Managing Capital Inflows: What Tools to Use?

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Contents   Page

EXECUTIVE SUMMARY

Emerging market economies are facing increasing challenges in managing the current wave of capital inflows. In an earlier note (Ostry et al., 2010), we laid out a set of circumstances under which capital controls could usefully form part of the policy response to inflow surges. For countries whose currencies were on the strong side, where reserves were adequate, where overheating concerns precluded easier monetary policy, and where the fiscal balance was consistent with macroeconomic and public debt considerations, capital controls were a useful part of the policy toolkit to address inflow surges. Beyond macroeconomic considerations, capital controls could also help to address financial-stability concerns when prudential tools were insufficient or could not be made effective in a timely manner. We also stressed that the use of capital controls needs to take account of multilateral considerations, as well as their costs and the mixed evidence on their effectiveness in restraining aggregate flows.

This note elaborates on how the macro and financial-stability rationales for capital controls fit together; how prudential and capital control measures should be deployed against various risks that inflow surges may bring; and specifically, how capital controls should be designed to best meet the goals of efficiency and effectiveness. Four broad conclusions emerge.

First, capital controls may be useful in addressing both macroeconomic and financial-stability concerns in the face of inflow surges, but before imposing capital controls, countries need first to exhaust their macroeconomic-cum-exchange-rate policy options. The macro policy response needs to have primacy both because of its importance in helping to abate the inflow surge, and because it ensures that countries act in a multilaterally-consistent manner and do not impose controls merely to avoid necessary external and macro-policy adjustment.

Second, while prudential regulations and capital controls can help reduce the buildup of vulnerabilities on domestic balance sheets, they both inevitably create distortions—reducing some "good" financial flows alongside "bad" ones—and may be circumvented. Thus, there is no unambiguous welfare ranking of policy instruments (though non-discriminatory prudential measures are always appropriate), and a pragmatic approach taking account of the economy's most pertinent risks and distortions needs to be adopted.

Third, measures need to be targeted to the risks at hand. When inflows are intermediated through the regulated financial system, prudential regulation will be the main instrument. When inflows bypass regulated markets and institutions, capital controls may be the best option if the perimeter of regulation cannot be widened sufficiently quickly or effectively.

Fourth, the design of capital controls needs to be tailored to country circumstances. Where inflows raise macro concerns, controls will need to be broad, usually price-based, and temporary (though institutional arrangements to implement controls could be maintained). To address financial-stability concerns, controls could be targeted on the riskiest flows, might include administrative measures, and could be used even against more persistent inflows.

I. INTRODUCTION[1]

Emerging market economies (EMEs) face increasing challenges in managing the strong recovery in capital inflows since the sudden stop of late-2008 and early-2009. The recovery has by no means been uniform across countries or regions, and not all types of flow have resumed—bank inflows generally and flows to emerging Europe have been lagging. But in a number of countries in emerging Asia and Latin America, policymakers are concerned that the pace of capital inflows is putting upward pressures on currencies (which, if not sustained, create economic dislocations when exchange rates come down, given the erosion in competitiveness and also currency risk in some balance sheets), and inflating credit and asset prices that may not be sustainable and could amplify financial fragilities down the road. Discussions have centered on the management of inflow *surges*, recognizing the broad medium-run benefits of global financial integration for economic growth and risk sharing.

In an earlier note (Ostry et al., 2010), we laid out a set of circumstances under which capital controls—by which we mean restrictive measures that discriminate on the basis of the residency of the parties to a capital transaction—could usefully form part of the policy response to capital inflow surges. We demarcated a role of capital controls to support macroeconomic goals on the one hand and financial-stability ones on the other. As a response to the macroeconomic risks from inflow surges, countries needed first (before resorting to controls) to allow the exchange rate to reach a level that is consistent, on a multilateral basis, with medium-run fundamentals; to build reserves to a level that is consistent with country-insurance metrics; and to make sure that the domestic policy mix (monetary and fiscal policies) is consistent with internal balance and a sustainable path for public debt. Beyond the macroeconomic considerations, our earlier paper simply noted that capital controls could also help to address financial-stability concerns alongside domestic prudential tools and regulations. Our note stressed that whenever capital controls are justified at the country level, they are also subject to multilateral constraints to ensure that flows are not displaced toward countries less able to absorb them. We also stressed that there are costs associated with the use of capital controls, and that the evidence on their effectiveness in influencing the volume of aggregate flows is mixed.

This note elaborates on our earlier contribution to consider: how the macroeconomic and financial-stability rationales for capital controls fit together; what combination of prudential measures and controls should be deployed against various risks that inflow surges may bring; and how specifically controls should be designed to best meet the goals of efficiency and effectiveness. We leave aside the possible role of structural policies—which are a critical element of the toolkit insofar as they underpin effective absorption and intermediation of inflows without amplifying financial fragilities—on grounds that they take time to implement and cannot be shifted quickly in response to inflow surges. The analysis below is confined to

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policies that are more amenable to short-run implementation. As in our previous note, the discussion here is solely on the use of inflow controls, not outflow controls (though reducing the latter—as, e.g., South Africa has done since late-2009—might help to reduce net inflows), and is generally geared to EMEs with largely open capital accounts that may be contemplating using marginal controls in the face of a sudden inflow surge.

