An Overview of Macroprudential Policy Tools

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Sections

Abstract

Macroprudential policies—caps on loan to value ratios, limits on credit growth and other balance-sheet restrictions, (countercyclical) capital and reserve requirements and surcharges, and Pigouvian levies—have become part of the policy paradigm in emerging markets and developed countries alike. But knowledge of these tools is still limited. Macroprudential policies ought to be motivated by market failures and externalities, but these can be hard to identify. They may also interact with various other policies, such as monetary and microprudential, raising coordination issues. Countries, especially emerging markets, have used these tools, and analyses suggest that some of those tools reduce procyclicality and crisis risks. Yet, much remains to be studied, including the costs of such tools, as they may adversely affect resource allocations; how best to adapt these tools to a country's circumstances; and preferred institutional designs, including how to address political economy risks. As such, policy makers should move carefully in adopting these tools.

Keywords

financial stability (/keyword/Financial+Stability), financial intermediation (/keyword/Financial+Intermediation), externalities (/keyword/Externalities), market failures (/keyword/Market+Failures), procyclicality (/keyword/Procyclicality), systemic risks (/keyword/Systemic+Risks), macroprudential policies (/keyword/Macroprudential+Policies)

1. INTRODUCTION

This article reviews existing research on the motivations for macroprudential policies, possible specific tools, actual usage, and lessons from experiences. The recent wave of financial crises has led to a greater recognition of the large and at times adverse real economic effects of finance. It has also made clear that existing tools—whether microprudential, monetary, fiscal, or other policies—even when conducted properly and effectively in their own ways, do not always suffice to assure financial stability. Combined with a broader rethinking of macroeconomic and financial policies (e.g., **Akerlof, Blanchard & Stiglitz 2014**), this understanding has led to a call for macroprudential policies, i.e., policies aiming to reduce systemic risks arising from excessive financial procyclicality and from interconnections and other cross-sectional factors.

According to **Clement (2010)**, the term macroprudential was first used in the late 1970s in work on international bank lending carried out by the Euro-Currency Standing Committee at the Bank for International Settlements (BIS). **Crockett (2000)** is among the first to draw attention in public forums to the need for macroprudential policies. **Elliott, Feldberg & Lehnert (2013)** review the history of macroprudential policies in the United States. Earlier literature reviews also include **Bank of England (2009)**, **Galati & Moessner (2011)**, and **Hanson, Kayshap & Stein (2011)**, and **Galati & Moessner (2014)** provide a recent review of empirical work (for a collection of papers, see also **Claessens et al. 2011**; for an extensive treatment, see **Freixas, Laeven & Peydró 2015**). Yet, though the need for macroprudential policies is now largely accepted, many questions remain, starting from the motivations for such policies.

In principle, macroprudential policies should be motivated by externalities and market failures arising from various financial frictions and market imperfections that exist even when microprudential supervision and monetary policy are conducted effectively (which regrettably is not always the case in practice). Few theoretical analyses exist, however, to guide macroprudential policies this way, and hardly any have been formally tested. Consequently, most often, the design of policies has not started from first principles, but instead arises from generic concerns. Related, the set of policies currently being considered is mostly based on existing microprudential and regulatory tools [i.e., caps on loan to value (LTV) ratios, limits on credit growth (CG), additional capital adequacy requirements, reserve requirements (RRs), and other balance-sheet restrictions], which have been given additional macroprudential objectives with forms of Pigouvian taxes and levies added.

Even though both the motivations and expected effectiveness of various policies are not well-known, usage has often proceeded on an ad hoc or experimental basis, especially in emerging markets. Evaluations of usage to date, mostly aimed at affecting developments in credit and housing markets, suggest that some tools help reduce financial procyclicality and lower crisis risks. Notably, in real estate markets, caps on LTV and debt service to income ratios seem to help in reducing booms, and thus busts, which are major sources of instability. RRs and targeted levies on foreign exchange exposures also help to reduce system-wide vulnerabilities. Progress is also being made using macroprudential (as well as other) policies to reduce the systemic risks created by large financial institutions.

Still, it is not well known how policies may be most effectively calibrated to circumstances (e.g., when and how much to raise or lower countercyclical capital requirements) and adapted to country characteristics (e.g., which tools to use given specific financial market structures). Knowledge on which policies and how to use them for risks in capital markets is very limited. Neither is much known about the costs of policies. By definition, macroprudential policies distort some behaviors. Unless perfectly targeted at the source, i.e., where the externalities or market failures arise, which is unlikely, policies may worsen some resource allocations. And by constraining the actions of agents, they may increase overall systemic risks.

Questions also arise regarding the best institutional design for usage, e.g., determining who is made in charge of macroprudential policies. Should these policies be conducted by a central bank, an existing microprudential or market conduct supervisory agency, a new macroprudential agency, or a committee composed of various agencies and others (such as representatives from a ministry of finance)? Institutional designs matter, as the conduct of macroprudential policies may interfere with the primary objectives of some agencies. A central bank may have more difficulty communicating its monetary policy stance when also in charge of macroprudential policy. And a microprudential authority may be less able to execute its goals when its staff needs multiple skills and is confronted with (at times conflicting) goals. Because these other policies are essential in their own right and likely more important overall for reducing systemic risks, a big concern would be if adopting macroprudential policies reduces the importance given to assuring properly conducted monetary policy—e.g., if and when these policies become a substitute for monetary policy—or to improving microprudential supervision.

A major issue, closely related to institutional design, is how the political economy of macroprudential policies will play out. By involving governments more directly into resource allocation, they (or the specific agencies in charge) will become (more) exposed to outside pressures. This risk needs to be acknowledged explicitly and addressed in institutional design(s), including accountability and transparency. Some policies may, for example, need to be presented to parliaments for broader public approval to avoid exposing regulatory agencies to political risks (e.g., of *ex post* not having "prevented" a real estate crisis when it decided *ex ante* not to set too low an LTV ratio so as to allow first-time buyers to acquire a home).

Overall, although the greater system-wide focus is welcome in light of recent crises, many unknowns and a large research agenda remain. In the meantime, policy makers may want to move cautiously in adopting macroprudential tools and prioritize the ones they do adopt and clearly state their objectives. If in the end only few policies are adopted, a key objective and possible main achievement could still be attained, that is, greater appreciation of a more system-wide view of finance in all its aspects and of the various policies that reduce the risk of crises and lower excessive procyclicality.

This review proceeds as follows. Section 2 presents the literature analyzing the motivations for macroprudential policies, considering both time-series (procyclicality) and cross-sectional systemic risk dimensions. Section 3 reviews the knowledge on the interactions of macroprudential policies with other policies (notably monetary) and their international dimensions. Section 4 describes possible tools, choices, and calibration strategies as well as their use to date. Section 5 presents findings of existing research and case studies. Section 6 concludes with lessons and outstanding policy issues, including current thinking about institutional design and research.

