.926*
capita (log)	(2.280)	(0.261)	(1.124)	(0.189)	(0.503)
Observations	***37***	***47***	***47***	***44***	***50***
Adj. R-squared	***0.214***	***0.556***	***0.121***	***0.140***	***0.417***

Notes: *MP Index* measures macropudential policy space using the macroprudential index described in Section II. *Other Policy Space* measured by the debt/GDP ratio in column (1), by the policy rate in columns (2) - (4), and by the ratio of FX reserves to GDP in column (5), all for end-2019. All columns estimated using OLS, except columns (4) and (5) estimated using a probit. All regressions include robust standard errors. See text for variable definitions. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Figure 1

Measures of the Macroprudential Stance over Time

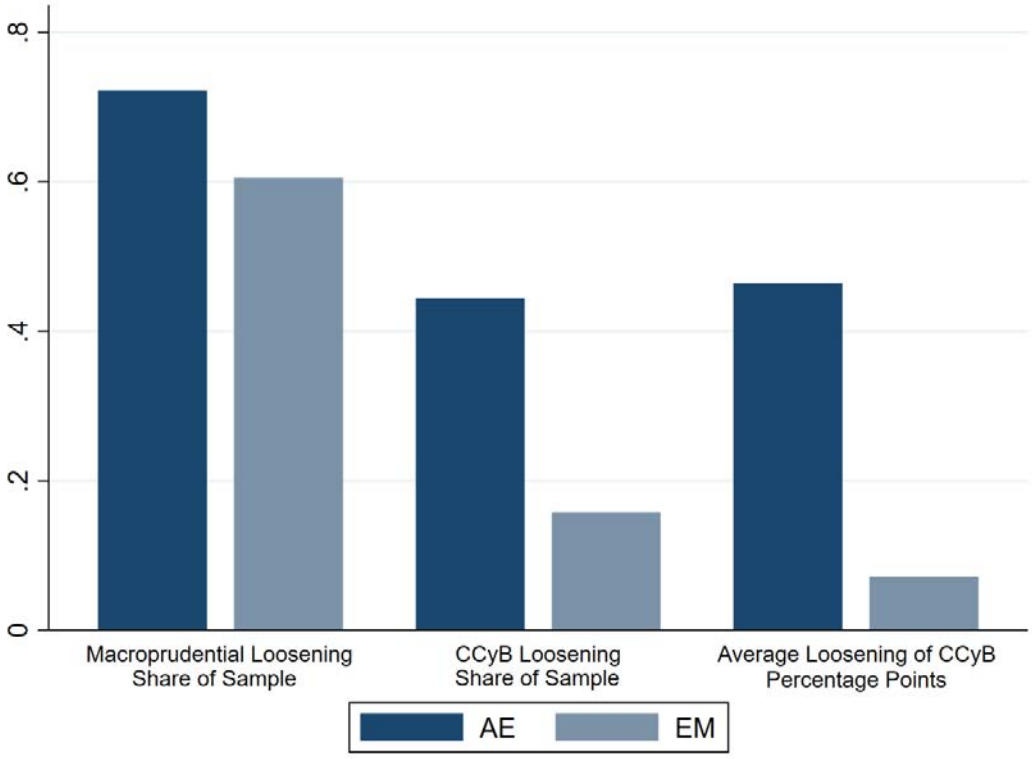


Notes: The upper panel shows three measures of the macroprudential stance: average levels of the CCYB, the LTV ratio (expressed as 100-ratio), and the stringency of FX regulations, which includes the cumulative use of limits on foreign currency lending, limits on gross open FX positions (including currency mismatch regulations), and reserve requirements on foreign currency assets. The lower panel is the mean, 25th and 75th percentile of the overall index of macroprudential stringency (constructed using the three data series in the top graph, as described in Section II).

Source: Data in the upper panel based on Alam et al. (2019), except the levels of the CCyB, which are from the BIS and the ESRB. Data in the lower panel are calculated as discussed in Section II.