Our conclusions, based on both analytical considerations and cross-country evidence, are:

- First, capital controls may be useful in addressing both macroeconomic and financial-stability concerns in the face of inflow surges, but regardless of the purpose, countries should first exhaust their macro policy options before implementing capital controls (or prudential measures that act as controls). The macro policy response needs to have primacy both because of its importance in helping to abate the inflow surge, and because it ensures that countries act in a multilaterally-consistent manner and do not resort to controls as a substitute for needed policy adjustments.

- Second, while prudential regulations and capital controls can help to reduce the buildup of vulnerabilities on balance sheets and the emergence of credit booms, they both inevitably create distortions—reducing some good financial flows alongside bad ones—and may be circumvented. Prudential tools that serve to directly limit capital inflows—thus acting as capital controls—can also have adverse multilateral implications, and should not be used as a substitute for macroeconomic policies. There is thus no clear welfare ranking across instruments, and a pragmatic approach taking account of all pertinent risks and distortions needs to be adopted. Non-discriminatory prudential measures that strengthen the resilience of the financial system are always appropriate.

- Third, measures should be targeted to the specific risks at hand. When inflows are largely intermediated through the regulated financial system, prudential tools can be the main instrument, possibly buttressed by controls on relatively risky banking inflows. When inflows bypass regulated markets and institutions (e.g., because domestic entities borrow directly abroad), and if the perimeter of regulation cannot be widened sufficiently quickly or effectively, then prudential regulations will have little traction and capital controls may be the only option. In some cases, a combination of prudential regulation and capital controls will reduce circumvention and distortions.

- Fourth, to design controls that are effective and efficient requires tailoring them to country circumstances. Where capital inflows are mostly raising macro concerns, controls should have broad coverage, usually be price-based, and only be imposed when flows are expected to be temporary (though this does not preclude keeping in place the administrative capacity to implement inflow controls). Where inflows mainly raise financial-stability concerns, controls can be more narrowly targeted on the most risky inflows, include administrative measures, and can be used against more persistent inflow surges. Even in the case of targeted controls, they should be designed with a view to closing loopholes that other inflow channels, including derivative markets, allow. Finally, administrative capacities of different agencies, institutional and legal constraints, and other country-specific factors will influence the design of the measures.

It goes without saying that there is no "one-size-fits-all" approach to capital control design, and what emerges from our analysis is a set of considerations about the design as a function of the types of inflows and the economic risks they pose, as well as a range of institutional and other factors. In Section II, we look at how the case for capital controls depends on possible tensions between macroeconomic and financial-stability risks. In Section III, we outline the potential toolkit (leaving aside macro-cum-exchange-rate policies discussed in our earlier note) for mitigating the risks associated with inflow surges. Section IV discusses how policy instruments should be assigned to deal with the various risks. Section V presents some stylized facts on the effectiveness of different measures in mitigating the risks from inflow surges. Section VI looks at the design of capital controls themselves, examining *inter alia* the pros and cons of price and administrative measures, broad versus targeted measures, and the role of legal, administrative and circumvention issues. Section VII concludes.

II. HOW DO MACRO AND FINANCIAL-STABILITY CONSIDERATIONS FIT TOGETHER?

In discussing the role of capital controls, it is critical to keep in mind the perspective that, while inflow surges pose a number of challenges, international financial integration is fundamentally beneficial to emerging market countries, since it eases financing constraints for productive investment projects, fosters the diversification of investment risk, promotes intertemporal trade, and contributes to the development of financial markets (see Dell' Ariccia et al., 2008).[2] Inflow surges, however, require an appropriate policy response because they can lead to economic overheating, excessive appreciation, or pressures in particular sectors of the economy (such as sectoral credit booms and asset price bubbles). Policy tools for coping with inflow surges consist of macroeconomic policies and prudential measures, with one of the key lessons from the crisis being that the latter part of the toolkit is at least as important as the former. In addition, and under certain conditions, capital controls may form part of the policy toolkit.
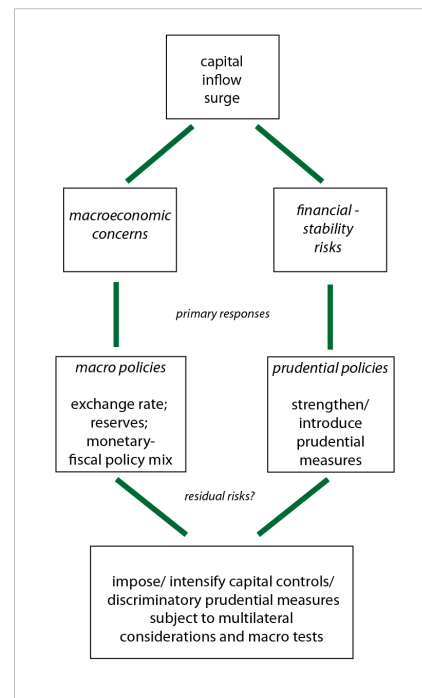
Figure 1 recaps the flow chart put forward in Ostry et al. (2010) to provide guidance on when capital controls can usefully be invoked to manage the risks from capital inflow surges. The chart has two branches: macroeconomic and financial-stability. Macroeconomic concerns

