Is There Macroprudential Policy without International Cooperation?

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In this paper we address three questions: (1) Does global finance require a common prudential standard? (2) Does global finance require international cooperation in overseeing the system's safety and soundness? And (3), does global finance require notification, cooperation, and coordination of dynamic regulatory policy adjustments? Our answer to the first question is that global finance does require a common prudential standard, defined as a level of required resilience, applied appropriately to all parts of the financial system. Without adoption of a common resilience standard, the international financial system will fragment and balkanize. In addressing the second question, we explain why shared, collective analysis is necessary to identify and mitigate stability-threatening shortfalls against that standard for resilience. This will be possible only with increased public and private transparency. Finally, we examine the daunting, but essential, task of implementing a dynamic prudential framework that maintains the system's resilience even as its structure and risk-taking behaviors change. The policy implications of our analysis focus on the need for global agreement, implementation monitoring, information sharing, and sometimes, given damaging spillovers, even collective regulatory responses to emerging threats. Institutions will need to be adapted to make all this feasible.

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1. Introduction

The world of economic and financial policymaking is abuzz with discussions on financial stability, macroprudential policy, their siblings, and their cousins. While we haven't counted, our impression is that there are at least as many research papers and conferences in this area as there are on monetary policy. This paper is designed to open up what we see as a neglected aspect of discussions around building an effective financial stability policy framework, one not yet addressed by the many theoretical papers enriching general equilibrium analysis with financial frictions or the empirical work developing early warning signals of impending systemic instability. We examine whether financial stability policy regimes can be designed and implemented by nations acting alone.

In monetary economics, questions of international cooperation and coordination have long had a prominent place. Broadly speaking, diagnoses and prescriptions have turned on the relative merits of floating versus fixed exchange rates in different circumstances. And at a practical level, central bankers have been meeting to discuss each other's monetary choices for the better part of a century. To date, however, so far as we know, there has been relatively little discussion of how domestic "macroprudential" regimes for adjusting core regulatory policies should fit together, or of how to cope if a key jurisdiction lacks such a regime. Our purpose with this paper is to promote a discussion of the international dimension of the macroprudential reform program.

Our starting point is the assumption that international finance matters. It is widely, but not universally, agreed that cross-border trade of goods and services has brought great benefits to a large number of people across the world. Trade supports middle-class living standards in the advanced economies and has pulled literally hundreds of millions of people out of abject poverty in the emerging market world. But this real side of globalization relies on financial intermediaries to fund the trading, make the payments, and insure the risks that cross borders. The recent crisis showed how problems on and off intermediaries' balance sheets can have very large costs both within and across national borders. The initial phase of reform, following the worst of the crisis, accordingly combined national and international measures to make financial intermediaries stronger. As time has passed, some countries have been deepening the macroprudential capabilities of their national authorities. However, they have done this without an international framework or, perhaps, even a consensus for the design and operation of such regimes. As a consequence, it remains unclear whether there needs to be a united, international endeavor. Hence, we ask, can there be effective macroprudential policy without international cooperation?

In tackling this question, we believe that it is necessary to step back and ask what the goals and components of a financial stability regime should be in the round. That helps both to warrant the existing cooperation on minimum standards and to set the stage for the discussion of why more cooperation is needed on surveillance of risks and of the more recent macroprudential turn. We seek, therefore, to answer the following three questions:

1. Does global finance require a common prudential standard?
2. Does global finance require international cooperation in overseeing the system's safety and soundness?
3. Does global finance require notification, cooperation, and coordination of dynamic regulatory policy adjustments?

The remainder of this paper is organized in seven parts. The next section presents some facts that motivate the analysis. Specifically, we discuss how, over the past quarter-century, finance has become global. Then, in the third section, we define the systemic resilience standard that we see as forming the basis for a financial stability policy framework. It is important to stress that our focus is on resilience, which is inherently a structural concept. Section 4 explains how, in principle, a resilience standard could be operationalized. Those two sections abstract from a world of nation states and regional groupings. Their analysis would apply to individual states under financial autarky or, alternatively, to a world without borders. The subsequent three sections address our three questions about the need for international cooperation and regimes. In Section 5, we discuss why no country or jurisdiction can maintain financial stability on its own—it is a problem of the commons that must be tackled worldwide in a joint and cooperative manner. In Section 6, we turn to a discussion of prudential supervision and oversight of the system's resilience—what it is and how it works. Section 7 is about macroprudential policy: why there is no escaping dynamic adjustment and why this will not be effective without international cooperation. We elaborate here on how the objective remains systemic resilience. And, while maintaining a given level of resilience may require changing regulatory settings over time, given our current level of understanding, we do not see a role for such tools in trying to fine-tune credit cycles or manage asset price booms. The final section concludes with our policy recommendations, centered on the need for institutional evolution and reform.

2. A Few Facts

Financial history is replete with examples of how stresses in one country's financial system quickly spread, sometimes catastrophically, to others. Two recent

examples serve to prove the point. After determining that its foreign exchange exposure exceeded three times its capital, on June 26, 1974, German supervisors withdrew the banking license of Germany's 35th largest bank: Bankhaus Herstatt. That day, a number of banks around the world had followed then-standard practice and transferred deutsche marks to Herstatt in Frankfurt with the expectation of receiving U.S. dollars in New York later in the day. Because of the six-hour time difference, Herstatt ceased operation between the time that it received payments and the time that it was scheduled to make them. The result was chaos in the international banking system.[1]

Our second example is more recent: the exposure in 2007–09 of European banks to the U.S. dollar assets, especially securities backed by subprime mortgages. Even though current account imbalances between Europe and the United States were relatively small, over the decade prior to the crisis, continental European banks managed to acquire substantial quantities of mortgage-backed and U.S. Treasury securities. McGuire and von Peter (2009) estimate that by 2007 this had created short dollar positions in excess of US$1 trillion. When interbank funding markets started to dry up, these institutions were left without sources to finance their dollar assets. And, since these banks were outside the United States, they did not have direct access to the Federal Reserve's (U.S. dollar) lending facility. This led, in December 2007, to the creation of U.S. dollar central bank liquidity swaps, where the Federal Reserve in essence lent dollars to a set of foreign central banks, who then on-lent them to their banks. At their peak in December 2008, the Fed lent US$583 billion to foreign central banks—most of this to Europe.[2]

In the case of Herstatt, the realization of the importance of cross-border spillovers in the post–Bretton Woods international monetary system led to the creation of arrangements for international cooperation that have now been in place for the better part of 40 years. This system delivered standards and institutions that have made payments systems robust—we are thinking of the introduction of real-time gross settlement systems, the creation of the CLS bank, and the convergence of international banking standards on capital and liquidity regulation in what has come to be known as "Basel III."[3] More recently, the 2007–09 financial crisis led to the recognition that financial spillovers go well beyond linkages created by regulated banks. Among other things, this has given us the Financial Stability Board, which is striving to extend cooperation and coordination in banking supervision to the global financial system as a whole.[4]

To appreciate the extent to which the financial system is global, it is worth having a brief look at some data. First, as Obstfeld and Taylor (2003) note, over the past 150 years capital market openness has waxed and waned. Following

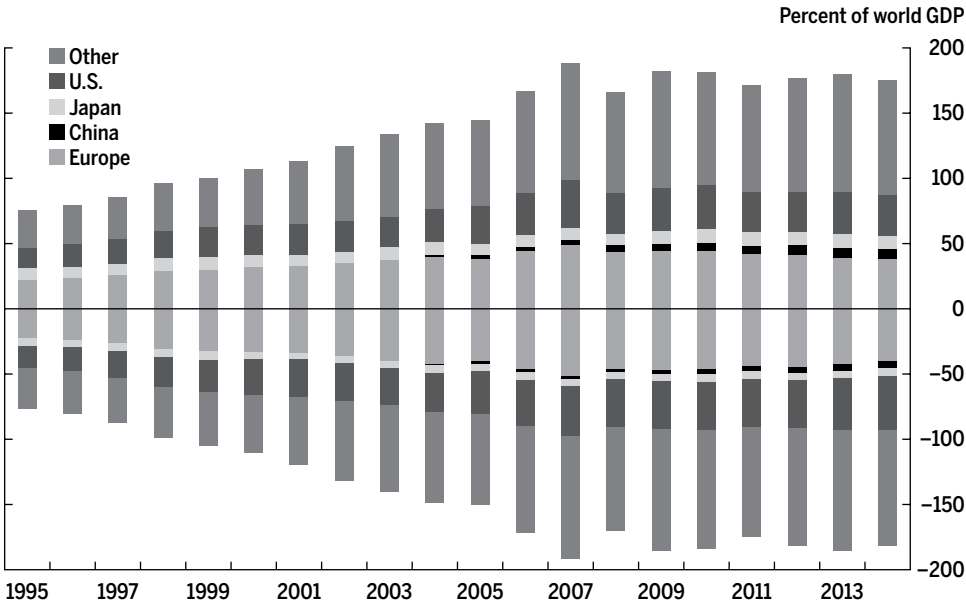
the Bretton Woods era, which was characterized by fairly strict capital controls, finance has gradually become more open and more global. It is fair to say that today capital flows across borders more freely than any time in the modern era, including the period of the pre–World War I gold standard. And, if anything, global financial integration has accelerated in the past 20 years.