Figure 2

Macroprudential Response to COVID-19

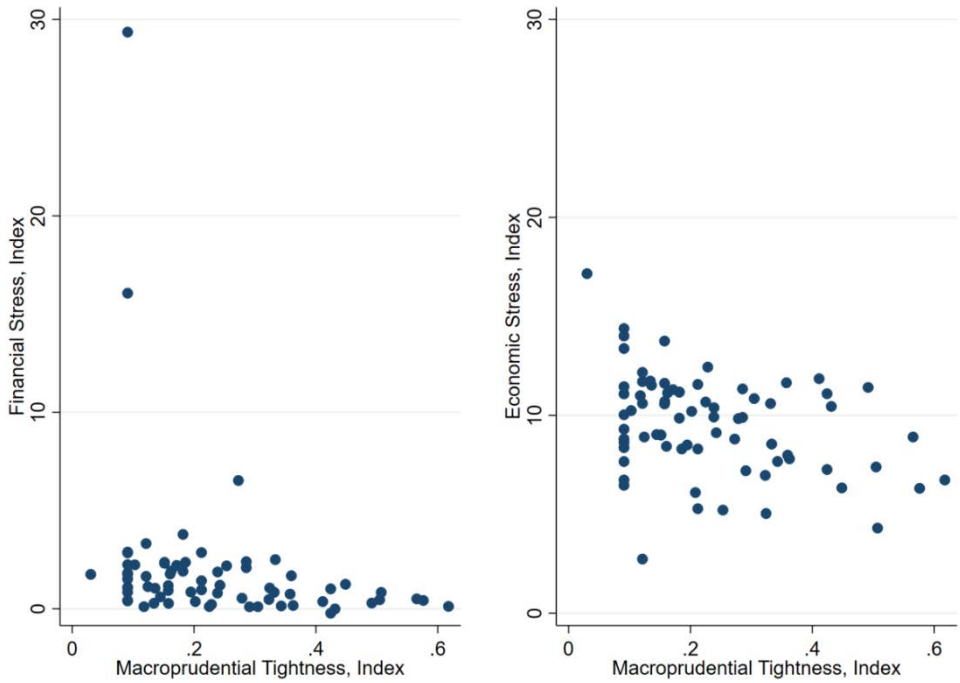


Notes: *Macroprudential Loosening* and *CCyB Loosening* report the share of advanced economies and emerging markets that eased each policy during 2020q1-2020q2. *Average Loosening of CCyB* reports the average decrease of the CCyB in percentage points across all countries (including those that did not adjust the CCyB).

Source: All data based on scrapped data from the IMF's Policy Tracker, except the average loosening in the CCyB is based on BIS and ESRB data.

Figure 3

Pre-pandemic Macroprudential Stance and Stress during the Early Stages of COVID-19