Figure 1. Using Capital Controls for Macroeconomic and Financial-Stability Risks

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[2] An inflow surge has typically been defined in the literature as an unusually large net inflow (see, e.g., Cardarelli et al., 2007), where "unusually large" means a significant (say, one standard-deviation) departure from long-run trend. But since the trend is usually calculated using two-sided (past and future) filters, such definitions may be of limited operational use.

center around the impact of aggregate inflows on exchange rate appreciation, but also include issues related to inflation and economic overheating. Financial-stability concerns cover risks posed by generalized credit booms and price increases across a variety of asset classes (macro, rather than sectoral, booms), or to sectoral balance sheet vulnerabilities and increases in the prices of individual, but systemically important, assets (e.g., housing). Balance sheet vulnerabilities include those of banks or nonfinancial entities (firms, households): risky external liability structures (e.g., over-reliance on short-term funding of long-term assets); unhedged currency exposure; and, in the case of banks, credit risk associated with lending in foreign currency to unhedged borrowers. As such, financial-stability risks may be in the financial sector, the non-financial sector, or both. Moreover, macro and financial-stability concerns interact, with the former impacting the financial sector, and vice versa.

Primary policy responses to address macroeconomic and financial-stability risks are, respectively, macroeconomic policies and prudential policies—the very same policies that would be used to cope with other shocks that economies face, whether relating to capital flows or not. Both sets of policies will generally need to be adjusted in response to inflow surges to ensure that macroeconomic and financial-stability risks are effectively managed.

Macroeconomic policy adjustments, as discussed in our earlier note, would include: allowing the currency to strengthen provided it is not overvalued; accumulating foreign exchange reserves to counter appreciation if the currency is on the strong side, and sterilizing the intervention if inflationary concerns emerge; lowering domestic policy rates if the output gap permits; and using available scope to tighten fiscal policy. An important goal along all of these dimensions is to have appropriate quantitative metrics to guide policies. Exchange rates, for example, need to be assessed on a multilateral basis vis-à-vis medium-run fundamentals, and take account of the likely evolution of these fundamentals as well as third-country competition in computing partner-country trade weights (see, for example, *Exchange Rate Assessments: CGER Methodologies*, IMF *Occasional Paper* 261, 2008, for discussion of a number of analytical approaches to assessing the consistency of exchange rates with fundamentals).[3] Assessed overvaluation, if it is to be policy relevant, should be quantitatively significant—especially given the uncertainties associated with estimating currency benchmarks. Likewise, reserve adequacy metrics need to be based on the likely evolution of capital outflows during a tail risk event—with the latter calibrated on the cross-country average experience—and a cost-benefit analysis of how reserves can help to smooth consumption in the face of such episodes (see *Country Insurance*, IMF *Occasional Paper* 254, 2007, for a previous analytical discussion of reserve adequacy metrics). And the domestic policy mix needs to be assessed against available quantitative information on the output gap and the sustainability of public finances.

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[3] In the universe of fundamentals, one should also consider the impact of possibly persistent capital inflows on the equilibrium exchange rate itself. When there is a shift in the stock demand for the assets of a country by international investors, sterilized intervention could serve to satisfy the foreign demand for local-currency assets during the period that international investors are adjusting their portfolios toward the higher desired stock. While this justifies intervention in the case of a permanent shift in the demand for EM assets, intervention should only take place after the exchange rate has appreciated to its multilaterally-consistent medium-run level.

We discuss in the next section the main components of the prudential toolkit (some of which explicitly restrict transactions between residents and nonresidents, while others may have the same discriminatory effect, even though they may not meet the strict legal definition of a capital control). At this point, we only mention that prudential instruments would in general need to be strengthened to reduce the financial-stability risks posed by inflow surges, but the specific tools that will be effective depend on the nature of risks and institutional constraints of the country. Given that in general there will be a multiplicity of risks, and that no individual instrument will have traction against all concerns in most real-world situations, multiple instruments will generally be required, though the mix will vary by country.

When are capital controls (or prudential measures that act like them) called for? Here we recall the point made in our earlier paper. Controls are part of the toolkit when certain macroeconomic conditions are satisfied, and when non-discriminatory prudential tools will not have traction in addressing the financial-stability risks. On the macro side, the relevant points are: the exchange rate is overvalued on a multilateral basis; further reserve accumulation would be undesirable (on country-insurance grounds or because the costs of sterilization are too high); overheating concerns preclude monetary policy easing; and there is no scope for more fiscal tightening. Even if macroeconomic considerations do not warrant the imposition of capital controls, financial-stability concerns might, since the economy may simply not be able to safely absorb a capital inflow surge using conventional prudential tools (that is, excluding capital controls).

In Figure 1, we have portrayed macro policies as the primary response to the macro risks associated with inflow surges, and prudential policies as the first line of defense against financial-stability risks. In reality, there are important cross effects. An appreciation of the currency may help to abate an inflow that is fuelling a housing bubble (a financial-stability risk, albeit quite likely with macro implications). Conversely, a reduced maximum loan-to-value ratio in the mortgage market may deflate a housing boom fuelled by foreign money, and the resulting slowdown in credit growth may ease macroeconomic overheating pressures (a prudential tool having traction against a macro risk).