2. MOTIVATION FOR MACROPRUDENTIAL POLICIES

2.1. Financial Crises Have Led to (Renewed) Attention on Macroprudential Policies

The recent global financial crisis and its aftermath have been painful reminders of the multifaceted interactions between macroeconomic and financial market developments (macrofinancial linkages). This understanding has led to (a call for) the adoption of macroprudential policies (as well as to a review and reform of other financial policies and institutions) (for more policy-oriented reviews, see **IMF 2013d**,**e**; **Eur. Cent. Bank 2014**; for a review of financial reforms in general, see **Claessens & Kodres 2014**; for policy makers' assessment, see **Financ. Stab. Board 2014b**). The fundamental rationales behind such policies, however, are not always clearly articulated. Proponents do not always start from the key externalities and market failures associated with activities of financial intermediaries and markets that may lead to excessive procyclicality and the buildup of systemic risk. Although they constitute proper underlying focuses, procyclicality and systemic risks can also relate to weaknesses in the conduct of microprudential and monetary policies. As such, they can arise from many factors, including policy deficiencies and aggregate shocks (e.g., commodity price shocks). These causes require their own approaches, including fixing deficiencies, but they are not all causes that macroprudential policies need to address. Even though macroprudential policies can mitigate, say, a general financial or business cycle or the presence of insufficiently disciplined large financial institutions, only externalities justify a macroprudential approach.

Identifying precisely the source of externalities operating through the financial system helps determine the best corresponding, specific macroprudential policies. Even though many policy-oriented papers, notably those by the Bank for International Settlements, have drawn attention to the need for a macroprudential approach (e.g., **Borio 2003**, **Borio & White 2003**, **White 2006**), most have not adopted the formal perspectives of externalities. Several recent papers (for one of the first to do so, see **Brunnermeier et al. 2009**), however, have identified some externalities that give rise to procyclicality and systemic risk.
De Nicolò, Favara & Ratnovski (2012), on which this section heavily draws, classify known externalities as follows (see also **Allen & Carletti 2012**, **Bank of Engl. 2011**, **Schoenmaker & Wierts 2011**):

1. Externalities related to strategic complementarities arise from the strategic interactions of banks and other financial institutions and agents; they cause a buildup of vulnerabilities during the expansionary phase of a financial cycle.

2. Externalities related to fire sales and credit crunches arise from a generalized sell-off of assets causing a decline in asset prices, deterioration of balance sheets of intermediaries and investors, and drying up of financing, especially during the contractionary phase of a financial (and business) cycle.

3. Externalities related to interconnectedness are caused by the propagation of shocks from systemic institutions or through financial markets or networks (contagion).

Although externalities may be classified in other ways, the literature generally makes a similar distinction, that is, between externalities that are more time series specific, i.e., give rise to procyclicality in good and bad times (under the first two externalities noted above), and those that are more cross sectional specific, i.e., due to interconnectedness (under the third externality). **Table 1** presents these externalities and notes specific groups of corresponding tools (reviewed in Section 4). I review the specific externalities in Sections 2.2–2.4 below.

Table 1
Macroprudential policy tools[a]

CLICK TO VIEW

2.2. Externalities Related to Strategic Complementarities

Owing to various reasons (many of which are not well understood), externalities related to strategic complementarities arise during the buildup of risks in a boom period. Historical experience suggests that financial intermediaries tend to assume exposures to common credit and liquidity risks in the upswing of a business cycle. This behavior amplifies financial cycles and contributes to asset price volatility because strategic complementarities arise in market interactions between rational agents, meaning that the payoff from a certain strategy increases with the number of other agents undertaking the same strategy. Increased competition in boom times further amplifies this effect, as it impacts economy-wide credit standards. With imperfect information, banks need incentives to assess borrowers' risk. In boom times, lower rents prompted by fiercer competition result in fewer incentives to screen potential borrowers. As a result, banks reduce the intensity of their screening, yet increase lending, thereby worsening the pool of borrowers (**Ruckes 2004**, **Dell'Ariccia & Marquez 2006**, **Gorton & He 2008**). By contrast, in the contractionary phase lower credit origination and less competitive pressures make for more screening.

Other sources of externalities related to strategic complementarities include reputational concerns and incentive structures for financial managers. When managers care about perceptions of their ability, their credit, investment, or other policies may be influenced by those of their colleagues (**Rajan 1994**). Excessive long-term risk taking may arise under structures that pay for short-term performance (**Acharya, Pagano & Volpin 2013**). Benchmarking in various forms leads to certain externalities, e.g., an institution reporting poor performance will be evaluated more leniently if many others report similarly. Institutions then have incentive to maintain risky lending, hide losses, or otherwise copy each others' behavior until the buildup of risks forces them to coordinate a strategy of loss recognition and external financing contracts (for a review, see **Allen & Saunders 2003**). Complementarities also come from institutional rules, such as mark-to-market (fair value) accounting or the required use of (similar) value at risk models (**Adrian & Shin 2010**, **2014**). Other sources appear more behavioral, for example, when investors chase similar investment opportunities (**Shleifer 2000**, **Barberis 2013**) or neglect the possibility of rare but large shocks (**Gennaioli, Shleifer & Vishny 2013**).

Finally, externalities related to strategic complementarities also arise from the optimal *ex ante* response of agents to *ex post* government interventions. The prospect of a bailout may result in strategic complementarities, because it may lead institutions, especially banks, to engage *ex ante* in correlated asset choices. Anticipating that simultaneous failures will trigger a bailout (to prevent a financial meltdown), banks may find it optimal to correlate risks to maximize the probability that any failure is a joint failure (**Acharya & Yorulmazer 2007**, **Farhi & Tirole 2012**). As firms mimic each other's strategy, overall vulnerabilities increase through, for example, correlated asset choices or maturity and exchange rate mismatches (**Ratnovski 2009**, **Allen & Carletti 2012**). These vulnerabilities in turn may lead to or deepen a financial bust.

2.3. Externalities Related to Fire Sales and Credit Crunches

A fire sale occurs when an investor is forced to liquidate an asset at a time when potential buyers are also troubled. Given limited buyers, the asset is sold at a price below its fundamental value, causing losses to the seller (**Shleifer & Vishny 1992**, **Allen & Gale 1994**). Not only does this asset fetch a lower price, but similar assets held by other financial institutions may also decline in value. This reduces the capitalization and ability to post assets as collateral of all financial institutions, forcing them to liquidate other assets. The next round of selling triggers further losses, more selling, etc., thus creating a pecuniary externality.

Fire sales and credit crunches are obvious options for banks because they issue liquid liabilities to fund illiquid assets, exposing them to the risk of having to liquidate investments prematurely, as happened in the Great Depression (**Rajan & Ramcharan 2014**). Although guarantees and central-bank support, such as deposit insurance and liquidity facilities, reduce the likelihood of fire sales, their effectiveness may be limited when banks also rely on wholesale funding, as many did before the recent crisis. The values of (similar) bank assets may also be depressed when other important players in the intermediation process that do not (formally) benefit from such support, such as broker-dealers and shadow banks, have to sell assets.