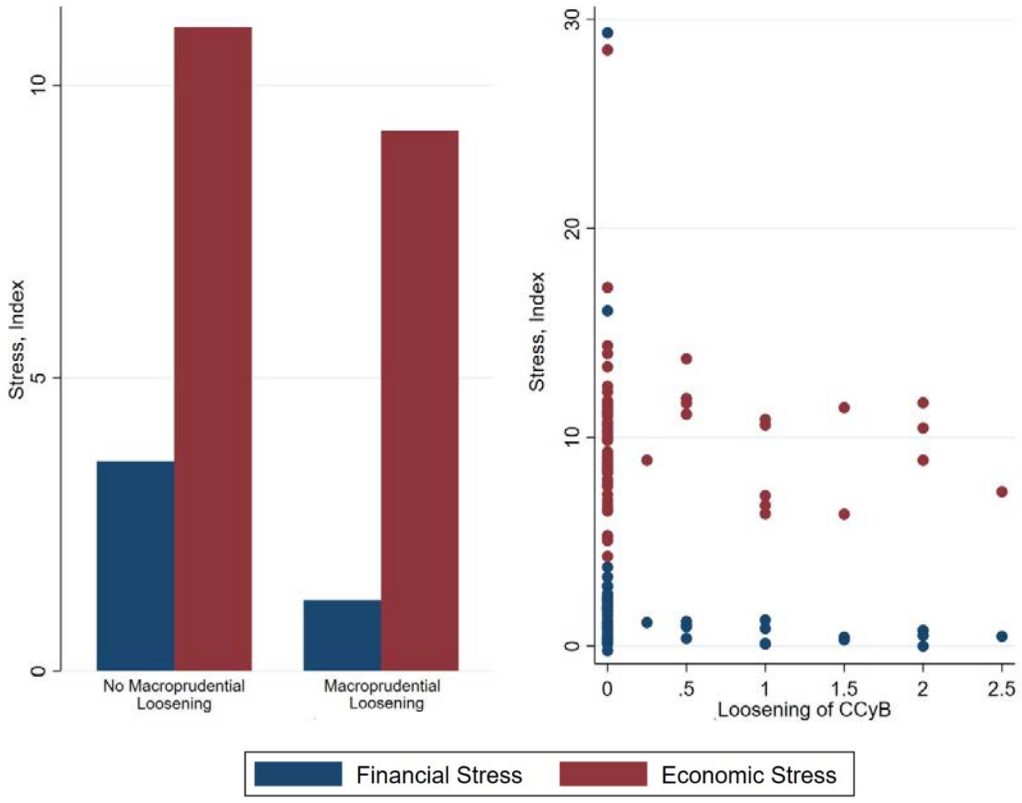


Notes: The *Financial Stress* index is an equally weighted combination of changes and percent changes from end-2019 to the "peak stress" in the first half of 2020 for sovereign CDS spreads (5-year, US$) from Bloomberg, and if this is not available, from the EMBI+ bond index. The *Economic Stress* index is the change in each country's forecast 2020 real GDP growth between January and June, according to the IMF's World Economic Outlook updates. *Macroprudential Tightness* is the value of the macroprudential index from end-2019 and described in Section II, with a higher value indicating a tighter macroprudential stance.

Source: *Financial Stress* measure based on data from Bloomberg and JPMorgan; *Economic Stress* measure based on data from the WEO database; *Macroprudential Tightness* is calculated using data from Alam et al. (2019), the BIS and ESRB.

