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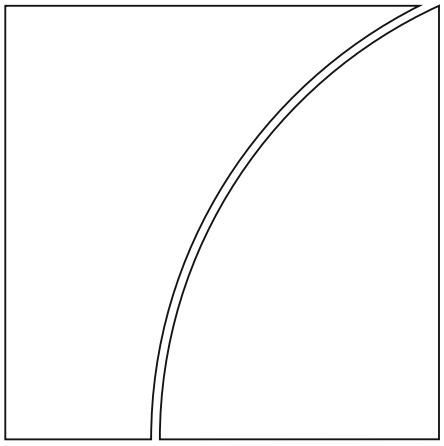

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Do macroprudential policies affect non-bank financial intermediation?

Stijn Claessens, Giulio Cornelli, Leonardo Gambacorta, Francesco Manaresi and Yasushi Shiina*

Abstract

We analyse how macroprudential policies (MaPs), largely applied to banks and to a lesser extent borrowers, affect non-bank financial intermediation (NBFI). Using data for 24 of the jurisdictions participating in the Financial Stability Board's monitoring exercise over the period 2002–17, we study the effects of MaP episodes on bank assets and on those NBFI activities that may involve bank-like financial stability risks (the narrow measure of NBFI). We find that a net tightening of domestic MaPs increases these NBFI activities and decreases bank assets, raising the NBFI share in total financial assets. By contrast, a net tightening of MaPs in foreign jurisdictions leads to a reduction of the NBFI share – the effect of a drop in NBFI activities and an increase in domestic banking assets. Tightening and easing MaPs have largely symmetric effects on NBFI. We find that the effect of MaPs (both domestic and foreign) is economically and statistically significant for all those NBFI economic functions that may pose risks to financial stability.

JEL classification: G10, G21, O16, O40.

Keywords: macroprudential policy, non-bank financial intermediation, shadow banking, international spillovers.

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1. Introduction

The Great Financial Crisis (GFC) of 2007–09 has highlighted the limits of traditional policies (notably microprudential and monetary policy) in addressing the potential negative effects of credit and asset price cycles on financial stability. As a response, central banks and regulators in emerging market economies (EMEs) and advanced economies (AEs) increasingly rely on long-advocated (eg Crockett (2000)) macroprudential policies (MaPs). MaPs that are addressed at banks include limits on credit growth, caps on loan-to-value and debt service-to-income ratios, and additional liquidity and capital requirements, such as minimum liquidity ratios or countercyclical capital buffers. In addition, MaPs such as loan-to-value limits have targeted risks related to borrowers.

These MaPs have limited the procyclicality of bank credit growth (Cerutti et al (2017a); for reviews of macroprudential policies, see Claessens (2015) and Galati and Moessner (2018)). Together with the various other reforms implemented since the GFC, including the Basel III framework and the closer supervisory oversight, MaPs have increased the resilience of banking systems around the world. However, two factors may limit their efficacy for overall financial stability.

First is the development of a large non-bank financial intermediation (NBFI) sector, also referred to as the shadow banking system. The NBFI sector represents a potential way through which financial intermediation could circumvent regulation in the core banking system, impairing the effectiveness of various policies, including MaPs, and potentially adding to overall financial stability risks. Indeed, research has found evidence that a tightening of MaPs may shift activities domestically towards the NBFI (Cizel et al (2019)).

Second is the presence of possible spillover effects across jurisdictions. Recent analyses have documented that MaPs can improve financial stability by reducing the impact of global factors (eg Takáts and Temesvary (2019), IMF (2020)). However, it has also been documented that cross-border lending allows financial markets to avoid MaPs and leads to spillover effects from MaPs (Avdjiev et al (2017), Cerutti and Zhou (2018)). This literature has by and large focused on the cross-country effect of MaPs on bank lending only, thus excluding effects on NBFI sector-related flows, and possibly underestimating total spillovers (Buch and Goldberg (2017)). However, this analysis is especially important given the growing role of non-bank financial intermediaries in cross-border capital flows in both AEs and EMEs (the so-called second phase of global liquidity; Shin (2014), Bruno and Shin (2015)).

This paper tries to fill this gap by studying how domestic MaPs affect the size of the NBFI assets both domestically and internationally. On the domestic side, we test if a tightening (easing) of MAPs is associated with an increase (decrease) of financial activities in NBFI. And, we test for cross-country spillovers by estimating whether the use of MaPs in foreign countries affects the size of the NBFI domestically.

We focus on data from a subset of jurisdictions participating in the annual monitoring exercise of the Financial Stability Board (FSB), for which a sufficient number of observations are available.[1] For these 24 jurisdictions, we observe yearly

[1] The jurisdictions are Argentina, Australia, Belgium, Canada, Chile, France, Germany, India, Indonesia, Ireland, Italy, Japan, Korea, Luxembourg, Mexico, the Netherlands, Russia,

data on NBFI over the period 2002–17. In particular, we focus on non-banks that perform economic functions that may give rise to bank-like financial stability risks (what has been called the "narrow measure" of NBFI, hereafter NBFI). The database also includes information on the size of financial sectors based primarily on balance sheet data. Finally, we use the full matrix of cross-country bank claims and liabilities sourced from the BIS international banking statistics. The data on MaPs are obtained from three different primary sources: Lim et al (2011, 2013), Kuttner and Shim (2016) and Cerutti et al (2017b). We classify MaPs under different categories over the period 2000–16 (which is convenient in our case, as we study the impact of lagged MaPs on the size of NBFI over 2002–17). In our baseline model, we estimate the effect of domestic and foreign MaPs (measured over a five-year rolling window) on the size of NBFI. Since foreign MaPs are likely to spill over across countries through financial linkages, we weight foreign countries' MaPs according to (beginning-of-period) claims and liabilities towards the country of study.

We find that a net tightening of domestic MaPs causes the share of domestic NBFI assets in total financial assets to increase, driven by both an increase in NBFI assets and a decrease in bank assets. A net tightening of MaPs by foreign countries leads to a reduction in the economy's share of NBFI in total financial assets. When we distinguish between tightening and easing of MaPs, we find that the effects are by and large symmetric. The effect of MaPs (both domestic and foreign) is economically and statistically significant for all components of NBFI assets (ie five economic functions as defined by the FSB: for details, see Section 2.1). The spillovers thus appear relevant for financial stability, in particular for collective investment vehicles, such as money market funds (MMFs) and fixed income funds, with features that make them susceptible to runs.

Our empirical results could be driven by spurious correlations between our dependent variables and domestic and foreign MaPs. To assure the robustness of our results, we implement a variety of tests. First, we perform a Philipps-Perron test to check the stationarity of the variables in our panel and provide evidence against serial correlation of the main variables over time. Second, we test whether omitted variables may be driving our results by implementing the Altonji et al (2005) selection test on "unobservables based on observables". Here we find that, if anything, omitted variables would bias our results towards zero, ie statistically insignificant results. As such, this test reinforces our results. Finally, we control for country-specific time-varying unobservables by introducing a country-specific time trend and by including time-varying country fixed effects. Our results are again robust to these permutations.

Our results complement and contribute to the existing literature and policy debates in several ways. First, our results confirm those of Cizel et al (2019) and Irani et al (2018), who show that MaPs cause substitution effects towards non-bank credit. We complement those by distinguishing within NBFI between the five economic functions as defined by the FSB. Second, we extend the evidence on the cross-country spillover effects of MaPs by estimating a direct effect on foreign economies' NBFI. In particular, we show that a domestic net tightening of MaPs may reduce NBFI (including those assets that are more exposed to runs) in foreign jurisdictions. This (positive) externality may imply that the domestically optimal MaP stance is laxer than what would be optimal from a global point of view. If externalities were internalised,

Singapore, South Africa, Spain, Switzerland, Turkey, the United Kingdom and the United States. We excluded some jurisdictions given the absence of information on the use of macroprudential measures or data gaps in the NBFI components.

there may be tighter regulation. More generally, the presence of cross-country spillovers affecting the NBFI sector calls for international coordination in the implementation of macroprudential policies. Third, and more broadly, we contribute to the growing literature that studies the evolution of global banking and its interaction with financial regulation (eg Buch and Goldberg (2017), Claessens and van Horen (2016), Takáts and Temesvary (2019)). Our paper also relates to the discussion on the use of MaPs to address financial stability concerns beyond the banking sector – ie in the NBFI sector as well as financial market infrastructures (ESRB (2016), Constâncio (2017)).

The remainder of the paper is structured as follows. Section 2 introduces the data used for the analysis and provides an initial descriptive analysis. Section 3 describes the empirical model and presents the estimation results. Section 4 concludes.

2. Data and stylised facts

The analysis in this paper is performed using two main databases. We match jurisdiction-level information on financial assets of the narrow measure of NBFI (hereafter, for simplicity, also referred to NBFI assets), collected in the FSB annual monitoring exercise, with data on MaPs enacted by central governments, central banks and supervisory agencies, collected by several researchers.