We have placed capital controls at the bottom of the Figure to emphasize that, because of their discriminatory nature, and regardless of whether imposed for macroeconomic or financial-stability concerns, the use of capital controls must come after other tools have been adjusted in response to the inflow surge.[4] Given the need for a multilaterally-consistent approach, the bar is much higher for the use of capital controls—especially broad-based controls—since the risk that controls are being imposed for beggar-thy-neighbor reasons is genuine. National authorities should first exhaust the available macro policy space and allow the exchange rate to strengthen to an appropriate degree, as well as strengthening

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[4] Any decision to actually use capital controls would, of course, also need to take account of their likely effectiveness relative to their costs. As noted in Ostry et al. (2010), evidence on the effectiveness of capital controls in influencing aggregate flows is mixed, possibly because of endogeneity bias in empirical studies. Evidence that controls affect the composition of inflows, and thus financial-stability risks, is stronger.

nondiscriminatory prudential tools, before resorting to capital controls.[5] Direct regulation of foreign currency borrowing by non-financial entities is another alternative, and such measures can be taken whenever they are administratively possible—though these measures, which may also raise multilateral concerns, should not be used to avoid necessary macroeconomic adjustment. Structural reforms to improve the capacity of the financial system to effectively intermediate inflows should always be pursued.

III. THE POLICY TOOLKIT

What tools are available to manage the risks from capital inflow surges? Beyond macro-economic policies (which were discussed in our earlier note), policymakers have available conventional prudential regulations and capital controls.[6] Prudential regulations, which are intended to strengthen the ability of the financial sector to cope with increased risk or to limit its ability to incur excessive risk, are typically implemented at the level of individual institutions even when they serve macro-prudential aims (see Box 1). For analytical purposes, such measures can usefully be divided into "FX-related" (regulations based on the currency of denomination of the transaction) and other prudential measures:

- *Prudential measures*

  ➢ *FX-related prudential measures* discriminate according to the currency, not the residency of the parties to the transaction. These measures are applied to domestic financial institutions, primarily to banks. Limits on banks' open FX position (as a proportion of their capital) are common, as are limits on banks' investments in FX assets.[7] Other measures may serve to limit bank lending in FX, especially to borrowers that lack a natural hedge, including for example, differential reserve requirements on liabilities in local currency and FX.

  ➢ *Other prudential measures* are intended to reduce systemic risk generally—e.g., by restraining the growth of lending by the domestic financial system—without implying discrimination based on residency or currency denomination. Typical measures include maximum loan-to-value (LTV) ratios, limits on domestic credit growth, asset classification and provisioning rules, sectoral limits on loan concentration, dynamic loan-loss provisions, and counter-cyclical capital requirements.

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[5]In practice, "exhausting macro policy space" leaves room to impose capital controls on a temporary basis after the announcement of policy measures, but before full implementation. Nondiscriminatory prudential measures are, of course, a part of the toolkit at all times.

[6] In addition, certain tax rules (e.g., tax deductibility of mortgage interest) could also play a role. Beyond capital controls and prudential measures, the regulatory framework may itself create incentives for certain type of capital inflow. Prior to implementing new measures, therefore, any regulatory features that provide disproportionate incentives for capital inflows in certain asset classes should be identified, and appropriate changes to taxes and regulations to eliminate unintended incentives should be undertaken. In what follows, it is assumed that such changes have been implemented.

[7] In some currency-board countries, exposures in the peg currency are excluded in the calculation of the open position. In our analysis, asymmetric open position limits, which introduce different limits on short and long positions, are categorized as FX-related measures—even though these could be considered a form of capital control inasmuch as they act to discourage inflows (e.g., a lower short position limit could limit capital inflows).

Box 1. Prudential Policies—Micro versus Macro

Micro-prudential policies. These policies attempt to improve individual institutions' resilience to risks (including those arising from international capital flows), but they may also reduce systemic risk by mitigating externalities arising from individual institutions' behavior. Examples include:

- Forward-looking provisioning of expected losses
- Valuation reserves to cover the risk of mean reversal in prices of marked-to-market assets
- Caps on LTVs/minimum collateral haircuts
- Higher risk weights on specific types of exposures (such as real estate lending)
- Minimum capital requirements, including better quality of capital (as in Basel III)
- Leverage ratios
- Capital conservation buffer (Basel III)
- Liquid assets buffer (Basel III)
- Limits on currency and maturity mismatches (Basel III NSFR)

Macro-prudential policies. Prudential policies in this case are aimed explicitly at systemic risk. Often, the macro-prudential toolkit will be based on existing micro-prudential tools, but with settings that are conditioned on macro-financial developments or indicators of systemic risk, either in a rule-based or a discretionary fashion. Some examples of such policies are:

- Cyclically varying provisioning requirements
- Cyclically varying LTVs
- Countercyclical capital buffer (Basel III)
- Capital/liquidity surcharge/levies on SIFIs
- Tax on volatile funding (Shin, 2010)
- Caps on credit growth
- Higher reserve requirements

- ***Capital controls*** limit the rights of residents or non-residents to enter into capital transactions or to effect the transfers and payments associated with these transactions.[8] Typical measures include taxes on flows from non-residents, unremunerated reserve requirements (URR) on such flows, or special licensing requirements and even outright limits or bans. Measures may be economy-wide, sector-specific (usually the financial sector), or industry specific (for example, "strategic" industries). Measures may apply to all flows, or may differentiate by type or duration of the flow (debt, equity, direct investment; short-term vs. medium- and long-term). While this taxonomy is analytically useful, it bears emphasizing that the classification is not always clear-cut, and often there are only fine distinctions among the measures.[9]

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[8] There is no unique generally accepted legal definition of capital controls. In the broadest sense they are measures meant to affect the cross-border movement of capital. In its *Code of Liberalization of Capital Movements*, the Organization for Economic Cooperation and Development (2009) considers measures to be capital controls subject to liberalization obligations if they discriminate between residents and nonresidents; see *The Fund's Role Regarding Cross-Border Capital Flows* at www.imf.org/external/pp/longres.aspx?id=4516.