Fire sales may also trigger an external-financing credit crunch with adverse real consequences. As banks' balance sheets are impaired, they will cut back on their financing. And as asset prices decline and collateral becomes less valuable, final borrowers (corporations, households, and sovereigns) have less access to finance, which worsens the real economy (**Goldstein, Ozdenoren & Yuan 2013**). Even more generally, small financial shocks may trigger demand and other real externalities (including those from capital flows), which may be aggravated by the zero lower bound on nominal interest rates (see **Korinek 2011**, **Schmitt-Grohe & Uribe 2012**, **Farhi & Werning 2013**, **Korinek & Simsek 2014**).

Even though fire sales and credit crunch externalities manifest in a downturn, the imbalances that sow the risks are often built up in booms. The reason is that atomistic agents take prices as given, but on aggregate, the equilibrium price depends on agents' joint behavior. Because they do not internalize the possible effects of a generalized fire sale on *ex post* borrowing capacity, agents may overborrow, leading to excessive leverage and inflated asset prices (**Caballero & Krishnamurthy 2003**, **2004**; **Lorenzoni 2008**; **Bianchi 2010**; **Jeanne & Korinek 2010**; **Manconi, Massa & Ayako 2012**; **Merrill et al. 2012**; **Stein 2012**; for a review, also see **Brunnermeier, Eisenbach & Sannikov 2013**).

2.4. Externalities Related to Interconnectedness

Banks and other financial institutions are very interconnected: The distress or failure of one affects the others. Spillovers may arise because of bilateral balance sheets (interbank) and other exposures (**Allen & Gale 2000**, **Diamond & Rajan 2011**, **Perotti & Suarez 2011**), asset price movements (as discussed above), or aggregate feedback from the real economy (**Bebchuk & Goldstein 2011**). It is possible for a financial institution to reduce but not entirely eliminate these risks, as interconnectedness is often beyond its individual control and actors do not internalize the systemic risk implications of their actions (**Acemoglu, Ozdaglar & Tahbaz-Salehi 2013**). Also, interconnectedness may arise for genuine mutual hedging and diversification motives (**Wagner 2011**). Related, as the financial networks literature (**Allen & Gale 2007**; **Gaia, Haldane & Kapadiab 2011**) has shown, though high interconnectedness mitigates the impact of small shocks by spreading them, it amplifies large shocks because they reaches more counterparties.

Interconnectedness externalities are particularly strong for systemically important financial institutions (SIFIs). Historically, systemic importance has been associated with the size of institutions, but recent events suggest a more complex picture: Interbank market linkages determine interconnectedness, and high leverage amplifies effects (**Drehmann & Tarashev 2011**; **Laeven, Ratnovski & Tong 2014**). In addition, interconnectedness and systemic importance may be present within and among nonbanks (e.g., hedge funds, money market mutual funds, or shadow banking) or institutions that support market infrastructure, such as central clearing counterparties.

Nevertheless, although size is not the only factor, distressed SIFIs cannot be easily wound down. Unlike smaller institutions, SIFIs are often complex, operate internationally, provide unique services, or are the backbone of financial infrastructure, making them “too big to fail” (for a review, see **Strahan 2013**). As a result, most interventions in SIFIs have also been de facto bailouts, which protect creditors (and sometimes shareholders and often management) from the full scale of losses. The anticipation of bailouts perversely affects the (risk-taking) incentives of SIFIs and other market participants. It introduces a race among

institutions to become systemically important, a classification that lowers the cost of funding and reduces market disciplining of SIFI creditors, especially the riskiest ones (**Ueda & Weder di Mauro 2012**). In turn, these behaviors lead to aggregate risk shifting and distorted competition.

Interactions between time-series and cross-sectional externalities also create systemic risks. Rapid growth of large financial institutions during a boom means procyclicality is reinforced by contagion risks. Conversely, complementarities may arise in the tools to be used to mitigate either source of externalities.

3. INTERACTIONS WITH OTHER POLICIES AND INTERNATIONAL DIMENSIONS

Macroprudential policies are not the only policies aimed at economic (including price) and financial stability. Others include monetary, microprudential, fiscal, as well as competition policies, with which macroprudential policies interact. Furthermore, the need to correct for the distortions introduced by other policies motivates some macroprudential policies. Owing to the possibility of international spillovers, both inward and outward, macroprudential policies may also overlap and develop interrelationships with capital flow management (CFM) policies. How should macroprudential policies be coordinated with these other policies? Next, I briefly review the (limited) literature addressing this question. I focus mostly on interactions between monetary and macroprudential policies because they are most relevant and have been most studied.

3.1. Macroprudential and Monetary Policies

Both macroprudential and monetary policies are useful for countercyclical management: Monetary policy is primarily aimed at price and economic stability, and macroprudential policies at financial stability. Because these policies interact, each may enhance or diminish the effectiveness of the other. The International Monetary Fund **(IMF) (2013b**,**c**) reviews the (limited) literature on the conduct of both policies in the presence of these interactions. It first presents an ideal but unrealistic benchmark in which both policies perfectly achieve their objectives. It then addresses three questions: If macroprudential policies work imperfectly, what are the implications for monetary policy? If monetary policy is constrained, what is the role for macroprudential policies? And with institutional and political economy constraints, how can both policies be adjusted?

3.1.1. Benchmark world: when policies work perfectly. Monetary policy alone cannot be expected to achieve financial stability effectively or efficiently because its causes are not always related to the interest rate level or the degree of liquidity in the system (which monetary policy affects). To mitigate the effects of financial distortions or when financial distortions are more acute in some sectors of the economy than in others, monetary policy is too blunt a tool. Pricking an asset price bubble, for example, may require large changes in the policy rate (**Bean et al. 2010**). Similarly, using macroprudential policies primarily for managing aggregate demand may create additional distortions by imposing constraints beyond where financial instability originates. For example, to limit general credit growth may be too harmful from an aggregate economic perspective. Thus, when both policies are available, it is desirable to keep the primary focus of monetary policy on price stability and of macroprudential policies on financial stability.

Monetary policy, however, affects financial stability: (*a*) By shaping *ex ante* risk-taking incentives of individual agents, it affects leverage and short-term or foreign currency borrowing (for a review, see **Dell'Ariccia & Marquez 2013**). (*b*) By affecting *ex post* the tightness of borrowing constraints, it may also exacerbate asset price and related externalities and leverage cycles. Similarly, it is possible for macroprudential policies to affect overall output by constraining borrowing and, hence, expenditures in one or more sectors. These side effects imply that one needs to consider how the conduct of both policies is affected. Most analytical papers to date find that the mere presence of side effects has no major implications for the conduct of both policies when policies operate perfectly.[1] In particular, most dynamic stochastic general equilibrium (DSGE) models suggest that monetary policy does not change markedly when macroprudential policies are also used, even when different types of shocks are considered. A big

caveat is that most models employ limited representations of financial systems and related financial frictions and often use assumptions that imply linear relationships, making both policies operate mostly similar (for DSGE models with nonlinearities, see **Benes, Kumhof & Laxton 2014a**,**b**).