Some numbers help to demonstrate this. Figure 1 traces the recent evolution of international investment positions for 127 countries as a percentage of world gross domestic product (GDP). From 1995 to 2014, gross international asset positions climbed steadily from 75 percent to 175 percent of world GDP. In nominal terms, that's an increase from $23.4 trillion to $135.7 trillion (at market exchange rates).

The extent of global integration allows countries to be sizable net creditors or debtors to the rest of the world. The chart includes both assets (which are positive) and liabilities (which are negative), so their sum represents the net position of a country or region with respect to the rest of the world. Some of them are large. For example, at the end of 2014, the United States was the world's largest net debtor, owing to the tune of 9 percent of global GDP, or about $7.0 trillion. On the other side, China and Japan are the largest net creditors,

FIGURE 1

Gross Cross-Border Asset and Liability Positions



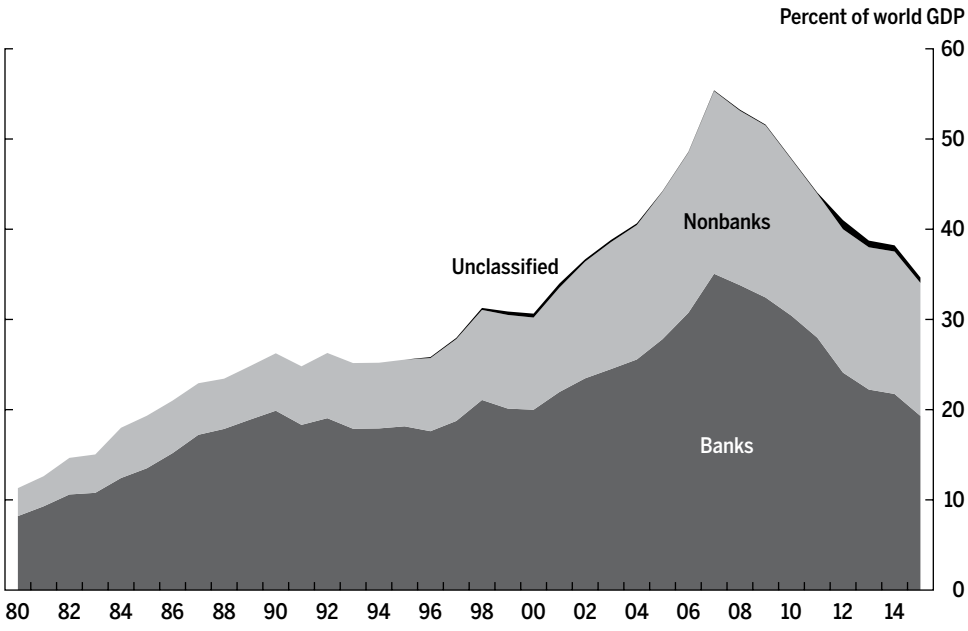
Sources: International Monetary Fund (IMF) International Financial Statistics and *World Economic Outlook*; and Bank for International Settlements (BIS).

with the world owing them a total of $5.1 trillion. While people differ in their conclusions about the desirability of this configuration of net positions, it is clear that if the structure of the financial system were to materially change, it might no longer be possible.

The explosion in cross-border asset holdings has been accompanied by a surge in cross-border bank claims. Figure 2 reports outstanding cross-border bank claims from 1980 to 2015. The level rose from 11 percent of global GDP to a peak of 55 percent on the eve of the financial crisis, and stands at just under 40 percent today.

This growth in cross-border financial activity has been supported by a set of enormous and very complex institutions and markets. Table 1 reports summary information for the 30 financial institutions that appear on the 2014 G-20 Financial Stability Board's list of global systemically important banks (G-SIBs).[5] The biggest of these, the Industrial and Commercial Bank of China and JP Morgan Chase, have assets in excess of $3 trillion. A total of 19 banks have assets in excess of $1 trillion—a level that exceeds the GDP of all but 15 countries in the world. And, while these banks have high reported regulatory capital ratios,

FIGURE 2
Cross-Border Outstanding Banking Claims



Sources: BIS Locational Banking Statistics, Table A1.1 and IMF *World Economic Outlook*.
Note: Data are annual.

TABLE 1
The Largest Global Banks

Bank Name (home jurisdiction)	Basel III Risk-Based Tier 1 Capital Ratio	Total Assets* (US$ bn)	Unweighted Leverage Ratio*	Assets as a Percentage of GDP	Estimated Number of Countries of Operation
Industrial & Commercial Bank of China (China)	12.40	3,615	6.97	34.5%	60
JP Morgan Chase (US)	12.81	3,339	5.56	18.6%	100
Bank of America (US)	12.52	2,823	5.42	15.7%	40
Agricultural Bank of China Limited (China)	10.02	2,816	5.84	26.9%	13
Bank of China Limited (China)	11.62	2,629	7.56	25.1%	27
HSBC (UK)	13.36	2,572	6.70	88.4%	80
Citigroup (US)	13.80	2,420	6.05	13.5%	140
BNP Paribas (France)	11.74	2,379	3.49	80.5%	87
Mitsubishi UFJ FG (Japan)	12.41	2,328	5.54	47.2%	40
Crédit Agricole Group (France)	14.82	1,895	4.32	64.2%	60
Deutsche Bank (Germany)	14.93	1,885	3.10	47.4%	70
Barclays (UK)	14.03	1,880	4.47	64.6%	50
Wells Fargo (US)	12.28	1,786	8.29	10.0%	35
Goldman Sachs (US)	13.54	1,633	4.86	9.1%	30
Mizuho FG (Japan)	11.45	1,567	4.54	31.8%	30
Sumitomo Mitsui FG (Japan)	13.32	1,530	5.36	31.0%	40
Royal Bank of Scotland (UK)	14.33	1,516	5.55	52.1%	30
Société Générale (France)	12.71	1,512	3.41	51.2%	76
Banco Santander (Spain)	12.38	1,490	3.37	103.4%	24
Morgan Stanley (US)	15.75	1,305	4.55	7.3%	24
BPCE Group (France)	12.78	1,301	4.44	44.0%	37
UBS (Switzerland)	19.14	1,015	3.96	143.7%	50
UniCredit (Italy)	11.40	974	3.83	43.9%	17
ING Bank (Netherlands)	14.25	962	5.14	112.2%	40
Credit Suisse (Switzerland)	16.70	939	3.45	133.0%	56
Nordea Bank (Sweden)	17.95	759	3.90	127.1%	19
BBVA (Spain)	12.31	744	4.22	51.6%	31
Standard Chartered (UK)	12.97	695	6.28	23.9%	70
Bank of New York Mellon (US)	12.45	407	4.26	2.3%	35
State Street (US)	14.17	300	4.69	1.7%	29

Sources: Federal Deposit Insurance Corporation (FDIC), IMF, bank corporate websites, and Wikipedia.

*All numbers are based on International Financial Reporting Standards (IFRS), except for the three Japanese banks, which use Japanese Generally Accepted Accounting Principles (GAAP), and Credit Suisse, which uses U.S. GAAP.