[9] Moreover, FX-related and other prudential measures (e.g., raising reserve requirements) often overlap with regulations aimed at ensuring the effective transmission of monetary/exchange rate policies.

- ➢ First, consider a regulation that sets higher reserve requirements on banks' liabilities to nonresidents than on residents—this would constitute a capital control. But a regulation that draws the boundaries not in terms of residency but in terms of the currency of denomination (and applies equally to residents and nonresidents) would not be a capital control, even though in practice most foreign-currency liabilities may be to nonresidents.

- ➢ Second, consider the case where a country sets higher marginal reserve requirements on nonresident local-currency bank deposits than on residents' deposits. Such a measure, while generally viewed as prudential in nature, would have much the same effect as a capital control.

- ➢ Third, a prudential measure that required banks to pay a tax on their non-core liabilities as proposed by Shin (2010) could well in practice operate just like a capital control if most of the funding that banks receive comes from nonresidents (say because domestic wholesale funding markets are thin, as is the case in many EMEs).

- ➢ Fourth, a LTV ratio would normally be considered a prudential measure, but if the LTV ratios differ according to the currency of denomination, they would more properly be classified as a FX-related measure.

Finally, in practice, the design of measures often reflects institutional constraints rather than differences in the intent of the measure. When the prudential framework is underdeveloped and financial markets are unsophisticated, capital controls may be more effective; but when financial markets work well and the use of capital controls is constrained by international obligations, prudential rules may be used (see Box 2 on the Korean case). In both cases, the intent (or part of the goal) of the rules may be similar: slowing aggregate or specific inflows.

All three categories of measure are common in EMEs (Fig. 2). Capital controls are most frequently directed to bond flows and least to FDI. Among FX regulations, open position limits are the most common, and FX lending limits occur in more than half the sample. Among other prudential regulations, reserve requirements and LTV ratios are the most common, followed by sectoral lending limits.

Figure 2. Frequency Distribution of Pre-Crisis Policy Measures*
(in percent of total observations)

Source: IMF's AREAER, Schindler (2009), and IMF country desk survey.
*Numbers reflect the share of countries with a measure in 2007.
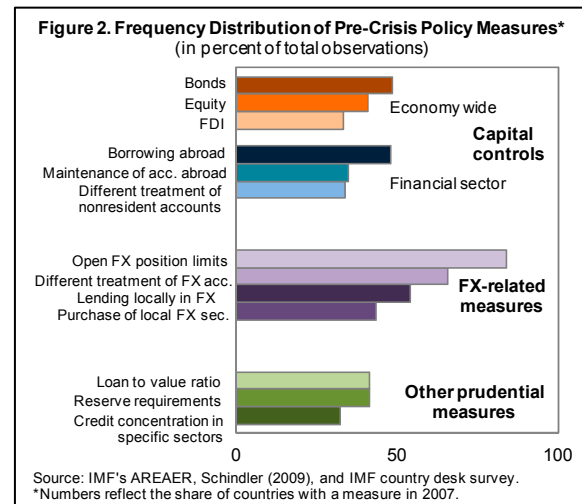
IV. MANAGING CAPITAL INFLOWS: MATCHING RISKS AND TOOLS

How should policymakers allocate these three groups of measures to the various risks associated with inflow surges? Policymakers should first exhaust macroeconomic policy options, especially before contemplating the use of capital controls or other discriminatory prudential measures. To determine which tools to use once macro policy options have been

Box 2. Korea—Macroprudential Rules in Relation to Capital Inflows

In Korea, there is strong demand by exporters—especially shipbuilders who face a somewhat predictable cycle of dollar receipts related to the long shipbuilding cycle—to hedge future export receipts. Exporters will wish to sell their dollars forward and buy Korean won. When, as was the case ahead of the financial crisis, there were broad expectations of won appreciation, exporters would want to engage in over-hedging to take advantage of any appreciation beyond the interest differential. Their counterparty would typically be an on-shore bank which would take the opposite position—buying dollars forward and selling Korean won forward (see Figure).

To do this, onshore banks (mostly branches of foreign banks) would borrow dollars from offshore banks, including their parent banks (a capital inflow in the balance of payments), exchange the dollars in the spot market for won to cover their long dollar positions, and invest the proceeds in domestic assets for forward delivery to the exporter. The onshore banks were thus fully hedged against FX risk. (Regardless of their transactions with shipbuilders, Korean banks could engage in "carry trade"—borrowing in FX and investing in local-currency assets in the expectation of a currency appreciation, but this would expose them to FX risk and would come up against open FX limits.)