Figure 4

Macroprudential Loosening and Stress during the Early Stages of COVID-19

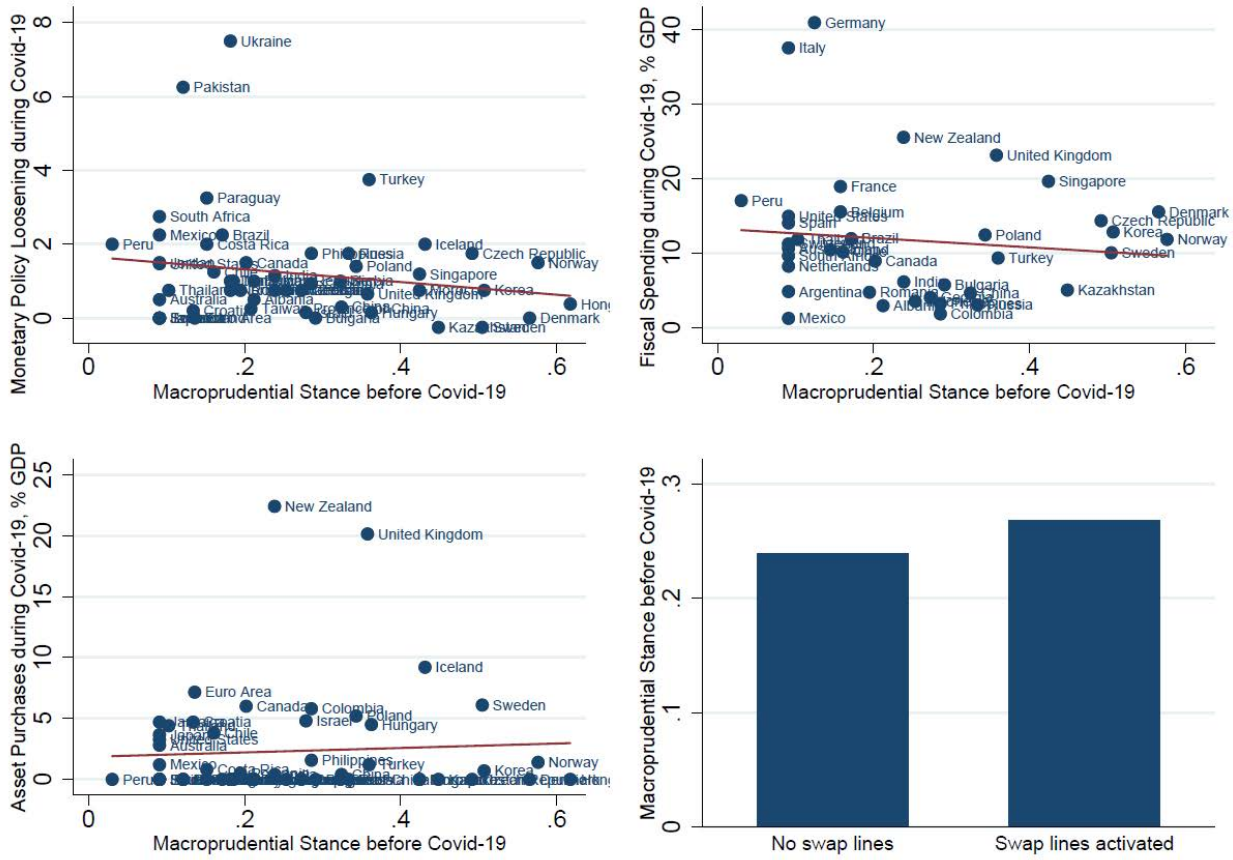


Notes: The *Financial Stress* index is an equally weighted combination of changes and percent changes from end-2019 to the "peak stress" in the first half of 2020 for sovereign CDS spreads (5-year, US$) from Bloomberg, and if this is not available, from the EMBI+ bond index. The *Economic Stress* index is the change in each country's forecast 2020 real GDP growth between January and June, according to the IMF's World Economic Outlook updates. *Macroprudential Loosening* is a dummy if a country reported a macroprudential loosening in the period 1/1/2020 – 6/31/2020 in the IMF Policy Tracker. *Loosening of CCyB* is the change in the CCyB in percentage points.

Source: *Financial Stress* measure based on data from Bloomberg and JPMorgan; *Economic Stress* measure based on data from the WEO database; *Macroprudential Loosening* based on data from the IMF Policy Tracker and *CCyB* data from the BIS and ESRB.