2.1 Non-bank financial activities

The FSB conducts an annual monitoring exercise to assess global trends and risks in the NBFI sector (the data collected was previously called the "annual monitoring exercise on the global shadow banking system").[2] It adopts a practical two-step approach. First, the monitoring exercise casts the net wide to capture developments in all non-bank financial institutions.[3] The exercise then focuses on a subset of NBFI entities that are involved in certain financial activities to create the "narrow measure of NBFI". This is meant to focus the data collection on those financial activities that may involve bank-like financial stability risks (ie maturity/liquidity transformation and/or leverage) and may warrant policy responses. This step is undertaken by classifying a subset of the NBFI entities into five economic functions (EFs).

Five economic functions involving non-bank credit intermediation that may pose risks to financial stability were identified in the FSB's high-level Policy Framework for Strengthening Oversight and Regulation of Shadow Banking Entities (hereafter the FSB Policy Framework) published in 2013.[4] These five EFs, listed also in Table 1, are:

i. Management of collective investment vehicles (CIVs) with features that make them susceptible to runs (EF1). Typical entity types that are classified include

[2] For the most recent results, see FSB (2020b).

[3] The monitoring universe of non-bank financial intermediation (MUNFI) or non-bank financial intermediation (NBFI) sector includes insurance corporations, pension funds, other financial intermediaries (OFIs) and financial auxiliaries.

[4] FSB (2013). See also FSB (2020a).

MMFs, fixed income funds, mixed funds, credit hedge funds and real estate funds.

ii. Loan provision that is dependent on short-term funding (EF2). Typical entity types that are classified include finance companies, leasing/factoring companies, and consumer credit companies

iii. Intermediation of market activities that depend on short-term funding or on secured funding of client assets (EF3). For example, broker-dealers and securities finance companies are classified into this EF.

iv. Facilitation of credit creation (EF4). For example, credit insurance companies, financial guarantors and monolines are classified into EF4.

v. Securitisation-based credit intermediation and funding of financial entities (EF5). Examples of entity types classified are securitisation vehicles, structured finance vehicles, and asset-backed securities.

In this paper, we use the total financial assets data for the so called "narrow measure of NBFI"[5] (EF1 to EF5) collected from 24 participating jurisdictions in the 2019 FSB monitoring exercise as an indicator for the NBFI size of the relevant jurisdiction.[6] The data are end-year outstanding amounts for the period 2002–17.[7]

The first row of Graph 1 shows the evolution of NBFI assets for two country groupings: advanced economies and emerging market economies. The black line indicates the median jurisdiction in the sample while the shaded area reports the interquartile range that excludes the first and the last quartile. This shows that NBFI activities have rapidly expanded, especially in the last part of the sample.

Similar considerations can be drawn looking at the second row of Graph 1 that reports the share of narrow NBFI measured over total financial system assets. Over our 16-year horizon of study, the median share has increased by 2 percentage points to 9% in AEs, and by 3 percentage points to 8% in EMEs.

The behaviour of a share is typical a stationary variable. We confirm that for the shares a Phillips-Perron test always rejects the null hypothesis of unit root against the alternative that the series is stationary. Similar results are obtained considering alternative measures for the variables we use (see next section for details). There are, however, differences in the evolution of NBFI assets across jurisdictions, in general and as a share of total financial assets. The second row of Graph 1, for example, shows

[5] The terms "narrow measure of NBFI" and "NBFI assets" are used interchangeably in this paper. This concept differs from the broader measure of total financial assets of the NBFI sector, previously referred as MUNFI. In 2017, the narrow measure of NBFI represented around 28% of the total financial assets of the NBFI sector for all 29 jurisdictions participating in the FSB monitoring exercise.

[6] A total of 29 jurisdictions participate in the FSB annual monitoring exercise. Data from 24 jurisdictions are used as sufficient number of observations are available. Thus, the description in this section may differ from the observations in FSB (2020a) using data from all 29 jurisdictions but they are broadly consistent.

[7] Converted into USD using a year-end exchange rates using a constant exchange rate (from end-2017). Some jurisdictions' narrow measures may be underestimated especially in early years due to gaps in available data. Data reported are based on a conservative assessment by authorities and may be further refined as more granular data become available.

that there were some signs of stagnation or very slow growth in the share of NBFI assets in total financial assets in AEs after the GFC, whereas in EMEs the share in general increased.[8]

The left hand panel of Graph 2 shows the evolution in dollar values of the different components of NBFI over time. Over the period 2002-2017, total NBFI activities had an average annual growth rate of 4.7%. CIVs with features that make them susceptible to runs (EF1) grew by 8.0%. These EF1 entities represent around two thirds of the total narrow measure of NBFI in 2017. CIVs in EF1 invest mostly in credit assets (eg for fixed income funds and MMFs, reflecting their business models) and are potentially involved in liquidity transformation.

Non-bank financial intermediaries engaging in loan provision dependent on short-term funding (EF2) grew at an average pace of 1.4% over the sample period to account for about 10% of the narrow measure in 2017. Finance companies, the entity type most commonly classified into EF2, may employ higher leverage and, in some jurisdictions, a high degree of maturity transformation.

The financial assets of market intermediaries that depend on short-term funding or secured funding of client assets (EF3) were stationary over the period and represented about 12% of the total narrow measure in 2017. Broker-dealers constitute the largest EF3 entity type. Reflecting their business models, broker-dealers in some jurisdictions tend to employ significant leverage, particularly when accounting for off-balance sheet exposures, although it seems considerably less than prior to the GFC.[9]

Entities involved in the facilitation of credit creation (EF4), such as financial guarantors and credit insurers, grew on average by 4%. Their share of NBFI remains very small (0.4% of the total in 2017), also due to the difficulty in capturing off-balance sheet exposures. Finally, securitisation-based credit intermediation (EF5) were stationary on average over the period, and accounted for 8% of the narrow measure in 2017.

2.2 Macroprudential policies

The data on MaPs are gathered from three different sources: Lim et al (2011, 2013), Kuttner and Shim (2016) and Cerutti et al (2017b).[10] These sources capture MaPs enacted by central Governments, supervisory authorities, and central banks. They classify MaPs under 10 categories: credit growth limits, liquidity requirements, maximum debt service-to-income ratio and other lending criteria, capital requirement/risk weights, provisioning requirement, limits on banks' exposure to the housing sector, reserve requirements, maximum loan-to-value ratio and loan prohibition, limits on net open position, and foreign currency lending limits.

[8] This observation is broadly consistent with the assessment using the most recent data for all participating jurisdictions in the monitoring exercise. See FSB (2020a), p 36.

[9] According to FSB (2018), net repo market funding of broker-dealers increased in 2017, after several years of reduced repo market funding.

[10] These data sets themselves draw on surveys of central banks and regulatory authorities, complemented with a variety of sources including official documents and reports, including financial stability reports and monetary policy bulletins.

Altogether, these different data sources allow us to build a database of MaPs covering the 24 jurisdictions analysed in this study over the period 1990-2016.

Graph 3 summarises these data and highlights the different degree of activism between AEs and EMEs (left- and right-hand panels, respectively), as well as before and after the GFC (red and blue bars, respectively). Macroprudential activism is clearly greater among EMEs across the whole sample than among AEs, but has increased over time across both groups.[11] Graph 3, furthermore, provides clear evidence of a sizeable heterogeneity across countries, and also within each group, that does not appear to be simply explained by size, openness, regional or other factors, a point to which we will return at the end of this paper.

For each category, the MaP policy index can take on three discrete values: –1 for loosening actions, 1 for tightening actions and 0 for no change. We use these policy actions to construct the aggregated macroprudential index used in the analysis. A shortcoming of this approach is that we treat all MaP actions in the same way and symmetrically. However, we relax this assumption in the following section to consider easing and tightening episodes separately and individual categories of MaPs.

We can use the information on the number of interventions aimed at easing/tightening to compute a country's MaP stance. The distribution of the net cumulative index for MaPs is reported in Graph 4. The macroprudential stance for AEs was generally loosening prior to the GFC and tightening after 2011. In EMEs, the MaP stance was neutral until 2001, and subsequently tightened, especially after the GFC.

MaPs can be divided into different categories. Some instruments are intended to increase directly the financial sector's resilience, while others focus on dampening the overall financial cycle. We classify the former as: (a) bank capital based measures (capital requirement/risk weights and provisioning requirements) and (b) liquidity requirements. Conversely, instruments that aim to smooth the credit cycle include (c) asset-side instruments (credit growth limits, maximum debt service-to-income ratios, limits on bank exposures to the housing sector such as maximum loan-to-value ratios); (d) changes in reserve requirements; and (e) currency mismatches instruments (limits on foreign currency exchange exposures and net open positions).[12]

Graph 5 shows that around one quarter of MaPs used in the 24 jurisdictions included in our analysis were aimed at directly increasing the financial sector's resilience (Graph 5, left-hand panel). The vast majority of measures were intended to smooth the cycle – ie they were used in a countercyclical manner to dampen credit booms or mitigate expected or realised credit crunches. In 43% of the case MaPs

[11] Activism across EMEs displays a marked upward trend, which might have reached its peak around the time of the GFC. See Altunbas et al (2018) for a more detailed description.