In June 2010, the Korean authorities announced a package of prudential measures to "prevent excessive foreign exchange leverage," which strengthened some measures that had been implemented the previous year. The concern leading up to the measures was that FX derivatives trading between banks and firms had led to an excessive increase in short-term external borrowing ahead of the crisis, and exposed the banks to a "sudden-stop" when offshore banks cut their credit lines to Korea. A November 2009 measure had required banks to gradually raise their long-term FX borrowing from 80 to 90 percent (later raised to 100 percent) of their long-term FX lending, This succeeded in reducing banks' short-term borrowing.

Figure: FX Hedging by Exporters

Flows to the exporter (swaps FX receipts into LC receipts)

over-hedging specifically forbidden by new regulation

1) Exporter expects export proceeds in the future

2) Exporter hedges onshore its currency risk by selling $ forward

Flows to the domestic bank or foreign bank branch (purchase $ forward from exporters and hedge currency exposure)

3) Bank sells hedge to exporter: receives $ forward and pay LC

Regulatory constraint on FX derivatives exposure applies here

4) Bank borrows $ offshore

5) Bank sells $ and buys LC in spot FX market

Recorded in BOP statiscis as external debt of the banking system

6) Bank invests onshore in LC assets (e.g.

t=0   t=1

Note: The horizontal line denotes the time line. Rectangles above (below) the line denote positive (negative) cash flows; rectangles in blue (yellow) denote payoffs in $ and local currency, respectively.

The 2010 measures included ceilings on FX derivative positions of banks (expressed in relation to bank capital), tighter restrictions on the provision of FX-denominated loans, and stricter liquidity ratios for domestic banks. Banks were also prohibited from providing "excess" hedging of underlying transactions for forward contracts with exporters.

The measures appear to have succeeded in preventing banks' external debt from returning to pre-crisis levels, but they did not help to substantially stem total capital inflows, in part because measures were targeted mainly at onshore entities (banks and corporates). The narrow scope of the measures (in light of Korea's open capital account) allows corporates to hedge their positions offshore. Offshore banks would still be able to offset their short-KRW positions resulting from the NDFs by investing in the onshore government bond market. The authorities also reinstated non-discriminatory withholding and capital gains taxes on non-resident purchases of government and central bank securities, which residents are already subject to. Nonetheless, they continue to be concerned with destabilizing capital inflows and are considering further measures to moderate inflows, including a levy on short-term bank borrowing.
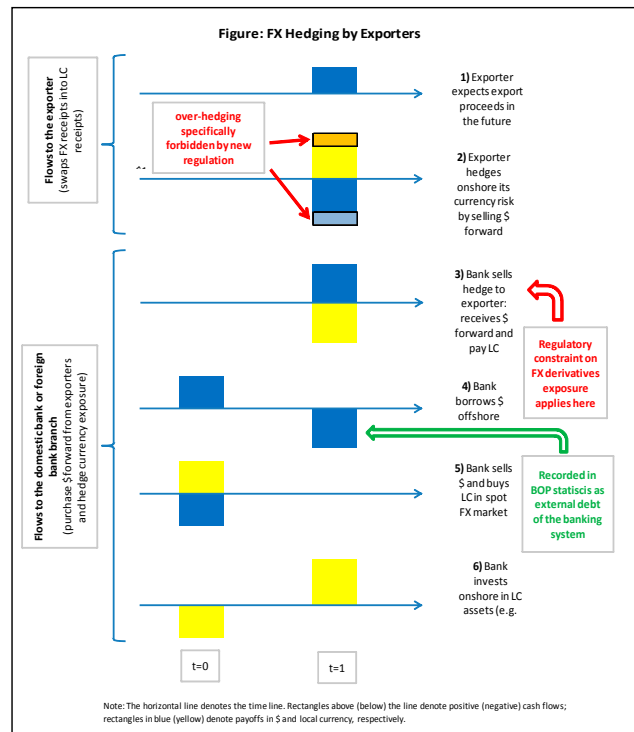
exhausted, it is useful to distinguish between flows intermediated through domestic regulated financial institutions (RFIs) and flows that are not so intermediated ("direct borrowing").[10]

Let us begin with the case where inflows are intermediated through the banks, which often account for the bulk of domestic RFIs: what are the risks and associated tools (Figure 3(a))? Three areas deserve particular attention:

- *Banks incur an excessively risky external liability structure*, for example, excessive reliance on short-term funding (wholesale or foreign deposits) to finance longer-term loans (e.g., mortgages in foreign currency). To target the risk, prudential tools (such as currency-dependent liquidity requirements) or capital controls (such as limits on external borrowing, or higher reserve requirements on liabilities to non-residents) could be used, in some combination.