3.1.2. When either macroprudential or monetary policies work imperfectly. In the real world, policies do not operate perfectly. Furthermore, neither policy is immune to political pressures and time inconsistency issues. As such, the conduct of both may need to be adjusted to consider the weaknesses in the other, but how is conceptually and empirically unclear. Weaknesses in macroprudential policies mean monetary policy more likely needs to respond to financial conditions. Indeed, in models where macroprudential policy is absent or time invariant, but with financial distortions still present, optimal monetary policy responds to some degree to financial conditions, in addition to output and inflation (**Curdia & Woodford 2009**, **Carlstrom & Fuerst 2010**, **Adam & Woodford 2013**). By extension, with imperfectly targeted or effective macroprudential policies and given its more general reach (e.g., as "it gets in all of the cracks"; see **Stein 2013**), monetary policy may need to respond to financial conditions and lend a hand in achieving financial stability. This "leaning against the wind" argument is, however, not generally accepted (e.g., compare **Bernanke & Gertler 2001** with **Bank Int. Settl. 2014**; see also **Yellen 2014**).

Similarly, macroprudential policy may need to respond to aggregate developments related to financial activities when monetary (and other) policies are constrained, as with economies pegging their exchange rate or in currency unions. The case of the eurozone shows the economic (and financial) risks that arise when booms are not (or cannot be) mitigated at the national level. When the effective monetary stance gives rise to macroeconomic imbalances or excessively strong overall risk-taking incentives, national macroprudential policies may need to be used, especially when other policies are imperfectly coordinated internationally (e.g., as when foreign lenders are not constrained from lending to the country).

The need to conduct macroprudential policies at the regional level in currency unions may arise not just from financial frictions, but also as a result of incomplete overall design. It is, for example, generally not thought to be necessary to conduct macroprudential policies at a regional level in the United States, even though booms and busts may be (and have been) regional. This is because, among other reasons, the financial safety net is nationally organized and funded, fiscal stabilizers operate across regions, and labor and other factors markets are flexible enough to allow for satisfactory reallocation of resources. Contra the situation in the United States, these conditions are not present to the same degree in all currency unions, including the euro. Regardless, macroeconomic risks need to be related to financial activities (e.g., a housing boom that is of macroeconomic concern, even when completely financed internationally). And when monetary arrangements are not adequate, strengthening the monetary policy's effectiveness will likely be better than using macroprudential policies as imperfect substitutes.

3.2. Interactions with Other Policies

Besides monetary policy, many other policies interact with or condition the use of macroprudential policies. These include fiscal, microprudential, and other structural policies. I briefly review the research in these areas.

3.2.1. Fiscal policy. Tax policies may contribute to systemic risk when they encourage leverage, as when interest payments are tax deductible or affect asset prices (see **De Mooij 2011**, **Keen & De Mooij 2012**). Therefore, macroprudential authorities have an interest in the correction of such biases. Even when not contributing directly to risks, taxes may affect the conduct of macroprudential policies. Real estate taxes (property taxes, stamp duties) may be capitalized into house prices (e.g., **Van den Noord 2005**), possibly making (future) tax policies relevant for financial stability. When Pigouvian taxes and levies address systemic risk externalities (**IMF 2010**), coordination between macroprudential and fiscal agencies may be needed. However, little is known about the quantitative importance of these aspects. In the aggregate, fiscal policy also matters because it can counter (or be a source of) procyclicality.

3.2.2. Microprudential policy. Macroprudential policies presume effective microprudential regulation and supervision. Most often, when conducted properly, microprudential objectives will be aligned with macroprudential policies, but there can be conflicts (**Angelini, Nicoletti-Altimari & Visco 2012**; **Osiński, Seal & Hoogduin 2013**). This possibility is most clear in bad times when a macroprudential perspective may suggest relaxing regulatory requirements—as they impede the provision of credit to the economy or contribute to fire-sale effects, whereas the microprudential perspective may seek to retain or tighten requirements—so as to protect the interest of depositors of individual banks or investors. In good times, conflict of interests are less likely, e.g., both authorities will ask banks to build up buffers, but the macroprudential perspective will likely call for greater prudence. Some of this conflict is institutionally related. For example, accounting indicators, more often used by microprudential authorities, likely give a more positive picture of an institution's balance sheet in boom times than a system's view would. Though recognized, how to address these issues remains a largely open question. As also argued by **Jeanne & Korinek (2013)**, an *ex post* strategy of cleaning up after a crisis may be part of an efficient approach to managing risks, thus calling for crisis management to coordinate with *ex ante* microprudential policies.

3.2.3. Other structural policies. Conflicts can also arise in the design of structural policies, e.g., when risks arise from how microprudential policies are conducted. For example, a very high LTV ratio is likely to increase the incidence of real estate booms. Even when set optimally from a microprudential perspective, capital requirements can increase overall procyclicality (**Angelini et al. 2010**, **Repullo & Suarez 2013**). While reducing the risk of runs on individual institutions, a public safety net, including deposit insurance, can also give rise to greater system risks (**Demirgüç-Kunt & Detragiache 2002**; **Demirgüç-Kunt, Kane & Laeven 2008**). The use of ratings may introduce (more) procyclicality (**Amato & Furfine 2004**). And accounting rules aimed at greater transparency and fostering more market discipline can mean more procyclicality because chances for a fire-sale increase when institutions mark asset to market (**Leuz & Laux 2010**, **Ellul et al. 2013**). Also, by affecting incentives for risk taking, an inverse U-shaped relationship between bank competition and financial stability may arise (**Allen & Gale 2004**; see also **Beck 2008**, **Ratnovski 2013**). And land use and construction policies yield significant impact on house price developments. These examples show that macroprudential policies need to be coordinated with many policy areas, in part as the need for them arises exactly from these other policies.

3.3. International Coordination: Financial and Policy Spillovers

The de facto international financial integration of most countries affects the desired use and effectiveness of macroprudential policies. Given financial integration, cross-border spillovers may arise when a financial cycle is in an upswing in one country but in a downswing in another or because countries are (or are not) using macroprudential policies.[2] As argued by **Shin (2012)** and shown by **Rey (2013)** and others, there is much global commonality to financial cycles, suggesting policies are naturally coordinated. However, cycles appear largely driven by conditions in major developed countries. Thus, it is not obvious that a commonality or addressing it only from a major countries' perspectives is optimal for all countries. Regardless, being financially integrated means countries have less control over their own financial stability.

Policy spillovers are also (more likely) to arise when countries vary in their policies or calibrations for dealing with similar risks or in their policy effectiveness. **Aiyar, Calomiris & Wieladek (2014a)** show that foreign bank branches increased their lending in the United Kingdom in response to tighter measures applied to local banks, a sign of cross-border competition and regulatory arbitrage. Additionally, when policies at the source country do not effectively stem risks related to outflows, recipient countries may be negatively affected if they cannot stop inflows. Spillovers also arise when institutions adjust to local restrictions by decreasing or increasing cross-border activities. **Aiyar et al. (2014)** show that, because supervisors required UK-based banks and subsidiaries to meet higher capital requirements during the 2000s, local banks lent less abroad, which may or may not have been optimal. Spillovers can also arise when institutions from country A reduce cross-border flows to country B in response to its rules and increase flows to country C (for a case of capital controls, see **Forbes et al. 2012**).