[12] An alternative classification for MaPs is possible. Specifically, policies that impact on lenders (ie loan supply) vs those policies that impact mostly borrowers (ie loan demand). MaPs for lenders include: credit growth limits, capital-based instruments (countercyclical capital requirements, leverage restrictions, general or dynamic provisioning); liquidity requirements, changes in reserve requirements, variations in limits on foreign currency exchange mismatches and net open positions and changes in risk weights. MaPs that impact borrowers include maximum debt service-to-income ratio and limits to banks' exposures to the housing sector as a maximum loan-to-value ratio. Those affecting banks' ability have some overlap with the ones aimed at increasing resilience and those affecting households' and firms' ability to borrow have some overlap with those aimed to mitigate the financial cycle, but the overlap is surely not perfect.

involved changes in reserve requirements for banks. Moreover, 80% of the measures were targeted towards lenders (Graph 5, centre panel). Overall, 62% of the interventions were intended to tighten financial conditions (right-hand panel). Of all the MaPs adopted, 67% were by EMEs (right-hand panel).

We match jurisdiction-level information on NBFI assets with data on MaPs. The final sample is composed of 260 annual observations from 24 jurisdictions. Table 2 shows the descriptive statistics of the variables used for the regression analyses. Table 3 reports non-stationarity tests for the financial asset variables used in the regressions. In particular, we report results of a Phillips-Perron unit root test. All tests show that variables are stationary, both using a model with one lag and a model with two lags.

2.3 Identifying domestic and external macroprudential interventions

For each jurisdiction, in each year, we count the number of easing MaPs (MaP_{it}^{E}) and the number of tightening MaPs (MaP_{it}^{T}). Following Boar et al (2017), we take a sum of interventions over a five-year moving window, so that:

$$MaP_{it}^{X} = \sum_{\tau=1}^{5} \widehat{MaP}_{it-\tau}^{X} \text{ for } X \in \{E, T\}.$$

This index identifies domestic MaPs.

We measure the effect in jurisdiction i of MaPs adopted in another jurisdiction j in year t, MaP_{jt}^{E} and MaP_{jt}^{T}, by weighting them by the share of financial claims j has towards i relative to total financial claims to i (w_{ij}) at the beginning of the period.

The share of financial claim measures the linkage between jurisdiction i and jurisdiction j and underlines the intensity of potential spillover effects. If the two countries have no financial linkages ($w_{ij} = 0$), we can assume that changes in MaPs in one country have no effect on the other. By contrast, if all financial claims to jurisdiction i are with respect to jurisdiction j only, we expect all the external effects of changes in MaPs on the size of NBFI in jurisdiction i to arrive through jurisdiction j ($w_{ij} = 1$).

Formally,

$$MaP\ OTHER_{it}^{E} = \sum_{j} w_{ij}\, MaP_{jt}^{E} \text{ and } MaP\ OTHER_{it}^{T} = \sum_{j} w_{ij}\, MaP_{jt}^{T}$$

where $w_{ij} = \sum_{T} \frac{Claims_{ijt}}{Claims_{it}} / T$ is the share of financial claims of j towards i, averaged over time.

We also test the robustness of the results to other measures of inter-country linkages. In particular, we present results obtained using total financial liabilities and the overall intensity of cross-country linkages (claims plus liabilities).[13]

[13] We also used other weights such as exports, imports or the trade balance (exports minus imports). We also measured the weights using a five-year rolling window, rather than fixing them overtime. Results are robust to these alternative weighting methods.

2.4 Some graphical evidence

To explore the effects of MaPs on NBFI, we first provide a simple graphical analysis. To do this in a simple way, we compute the net tightening in domestic MaPs:

$$MaP_{it} = MaP_{it}^{T} - MaP_{it}^{E}$$

and the net tightening in foreign MaPs:

$$MaP\ OTHER_{it} = MaP\ OTHER_{it}^{T} - MaP\ OTHER_{it}^{E}.$$

Graph 6 shows the correlation between MaPs and the development of the NBFI (as measured by the share of NBFI assets in total financial assets). In particular, the upper panel shows the correlation between NBFI and domestic MaPs (MaP_{it}), while the lower panel studies the correlation between the NBFI and MaPs implemented in other countries (weighted by net claims; $MaP\ OTHER_{it}$).

In the left-hand panels, we first average the share of NBFI assets in total financial assets and the MaP variables at the country level. We then calculate a simple correlation. We therefore have 24 observations, one for each jurisdiction. The first regression shows that, across countries, the correlation between the relative size of the NBFI and the average measure of domestic MaPs is not statistically significant. By contrast, the correlation with respect to external MaPs is statistically significant at the 5% level.

The right-hand panels of the graph report the correlation between the variables after filtering out unobserved heterogeneity by jurisdiction and year. In other words, each dot is the residual of one ordinary least squares (OLS) regression where each variable is regressed against jurisdiction and year fixed effects. In this case, the correlation of NBFI assets with respect to domestic MaPs turns out to be statistically positive, while the correlation with foreign MaPs is clearly negative and significant at the 5% level.

The graphical analyses do not control for additional covariates at the jurisdiction level, which may be an important source of omitted variable bias. For example, the development of the NBFI can be associated with stronger economic growth, which in turn may induce authorities to implement MaPs (Boar et al (2017)). This could bias the correlation between MaPs and NBFI. Moreover, the effectiveness of MaPs is reduced in more open economies when firms and households could obtain funds from other financial sources abroad (Cerutti et al (2017b), Cerutti and Zhou (2018)). To control for this and other sources of bias, we rely on a panel regression analysis.

3. Empirical analysis

Panel regression analysis can help us derive more precise conclusions about the link between MaPs and the development of the financial sector, macroeconomic volatility and MaPs. We need to be careful in controlling for unobserved factors, whether across jurisdictions or time-varying, that might have an influence on the development of the NBFI not captured by our set of observable variables. And we need to control

for possible reverse causality, ie that a jurisdiction might choose to implement certain MaPs simply in response to the general development of the financial system.

3.1 The model

Our baseline model regresses the share of NBFI assets over total financial assets ($\frac{NBFI}{TFA}_{it}$), measured in year t for country i, on the MaPs adopted by the domestic jurisdiction and by other jurisdictions over the previous five years. In our baseline model, MaPs are proxied by the net tightening of MaPs. We enrich the model with several covariates, to control for alternative explanations of the relationship of interest. First, a larger financial sector is positively correlated with the development of NBFI, and it may induce policy makers to use MaPs: for this reason, we control for the share of total financial assets to GDP. Second, independence of supervisory authorities is a key condition for MaPs to be promptly and effectively adopted and modified, not being constrained by political considerations, and an independent supervisory authority may be better able to monitor the banking system, thus inducing a stronger development of the NBFI: we therefore include an index of supervisory authority independence (Barth et al (2004)). Additional controls include log GDP per capita, lagged real GDP growth and inflation. Finally, to account for unobserved factors we use country and time fixed effects.

In particular, we estimate (1):

$$\frac{NBFI}{TFA}_{it} = a_i + b_t + \beta\, MaP_{it} + \gamma\, MaP\ OTHER_{it} + \delta_1 \frac{TFA}{GDP} + \delta_2 SUPERVISION + controls + \varepsilon_{it}$$

We normalize both the dependent and the MaP variables to ease the interpretation of the coefficients, their comparability and evaluation of economic significance across variables. Therefore, the coefficients refer to how many standard deviation a dependent variable will change per standard deviation increase in the predictor variable.

Then, we disentangle the effects of a tightening in MaPs from those of an easing to control for asymmetric effects, if any. The model to be estimated is then (2):

$$\frac{NBFI}{TFA}_{it} = a_i + b_t + \beta_1\, MaP^E_{it} + \beta_2\, MaP^T_{it} + \gamma_1\, MaP\ OTHER^E_{it} + +\gamma_2\, MaP\ OTHER^T_{it} + \delta_1 \frac{TFA}{GDP} + \delta_2 SUPERVISION + controls + \varepsilon_{it}$$

3.2 Baseline results

Results using OLS are reported in Table 4, with different options to weigh MaPs in foreign countries. Here we focus on our preferred specification (column I), which

closely follows equation (1), ie weighing foreign MaPs by financial claims from domestic institutions.[14]

Consistent with the graphical evidence, we find that tightening of domestic MaPs is associated with an increase in the share of NBFI assets in total financial assets. This result is consistent with Irani et al (2018), who investigate the connection between capital regulation and non-banks in the US syndicated loan markets. In particular, they find that banks reduce retention (share of syndicated loan) and non-banks fill the void when capital regulation increases. This effect is stronger for banks with: (i) lower level of capitalisation; and (ii) large Basel III shortfalls. Substitution effects towards non-bank credit are also detected in Cizel et al (2019), especially in advanced economies. Cizel and co-authors find that quantity restrictions are particularly effective in constraining bank credit, but also cause the strongest substitution effects by non-banks.

Based on the results reported in Table 4, a one standard deviation increase in net MaPs tightening is associated with an increase in the share of NBFI assets in total financial assets of around 7% of its standard deviation. Results are quite stable using different weighting schemes.

We can read the above results in an alternative way. As the standard deviation of domestic MaPs is 2.51 and that of NBFI to total financial assets (TFA) is 6.23 percentage points, a net tightening of 1 over the five preceding years leads to an increase of the share of NBFI in TFA of around 0.2 percentage points (0.07 * 6.23 / 2.51 = 0.17).