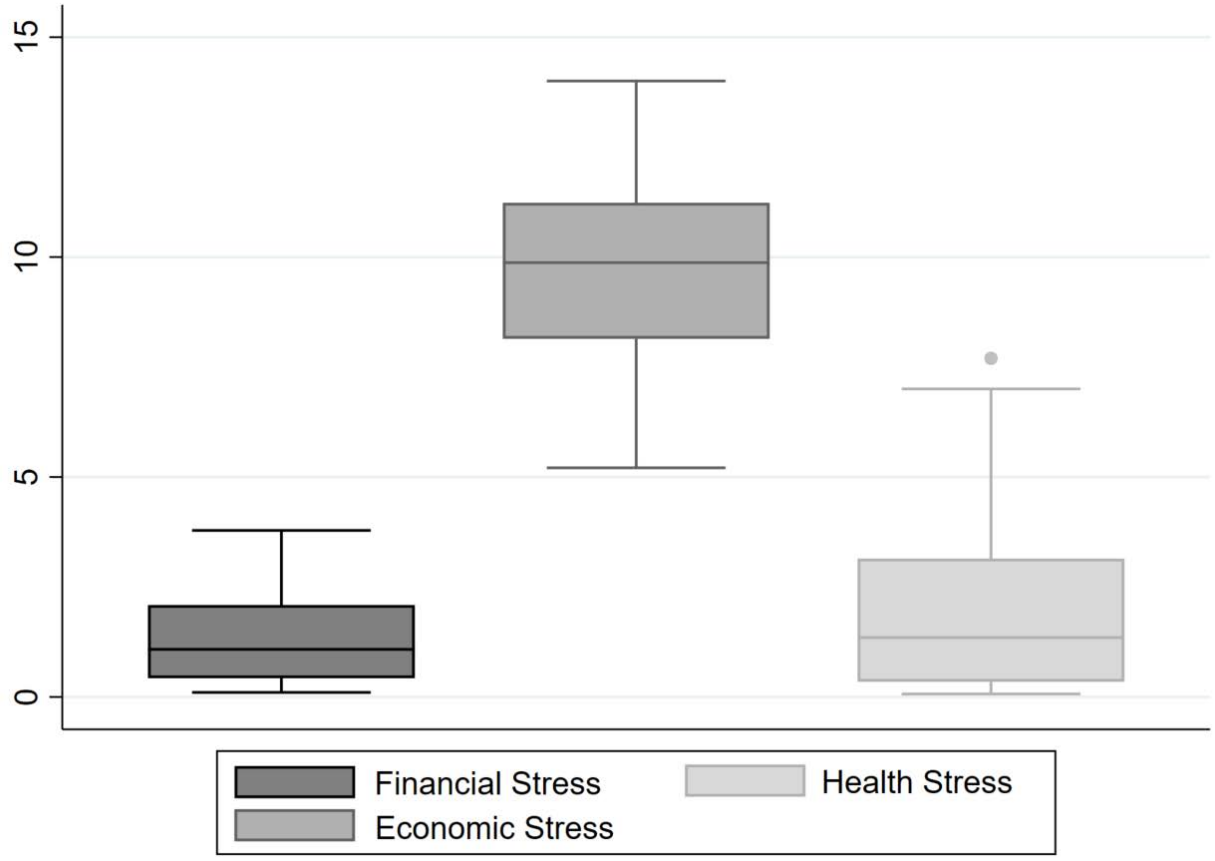
Figure 5

Macroprudential Stance and Other Policies



Source: *Monetary Policy Loosening* is changes in policy interest rates based on data from Haver. *Asset Purchases* are calculated as a percent of GDP based on purchase data from central banks' websites for AEs and Fratto et al. (2021) for EMs. *Fiscal Spending* is the change in the 2020 fiscal balance in response to COVID-19 (as a percent of GDP) from the IMF Policy Tracker. *Swap Lines* are a dummy variable if the country activated a swap line with another country from the IMF Policy Tracker. All policy responses are calculated over the first six months of 2020 unless noted otherwise. The macroprudential stance is the broad macroprudential index described in Section II using data from Alam et al. (2019), the BIS and ESRB, with a higher value indicating a tighter macroprudential stance.

Appendix Figure A.1
Country-Specific Stress Variables



Notes: Country-specific stress variables for the first half of 2020. *Financial Stress* is an equally-weighted combination of the (i) percentage change and (ii) absolute change of the CDS spread (or the EMBI spread if the CDS is not available) from end-2019 to the peak level in the first six months of 2020; *Economic Stress* is the change in the real GDP forecast for 2020 from January to June 2020; *Health Stress* is the number of confirmed COVID-19 cases per 1000 people. Data is winsorized at the 5% and 95% level.

Sources: CDS from Bloomberg; EMBI from JPMorgan; Real GDP forecasts from WEO database; Confirmed COVID-19 cases per 1000 people from Oxford's Coronavirus Government Response Tracker (OxCGRT).