Notes: Number of countries of operation are approximate and include branches, subsidiaries, and representative offices. Total assets and the leverage ratio are for end-June 2015. IFRS estimates are from FDIC (2015). Ratio to GDP computed used is the average of the 2014 and 2015 IMF *World Economic Outlook* estimates.

ranging from 10 percent for the Agricultural Bank of China to 19 percent for UBS, their unweighted leverage ratios are as low as 3.10 (for Deutsche Bank).[6]

For our purposes, it is important to note two things. First, regardless of whether they have operating subsidiaries, branches, or simply representative offices in a particular jurisdiction, it is almost surely the case that the vast

majority of these banks do business with either financial institutions or non-financial businesses and, in some cases, households in a large number of countries.[7] The numbers range from a low of 13 countries for the Chinese giant the Agricultural Bank of China Limited to a high of 140 for Citigroup. The rest of the banks in Table 1 are somewhere in between, with the median operating in 40 countries. To put these numbers in perspective, the International Monetary Fund currently has some 188 member countries, the United Nations has 193, and FIFA (Fédération Internationale de Football Association) has 209. So Citigroup is operating in nearly three-quarters of the recognized jurisdictions in the world, and the median bank is in more than one-fifth.

Second, these banks are often very large relative to the size of their home country economies. UBS and Credit Suisse are at the top of the range, with balance sheets of well over 100 percent of Swiss GDP. The median bank has assets that are more than 40 percent of GDP. The American banks, while extremely large in absolute terms, turn out to be small relative to the size of the U.S. economy, but their foreign operations are likely very big relative to the economy of some host countries. And, taken as a group, the total assets of these 30 institutions sum to fully two-thirds of current global GDP measured at market exchange rates.

Global finance means not only cross-border asset ownership, lending, and institutions; it also means global markets. While it is difficult to get a clear fix on the extent to which financial markets are globalized, what we can say is that large trading platforms are now populated by actors from all over the world who trade in lots of currencies. The Chicago-based CME Group, the biggest trading platform in the world today, clears on the order of 3 billion trades annually with a notional value of $1,000 trillion (that's $1 quadrillion) in a combination of cash, futures, and options in interest rates, equity indexes, foreign exchange, energy, agricultural commodities, metals, weather, and real estate. And, they list products in 18 currencies and have 72 clearing members from all over the world.

LCH.Clearnet in London is also very large, with annual clearing of more than nearly 1 billion trades in 17 currencies with a notional value exceeding €70 trillion for roughly 150 members housed in nearly two dozen countries. And the Intercontinental Exchange (ICE) reports futures and options volume in excess of 1 billion contracts in 2014.

Our point is that the 21st century finance system is global. Modern financial institutions operate across borders. Modern financial markets are international. Funds in more than a dozen currencies move across borders continuously. We believe, but do not defend here, that this system brings substantial benefits that the authorities should work to support and protect. And even if these benefits

were to be modest, the internationalization of the system is a concrete fact. It would take a massive act of sustained political will to unravel this complex web of relationships, and arguably an even larger effort to manage it smoothly. This motivates our examination of the rules of the game for and oversight of global finance.

3. The Core of a Regime for Financial Stability: A Standard for Resilience

The problem of financial instability confronts and afflicts countries irrespective of whether the world is globalized. So, in this section and the next, we step back and contemplate how a regime for stability should be constructed when state boundaries and questions of international cooperation or coordination are ignored.

This endeavor often meets with comments along the lines of "we know what financial *instability* looks like but, unlike price stability, we don't know even how to define, let alone measure, financial *stability*." Were this true, it would be a major problem, leaving the authorities either relying on mopping up after the event—a strategy that was tried and abjectly failed in the run-up to the 2007 U.S. subprime crisis—or chasing after each and every potential vulnerability or bout of exuberance in markets just in case they pose a risk to stability.

We believe that the core of a regime for stability should be a standard for resilience. By this we mean that the financial system as a whole should be "sufficiently" resilient to ensure that the core services of payments, credit supply, and risk transfer and pooling can be sustained in the face of large shocks. Obviously, there is a question of how big a shock the system should be able to withstand. Among other things, that depends on the force with which first-round losses are propagated through the system.

The appropriate degree of required resilience also depends on whether there are any long-run tradeoffs between a strong financial system and other things we care about. On the one hand, a very big financial crisis can deplete the economy's productive capacity and, possibly, put it on a persistently lower growth path. On the other hand, some of the risk-taking behavior that can lead to crises might increase the availability of funds to projects that raise welfare over the long run.[8]

For these reasons, the choice of how resilient the system should be must have a democratic pedigree. Public outrage about the most recent crisis suggests that it would be a mistake to tolerate a financial collapse more frequently than every 70 years or so, which—given life expectancy today—could mean that someone could expect to be hit twice, once as a young wage earner and

again as a pensioner.[9] But do we want the system to be so safe that crises come every thousand years? Or every 5 million years?

We expand on this idea in the next section. Another question is to whom the standard of resilience should apply. Traditionally, the answer has been, above all to banks but also to insurers and major securities dealers. We think that this misses something profound about the nature of both finance and the financial stability problem.

It is typical to think of "financial stability" as a public good, like price stability and national defense; a good available to all and which no one can deplete or undermine. But following Tucker (2015), we think of financial stability as a problem of the commons. That is, it is analogous to grazing on public lands or fishing in public waters. Individuals have the incentive to do things that degrade the environment for everyone else.

To be specific, we think of financial stability as based on a common resource: the resilience of the system that is non-excludable but rivalrous. That is, if the financial system is stable, no one can be kept from basking in the glow of its stability. But individuals can act in ways that reduce the resilience of the system as a whole. Just as a farmer has the incentive to overgraze his or her cows, letting them eat until the public green becomes bare, leading to the starvation of others' herds and eventually their own, an actor in the financial system has an incentive to behave in ways that deplete its resilience and so put others at risk.

Individual institutions can deplete the resilience of the financial system outside of the public view through their hidden actions. For example, they can issue debt so that, given the inherent opacity of their portfolios, they are in fact more risky than they outwardly appear.[10] And, even if regulated, they can undertake business that makes them more risky than is permitted by at least the spirit of the rules. If they lie outside the regulatory perimeter, institutions and structures can dress up their provision of core financial services in ways that would be subject to much stricter standards were they within the perimeter. In other words, the problem of regulatory arbitrage—avoiding and evading rules designed to keep the providers of core services safe and sound—should be central to the design of a regime for stability.

For many common-resource problems, the costs are visited on the perpetrators themselves and only upon them. In a village that doesn't trade with outsiders, the overuse of common grazing land hurts only the villagers. But the financial stability commons problem has negative externalities for the end users of financial services and, thus, for the economy as a whole.[11] Further, unless the participants in financial markets are few and relatively homogenous, we cannot rely on the kind of cooperative solutions pursued in other areas.[12]

Once we realize that financial stability is a common, but rivalrous, resource that can be depleted by individual actions, it becomes clear that systemic risk is a consequence of actions that are more pervasive than those created by the explicit government safety net. That is, the lender of last resort to de jure banks has been provided by central banks since the 19th century, and the deposit insurance that governments have supplied since the 1930s surely make matters worse. But they are not the ultimate source of the problem.

Our analysis implies that a financial stability policy regime has the following three elements:

1. a standard for resilience that is applied to all parts of the system, taking account of the threats that they can pose to the delivery of core services in the face of big shocks
2. surveillance of firms, funds, and structures, as well as of the system as a whole, to identify and rectify hidden actions that undermine resilience
3. dynamic adjustment of core regulatory parameters to maintain the desired degree of resilience in the face of material changes in risk-taking behavior or of changes in the structure of the system that would make the propagation shocks more virulent

In the remainder of this paper, we examine each of these in turn. The basics of the first element, how to operationalize a standard for resilience, follows in the next section. We then proceed in Section 5 to explain why the standard must be international. But before proceeding, it is important to say something about how the abstract idea of a "standard for resilience" would be manifest in the world of public policy.