Net tightening of MaPs in other countries has an opposite effect: a one standard deviation tightening induces a decrease in the share of NBFI assets of 12–18% of its standard deviation, depending on the weighting scheme.[15] In this case, as the standard deviation of foreign MaPs weighted by our three different measures is between 1.48 and 1.67 and that of NBFI/TFA is 6.23 percentage points, a net tightening of 1 over the five years leads to a decrease in NBFI/TFA of 0.5–0.8 percentage points.

We assess the robustness of these results in two ways.

First, we test for the possible presence of serial correlation in the residuals. Because serial correlation in linear panel-data models biases the standard errors and causes the results to be less efficient, we test for the presence of serial correlation in the idiosyncratic error term in a panel-data model. In particular, we used the fixed-effects one-way models derived by Wooldridge (2002) that can be applied under general conditions and have good size and power properties in reasonably sized samples (Drukker (2003)). All tests excluded the presence of serial correlation.

[14] All tables report robust standard errors. The results are very similar using different cluster procedures (see Appendix).

[15] To account for possible reverse causality problem, we also used the dynamic generalised method of moments (GMM) panel methodology (see eg Arellano and Bond (1991) and Blundell and Bond (1998)). The inclusion of the lagged dependent variable and the use of instruments do not qualitatively change the results. The results, not reported for the sake of brevity, indicate that both the sign and size of the coefficients of interest are confirmed, while statistical significance declines due to the reduction of the sample size (a number of observations are used as lagged instruments in the estimation procedure).

Second, we test for the possible existence of biases in the relationship between MaPs and NBFI assets. While the set of potential covariates and fixed effects that we include is able to explain a large share of the variability in NBFI assets (as is apparent from the adjusted R^2 being generally above 90% in Table 4), it may be still possible that time-varying unobservables may be biasing the relationship between MaPs (domestic and foreign) and NBFI assets. To test for this possibility, we rely on the methodology developed by Altonji et al (2005) and extended by Oster (2019). The basic idea is to use the relationship between MaPs and their observable covariates to study the relationship between MaPs and unobservables. Omitted variable bias would then be proportional to the change in MaPs coefficients when we move from a restricted model (where we exclude covariates) to an unrestricted one. In order for this change to be informative, coefficient movements need to be scaled by the observed increase in R^2. Table 5 presents the coefficients of domestic and foreign MaPs and the R^2 obtained by estimating model (1) in a restricted version (ie omitting all time-varying country-level controls) and in an unrestricted one, corresponding to specification (i) of Table 4. Results show that unrestricting the model increase the (absolute) size of the coefficients, while R^2 increases by around 2%. This signals that, if anything, omitted variables are biasing our coefficient towards zero and that the estimated effects are likely conservative. This results in a negative degree of proportionality between observable and unobservable bias (last column of Table 5).

3.3 Tightening vs easing of macroprudential policies

Table 6 shows the estimates of model (2) that distinguish between the impact of tightening vs easing of MaPs. The three columns report the results for the three different ways to weigh MaPs in foreign countries. All columns show that domestic MaPs have remarkably symmetric effects: coefficients for easing and tightening domestic MaPs are quite similar, both in magnitude and statistical significance. Conversely, the effects of macroprudential interventions in foreign countries on NBFI have the expected sign (negative on tightening and positive on easing) but while the effect of tightening is not significant, that for easing is significant. However, a formal test indicates that the effects of a tightening in foreign MaPs and that of an easing in foreign Maps are statistically similar for all three weighting schemes.

3.4 Impact on the level of NBFI assets and banking assets

In the analysis conducted so far, we have used as a dependent variable the share of NBFI assets in total financial assets. This share may be affected if MaPs impact either the numerator, or the denominator, or both. To identify which of these effects are driving our results, we estimate again equation (1) using the log of NBFI assets and the log of banking assets as dependent variables.[16]

Table 7 shows that in case of a net tightening in domestic MaPs the log of NBFI assets increases significantly. At the same time, as the rationale of the policy would suggest, assets held by banks headquartered in the home jurisdiction decline. So in the case of a domestic MaP, it is both the numerator and denominator that moves, and in opposite direction.

[16] We excluded from the analysis assets of the central bank and public financial institutions.

We can also quantify the effects. As the standard deviation of domestic MaPs is 2.51 and that of the log of NBFI assets is 2.29, a net tightening of 1 over the five years lead to a rise in NBFI assets by 5% (0.06*2.29/2.51=0.05). By contrast, as the standard deviation of the log of banking financial assets is 1.91 percentage points, a net tightening of 1 over the five years lead to a decrease in banking assets by 2% (–0.024*1.91/2.51=0.02).

In case of a net tightening of MaPs in foreign countries, while NBFI assets domestically decline, we observe an increase in banks' activity. This is in line with our result of a reduction in the share of NBFI assets in total financial assets.

The effects are estimated with less precision with respect to a domestic net tightening. A net tightening of foreign MaPs of 1 over the five years leads to a decrease in NBFI assets of 6–11% and a correspondent increase in banking financial assets of 3–9%, depending of the measure used to weight the effects of foreign MaPs.[17]

The fact that banks' activity in the domestic jurisdiction increases because of a net tightening abroad is particularly interesting. This result could reflect a shift in the domestic economy of some foreign banking activity that is affected by the MaPs (Nocciola and Żochowski, 2019). Indeed, Avdjiev et al (2017) find that a tightening of local currency reserve requirements in the jurisdiction in which a bank is headquartered leads to greater international bank lending to other jurisdictions. Similarly, a tightening of loan-to-value limits in the home jurisdiction of banks is associated with higher lending to foreign borrowers, especially in the case of better capitalised and more liquid banks. Aiyar et al (2014) analyse the experience for the United Kingdom and find that capital requirements can be circumvented by foreign bank branches that are not affected by regulation, or by the domestic NBFI. The recent multi-study initiative of the International Banking Research Network (Buch and Goldberg (2017)) confirms this finding and shows that the effects of prudential instruments sometimes spill across borders through bank lending. And it also shows that such effects have not been large on average. Interestingly, international spillovers vary across prudential instruments and across banks. Bank-specific factors such as balance sheet conditions and business models drive the amplitude and direction of spillovers to lending growth rates, a result highlighted also in Reinhardt and Sowerbutts (2015).

3.5 Disentangling the effects among different components of non-bank financial assets

In this section, we evaluate the effects of MaPs on the different components of NBFI (Table 1). The first component includes management of collective investment vehicles (CIVs) with features that make them susceptible to runs. As seen in section 2, this

[17] Interestingly, Fong et al (2021) find that the cross-border linkages between shadow banking systems depend on the level of global liquidity. The linkages are tenuous across borders during tranquil periods, but increase significantly in times of tightening global liquidity. The authors find that these spillover effects can be explained by a small number of economy-specific factors, including capital stringency in the banking sector.

component – labelled as EF1 – has constantly gained relevance during the sample period and represents 65% of total NBFI assets at the end 2017.[18]

Table 8 shows that in case of a net tightening in domestic MaPs the log of EF1 assets increases significantly. The effects are also sizeable. As the standard deviation of domestic MaPs is 2.51 and that of the log of EF1 financial assets is 2.27 percentage points, a net tightening of 1 over the five years determines an increase of the assets under management of CIVs by 8% (0.09*2.27/2.51=0.08). For example, in the case of a net tightening in bank capital requirements it becomes more attractive for firms to issue bonds and for CIVs to purchase these. In case of a net tightening of MaPs in foreign countries, EF1 assets (domestically) decline by 5–12%, depending of the different measure used to weight the effects of foreign MaPs.

The second component includes assets of non-bank financial entities engaging in loan provision that is dependent on short-term funding (EF2). These are the assets of finance companies, leasing/factoring companies and consumer credit companies that are in direct competition with banks. Table 9 shows that in case of a net tightening in domestic MaPs EF2 assets increase by around 18% (0.15*2.89/2.51=0.18). A tightening in bank conditions favour leasing/factoring and other non-bank intermediaries to take over from bank lending. In case of a net tightening of MaPs in foreign countries, EF2 assets (domestically) decline by 48–78%, depending of the different measure used to weight the effects of foreign MaPs.

The third component comprises assets of market intermediaries that depend on short-term funding or secured funding of client assets (EF3). This aggregate includes mainly the assets of broker-dealers and securities finance companies. Even in this case the effects of changes in MaPs are economically relevant. Table 10 indicates that in case of a net tightening in domestic MaPs EF3 assets increase by around 23% (0.17*3.33/2.51=0.23). In case of a net tightening of MaPs in foreign countries, EF3 assets (domestically) decline by 50–62%, depending of the measure used to weight the effects of foreign MaPs.

Given the volatility and relatively scarce weight of the EF4 component (assets of financial guarantors and credit insurers), it was not possible to perform a proper analysis. Regression results were quite unstable, because of the limited number of observations per year and their more volatile behaviour. Instead, we chose to pool together the EF4 and 5 categories. The latter refers to securitisation-based credit intermediation and includes assets of securitisation vehicles, structured finance vehicles and asset-backed securities. We will label this joint component EF4–5.