Even though the scope for (policy) spillovers is large, the case for international coordination and cooperation depends on the presence of negative externalities. Despite the limited analysis of welfare gains from coordinating macroprudential policies (see **Jeanne & Korinek 2014**), analysis on multilateral aspects of CFM tools (e.g., **Ostry, Ghosh & Korinek 2012**) relates. Building on this relation, **Korinek (2014)** argues that spillovers can lead to inefficiencies under three circumstances: if policies are beggar thy neighbor, if policy instruments to deal with externalities operate imperfectly, and if global markets are incomplete or restricted (see also **Brunnermeier & Sannikov 2014**). **Jeanne (2014)** shows the need for coordination when some countries are in a liquidity trap because the global real interest rate cannot adjust sufficiently.

Though there may be some (limited) scope in principle, policy coordination is hard to implement in practice (see **Ostry & Ghosh 2013**). To date, coordination has been limited, with instruments and mechanisms defined for only the countercyclical and systemic capital surcharges in Basel III (**Basel Comm. Bank. Superv. 2011**). More progress may be envisioned, but (policy) spillovers are likely to remain. For individual countries, CFM tools may then be part of a useful policy response (**IMF 2012c**), which raises the question of how to coordinate between CFM tools and macroprudential policies. Here, **Korinek & Sandri (2014)** provide a useful dichotomy: Macroprudential policies should address externalities related to domestic credit, and CFM tools should address those related to exchange rate movements. How to make this focus operational, however, remains to be determined (see **Ostry et al. 2011**).

4. POSSIBLE MACROPRUDENTIAL TOOLS AND ACTUAL USES

This section reviews first the tool kit available in principle and then the actual use of policies.

4.1. The Tool Kit Available: Use and Calibration of Macroprudential Policies

Many macroprudential tools have been proposed and some have been used, even before the recent crisis. The tool kit available in principle is quite large and includes existing microprudential and other regulatory tools, taxes and levies, and new instruments (see **Table 1**) (for other classifications, see **Comm. Glob. Financ. Syst. 2010**, **IMF 2011b**, **Eur. Syst. Risk Board 2014**). Most tools considered to date apply to the banking system, mainly owing to the existence of microprudential tools adaptable to macroprudential objectives and related more extensive theory and knowledge. A lack of understanding of possible externalities in other financial market segments is, however, also at play (e.g., for a review of shadow banking, see **Claessens et al. 2012**; regarding insurance, see **Int. Assoc. Insur. Superv. 2013**). Note further that many instruments (can) also serve other policy objectives, including, besides microprudential, assuring consumer protection or fostering greater competition, and that other tools may be considered.

Table 1 notes the three goals of macroprudential policies: enhancing resilience, dampening the cycle, and dispelling gestation of the cycle (as per Section 3). Also included are five sets of corresponding tools: (*a*) quantitative restrictions on borrowers, instruments, or activities; (*b*) capital and provisioning requirements; (*c*) other quantitative restrictions on financial institutions' balance sheets; (*d*) taxation/levies on activities or balance-sheet composition; and (*e*) other more institutional-oriented measures, such as accounting changes, changes to compensation, etc. Except for quantitative restrictions on borrowers, instruments, or activities, which aim to affect demand for financing, all tools affect the supply side of financing. The first four measures are meant to be time, institution, or state varying, whereas the fifth is more structural.[3]

Tools under the 15 combinations noted in **Table 1** include those correcting (for factors that can give rise to) externalities and market failures or those compensating for policies that can contribute to adverse financial dynamics (such as the procyclicality introduced by microprudential capital requirements). Besides mapping each tool to specific externalities, with some tools possibly mitigating more than one, the table also maps tools to intermediate targets, such as changes in credit, leverage, asset prices, interconnections, and the like. Knowledge on which intermediate indicators to use and how to calibrate tools is still limited, however (see also **IMF 2013d, e**).

The preferred use of policies, in their extensive (whether to use a specific tool) and intensive (how much to use it) margins, varies according to the degree of amplification in the financial (and real) cycles, exposures to systemic shocks and risks, and the effectiveness of (specific) policies. As such, many dimensions come into play, including a country's structural, institutional, and financial market characteristics. Models provide some limited guidance for use and calibrations. It is possible for DSGE models with financial frictions to suggest an optimal mix of macroprudential and monetary policies (e.g., **Kannan, Rabanal & Scott 2009**; **Quint & Rabanal 2013**) or for some historically derived indicators of (excessive) procyclicality and systemic risks, e.g., a notion of a credit gap, to suggest specific dynamic provisioning (DP) surcharges (**Drehmann et al. 2010**). And a Pigouvian tax on SIFIs can be made to depend on measures reflecting the size of interconnectedness externalities (**Kocherlakota 2013**).

Many questions exist, however, on which measures reliably indicate systemic risk buildup, with both Type I and II errors, and on the time horizon at which risks can be detected. Notably, how to account for a country's circumstances and characteristics is still unclear. Some factors are likely relevant: the overall depth of a country's financial system, which differs vastly; financial structure, e.g., the importance of banks versus capital markets, with institution-based measures likely of greater importance than are borrower-based measures when most financing comes from a regulated system;[4] as well as the industrial organization and ownership structure, because a more concentrated system makes the application of tools easier or because domestic, state-owned, and foreign banks react differently to policies.

International financial integration and exchange rate regimes matter as well. Openness affects exposures, both directly (to, say, capital flows risks) and indirectly, given the strong links between behavior of capital flows and banking vulnerabilities (e.g., **Hahm, Shin & Shin 2013**; **Cerutti, Claessens & Ratnovski 2014**). Financial integration also affects how effective policies may be. A very open capital account and large foreign bank presence make circumvention more likely. And with a fixed exchange rate, monetary policy cannot be a complementary tool. These and other considerations will affect which policy is best and whether CFM tools can complement (e.g., **Hahm et al. 2011**).

Preferred use could also vary according to the availability and effectiveness of fiscal and microprudential policies. High public debt makes countercyclical fiscal policy harder to implement, thereby making macroprudential policies more important. Microprudential supervision may face greater challenges in some markets. Institutional (e.g., lack of data, know-how, and skills in supervisory agencies), political economy, and other constraints may lead countries to adopt macroprudential policies in specific ways. Use could also vary with other tools available to mitigate systemic risks. Stress tests could complement macroprudential policies: Compared with macroprudential policies, stress tests are more forward looking, less coarse in their application (say, by having very granular asset categories for risk scenarios), and more tailored to (emerging) vulnerabilities. Furthermore, financial reforms are proceeding in various coordinated (e.g., new liquidity requirements) and country-specific (e.g., Vickers, Volcker, and Liikanen rules) ways, putting overall institutional environments in flux and requiring further adaptations.

4.2. Actual Use of Macroprudential Policies

Information on the actual use of macroprudential policies is limited, in part because tools (and/or their use) are not always clearly identified (some, but not most, countries have adopted more explicit frameworks). Nevertheless, the IMF has collected data for approximately 65 countries (see **Lim et al. 2011**; for exact coverage and data definitions, see **Cerutti, Claessens & Laeven 2015**). The seven specific instruments reviewed here are caps on LTV and debt to income (DTI) ratios, limits on CG, limits on foreign lending [foreign currency (FC)], RR, DP, and countercyclical requirements [countercyclical (CTC)]. These measures may be organized along the categories listed in **Table 1**: those aimed at borrowers (caps on LTV and DTI ratios), those aimed at financial institutions' assets (limits on CG and FC) and liabilities (RR), and those aimed at building buffers (DP, CTC).