In practice, the Basel Capital Accord for banks and the accompanying capital add-on for systemically important financial institutions (SIFIs) manifests an underlying standard for resilience. It has not been explained or debated what probability of crisis it leaves open, and to do so would require explicit assumptions about the structure of the system and how shocks are propagated across it. Our point is that the same standard should be applied to other sectors, even though the relevant regulatory requirement might be quite different in kind or might be calibrated quite differently even if similar in kind.

Examples of policies to help preserve stability by building resilience or enabling market discipline of resilience include limits on asset concentrations and enhanced transparency requirements. We do not explore these here, but we want to highlight that a universal "prudential" standard of resilience almost surely would not entail universal application of bank-style regulation.[13]

The second component of the framework relates to the conception and delivery of supervision, very broadly defined. This is the topic of Section 6. The third

element, the subject of Section 7, is about what, following Tucker (2015), we call macroprudential policy.[14]

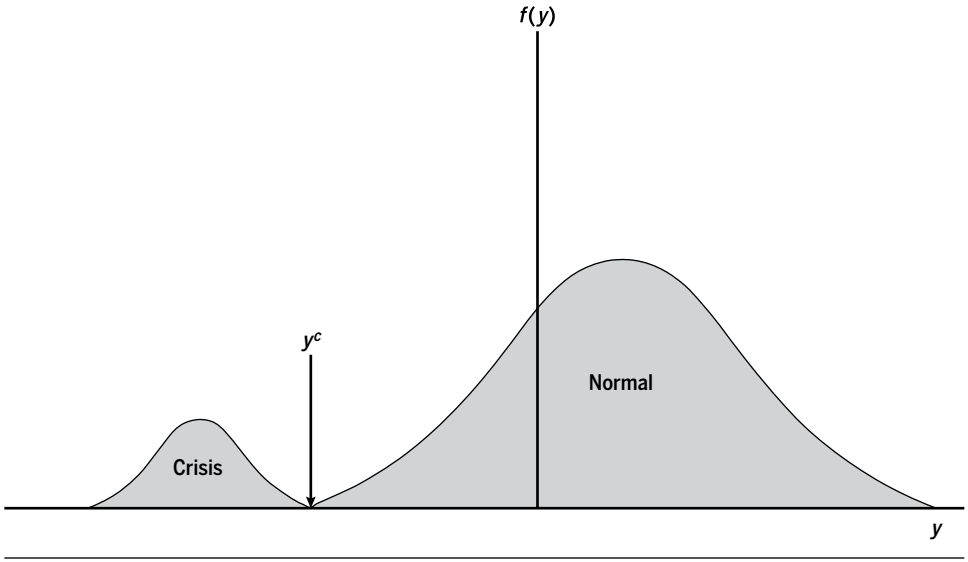
4. Modeling Systemic Resilience

Specifying a resilience standard is ultimately a quantitative exercise. It requires modeling and measurement that forms the basis for a financial stability policy framework. An early step in this process is to create a measure of resilience analogous to the consumer price index. So, in the same way that inflation-targeting central banks care about both the level of and change in prices, the financial stability policy authority would care about the level of and change in the index of systemic resilience.

To understand how we might construct such an index in practice, start with a simple representation of the distribution of possible outcomes for the output gap, y, in Figure 3. The density for y is given by $f(y)$, and it has two modes, one coming from a normal business cycle regime (the one on the right of the figure) and one from a crisis regime (shown on the left of the figure). The two regimes are separated by a threshold level of y, y^c. We have drawn the density in an intentionally stylized manner to emphasize the almost discrete nature of a crisis.[15]

Standard welfare analysis suggests that policymakers should be concerned about, among other things, the volatility of the output gap.[16] This leads naturally

FIGURE 3
Probability of Output Gap Outcomes



to a definition of resilience that has two parts. The first is the probability of a crisis and the second is the severity of the crisis, conditional on it occurring. We label the probability as $p = \Pr(y < y^c)$ and the severity as $s = E(y|y < y^c)$. Assuming that we can construct the density $f(y)$, these are both well defined.

Analogous to inflation targeting, where legitimacy of the target level requires a mandate from elected representatives, here we would expect the Congress or Parliament to determine (or at least endorse) the maximum level of p and s that society is willing to tolerate. This pair, call it (p^*, s^*), is the target for the financial stability policy authority. And this is what we mean by a *resilience standard*.

One way of stating the task of the policymaker is to keep $(p,s) < (p^*, s^*)$. Doing this requires modeling the evolution of (p,s) in a manner that admits some form of control. So, in the same way that we believe monetary policymakers can change interest rates in an effort to keep inflation close to target (at least in normal times), there must be some set of instruments that allow policymakers to influence (p,s)—these would naturally include what are now commonly referred to as "macroprudential" tools.[17]

To see how we might make such a policy framework implementable, turning the inherently unobservable (p,s) into something that can be monitored, recall that macroeconomists think of economic systems in terms of impulses or shocks that are amplified and propagated by the structure of the economic and financial system. We can think of $f(y)$, and hence (p,s), as arising from this combination of shocks and structure.

There are a variety of ways to formalize this construction. The simplest is to consider a vector autoregressive representation of the economy in which the lag polynomials and the variance of the shocks switch between states, normal and crisis. The transition between states, in turn, depends on conditions in the financial system. For the purposes of exposition, we label the moments of the density of the shocks hitting the economy as μ, and the vector of economic and financial quantities that both influence the state transition and the amplification potential of the propagation mechanism as Z. In very abstract terms, we can then think of (p,s) as a function of (μ, Z), $(p,s) = g(\mu Z)$.

It is worth pausing to provide a few examples of the sorts of things that we have in mind. Focusing on the economic structure, we can think of two types of things that would change the amount that a particular shock is amplified and propagated through the system. The first is the reaction of agents in the economy to a shock. While a number of things will affect this, the biggest is likely to be the structure of balance sheets. Several decades of studying the monetary policy transmission mechanism, combined with more recent work on financial

crises, leads to the conclusion that debt matters—household net worth, firm borrowing, and government indebtedness all have an influence. And, roughly speaking, a given sized negative shock will have a bigger negative impact the more debt there is in the economy.

As for the structure of the system itself, innovations in the financial instruments, markets, and institutions can create changes that affect crisis probability and severity for a given size of shock. The introduction of new, complex derivatives; the creation of securities funds with banklike characteristics (bond funds, exchange-traded funds, and the like); and changes in trading technologies and platforms are just a few examples.

While we are not being very precise in a mathematical sense, we conjecture that for a large class of models the function g can be inverted, making it possible to compute $Z^* = g^{-1}(p^*, s^*; \mu)$. That is, the target crisis probability/severity combination can be turned into a target that is a function of the moments of the density of the shocks (among other things). Since Z is observable, the authorities would then be required to announce the current level of Z^* as a part of the communication regime in the financial stability policy framework. And their policy objective would be to keep $Z < Z^*$. If our conjecture is correct, then this represents an implementable resilience standard.[18]

To see what this might mean, consider the relatively straightforward case of an economy where all intermediation is through a banking system. As a consequence of limited liability and government guarantees (both explicit and implicit), banks engage in too much credit transformation, too much liquidity transformation, and too much maturity transformation. That is, they hold assets that are too risky, too illiquid, and too long term relative to what would be socially optimal. And, because of their balance sheet structure, individual institutions are creating financial stability risks. In such a circumstance, the lower a bank's capital, and the more liquid and shorter term its liabilities for a given asset structure, the more likely a given sized shock will create stress and possibly failure. This means that (p,s) are functions of capital adequacy, liquidity, and maturity transformation—what we are calling Z.

Having converted the systemic resilience standard into one that is observable, authorities now require tools that are capable of influencing Z. They will need to understand both qualitatively and quantitatively how it is that their instruments will change the resilience of the system. Again, the specifics will surely be complex, but the more general point is that, as suggested in the previous section, any changes in either the economic and financial structure or the distribution of the shocks will change the probability and severity of crisis for a given policy setting, implying that the policy itself has to be adjusted.

Returning to the simple example of a bank-based financial system, Basel III-style standards are one such tool. That is, risk-weighted capital requirements and the liquidity coverage ratio are designed to influence the riskiness of individual banks and hence the banking system. As we note in the previous section, in a modern financial system, resilience is dependent on much more than just banking. So, this example is clearly simplistic.