Table 11 shows that in case of a net tightening in domestic MaPs the log of EF4–5 assets increases significantly. As the standard deviation of domestic MaPs is 2.51 and that of the log of EF4–5 financial assets is 3.45 percentage points, a net tightening of 1 over the five years determine an increase of securitised assets by 15% (0.11*3.45/2.51=0.15). In case of a net tightening of MaPs in foreign countries, EF4–5 assets (domestically) decline by 56–75%, depending of the measure used to weight the effects of foreign MaPs.

[18] For an evaluation of flow vs valuation effects in MMFs, equity funds and fixed income funds, see Box 1.1 in FSB (2020b).

4. Conclusions

The development of a relatively large non-bank financial sector is a key feature of the last two decades in both AEs and EMEs. This paper provides evidence that one determinant of this growth is the implementation of MaPs in the banking sector, using data from the FSB monitoring exercise over the period 2002–17 and information on MaPs collected by several researchers. Our results suggest that financial intermediaries in the NBFI sector react to regulations aimed at banks. We also show that this is not limited to domestic markets: financial intermediaries in a jurisdiction react to foreign jurisdictions' policy choices.

In particular, we find that a net tightening of domestic MaPs typically leads to an increase of around 0.2 percentage points in the share of domestic NBFI assets in total financial assets. This is driven by both an increase in NBFI assets and a reduction in bank assets. At the same time, tightening MaPs in foreign jurisdictions reduce the share of NBFI assets in total domestic financial assets. All components of NBFI assets react to domestic and foreign changes in the MaP stance.

This evidence shows that financial regulations spill over to other sectors that were not targeted, both within and across borders. The presence of externalities may imply that the domestically optimal MaP stance could be laxer or tighter than what would be optimal from a cross-country point of view. This calls for international coordination in the development and enactment of MaPs in order to better internalise such externalities.

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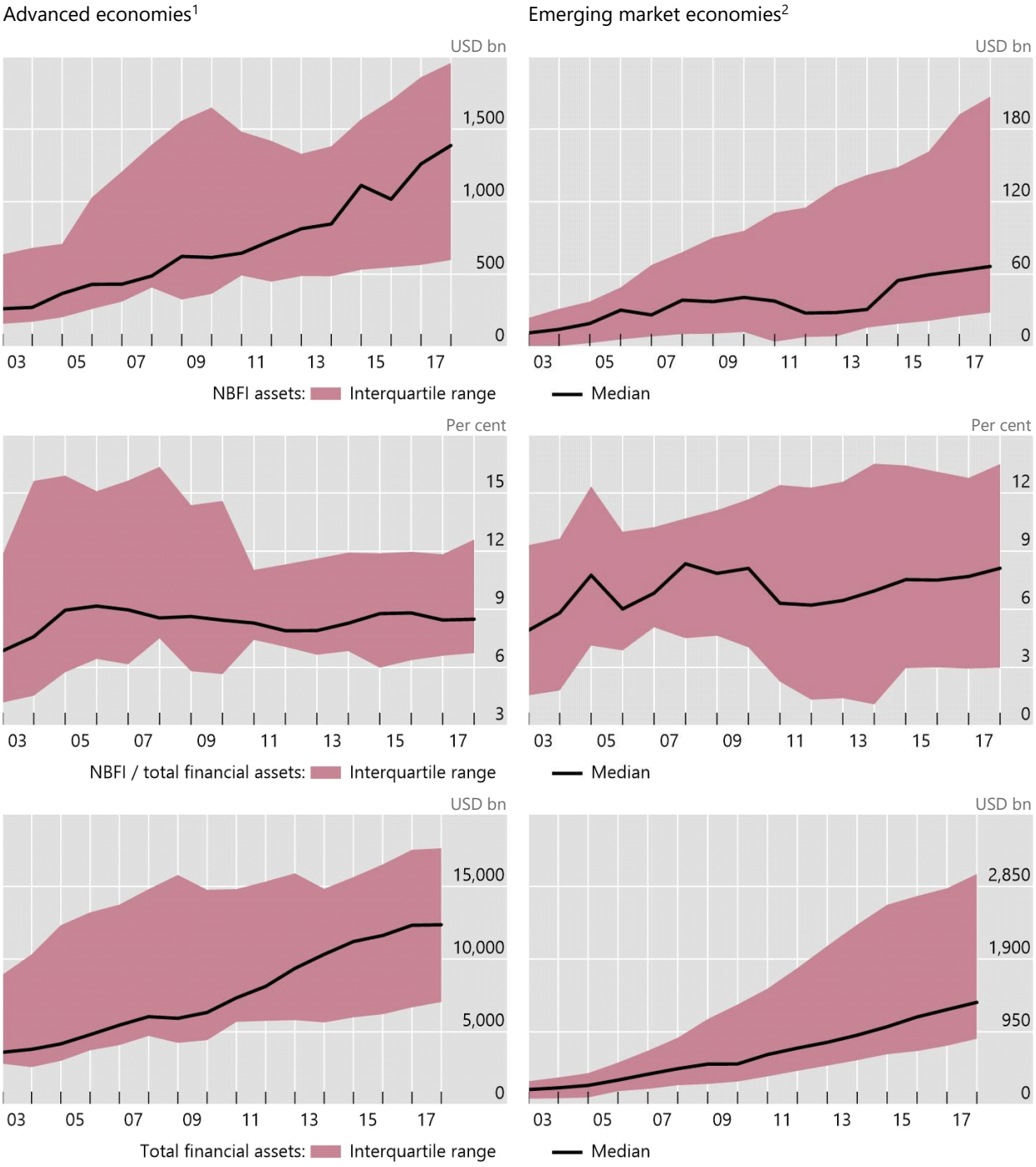
Evolution of non-bank financial intermediation and total financial activities

Graph 1

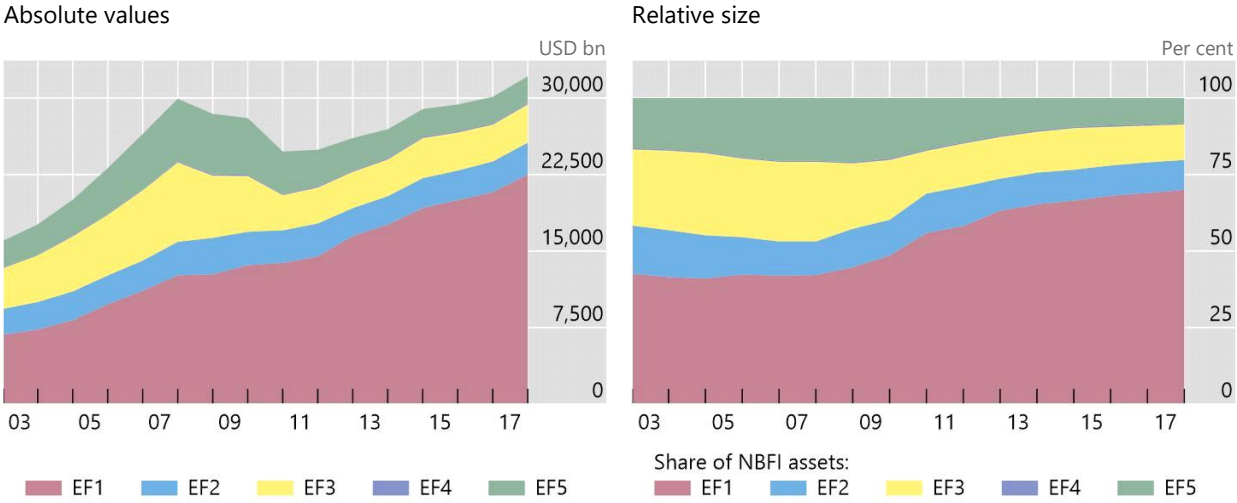


[1] AU, BE, CA, CH, DE, ES, FR, GB, IE, IT, JP, LU, NL and US. [2] AR, CL, ID, IN, KR, MX, RU, SG, TR and ZA.

Sources: FSB; authors' calculations.

Evolution and composition of the narrow measure of non-bank financial intermediation

Graph 2

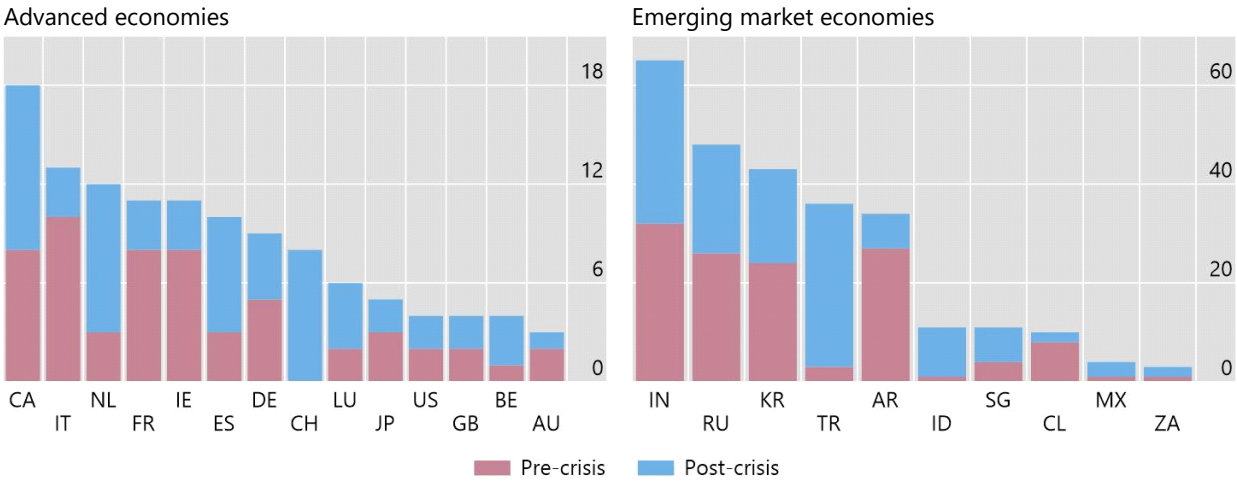


Sources: FSB; authors' calculations.