4.2.1. Usage of policies in general. In the sample collected by the IMF, 42 countries—of which 28 are emerging and developing and 14 developed—implemented at least one instrument once during 2000–2013, whereas 23 never used any (for details, see **Cerutti, Claessens & Laeven 2015**). Most usage is by emerging markets, consistent with their greater needs; greater exposure to external shocks, including from volatile capital flows; and having more imperfect and generally less liberalized financial systems with more market failures. LTV ratios are used most often (**Table 2**). Twenty-four countries used them at least once. Next are DTI ratios (23 countries), limits on FC (15), RR (10), DP (7), limits on CG (6), and CTC (5). Weighted by the length of time and relative to overall use, most often used, again, are LTV ratios, composing 28% of country-year combinations when a policy was used. Following closely behind are DTI ratios (24%), then RR (15%), limits on FC (14%), limits on CG (9%), DP (8%), and finally CTC (2%).

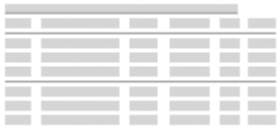

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Table 2
Overall use of macroprudential instruments

4.2.2. Usage of policies by country groupings. Use varies among countries (**Table 2**). In developed countries, LTV and DTI ratios are used the most, whereas other policies are rarely used. Differences become starker considering the duration of their use. Emerging markets use more policies and for longer than do developed countries, and they tend to favor more foreign exchange and liquidity-related policies (FC, RR), perhaps owing to their concerns with large and volatile capital flows and related systemic risks. But they also use CG limits more often, possibly because their systems are less liberalized. Developed countries prefer the demand for credit-related LTV (55%) and DTI (20%) ratios, perhaps out of concern with excessive leverage. The increased usage since the late 1990s by more countries reflects growing recognition of these policies. Overall, immediately before the current financial crisis, emerging markets used these policies four times more intensively than did developed countries, with this ratio declining to 3.3 as developed countries started to use them.

5. RESEARCH AND OTHER EVIDENCE ON EXPERIENCES

The sections below review the literature on the effectiveness of macroprudential policies. Most provide cross-country aggregate analyses that investigate cyclical aspects, notably, within credit and housing markets. Other microcase studies largely focus on cyclical aspects, and some work focuses on cross-sectional systemic risk aspects.

5.1. Aggregate Cross-Sectional Studies Focusing on Procyclicality

Several papers have analyzed the effects of policies on various measures of financial vulnerability and stability (see Eur. Cent. **Bank 2012**; **IMF 2013b–e**, notably 2013e, tables 4 and 5; for reviews, also see **Eur. Cent. Bank 2014**). Using cross-country regressions, **Lim et al. (2011)** document that some policies are effective in reducing the procyclicality of credit and leverage. Specifically, tools such as LTV and DTI ratios, ceilings on credit growth, RR, and DP rules can mitigate procyclicality. The **IMF (2013c)** also investigates in a cross-country context how (changes in) policies affect financial vulnerabilities (CG, house prices, and portfolio capital inflows) and the real economy (output growth and sectoral allocation, i.e., the share of residential investment), while considering whether effects are symmetric between tightening and loosening. Overall, both (time-varying) capital requirements and RRs significantly affect credit growth, and LTV limits and capital requirements (but not RRs) strongly affect house price appreciation rates, and RRs reduce portfolio inflows in emerging markets with floating exchange rates. However, no significant indication of asymmetric responses is found. LTV ratios appear to impact overall output growth, perhaps by reducing construction investment, but no other policies do so.

Crowe et al. (2011) find that policies such as maximum LTV ratios have the best chance of curbing a real estate boom. They also argue that their narrower focus reduces their overall costs. And, measures aimed at strengthening the banking system (such as DP), even when failing to stop a boom, may help to cope with a possible bust. The **IMF (2011a)** finds LTV tools are effective in reducing price shocks and containing feedback between asset prices and credit. **Vandenbussche, Vogel & Detragiache (2012)** find that capital ratio requirements and nonstandard liquidity measures (marginal RRs on foreign funding or linked to credit growth) have helped slow down house price inflation in Central, Eastern, and Southeastern Europe.

Dell'Ariccia et al. (2012) find that macroprudential policies can reduce the incidence of general credit booms and decrease the probability that booms end up badly. Using specific policies, they find credit and interest controls and open foreign exchange position limits are significant in most regressions. Consistent with a focus on vulnerabilities, policies reduce the probability of a boom that ends up in a financial crisis or subsequent economic underperformance, i.e., policies reduce the risk of a bust, while simultaneously reducing how troubles in the financial system affect the rest of the economy.

Using panel, generalized method of moments regressions, **Claessens, Ghosh & Mihet (2013)** investigate how changes in the balance sheets of approximately 2,800 banks in 48 countries over 2000–2010 respond to specific policies. Controlling for endogeneity and country characteristics and macroeconomic policies (by including, for example, countries' lagged GDP growth and interest rates), they find that measures aimed at borrowers—LTV and DTI caps as well as CG and FC limits—are effective in reducing growth in a bank's leverage, asset, and noncore to core liabilities. Even though countercyclical buffers (such as RR and DP) also help mitigate increases in bank leverage and assets, few policies help stop declines in adverse times, consistent with the *ex ante* nature of macroprudential tools and the challenges in adjusting policies in times of stress (e.g., how quickly and far to allow banks to reduce their capital buffers).

Using data from 57 countries spanning more than three decades, **Kuttner & Shim (2013)** investigate whether nine noninterest rate policy tools, including macroprudential, help to stabilize house prices and housing credit. Using conventional panel regressions, they find housing credit growth is significantly affected by changes in the maximum debt service to income ratio, maximum LTV ratios, limits on exposure to the housing sector, and housing-related taxes. But only a limit on the debt service to income ratio significantly affects housing credit growth when the authors use mean group and panel event study methods. In addition, of the policies considered, only a change in housing-related taxes has a discernible impact on house price appreciation.

Zhang & Zoli (2014) review the use of key macroprudential instruments and capital flow measures in 13 Asian economies and 33 other economies since 2000 and study their effects. Their analysis suggests that measures helped curb housing price growth, equity flows, credit growth and bank leverage. Among the measures used, LTV ratio caps, housing tax, and those related to foreign currency were especially effective.

Though suggestive, the above-mentioned studies come with many caveats. Several struggle with identification and endogeneity—e.g., policies are adopted when a cycle is already about to end—and other biases, which can only partially be addressed by econometric techniques (such as generalized method of moments). Almost all these studies face challenges in controlling for other country characteristics, including the quality of microprudential supervision. Few consider both the use of a policy and its intensity (e.g., the presence of an LTV ratio and its level, whether set high or low) or differentiate by cycle phase (e.g., to investigate whether policies are most helpful in mitigating booms or building buffers for busts). Almost all focus on credit and housing developments, but none study risks in capital markets and nonbank financial institutions. No study identifies the specific externalities or market failures that policies are supposed to address. Instead, they primarily analyze manifestations of financial cycles that are of supposed concern, especially asset prices: For example, studies are less clear on how LTV ratios reduce systemic risks, rather than control house prices per se.