In this formulation, minimizing the variance of output can be divided into two tasks. The first is neutralizing small shocks in normal times. This is the role traditionally assigned to monetary policy. The second is to maintain the resilience of the system by minimizing the probability of a transition to the crisis state. This is the role that we are now assigning to the newly constituted financial stability authorities.

Importantly, though, financial stability policy aimed at maintaining systemic resilience is not about managing what has come to be known as the "credit cycle." As we noted, credit can, and likely does, play a role in systemic resilience. But it is the broader objective of lowering the frequency and severity of crises that forms the basis for actions by macroprudential authorities. And, it is easy to imagine that if the financial system were to shift into the crisis state, interest rates would hit the zero bound. Given the inability of conventional monetary policy to further neutralize shocks at that point, the idea is that financial stability policy sets and articulates a standard for resilience, and macroprudential adjustment of regulatory parameters sustain the achievement of that standard as conditions change even at the zero bound. That framework and those tools are needed to keep us from relying entirely on macroeconomic policy to revive the economy following crises.[19]

5. From Local to Global Financial Stability

Having set up a framework for thinking about financial stability policy, we now relax our "one-country" assumption and return to our three questions about whether common standards are needed and about whether cooperation or coordination, or both, are needed in implementing any such standards. To be clear about terminology, we use the term *cooperation* to mean that jurisdictions A and B choose to exchange information and that they make their policy decisions in the light of those exchanges, seeking not to make each other worse off than they would be otherwise. And we use *coordination* to mean that A and B enter into a more or less binding agreement in which each makes policy choices conditional on the choices the other makes.

We now turn to our first question: Is the systemic resilience standard local or global? Can one country or jurisdiction have a standard that is more or less

rigorous than others, with a plurality of standards across the world? Or does the standard have to be set at a comparable level globally?

To understand why we think that a standard has to be global, recall our examples at the beginning of Section 2: the collapse of Bankhaus Herstatt in 1974 and the global dollar shortage in 2008–09. These two cases make it clear that financial stresses cross international borders with impunity. To put the matter into stark perspective, consider two almost trivial additional examples: the states of the United States, and the member states of the European Union (EU).

Given the history of banking panics in the United States, no reasonable person would suggest that the financial stability in Ohio and Pennsylvania can somehow be thought of as distinct from that in California and Oregon.[20] That is, the financial system of the 50 U.S. states rises and falls together. And this has nothing to do with either the safety net, which we mentioned earlier, or interstate banking, which has only been possible since 1994.[21]

Turning to the European Union, the principle of the single market means that a bank with authorization to operate in one country can then provide services in any of the other 27 member states. That is, a bank receiving a charter from authorities in any one national jurisdiction can branch into or provide services in others.

So, in the United States, banking and finance clearly do not stop at state borders. In the EU, they do not stop at national borders. As we pointed out earlier, the largest global banks, operating in dozens of countries, provide a wide array of financial services to households, firms, and governments, some of which can be critical to the host country's economy. The failure of any one of these could be devastating not only for the country where it is based (the home jurisdiction responsible for consolidated supervision of the group) but for other countries as well.

The immediate implication is that financial stability does not stop at the border—any border! In the terminology we established earlier, the common financial stability resource is global. In the same way that a bank inside a country can create financial instability locally, a large institution (or a host of smaller ones) can create instability globally.

This can happen in a number of simple and basic ways. First, cross-border lending can weaken the balance sheets of borrowers in other countries, reducing the resilience of their financial system. Second, a financial institution operating in a large number of countries can get into trouble, creating instability everywhere it operates. Third, a bank can have a broad array of counterparties around the globe, so that when it gets into trouble it impairs the financial systems elsewhere. Fourth, a bank could have very similar exposures and

business lines to banks in other countries, so that when it hits difficulty, customers and counterparties begin to worry about the whole set of them. In all of these cases, real or imagined problems can spread rapidly without concern for national boundaries.

So, if global finance is to be sustained, if we want to avoid fragmentation and nationalization, financial stability is a shared, global concern. With open capital markets, with large cross-border financial flows, and with multinational financial institutions, no country can be safe on its own. The immediate implication is that the financial resilience standard—the probability and severity of a financial crisis—must be shared. And, as a direct consequence, local prudential regimes must adopt a common global standard.

This bring us to the first question we asked in the introduction: Does global finance require a common prudential standard? Our unequivocal answer: Yes.

Once a common international standard is agreed upon and announced for various different parts of the financial system, each national stability authority faces a problem. Will their counterparts faithfully incorporate the agreed policies into their national (or, for example in the EU, regional) regime? Can they credibly commit to implement the globally agreed standard? Or will they deliberately set the local legal or regulatory regime in ways that fall short? It is essential that each party to the international standard has some assurance that there will be fair and faithful implementation everywhere.

But even when there is no uncertainty about whether everyone is adhering to the letter and spirit of the agreed standards, a further risk persists. This brings us to our second question: Does global finance require international cooperation in overseeing the system's safety and soundness?

6. Surveillance and Supervision of System Resilience

Each country's financial stability authority faces the possibility that parts of the financial system both in their own jurisdiction and in others will find ways around the agreed regime. And, as a consequence, the resilience of the domestic and global system will fall short of the common standard.

Our question is what to do about this. More specifically, can supervision of firms, funds, and other financial structures be conducted entirely at the national level, without international cooperation; and if cooperation is warranted, what form should it take? Concretely, does the existing system of "colleges" of home and host supervisors of individual firms, as currently conceived, deliver what is needed?[22]

Recall that maintaining resilience requires that someone ferret out hidden actions. Or, to put it another way, the problem for the authorities is finding a way

to mitigate regulatory arbitrage. That being so, the solution cannot be to pile up more and more rules, since they themselves become the targets of arbitrage, avoidance, and evasion. Rules may have a place in pushing firms into addressing internal agency problems and into improving transparency, but they are not a substitute for supervision of what is going on inside firms and surveillance of developments across the system as a whole.

Financial supervision in the modern world requires watching institutions at close range. This means that in order to detect and deter problems of hidden action, supervisors are required to obtain and guard private information. Given this, we must reinterpret our question about cooperation in oversight as follows: Can confidential information about individual financial institutions remain segmented across jurisdictional boundaries? Can we have a system in which the U.S. authorities know only about U.S. firms, the euro-area supervisors know only about euro-area firms, and so on?

There are two problems here, one concerning information and the other trust. Taking them in reverse order and assuming, for now, that each national supervisor is in principle capable of getting access to all the information on their own institutions that they need directly from their own efforts, can each authority rely upon their counterparts to exercise those capabilities and so ensure that the firms in other jurisdictions are sound? It is at least plausible that such blind reliance would be misplaced. Whether due to regulatory capture, political pressure, forbearance, incompetence, or some combination of all of these, a supervisor might not deliver what is expected by those elsewhere. And, for the reasons discussed in earlier sections, when that happens, it spells trouble for everyone.

The intrinsic problem here is that the supervisor's outputs (what it is doing and what it is learning) are not visible. This generates a need for each national supervisor to validate the integrity of the work of its peers. One possibility is to publish more of what they learn about the institutions they are examining. Supervisors have in fact taken a step in this direction with the production and publication of stress-test results. But how does the supervisor in country A know that the supervisor in country B conducted their local stress test with integrity? To be sure, they would need to be able to observe the stress tests at much closer range than current practice encourages or allows. We will return to this in the final section.

This problem is really about much more than whether one country's supervisors can provide another's with the minimum information that would be needed for the first to prove that the second can trust their supervision of "their" banks. With banks operating in multiple jurisdictions through branches

and subsidiaries, as well as interacting with institutions in other jurisdictions, supervisors cannot even properly assess their own banks without substantial cooperation and the exchange of significant amounts of information. Even if home supervisors have information on their banks' exposures in and to another country, how can they assess how risky their banks are without a deeper understanding of the vulnerabilities of that second country's financial system? Among other things, the first country's supervisors need to know the creditworthiness of the second country's banks' customers and counterparties—both real-economy borrowers and other financial institutions and structures.