Policy activism varies between countries[1]

Number of policy actions

Graph 3



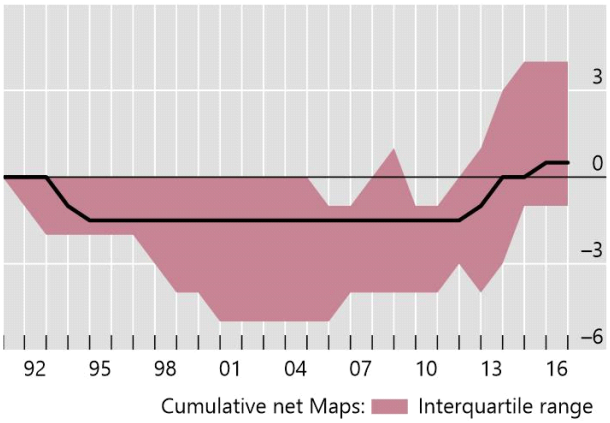
[1] The sample covers macroprudential policy actions adopted in 24 countries (14 AEs and 10 EMEs). The database is constructed using information in Lim et al (2011, 2013), Kuttner and Shim (2016) and Cerutti et al (2017b). Data for the pre-crisis period cover the 1990–2007 period, while the post-crisis period refers to 2008–16.

Sources: IMF; BIS; authors' calculations.

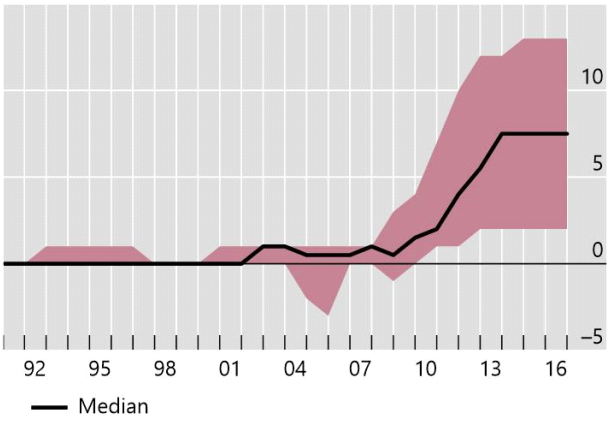
Net cumulative MaPs; 1990-2016

Graph 4

Advanced economies[1]



Emerging market economies[2]



Cumulative net MaPs: Interquartile range Median

[1] AU, BE, CA, CH, DE, ES, FR, GB, IE, IT, JP, LU, NL and US. [2] AR, CL, ID, IN, KR, MX, RU, SG, TR and ZA.

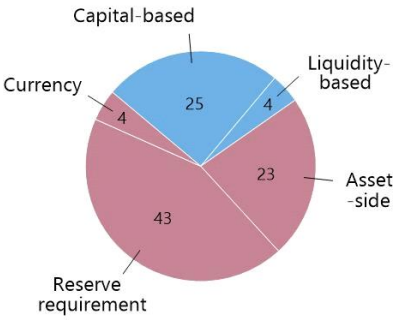
Source: Authors' calculations.

Use of macroprudential instruments[1]

In per cent

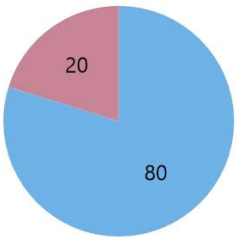
Graph 5

Type of instrument



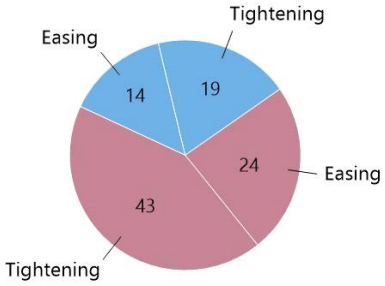
Resilience
Cyclical

Type of instrument



Lender
Borrower

Advanced vs emerging market



Advanced economies
Emerging market economies

[1] The sample covers the period 1990–2016. Macroprudential tools for resilience include (a) capital-based instruments (countercyclical capital requirements, leverage restrictions, general or dynamic provisioning) and (b) liquidity requirements. Cyclical macroprudential tools include (c) asset-side instruments (credit growth limits, maximum debt service-to-income ratio, limits to banks' exposures to the housing sector as a maximum loan-to-value ratio); (d) changes in reserve requirements; and (e) currency instruments (variations in limits on foreign currency exchange mismatches and net open positions).

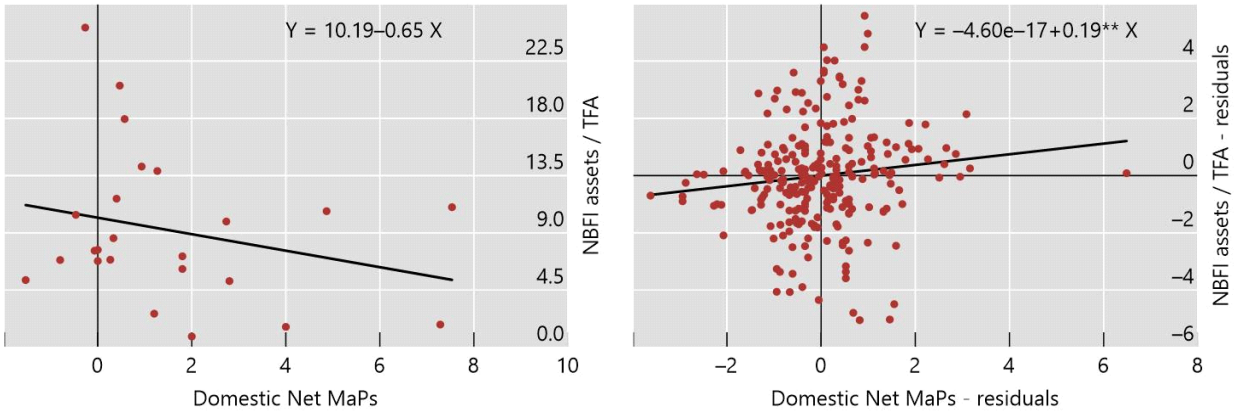
Macroprudential tools for lenders include: credit growth limits, capital-based instruments (countercyclical capital requirements, leverage restrictions, general or dynamic provisioning); liquidity requirements, changes in reserve requirements, variations in limits on foreign currency exchange mismatches and net open positions and changes in risk weights. Borrower macroprudential tools include maximum debt service-to-income ratio, limits to banks' exposures to the housing sector as a maximum loan-to-value ratio.

Source: Authors' calculations.

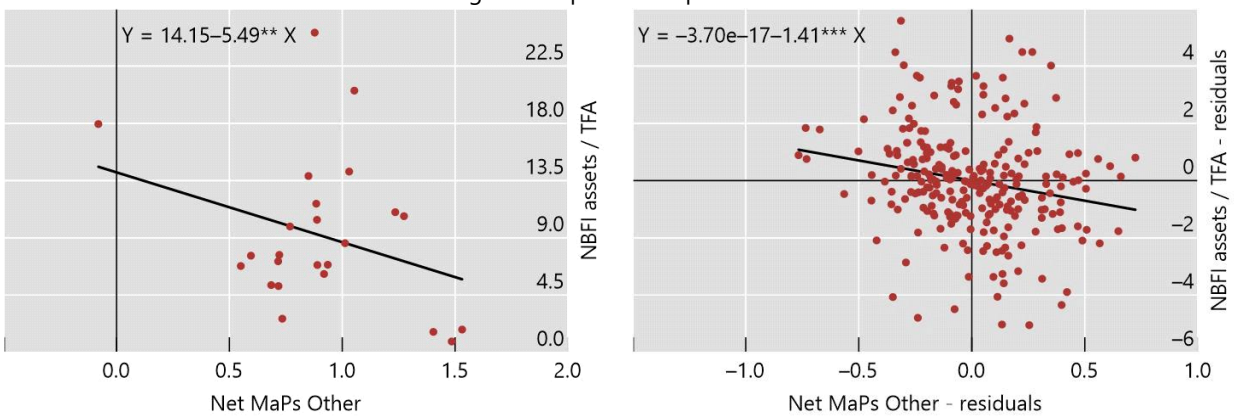
Conditional correlations[1]

Graph 6

Non-bank financial intermediation and domestic macroprudential policies



Non-bank financial intermediation and foreign Macroprudential policies



[1] Conditional correlations between macroprudential policies (in own country and in other countries) and share of NBFI assets in total financial assets.