Nevertheless, both analytical reasoning and existing evidence suggest some basic directions. Higher sectoral capital requirements, such as a countercyclical capital buffer (CCB) and other capital surcharges, by definition, help to increase resilience by creating additional buffers. Direct measures, such as caps on LTV and DTI ratios, are likely to limit mechanisms that create positive feedback between credit growth and asset price inflation. At the same time, such caps may enhance resilience and reduce the risks of fire-sale dynamics.

5.2. Case and Other Studies on Procyclicality and Cross-Sectional Risks

Country-specific case studies investigating the role of macroprudential policies in reducing financial procyclicality often focus on specific risks or market segments and use micro data. **Jiménez et al. (2012)** find that DP may have been useful in taming credit supply cycles in Spain, even though it did not suffice to stop the boom (see also **Saurina 2009**). More importantly, during bad times, DP helps smooth a downturn, upholding firm credit availability and performance during recessions. Using sectoral data, **Igan & Kang (2011)** find LTV and DTI limits to moderate mortgage credit growth in South Korea. Policies also appear to reduce real estate cycles in Hong Kong (**Wong et al. 2011**).

At times, use of macroeconomic tools is interpreted with a macroprudential perspective. Using detailed, bank-firm matched data, **Dassatti Camors & Peydró (2014)** investigate the effects of a large and unexpected increase in RR in Uruguay in 2008. Their evidence suggests some ambiguous results. On the one hand credit growth declined on aggregate; on the other, riskier firms received more credit. They also document that larger and possibly more systemic banks were less affected. There may thus be trade-offs using RR, because less credit does not necessarily mean fewer system risks (RR may still be beneficial as a macroeconomic tool).

In the United Kingdom, the use of microprudential tools over the period 1998–2007 has been interpreted through a macroprudential perspective. **Aiyar, Calomiris & Wieladek (2014b)** show that bank-specific higher capital requirements dampened lending by banks, with quite strong aggregate effects: An increase in requirements of 1% reduced bank lending by between 5.7% and 7.6%, i.e., a high multiplier (for an early review of the effects that large shocks to banks have on lending and economic activity, see **Bernanke & Lown 1991**; for a review of the limited impact that microprudentially motivated higher capital requirements have on lending, see **Claessens 2015**, **Thakor 2014**). Tighter monetary policy also reduced the supply of lending, but not for large banks.

A case study analyzing house prices for Israel (**IMF 2014a**) shows that macroprudential measures have effects, but only over the 6-month period following adoption. Among the measures, LTV ratios are more effective than are DP and CTC. Although policies reduce transactions to some degree, evidence is limited regarding their contribution to curbing house price inflation. This study of Israel also shows that macroprudential policies create challenges for communication and accountability, even more so when loose monetary policy conditions, proper in their own right, provide opposing forces. Macroprudential policies also have social and political sensitivities, notably when first-time buyers are excluded from housing markets. Other countries, such as Canada and Sweden, have been facing similar challenges: In environments of low interest rates, these countries have experienced strong increases in house prices and household debt, even though they use some macroprudential policies.

To limit systemic liquidity risks in South Korea, a macroprudential stability levy on short-term foreign exchange lending and a core funding ratio were imposed (**Shin 2010**). Analysis (**IMF 2012a**) suggests that these measures contributed to a shift away from short-term foreign exchange funding, mostly driven by shifts of foreign branches toward longer-term funding. Accordingly, as **Bruno & Shin (2014)** show, interbank capital flows to Korea have become less sensitive to global financial conditions compared with those of other Asian countries. **Aregger, Brown & Rossi (2013)** find that higher capital gains taxes in Switzerland (where taxes vary across cantons) exacerbate house prices dynamics, whereas transaction taxes have no impact, making taxes not suitable to prevent excessive house price growth.

Basel III includes a CCB, and the **Basel Committee on Banking Supervision (2010a)** has suggested a methodology for setting it, with bodies such as the **European Systemic Risk Board (2014)** providing further guidance for their regional (European Union) jurisdictions. The CCB is loosely calibrated on the probability and cost of systemic crises (see **Drehmann et al. 2010**). This guidance suggests increasing capital if credit to GDP rises substantially above its trend value, e.g., up to 2.5% of risk-weighted assets if the so-called credit-to-GDP gap rises above 10 percentage points, with room for discretion whether and when to invoke (and an ability to impose a higher CCB). Some countries (the United Kingdom, Switzerland, India, and New Zealand) have opted to implement this CCB.[5] As its incentive effects are likely limited, its value derives mainly from providing higher buffers in bad times. Questions remain though, notably not only on what basis to release the CCB when the cycle turns (some favor adverse developments in asset prices, which are timelier, whereas others prefer those in credit markets, which are less subject to interpretation), but also on how to adapt the CCB when credit is a small part of overall financial intermediation (as in the United States).

In terms of reducing systemic risk of a cross-sectional nature, the **Basel Committee on Banking Supervision (2013)** has agreed on a methodology for the systemic capital surcharges for both global and domestic systemically important banks and determined (and published) the individual surcharges (from 1% up to 3.5%) for the 30 global SIFIs identified (**Financ. Stab. Board 2014a**). Some individual countries, such as Austria, Denmark, Singapore, and Sweden, have gone beyond the Basel III standards and instituted higher capital requirements for their large domestic banks, and a number of other countries plan to do so as well. The United States has also adopted a more stringent leverage requirement for large banks, whereas Switzerland has additional contingent capital and leverage requirements for its large institutions. No studies exist, however, on the impact and effectiveness of these measures or of the CCB.

Otherwise, work has focused primarily on the identification and measurement of systemic risks due to contagion and other spillovers in interbank and other financial markets (for reviews of tools for financial system monitoring, applied largely to the United States, see **Bisias et al. 2012**; **Adrian, Covitz & Lang 2013**; for a more general review, see **Arsov et al. 2013**). Now, many central banks, supervisory agencies, and international agencies more closely supervise their large financial institutions, including insurance corporations (as the “too big to fail” problem is still prevalent) (see also **IMF 2014b**; **Laeven, Ratnovski & Tong 2014**). Many also conduct (regular) stress tests, which, inter alia, help to identify those institutions more likely to cause systemic distress.[6] Other relevant efforts under way include new regulations for shadow banking (**Adrian & Ashcraft 2012**) and financial infrastructure reforms.

So far, however, these exercises are aimed mainly at supervisory actions (e.g., asking for more capital or winding down of weak institutions) or institutional and structural changes (e.g., greater use of central clearing counterparties). Yet, they may also be linked to the use and intensity of macroprudential tools. Network and interconnection models as well as other cross-sectional tools, for example, could help with the design and calibration of tools or infrastructures. So far, however, mapping between risks and tools (e.g., how to map risk of contagion into preventive measures) seems not to be clear enough for policy applications.