- *Bank assets are excessively risky:*

  ➢ *Credit risk associated with FX lending*. Such credit risk arises, for example, when the ultimate borrower (a firm or household) contracts FX debt but its income is in local currency, so the borrower is unhedged.[11] More stringent FX-related regulations on banks—for example higher capital requirements on FX loans—or even outright prohibition of, or limits on, loans to borrowers who cannot demonstrate a natural hedge, may be appropriate.[12]

Figure 3(a) Choice of Instruments to Mitigate Risks Associated with Flows through the Banking System 1/

1/ Assuming macro policy options have been exhausted, and taking due account of multilateral considerations.
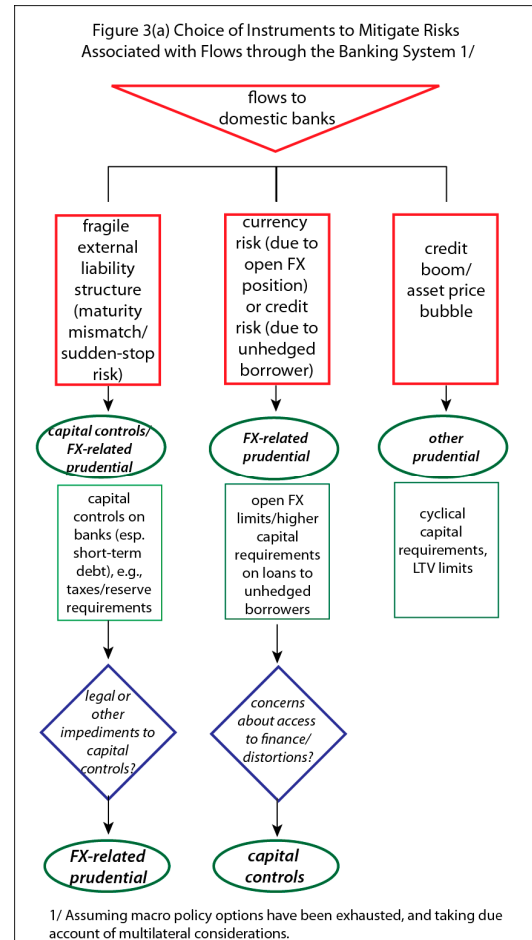
  ➢ *Currency risk reflected in open FX positions*. In contrast to the previous case where banks lend in FX, here they lend in local currency but have borrowed in FX, incurring currency risk. Possible responses include tightening FX open position limits (in relation to bank capital) and stepping up FX liquidity requirements.[13]

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[10] Under this taxonomy, nonbanks that are outside the regulator's purview are part of direct borrowing.

[11] Ranciere, Tornell and Vamvakidis (2010) show that, while FX lending to unhedged borrowers is associated with more severe crises, it is also associated with faster growth by easing financing constraints. The regulation of FX loans should strike a balance between the competing objectives of resilience and credit availability.

[12] Residents may try to circumvent such a measure by borrowing directly from abroad. While this would address the credit risk of local banks, the currency risk of the ultimate borrowers would remain.

[13] Such limits are usually established in terms of the bank's net open position, which can imply significant currency exposure of the end-borrower (thus transforming currency risk into credit risk to the bank). Limits on

(continued…)

- *Bank lending is amplifying broader macroeconomic risks (a lending or asset price boom)*. The normal response in a closed economy would be to tighten monetary policy, but here such tightening might well attract more capital, fueling the boom. Prudential rules that reduce the risk of a lending boom in local currency or FX can be an appropriate response—for example, increasing reserve requirements equally or in a differentiated manner on local-currency and FX liabilities, raising risk weights in capital adequacy calculations for certain types of lending, or tightening loan classification rules, all of which would tend to raise bank spreads and lending rates, helping to slow credit growth. Likewise, if lending fuels an asset price boom, the response could include enhancing prudential measures, such as counter-cyclical capital requirements, lower loan-to-value ratios (especially for real estate loans), and higher margin requirements (for equity-related lending). Box 3 reviews some recent cases of macro-prudential policies deployed to curb excessive credit growth and/or asset price inflation.

What is the bottom line in terms of the policy response when flows are intermediated through the regulated banking system? *Prudential measures, targeted to the key concerns—the external liability structure, currency and credit risk, and broader risks from lending/asset price booms—may be the appropriate response. Capital controls may also be useful if prudential measures cannot effectively deal with the targeted risks in a timely manner; economy-wide capital controls may also be indicated if flows might migrate to the unregulated financial sector (see below).*

What factors might tilt the balance among these types of measures? Since prudential measures are designed to reduce risks in the financial sector, they are the obvious choice, especially when supervision is effective. This basic observation, however, might be nuanced by a couple of further considerations. First, concerns about the efficiency of financial sector supervision may favor more rudimentary measures, such as capital controls. Second, as noted above, prudential regulation on RFIs may cause flows to be intermediated through the unregulated financial sector (see Box 4 on Croatia's experience). This may argue for a customized mix of capital controls and prudential measures geared to country circumstances (including the sophistication of domestic financial markets and the scope for regulatory arbitrage), which could both reduce distortions and limit circumvention. Third, concerns about a level playing field for access to credit by large versus small and medium sized enterprises (SMEs) might favor one type of measure over another. Both prudential measures and capital controls imposed on RFIs may lead to direct borrowing abroad by domestic enterprises. Studies have shown that capital controls can make access to financing more difficult for smaller firms (Forbes, 2007) and domestically-owned firms (Harrison, Love, and McMillan, 2004). But prudential measures curbing credit growth will also disproportionately affect SMEs, since they are more dependent on bank financing and not as able to borrow directly abroad. Therefore, capital controls on direct borrowing abroad may actually create a more level playing field for SMEs than regulations that raise the cost of bank borrowing.

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banks' gross foreign currency exposures are possible, though these may unduly constrain their ability to provide hedging instruments to the non-financial sector.