In other words, supervisors in a given jurisdiction cannot assess whether their banks, or their banking system, meet the resilience standard without a comprehensive assessment of every jurisdiction and, more, the prospects for spillovers between countries if any of them gets into trouble. And we cannot stop at the first step. If one country's banks are exposed to banks in another country, which in turn are exposed to counterparties in yet a third country, the supervisors would need to know about that too.

It is impossible to see how this can be done without cooperation—and cooperation that is not currently a part of either the microsupervisory colleges, as we understand them, or the general-policy groupings created by the Financial Stability Board, as we have experienced them. Ensuring that a common resilience standard is met necessitates a form of common, joint surveillance of individual firms with a candor that, we suspect, is all too often lacking. But without that, we do not see how the common resilience standard can be maintained.

So the answer to our second question is, yes, global finance absolutely requires international cooperation in overseeing the system's safety and soundness.

7. Macroprudential Policy: Dynamic Adjustment to Maintain the Resilience Standard

Up to this point we have described and advocated the need for a common, global standard of financial resilience. We have described how that standard needs to take concrete form in base regulatory requirements for different parts of the financial system, taking into account their different circumstances. And we have explained that the purpose of microsupervision is to uncover and deter hidden actions designed to undermine the resilience standard. Each of those requires international cooperation, coordination, or, in the case of standard setting, common action. Now we reach our final, and biggest, question: Does global finance require notification, cooperation, and coordination of dynamic regulatory-policy adjustments?

A standard of resilience reflects not only society's tolerance for crisis, which is a normative matter for democratic debate, but also positive scientific inputs regarding the prospective distribution of shocks hitting the system and the structure of the financial system through which those losses are propagated and magnified. Since either or both of these can (and likely will) materially change over time, it follows that maintaining the desired level of resilience requires the adjustment of regulatory parameters. These policy changes might involve making changes to headline capital requirements, adjusting risk weights for exposures to particular sectors, or modifying minimum margin and haircut requirements. We label these adjustments as *dynamic macroprudential policy* (DMPP).

Before turning to our core question about whether such policies require international cooperation and coordination, we will make a few preliminary points about DMPP.

Perhaps most important, as we mentioned earlier, the adjustment of macroprudential tools is not primarily about managing the credit cycle or about leaning against asset price bubbles. The focus is on maintaining resilience, assuring that the financial system can absorb busts without the drying up of the supply of core financial services necessary to maintain economic activity.

This view is based primarily on our skepticism about whether economic policymakers and researchers have sufficient knowledge to deploy macroprudential tools to tune credit or asset price cycles. Here the comparisons drawn between financial stability policy and monetary policy seem to us to be stretched too far.

To understand why we say this, consider that, when a monetary policy authority announces its periodic policy decision, the incremental information for the markets is just that: the policy rate, the increment to quantitative easing, or whatever. There might also be important information about the authority's view of economic prospects and the outlook for inflation, but the macroeconomic data used to formulate that view will all have been in the public domain. While monetary authorities have private information about themselves, they rarely have private information about the world.

The position of a financial stability authority could hardly be more different. In announcing a policy decision, a macroprudential policymaker reveals not only their decision; they also disclose, explicitly or implicitly, private information about the condition of the financial system. Remember, financial stability policy is based at least in part on an assessment of the resilience of individual institutions that necessarily relies on confidential supervisory information. This means that the effects of policy announcements on things like credit spreads

depend upon the market's judgment of both the policymaker's actions and the information that is revealed. As a result, it is hard to be sure of even the sign of the effect of a change in, say, capital standards on credit volumes and credit spreads.

To see what we mean, consider what can happen when the authorities raise capital requirements with the intention of strengthening banks and improving resilience. The information signal in this case is that banks are weak and resilience insufficient. The impact depends on what market participants thought prior to the announcement. If the belief was that banks were strong, the new information is that they were in fact not strong enough. Keeping in mind that strong banks lend and weak banks don't, the result will be a fall in credit availability. But if, prior to the announcement, the common belief was that banks were very weak, the policy could lead to the conclusion that banks are going to be stronger than originally thought, in which case the cost of capital may fall, enabling lending volumes to rise.

The fact that macroprudential policy actions inevitably entail the release of previously private information is what leads us to remain focused on the objective of maintaining resilience, where the effectiveness of measures should be easier to comprehend and assess. If banks have to increase their equity by X percent, their resilience will likely increase by some positive, monotonic function of X.

Turning, then, to our third question, it follows from the discussion in the previous section that making accurate judgments on whether to take action will require rich exchanges of information among countries. But do the policy actions themselves need to involve cooperation or even coordination?

The answer to this question depends on the presence, nature, and potency of spillovers—and, in the new vernacular, on the magnitude of *spillbacks*. While lately there has been discussion of these issues as they relate to monetary policy, the debate around spillovers from macroprudential policy has barely begun.

There is, however, a profound distinction between monetary policy and macroprudential policy that is rooted again in the release or signaling of private information. Consider an example where the authorities in country A announce that they are taking action because of concern about the riskiness of their financial system's exposures to a business sector that operates globally—say, the energy sector. Say, in addition, that the financial system of country B is known to be even more exposed to the energy sector than that of country A. And, further, assume country A's financial system is heavily exposed to country B's financial system. In those circumstances, the authorities of country A might find it in their own narrow interests to communicate to the authorities

of country B about the actions they were planning to take, with a view to seeing whether country B might take action too. Alternatively, the authorities of country A might need to take action to make their financial institutions hold more capital against exposures to country B's financial institutions.

In this example, self-interest motivates country A's cooperation—its supervisors are concerned about their own financial system. But even without that, there are reasons to cooperate given that this is not a one-shot game and no authority has a monopoly on expertise in spotting stability-threatening exposures. In a repeated game, country A has an incentive to alert country B of their worries about exposures to, for example, the energy sector that could harm that country's financial system because at some future point country B might be the first to spot a shared danger in the same sector or elsewhere.

A special case arises when a risky sector is entirely located in one country. Two recent examples immediately come to mind: Should the UK authorities have alerted the U.S. authorities if, hypothetically, they had decided during the mid-2000s to make UK banks hold more capital against U.S. subprime exposures? Or should the U.S. authorities have alerted the European authorities if, again hypothetically, they had decided in the late 2000s or early 2010s to raise the capital their banks were required to set aside against some euro-area exposures?

The argument against cooperation in these types of cases is that it reduces the risk of retaliation. This is not dissimilar from what happens in trade policy, so we hope it can be avoided voluntarily. (We will come back to this analogy in the conclusion.) The more positive argument is that cooperation will ensure that the initiating authority can benefit from their foreign counterpart's knowledge and expertise, perhaps prompting them into action themselves. Indeed, one can imagine cases where acting unilaterally makes one worse off. The simplest case is where one country reveals the depth of a second country's problems, only to bring on a crisis there. That then, in turn, affects the first country before its firms have had time to build sufficient resilience.

With that last thought we move into the area of coordination. The challenge is how to create incentives that yield the best collective outcome without any jurisdiction being worse off than if they had been able to act unilaterally. We plainly want to avoid an outcome where one country fails to act, leaving itself vulnerable because its policymakers cannot bring themselves to act in the face of pleas from the other country to desist (and forebear!).

The broad answer to our third question is therefore clear but less straightforward to operationalize than our answers to Questions 1 and 2: Dynamic

macroprudential policy requires a degree of international cooperation and may in some circumstances benefit from coordination.

8. Policy and Institutional Implications: Answering the Three Questions

We have now provided high-level answers to the questions posed at the beginning of this essay: global finance requires a common prudential standard, with international cooperation in overseeing the system's safety and soundness, and notification, cooperation, and sometimes coordination of dynamic macroprudential policy settings. Without adoption of a common resilience standard, the international financial system will fragment and balkanize. Without cooperation in supervision and surveillance, the resilience standard cannot be maintained. And without cooperation and coordination, dynamic policies risk leaving individual jurisdictions worse off. Taken as a whole, this leads us to conclude that financial stability policy generally and macroprudential policy in particular require international cooperation.