Nevertheless, because these country case and other studies are better at identifying specific channels, they present advancements over cross-country analyses. At the same time, they come with the caveat that they do not control for, or allow exploration of, the role of different country's circumstances and conditions. Being focused on one segment of the financial system, many often do not analyze circumventions and risk transfers to other, possibly less regulated, parts. An ideal study analyzing comprehensive micro data for many countries has so far been largely elusive.

5.3. Costs and Trade-Offs

By constraining borrowing and, hence, expenditures in one or more sectors of the economy, macroprudential policies affect overall output. Conceptually, the transmission of macroprudential policies to financial and real variables may vary across tools (for a model assessing the costs and benefits of various policies, see **Kashyap, Berner & Goodhart 2011**). Obvious examples include CTC and RR that may affect overall lending and output and LTV limits that have more sectoral impacts. Policies can in principle also affect the overall price-setting process (i.e., by making the allocation of resources across sectors less flexible). These effects may differ not just by tool used, but also by the stage of a country's financial or economic cycles.

Actual quantitative effects of policies on the real economy, however, are not well-known, in large part owing to a lack of data and experiences. Some papers nevertheless try to assess these impacts. Empirical (though preliminary) analysis finds that short-run effects on overall output are small, even for broad-based tools, such as capital and liquidity requirements (**IMF 2013c**; for analysis of the structural and transitional costs and benefits of higher capital adequacy requirements, see **Basel Comm. Bank. Superv. 2010b**; for analysis of the lower risks of systemic crises against foregone growth due to higher financial intermediation costs, see **Financ. Stab. Board, Basel Comm. Bank. Superv. 2010**). Moreover, appropriate variations in monetary policy (unless it is constrained) may counter some real costs. But these findings remain very tentative, and work on the relative strength of the effects across tools is even more limited (see **Comm. Glob. Financ. Syst. 2012**).

Importantly, as with other risk-based policies (e.g., monetary policy, which takes actions under uncertainty), macroprudential policies must weigh Type I and Type II errors. Analytical frameworks for assessing associated costs and benefits (as laid out in **De Nicolò, Gamba & Lucchetta 2012**; **IMF 2012b**; **Arregui et al. 2013a**,**b**; **Blancher et al. 2013**), though sometimes basic (e.g., **Elliott 2011**), may help to assess the trade-offs of policies in terms of specific parameters (to be estimated or judged)—such as the probability of a crisis, loss given a crisis, and the cost of a policy decision—and thereby offer some guidance.

6. BROADER LESSONS AND REMAINING ISSUES FOR RESEARCH AND POLICY MAKING

The recent crisis has led to a reexamination of policies for macroeconomic and financial stability. Part of the thinking that has evolved involves the adoption of a macroprudential approach to mitigate boom-bust patterns and systemic risks in financial markets. Many countries, developed and emerging, have accepted this new paradigm. Its objectives, conceptual foundations, and exact features, however, have not been fully determined. I highlight some major knowledge gaps and where practices at times are confused.

On the conceptual side, what the debate, and some of the literature, does not always recognize is that the correction of externalities needs to be seen as an intermediate target. Only by adopting policies that control or reduce externalities can the market failures that lead to systemic risk be mitigated. Ideally, a specific tool would be developed for each externality, though all tools need not differ by externality and can complement each other: Capital (surcharges), for example, may be important in reducing several externalities. Regardless, a start would be a clear recognition of the causes for systemic risk. Here much more analytical work on specific externalities arising in financial intermediation is needed. Otherwise, macroprudential policies may be used for the general management of business and financial cycles. This can introduce distortions adversely affecting resource allocation, undermine transparency and accountability, and (further) expose regulators to political pressures.

With actual experiences still limited, evidence on the effectiveness of specific tools is only slowly accumulating and comes with many (economic and econometric) caveats, making it difficult to determine which policies to use and when to tighten or loosen them. Furthermore, although addressing one distortion may reduce some manifestations of risks, it can also worsen overall financial stability. In addition, tools may not be able to reach some activities that lead to systemic risks. Tighter regulations also create stronger incentives for circumvention, which runs the risk of having vulnerabilities build up outside of the regulatory perimeter and of policymakers' sight. Moreover, systemic risk considerations may impede the optimal

deployment of instruments. Cooperation and coordination with domestic microprudential supervisory agencies and international oversight committees may be legally or institutionally difficult. Additional data are being collected: For example, the IMF currently collects data on financial soundness indicators from 98 regular reporters (**http://fsi.imf.org** (http://fsi.imf.org)), and the Bank for International Settlements collects SIFI data. Nevertheless, deficiencies in quantity and quality of data can hinder analyses and calibrations (**Heath 2013**; **Brunnermeier & Krishnamurthy 2014**; **Cerutti, Claessens & McGuire 2014**).

Many of these factors vary across countries. Developing countries, for example, are likely to face more institutional and data hurdles as well as greater risks of discretionary policy implementations. Overall, the best approaches given specific country conditions and characteristics remain open questions (see **Acharya 2013**, **Shin 2013**).

Besides measuring risks and calibrating tools, additional challenges include political economy pressures and risks, which relate in part to the limited knowledge on the effectiveness, costs, and distortions of tools as well as the issues associated with calibrations, adaptations, the perimeter (e.g., shadow banking), interactions among policies, conflicts of interests with other goals, and (international) coordination. As a result, rules-based policies remain a distant goal. Thus, institutional design should allow for sufficient analytical capacity and lessons to be learned. As the recurrence of crises shows, however, even with more knowledge (as exists on, say, microprudential policies), robust policies aimed at financial stability are not easy to implement. As with other attempts, macroprudential policies may fall short.

This situation makes the need for an institutional design robust to both *ex ante* pressures and *ex post* risks all the more important. Design involves determining the location of a macroprudential policy function as well as consideration of different models—centralized, inside or outside a central bank, or using a committee structure—each of which has various benefits and risks (see **Nier et al. 2011**). Regardless of model, however, transparency and accountability in the conduct of macroprudential policy as well as operational independence are necessary. Although research has addressed the benefits of independence in monetary policy function and identified some modalities for achieving it, sound governance arrangements for a macroprudential policy function (as well as for microprudential regulation and supervision) often have yet to be adapted (see also **IMF 2013a**).

All in all, given these and other limits on current knowledge, one should proceed with modesty. A Bayesian updating approach may be attractive: Not only does such an approach use tools whose impacts are well known and incorporates other tools only as one learns more, but it also reduces some of the political economy risks (see also **Calomiris 2013**). Institutional designs also have to proceed with caution. A more gradual approach does not mean progress is not made. Policy prioritization would help avoid too much discretion and too little transparency and accountability. This path could still achieve a key and the possible main objective of a new paradigm: a view of system-wide financial stability accepted in all aspects of policy making, including microprudential, monetary, fiscal, and competition. This needed change in mind-set should help with better overall policy making and supervision. As more data and research become available, it will be possible to improve further the motivations, calibrations, adaptations, and (institutional) designs of macroprudential policies and to adopt specific ones.

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