Source: Authors' calculations.

Classification of non-bank financial intermediation by economic functions (EFs) Table 1

Economic function	Definition	Typical entity types
EF1	Management of collective investment vehicles with features that make them susceptible to runs	MMFs, fixed income funds, mixed funds, credit hedge funds, real estate funds
EF2	Loan provision that is dependent on short-term funding	Finance companies, leasing/factoring companies, consumer credit companies
EF3	Intermediation of market activities that is dependent on short-term funding or on secured funding of client assets	Broker-dealers, securities finance companies
EF4	Facilitation of credit creation	Credit insurance companies, financial guarantors, monolines
EF5	Securitisation-based credit intermediation and funding of financial entities	Securitisation vehicles, structured finance vehicles, asset-backed securities

The FSB Policy Framework acknowledges that shadow banking may take different forms across jurisdictions due to different legal and regulatory settings as well as the constant innovation and dynamic nature of the non-bank financial sector. It also enables authorities to capture new structures or innovations that may create financial stability risks from NBFI, by looking through to the underlying economic function and risks of these new innovative structures. Thus, the entity types listed should be taken as typical examples. For details, see FSB (2018, 2020).

Source: FSB.

Descriptive statistics[1]

Table 2

Variable	Mean	St dev	Min	Max
NBFI/Total Financial Assets	9.77	6.23	0.30	29.54
Log-NBFI assets	12.30	2.29	5.92	16.50
Log-banking assets	14.00	1.91	8.19	16.79
Log-economic function EF1	11.78	2.27	5.54	15.77
Log-economic function EF2	8.99	2.89	4.26	14.38
Log-economic function EF3	8.06	3.33	0.61	15.38
Log-economic function EF4–5	9.11	3.45	1.07	15.15
Total Financial Assets/GDP	174.01	107.72	2.62	333.27
MAP	1.13	2.51	–2.00	12.00
MAP^E (easing)	0.68	1.44	0.00	12.00
MAP^T (tightening)	1.82	3.05	0.00	18.00
MAP other – weighted by claims	1.14	1.48	–0.64	5.21
MAP $other^E$ (easing) – weighted by claims	0.44	0.22	0.02	1.07
MAP $other^T$ (tightening) – weighted by claims	1.58	1.51	0.05	5.46
MAP other – weighted by liabilities	1.28	1.67	–0.64	6.23
MAP $other^E$ (easing) – weighted by liabilities	0.40	0.21	0.03	0.94
MAP $other^T$ (tightening) – weighted by liabilities	1.67	1.67	0.01	6.39
MAP other – weighted by claims + liabilities	1.20	1.55	–0.64	5.52
MAP $other^E$ (easing) – weighted by claims + liabilities	0.42	0.19	0.03	0.89
MAP $other^T$ (tightening) – weighted by claims + liabilities	1.62	1.57	0.07	5.75
Log GDP	13.69	1.11	10.30	14.92
Lagged real GDP growth	2.14	2.38	–9.77	6.12
Inflation	0.03	0.03	–0.02	0.09
Supervisory authority protection	0.80	0.41	–1.00	1.00

[1] The number of observations is 260.

Source: Authors' calculations.

Non-stationarity test on the financial asset variables[1, 2]

Table 3

	P-value	
Variable	Lag (1)	Lag (2)
NBFI assets / total financial assets	0.00	0.00
Log-NBFI assets	0.00	0.00
Log-banking assets	0.00	0.00
Log-economic function EF1	0.00	0.00
Log-economic function EF2	0.00	0.00
Log-economic function EF3	0.00	0.00
Log-economic function EF4–5	0.02	0.02
Total financial assets / GDP[3]	0.03	0.01

[1] All the variables have been standardised dividing each variable by its standard deviation. [2] The model considered in column I (l) includes one lag (two lags) of the variable and a constant. Each column reports Fisher-type unit root test for panel data using the Phillips-Perron test. The null hypothesis is the presence of a unit root (stochastic trend). [3] Non-standardised.

Source: Authors' calculations.

Baseline model

Table 4

Explanatory variables	(I) Other countries' MaPs weighted by claims	(II) Other countries' MaPs weighted by liabilities	(III) Other countries' MaPs weighted by claims + liabilities
L1.Net MaP tightening	0.0786**	0.0724**	0.0686**
	(0.0304)	(0.0319)	(0.0316)
L1.Net MaP tightening, other	–0.184***	–0.124***	–0.177***
countries	(0.0513)	(0.0431)	(0.0513)
Total financial assets / GDP	0.107***	0.100***	0.103***
	(0.0170)	(0.0175)	(0.0174)
Supervisory authority protection	–0.205**	–0.192**	–0.195**
	(0.0933)	(0.0967)	(0.0964)
Other controls[1]	Y	Y	Y
Country FE	Y	Y	Y
Year FE	Y	Y	Y
Observations	260	260	260
Adjusted R-squared	0.924	0.923	0.924

The dependent variable is the share of NBFI assets in total financial assets. All variables are divided by their standard deviation. Robust standard errors in parentheses; ***/**/* denotes results significant at the 1/5/10% level.

[1] Other controls include log GDP, lagged GDP growth and inflation.

Source: Authors' calculations.

Test for omitted variable bias[1,2]

Table 5

Variable	Restricted		Unrestricted		Degree of proportionality
	Beta	R-squared	Beta	R-squared	
L1.Net MaP tightening	0.0722	0.920	0.0786	0.937	–3.409
L1.Net MaP tightening, other countries	–0.1145	0.920	–0.1844	0.937	–0.672

[1] All the variables have been standardised dividing each variable by its standard deviation. [2] The model estimated is the one in column (I) of Table 4. The restricted version does not include total financial assets over GDP, supervisory authority protection, log GDP, lagged GDP growth, and inflation.

Source: Authors' calculations.

Tightening vs easing MaPs

Table 6

Explanatory variables	(I) Other countries' MaPs weighted by claims	(II) Other countries' MaPs weighted by liabilities	(III) Other countries' MaPs weighted by claims + liabilities
L1.MaP easing	–0.114**	–0.158***	–0.142**
	(0.0560)	(0.0585)	(0.0555)
L1.MaP tightening	0.0885**	0.105**	0.0922**
	(0.0399)	(0.0406)	(0.0393)
L1.MaP easing, other countries	0.108***	0.106***	0.121***
	(0.0318)	(0.0363)	(0.0337)
L1.MaP tightening, other	–0.102	–0.048	–0.044
countries	(0.0793)	(0.0712)	(0.0784)
Total financial assets / GDP	0.106***	0.109***	0.106***
	(0.0166)	(0.0177)	(0.0168)
Supervisory authority protection	–0.209**	–0.258***	–0.234**
	(0.0898)	(0.0978)	(0.0908)
Other controls[1]	Y	Y	Y
Country FE	Y	Y	Y
Year FE	Y	Y	Y
Observations	260	260	260
Adjusted R-squared	0.926	0.926	0.927

The dependent variable is given by the share of NBFI assets in total financial assets. All variables are divided by their standard deviation. Robust standard errors in parentheses; ***/**/* denotes results significant at the 1/5/10% level.

[1] Other controls include log GDP, lagged GDP growth and inflation.

Source: Authors' calculations.

Effects of MaPs on the level of NBFI assets and banking assets

Table 7

	Logarithm of NBFI assets			Logarithm of banking financial assets		
	(I)	(II)	(III)	(IV)	(V)	(VI)
Explanatory variables	Other countries' MaPs weighted by claims	Other countries' MaPs weighted by liabilities	Other countries' MaPs weighted by claims + liabilities	Other countries' MaPs weighted by claims	Other countries' MaPs weighted by liabilities	Other countries' MaPs weighted by claims + liabilities
L1.Net MaP tightening	0.0602***	0.0580***	0.0562***	–0.0257**	–0.0244**	–0.0231**
	(0.0162)	(0.0163)	(0.0161)	(0.0112)	(0.0108)	(0.0110)
L1.Net MaP tightening, other	–0.0689**	–0.0469*	–0.0775***	0.0215	0.0765***	0.0713***
countries	(0.0329)	(0.0247)	(0.0297)	(0.0186)	(0.0149)	(0.0167)
Supervisory authority protection	–0.0863***	–0.0823***	–0.0822***	–0.0533***	–0.0603***	–0.0574***
	(0.0297)	(0.0300)	(0.0304)	(0.0201)	(0.0212)	(0.0209)
Other controls[1]	Y	Y	Y	Y	Y	Y
Country FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Observations	260	260	260	260	260	260
Adjusted R-squared	0.989	0.989	0.989	0.996	0.996	0.996

The dependent variable in columns (I)–(III) is the natural logarithm of NBFI assets; the dependent variable in columns (IV)–(VI) is the logarithm of banking financial assets. All variables are divided by their standard deviation. Robust standard errors in parentheses; ***/**/* denotes results significant at the 1/5/10% level.

[1] Other controls include log GDP, lagged GDP growth and inflation.