Our earlier discussion does no more than hint at the institutional structures needed to support the system we have outlined. We now turn to a more detailed discussion of how this might be accomplished.

If financial stability is a *global* common good, then it faces two problems of the commons. There is the problem of financial intermediaries around the world consuming the common resource of resilience, and there is a separate problem of national authorities allowing firms operating from their jurisdiction to do so with a view to somehow securing a national advantage. Are either of these problems amenable to a cooperative solution among the relevant populations?

There are far too many private financial market participants for them to coordinate and act together to contain their incentives to erode the system's resilience. And, given that the private costs of systemic distress are lower than the social costs visited on nonfinancial firms and households, they have weak incentives to do so in any case. By contrast, the national authorities of the main jurisdictions both have the incentive and are few enough in number that coordination should be feasible.

A quarter of a century ago, Elinor Ostrom (1990) proposed a set of governance principles for addressing common-resource problems. These included the definition of clear group boundaries, the matching of rules governing use to local needs, ensuring that those affected by rules can participate in modifying them, developing a system for monitoring behavior, graduate sanctions for violators, and low-cost means of dispute resolution. Reading through this list, we

are struck by how closely the design of the World Trade Organization (WTO) conforms to Ostrom's requirements. Can we produce an equally effective set of institutional arrangements for producing what we see as the necessary cooperation in the areas of standard setting, supervision, and dynamic macroprudential policy?

Starting with the common resilience standard, we noted that it is not enough simply to come to an agreement on the details of various capital and liquidity requirements, derivative-market requirements, disclosure standards, and the like. Implementation is at least as important as agreement on the standards themselves. For this, we need *implementation monitoring.* In Basel, for example, prior to Basel III, Basel Committee on Banking Supervision member countries would participate in the negotiations with the understanding that the final agreement would become a part of their legal and regulatory system, but no one ever checked. And, since 1999 the IMF's Financial Sector Assessment Program (FSAP) has attempted to conduct comprehensive and in-depth analyses of the quality of countries' financial regulatory and supervisory systems. However, it has proven difficult for FSAPs to get beyond simply checking whether the rules themselves are in line with the international standards. Prior to the crisis, it was as if monitoring of speed limits meant checking to see if the signs were appropriate, without any regard for what drivers were actually doing.

Today, there are various types of implementation monitoring schemes in place designed to improve on past practice. The Basel Committee now examines whether national regulations conform to the Basel III agreement. The Basel Committee on Payments and Market Infrastructure, in partnership with the International Organization of Securities Commissions (IOSCO), monitors implementation of the Core Principles for Financial Market Infrastructure. And the Financial Stability Board engages in a set of thematic and country peer reviews intended to both monitor implementation and assess the effectiveness of international standards.

These initiatives reinforce and help give bite to IMF FSAPs. But will they suffice? Because of the inherently political nature of the process, the results have been mixed. Difficulties arise for a variety of reasons. Where parliaments need to pass laws to ensure material compliance with the standard, there is a need for regulators (and the international authorities) to explain why common action is warranted. Otherwise, politicians may understandably react badly to any misperception that they are being instructed by unelected technocrats in Basel, Madrid, or Washington. In cases where officials are beholden to their financial institutions, regulatory capture hampers adoption of the common

standard. And even in cases where executive action is sufficient, national pride can become an impediment to action.[23]

All of that said, there is reason to believe that national authorities understand the desirability of ensuring global compliance with the agreed-upon rules and will work toward that goal. But what about faithful application of the standards in practice? The difficulties within borders are compounded as we move beyond them. That is, domestic enforcement in the face of the relentless adaption of institutions, markets, and instruments aimed at avoiding and evading regulatory requirements, already a major challenge for national authorities, is even worse at the global level. We have argued that promulgating more complex, detailed rules is not the solution, as it simply leads to more adjustment (with more lawyers, accountants, and financial engineers).

We believe that stress tests provide at least a partial solution to this problem, both domestically and internationally.[24] Modern stress testing builds on the U.S. experience during the crisis. In late 2008, the solvency of the largest American intermediaries was in doubt. That uncertainty made their own managers cautious about taking risk and it made potential creditors, counterparties, and customers wary of doing business with them. Those doubts contributed to the extreme fragility in many financial markets, leading to a virtual collapse of interbank lending. Part of the remedy was a special disclosure procedure in which the Federal Reserve, the Office of the Comptroller of the Currency, and the Federal Deposit Insurance Corporation jointly conducted an extraordinary set of "stress tests" on 19 bank holding companies and, in May 2009, published the results.[25] The tests evaluated, on a common basis, the prospective capital needs of the 19 largest U.S. banks in light of the deep recession that was well under way. While observers questioned whether the tests were stringent enough—the "stress" scenario quickly turned into the central forecast—the results were sufficient to reassure the government, market participants, and the banks themselves that most of the institutions were in fact solvent. Partly as a consequence, conditions in financial markets rapidly improved. And, armed with the stress-test evidence of their well being, most large banks were able to attract new private capital for the first time since the Lehman failure the previous September.

Our view is that, depending on how they develop, stress tests may prove to be one of the most powerful prudential tools available for safeguarding the resilience of the financial system. They take seriously the fact that when a large common shock hits, there is no one to sell assets to or raise capital from. By ensuring that each individual institution can withstand significant stress, it

raises the likelihood that the system can. And, importantly, by adjusting the scenarios, prudential authorities can maintain a chosen level of resilience. At least in principle, stress tests can both account for changes in the distribution of the shocks that can hit the system and ensure that the amplification potential of the propagation mechanism does not increase. Moreover, they reveal otherwise hidden information on the firms and on the work of supervisors.[26]

The question is how to use stress tests not only to buttress resilience at the level of individual jurisdictions, but globally. We see the solution as having three parts: a common scenario with international components that are cooperatively designed, the sharing of detailed test results, and third-party monitoring.

Each of these requires a form of global cooperation that could grow naturally out of institutions that already exist. For example, the Financial Stability Board's (FSB) Standing Committee for the Assessment of Vulnerabilities could take on the task of developing the global component of stress-test scenarios. The results would then become a core part of the IMF-FSB twice yearly Early Warning Exercise that is reported to finance ministers and governors at the IMF's International Monetary and Financial Committee (IMFC). The sharing of detailed stress-test results, since it would involve sensitive institution-specific information, would have to be done at the level of supervisors. The agreement governing the confidential information on G-SIBS, currently collected on a weekly basis by the International Data Hub at the BIS, and the confidential reports that are produced and distributed to supervisors around the world might serve as a model. This all needs to be done at a senior level—involving those directly accountable to parliaments—and not simply amongst staff, as experience suggests they face incentives to dilute information exchanges.

As for monitoring of the stress tests to ensure their credibility, we see a role for the private sector, for national authorities, and for international institutions. On the first, we note that market analysts are already working to evaluate stress-test outcomes in their work to provide information to bank shareholders. In addition, and similar to regular monitoring of monetary policy decisions by a combination of parliamentarians, market economists, and academics, there would be a role for a group that might be referred to as the "global stress-test watchers." These people would form views on the quality of the scenarios and the plausibility of the results at a high level. They will emerge spontaneously, provided that stress tests provide market-sensitive information, giving market participants an incentive to seek third-party analysis of the results.

But given the necessary confidentiality of much of some of the information that both goes into and comes out of the tests, private-sector observers would not be in a position to do a comprehensive audit to verify their quality. This leads

us to conclude that there is a role for groups of national supervisors and for the international financial institutions (IFIs). For example, supervisors from the United States, the United Kingdom, the euro area, and Japan might check each other's tests, and some combination of the IMF, BIS, and FSB could be given an oversight role. Monitors would make public pronouncements on the quality of the testing procedures and, consequently, on the soundness of the results.

Finally, we turn to the challenges posed by the need for notification, cooperation, and coordination in the pursuit of dynamic macroprudential policy (DMPP). As we noted at the end of the previous section, this is a nearly intractable problem. In the spirit of this paper's international perspective toward policy in general, we see a solution in the creation of groupings like those used by central banks. Examples of periodic meetings in which the official sector exchanges information are the BIS bimonthly meetings, which typically attract 40 to 50 central bank governors, and the quarterly meetings of the Committee on the Global Financial System (CGFS), which is composed of representatives from the 22 largest central banks in the world. In one form or another, and at varying frequency, these meetings have existed for decades. Their purpose has always been to exchange information on current issues related to monetary policy both domestically and globally.

We propose that a similar set of meetings be organized among the financial stability authorities of the world. The hope is that such a forum could grow into one where the possibility or prospect of dynamic policy adjustments are discussed candidly and openly, enabling de facto cooperation and coordination. But such a system faces an immediate challenge: who do you invite? In some jurisdictions it is clear who is in charge of financial stability policy. For example, in the United Kingdom it is the governor of the Bank of England, and in the euro area it is the president of the European Central Bank. But who would you invite from the United States? We are reminded of Henry Kissinger's famous quip about foreign policy: "Who do I call if I want to call Europe?" If you want to call the United States to discuss global financial stability policy, who do you call? We see this as a major impediment to the construction of a policy framework that is capable of delivering financial resilience globally and therefore within the United States itself.[27]

Since it can be done quickly, our instinct is to build a relatively informal mechanism for cooperation and coordination. One criticism of this approach is that we are suggesting more meetings be added to the calendars of public officials who are already struggling to handle the load they currently face. There is an alternative, more formal approach to facilitating the required cooperation and coordination: create an organization analogous to the WTO. As mentioned

earlier in passing, financial stability bears some striking similarities to international trade. Both are common goods. In both cases, individual firms, institutions, or countries have an incentive to degrade the environment to the detriment of others (and ultimately themselves). To solve this problem in the trade realm, the WTO uses its treaty-based legitimacy to negotiate international agreements, monitors their implementation, and sanctions violators. We are not convinced that it would be possible to construct an analog to protect the financial stability commons, not least because the dynamic element of macroprudential policy unavoidably entails the exercise of constrained discretion. But we do think that cooperation and monitoring needs to be taken as seriously as it is in the trade field if the global financial stability commons is to be preserved.

Returning to where we started, in the title to this essay we asked whether there can be macroprudential policy without international cooperation. Our answer is very clearly "no." Without cooperation we risk nationalization and balkanization of the financial system. Such a world would be populated by a combination of small local firms and very large super-SIFIs that would be able to cover the very high costs of operating internationally.

Cooperation means agreement, implementation, and enforcement of a common resilience standard. This, in turn, requires mutually agreed mechanisms for monitoring, combined with candid, honest, and regular communication. Should it be thought that those arrangements already exist, our experience suggests that it is, at best, work in progress. A culture of "national champions" or national pride or vulnerability inserts sand into a system that can realistically aspire to more. As stability is restored, there is an opportunity to break new ground. The prospect of dynamic macroprudential policy raises the stakes. It is so much easier to claim satisfaction with information exchanges when not much depends on it in the short run. Once prudential policy is adjusted dynamically by key jurisdictions, it will become apparent that more exchange and cooperation is needed—not in an ideal world but in the real world—if authorities are to deliver the domestic mandates that their legislatures have given to them. It would be better for institutional structures and practices to get ahead of the game. This paper is a plea for just that.

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NOTES

1 See Bank for International Settlements (2004) for a discussion of this incident.

2 On December 12, 2007, the Federal Open Market Committee authorized reciprocal swap lines with the Bank of Canada, the Bank of England, the European Central Bank, the Federal Reserve, and the Swiss National Bank. In September and October of 2008, the following central banks were added: the Reserve Bank of Australia, the Banco Central do Brasil, the Bank of Canada, Danmarks Nationalbank, the Bank of Japan, the Bank of Korea, the Banco de Mexico, the Reserve Bank of New Zealand, Norges Bank, the Monetary Authority of Singapore, and Sveriges Riksbank. The original agreements terminated on February 1, 2010. Several months later, in May 2010, the arrangements with the Bank of Canada, the Bank of England, the European Central Bank, the Bank of Japan, and the Swiss National Bank were renewed. And, in October 2013, the swap lines were converted into standing arrangements.

3 See Basel Committee on Banking Supervision (2011) for a description of the Basel III standards.

4 See Tucker (2014) for a discussion of the importance of international cooperation in the context of the lender of last resort.

5 See Financial Stability Board (2014).

6 By comparing the risk-weighted capital ratios with the unweighted capital ratios, we can compute the relationship between total and risk-weighted assets. Assuming that the risk weights are broadly accurate, this number provides one measure of how conservatively a bank's assets are being managed. At end-June 2015, it ranged from 1.5 for Wells Fargo to 4.8 for Credit Suisse. (The asset-weighted average of this number across all 30 banks is 2.7.) The reason for emphasizing *reported* capital ratios is explained in Section 6.

7 See McCauley, McGuire, and von Peter (2010) for a discussion of the global nature of banks.

8 See Ranciere, Tornell, and Westerman (2008).

9 Schularick and Taylor (2012) catalog 79 crises in a sample of 14 countries from 1870 to 2008, implying that over the past century and a quarter, advanced economies have experienced crises on average once every 25 years.

10 The fact that an individual institution has an incentive to deplete the financial stability commons means private and social incentives diverge. That is, there is a classic externality. In the case of a bank, owners and managers succumb to moral hazard due to a combination of limited liability, the government safety net, and authorities' past tendency to bail out insolvent firms. Spillovers involving the case of a single bank failure turn into a systemwide panic, and the fire-sale and credit-crunch externalities arise from generalized balance sheet shrinkage. See Hanson, Kashyap, and Stein (2011) for a detailed discussion of the externalities that form a theoretical basis for broad-based capital and liquidity regulation.

11 Tucker thanks Diane Coyle for exchanges that highlighted the need to bring out this point.

12 We return to this issue in the final section, where we discuss how we might construct a system that meets Ostrom's (1990) principles for getting private-sector actors to manage a common in this environment.

13 We share the concern of others that insurance regulation, with the promulgation and implementation of Solvency II, is moving in this direction without sufficient consideration for its suitability to the task.

14 There is a fourth essential component of a financial stability policy regime: the ex ante arrangements for crisis management. Although this affects the incentives of firms' management, owners, and creditors, we do not pursue it here, as our focus is on pure ex ante or prophylactic measures.

15 While we do not focus on empirics here, we note that this density can be constructed from data such as that in Laevan and Valencia (2012) and Schularick and Taylor (2012).

16 Woodford (2003) shows that a second-order approximation leads to a loss function for policymakers that includes the variance of output or consumption, as deviations from the flexible-price equilibrium levels, plus one term for each friction that is introduced into the model. In the traditional New Keynesian case of price rigidity, this leads to a term in the squared deviation of prices from their equilibrium level. It should not be concluded, however, that the social welfare function necessarily contains only output or potential output. Imagine that a crisis halts the provision of core financial services today but does little

damage to the actual or potential path of aggregate output. Society might legitimately care about the hardship suffered today by some parts of the community due to their lack of access to substitute services.

17 See Committee on the Global Financial System (2010, 2012) for a detailed discussion of macroprudential tools and how they might be used.

18 The model constructed by Ajello et al. (2015) is but one recent example of what we have in mind.

19 Farhi and Werning (2015) provide a theoretical foundation for such a system.

20 See Jalil (2015) for a recent discussion of the pre-1929 banking panics.

21 The Riegle-Neal Act repealed the 1927 McFadden Act prohibitions on interstate branching.

22 See Basel Committee on Banking Supervision (2014a) for a recent discussion of supervisory colleges.

23 We note in this context that the Basel Committee peer review monitoring exercise graded the European Union's Capital Requirements Directive IV (CRD IV) as "materially non-compliant." See Basel Committee on Banking Supervision (2014b).

24 While we do not focus on it here, we note that requirements that derivative instruments be centrally cleared is another integral part of a more general solution. See Cecchetti (2013) for a discussion.

25 See Board of Governors of the Federal Reserve System (2009).

26 Stress tests are not a panacea, as they rely on the use of models—both supervisory models and institutions' own internal risk models. Calibration of these can be quite difficult. People are working on solutions, one of which involves the use of common hypothetical portfolios.

27 See Kohn (2015) for a discussion of how financial stability policy might be effectively organized in the United States.