Source: Authors' calculations.

Effect on management of collective investment vehicles

Table 8

	Logarithm of EF1 assets		
	(I)	(II)	(III)
Explanatory variables	Other countries' MaPs weighted by claims	Other countries' MaPs weighted by liabilities	Other countries' MaPs weighted by claims + liabilities
L1.Net MaP tightening	0.0969***	0.0944***	0.0929***
	(0.0259)	(0.0263)	(0.0259)
L1.Net MaP tightening, other	–0.0765**	–0.0375*	–0.0675**
countries	(0.0328)	(0.0225)	(0.0281)
Supervisory authority protection	–0.0846*	–0.0816*	–0.0810*
	(0.0441)	(0.0451)	(0.0453)
Other controls[1]	Y	Y	Y
Country FE	Y	Y	Y
Year FE	Y	Y	Y
Observations	258	258	258
Adjusted R-squared	0.986	0.986	0.986

The dependent variable in columns (I)–(III) is the natural logarithm of collective investment vehicles (CIVs) with features that make them susceptible to runs (EF1) These assets include: MMFs, fixed income funds, mixed funds, credit hedge funds, real estate funds. All variables are divided by their standard deviation. Robust standard errors in parentheses; ***/**/* denotes results significant at the 1/5/10% level.

[1] Other controls include log GDP, lagged GDP growth and inflation.

Source: Authors' calculations.

Effect on loan provision that is dependent on short-term funding Table 9

	Logarithm of EF2 assets		
	(I)	(II)	(III)
Explanatory variables	Other countries' MaPs weighted by claims	Other countries' MaPs weighted by liabilities	Other countries' MaPs weighted by claims + liabilities
L1.Net MaP tightening	0.153**	0.143**	0.135*
	(0.0736)	(0.0708)	(0.0698)
L1.Net MaP tightening, other	–0.247**	–0.410***	–0.416***
countries	(0.105)	(0.0953)	(0.114)
Supervisory authority protection	–0.125	–0.0878	–0.102
	(0.110)	(0.116)	(0.114)
Other controls[1]	Y	Y	Y
Country FE	Y	Y	Y
Year FE	Y	Y	Y
Observations	260	260	260
Adjusted R-squared	0.833	0.840	0.837

The dependent variable in columns (I)–(III) is the natural logarithm of loan provision that is dependent on short-term funding (EF1) These assets include those of finance companies, leasing/factoring companies, consumer credit companies. All variables are divided by their standard deviation. Robust standard errors in parentheses; ***/**/* denotes results significant at the 1/5/10% level.

[1] Other controls include log GDP, lagged GDP growth and inflation.

Source: Authors' calculations.

Effect on intermediation of market activities

Table 10

	Logarithm of EF3 assets		
	(I)	(II)	(III)
Explanatory variables	Other countries' MaPs weighted by claims	Other countries' MaPs weighted by liabilities	Other countries' MaPs weighted by claims + liabilities
L1.Net MaP tightening	0.173**	0.165**	0.159**
	(0.0675)	(0.0653)	(0.0642)
L1.Net MaP tightening, other	–0.220**	–0.268***	–0.289***
countries	(0.102)	(0.0890)	(0.104)
Supervisory authority protection	–0.310***	–0.286***	–0.294***
	(0.0946)	(0.0987)	(0.0978)
Other controls[1]	Y	Y	Y
Country FE	Y	Y	Y
Year FE	Y	Y	Y
Observations	260	260	260
Adjusted R-squared	0.873	0.875	0.874

The dependent variable in columns (I)–(III) is the natural logarithm of market activities that is dependent on short-term funding or on secured funding of client assets (EF3) These assets include those of broker-dealers, securities finance companies. All variables are divided by their standard deviation. Robust standard errors in parentheses; ***/**/* denotes results significant at the 1/5/10% level.

[1] Other controls include log GDP, lagged GDP growth and inflation.

Source: Authors' calculations.

Effect on intermediation on securitisation based credit intermediation

Table 11

	Logarithm of EF4–5 assets		
	(I)	(II)	(III)
Explanatory variables	Other countries' MaPs weighted by claims	Other countries' MaPs weighted by liabilities	Other countries' MaPs weighted by claims + liabilities
L1.Net MaP tightening	0.107*	0.0980	0.0910
	(0.0646)	(0.0659)	(0.0644)
L1.Net MaP tightening, other	–0.240**	–0.306***	–0.339***
countries	(0.102)	(0.0930)	(0.107)
Supervisory authority protection	–0.117	–0.0894	–0.0982
	(0.0949)	(0.0986)	(0.0980)
Other controls[1]	Y	Y	Y
Country FE	Y	Y	Y
Year FE	Y	Y	Y
Observations	260	260	260
Adjusted R-squared	0.798	0.802	0.801

The dependent variable in columns (I)–(III) is the natural logarithm of activities related to the facilitation of credit creation (EF4) and securitisation-based credit intermediation and funding of financial entities (EF5). Assets included in EF4 are those of credit insurance companies, financial guarantors, monolines. Assets included in EF5 are those of securitisation vehicles, structured finance vehicles and asset-backed securities. Robust standard errors in parentheses; ***/**/* denotes results significant at the 1/5/10% level.

[1] Other controls include log GDP, lagged GDP growth and inflation.

Source: Authors' calculations.

Appendix

Baseline model with standard errors clustered by year — Table A1

Explanatory variables	(I) Other countries' MaPs weighted by claims	(II) Other countries' MaPs weighted by liabilities	(III) Other countries' MaPs weighted by claims + liabilities
L1.Net MaP tightening	0.0786***	0.0724**	0.0686**
	(0.0245)	(0.0286)	(0.0274)
L1.Net MaP tightening, other	–0.184***	–0.124***	–0.177***
countries	(0.0521)	(0.0410)	(0.0437)
Total financial assets / GDP	0.107***	0.100***	0.103***
	(0.0169)	(0.0151)	(0.0157)
Supervisory authority protection	–0.205**	–0.192**	–0.195**
	(0.0832)	(0.0856)	(0.0860)
Other controls[1]	Y	Y	Y
Country FE	Y	Y	Y
Year FE	Y	Y	Y
Observations	260	260	260
Adjusted R-squared	0.924	0.923	0.924

The dependent variable is given by the share of NBFI assets in total financial assets. All variables are divided by their standard deviation. Standard errors clustered by year in parentheses; ***/**/* denotes results significant at the 1/5/10% level.

[1] Other controls include log GDP, lagged GDP growth and inflation.

Source: Authors' calculations.

Baseline model with standard errors clustered by geographical areas[1] Table A2

Explanatory variables	(I) Other countries' MaPs weighted by claims	(II) Other countries' MaPs weighted by liabilities	(III) Other countries' MaPs weighted by claims + liabilities
L1.Net MaP tightening	0.0786**	0.0724*	0.0686*
	(0.0221)	(0.0274)	(0.0248)
L1.Net MaP tightening, other	–0.184**	–0.124**	–0.177**
countries	(0.0597)	(0.0346)	(0.0558)
Total financial assets / GDP	0.107**	0.100**	0.103**
	(0.0238)	(0.0256)	(0.0248)
Supervisory authority protection	–0.205	–0.192	–0.195
	(0.216)	(0.229)	(0.229)
Other controls[2]	Y	Y	Y
Country FE	Y	Y	Y
Year FE	Y	Y	Y
Observations	260	260	260
Adjusted R-squared	0.924	0.923	0.924

The dependent variable is given by the share of NBFI assets on total financial assets. All variables are divided by their standard deviation. Standard errors clustered by geographical area in parentheses; ***/**/* denotes results significant at the 1/5/10% level.

[1] The sample has been divided into five geographical areas: Africa, Asia and Oceania, Europe, Latin America and North America. [2] Other controls include log GDP, lagged GDP growth and inflation.

Source: Authors' calculations.

Baseline model with standard errors clustered by geographical area and year[1]

Table A3

Explanatory variables	(I) Other countries' MaPs weighted by claims	(II) Other countries' MaPs weighted by liabilities	(III) Other countries' MaPs weighted by claims + liabilities
L1.Net MaP tightening	0.0786**	0.0724*	0.0686*
	(0.0240)	(0.0274)	(0.0271)
L1.Net MaP tightening, other	–0.184**	–0.124**	–0.177**
countries	(0.0620)	(0.0389)	(0.0534)
Total financial assets / GDP	0.107**	0.100**	0.103**
	(0.0248)	(0.0254)	(0.0251)
Supervisory authority protection	–0.205	–0.192	–0.195
	(0.209)	(0.220)	(0.220)
Other controls[2]	Y	Y	Y
Country FE	Y	Y	Y
Year FE	Y	Y	Y
Observations	260	260	260
Adjusted R-squared	0.924	0.923	0.924

The dependent variable is given by the share of NBFI assets in total financial assets. All variables are divided by their standard deviation. Standard errors clustered by geographical area and year in parentheses; ***/**/* denotes results significant at the 1/5/10% level.

[1] The sample has been divided into five geographical areas: Africa, Asia and Oceania, Europe, Latin America and North America. [2] Other controls include log GDP, lagged GDP growth and inflation.

Source: Authors' calculations.

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