Box 3. Macroprudential Policies, Credit Growth, and Asset Prices: Some Recent Experiences

Macro-prudential measures to stem capital inflows and reduce excessive credit growth have had mixed results (Table 1). A VAR analysis of EMEs indicates that tightening of macro-prudential measures in Croatia (2003-07), Korea (2008), India (2007), and Peru (2007-08) contributed to a reduction in credit growth, but in other cases, macro-prudential measures proved less effective. A tightening of macro-prudential measures in Colombia in 2007 did not stem credit growth (although a URR, supported by these macro-prudential policies, did reduce portfolio inflows, see Box 6).[1] Romania imposed speed limits on credit growth in 2003-08, which were expressed as a percentage of bank capital; however, increases in bank equity through FDI in the banking sector allowed strong credit growth to continue. Although macroprudential policies appear to have lengthened the composition of capital inflows in Croatia, Peru, Romania, and Uruguay, the effect on the total net flows was limited; such measures, implemented in combination with capital controls, appear to have reduced inflows in Colombia

Macro-prudential policies have contributed, however, to financial sector resilience, even when they have failed to prevent a credit boom. The measures in Croatia (see Box 4), Korea and Peru appear to have lengthened the maturity of capital inflows, thus helping to reduce maturity mismatches in the banking sector. Following the prudential measures introduced in Korea in 2009-10, banks' foreign borrowing decelerated, as intended, but the measures did not stem capital inflows overall (see Box 2). In Uruguay, the composition of inflows shifted from external borrowing to FDI inflows over 2003-08, thereby improving the maturity structure and reducing the exposure of the financial sector.

Macro-prudential measures usually did little to restrain asset prices. Several countries (Croatia, India, and Romania) introduced prudential measures to rein in stock market or real estate price increases, but these did not prove to be effective. In the case of Vietnam, macro-prudential policies appear to have moderated a stock market boom (although the estimated impact is small).

On balance, prudential measures are more likely to be effective when accompanied by supportive macroeconomic policies that help to rein in domestic demand (particularly against the backdrop of an open capital account).[2]

Table 1. Effectiveness of Measures Aiming at Financial Stability Concerns			
Country	Major measures	Aim of measures	Effectiveness
Colombia	Dynamic provisioning, marginal reserve requirement (MRR), and limits on banks' gross derivative positions in conjunction with the URR (all 2007)	Reduce credit growth	No strong effect on credit growth
Croatia	Speed limit (2003, 2007); liquidity ratio (2006-08; marginal reserve requirement (2004-07)	Reduce credit growth and unhedged foreign borrowing	Speed limit and reserve ratio reduced credit growth, but MRR had no strong impact. Prudential measures decreased FX lending and lengthened the maturity of capital inflows, but had no effect on asset prices
India	Raised cash reserve ratio (2007)	Reduce credit growth and asset price increases	Reduced credit growth (though statistically the effect is weak), and had no effect on asset prices
Korea	Applied strict liquidity ratios on the banking sector and limits on foreign currency lending to residents (2008); cap on banks' FX forward positions (2010)	Reduce credit growth, unhedged foreign borrowing, and banks' external borrowing	Insignificant effect on FX lending to households, but reduced credit growth. Banks' foreign borrowing dropped following the introduction of the cap.
Peru	Tighter loan classification and provisioning requirement (2007-08); marginal reserve requirement on FX deposits (2008)	Reduce credit growth	Slowed down credit expansion and lengthened the maturity of capital inflows.
Romania	Speed limit on credit growth (2005-07); raised reserve requirements on FX deposits (2002-06); tighten prudential rules on real estate lending	Reduce credit growth and unhedged foreign borrowing	Reduced bank-intermediated foreign flows, but strong credit growth and FX lending to residents continued as increase in financial FDI funded lending
Uruguay	Prudential measures on loan classification and provisioning (2003-08)	Address financial fragilities after the banking crisis and dedollarize economy	Insignificant effect on credit expansion that started in 2006 and reflected a gradual recovery from the drastic contraction during the banking crisis, but reduced credit risk and FX lending to residents, and shifted the composition of inflows away from foreign borrowing to FDI inflows
Vietnam	Cap on securities related credit (2007)	Curb speculative investment in securities	Moderated the stock market boom

[1]There is some evidence, however, that the Colombian macroprudential measures were effective in containing credit growth in specific sectors, for example, consumer credit (see IMF, 2010, *REO: Western Hemisphere Department*, October).
[2]For further details, see Chikako Baba, "Effectiveness of Capital Controls in Emerging Markets in the 2000s", mimeo.

Box 4. Dealing with Capital Inflows and Excessive FX Lending: The Case of Croatia

Foreign-owned banks have dominated the Croatian banking system since 2000, and have played a key role in moving foreign capital into Croatia (see Jankov, 2009). The surge in capital inflows raised macroeconomic and financial-stability concerns, especially given the important component of household consumer borrowing.

The Croatian National Bank (CNB) faced a number of constraints in stemming capital inflows: 1) the inflexible exchange rate regime limited the use of monetary policy; and 2) fiscal policy was constrained due to large structural budget problems. Therefore, the CNB responded to capital inflows chiefly by adopting various prudential measures on the financial sector, some of which included an element of capital control.

In 2003, the CNB introduced a speed limit to bank lending and a rule on minimum retained earnings if bank lending exceeded a certain threshold. Banks responded to the limit by selling part of their loan portfolio to affiliated leasing companies (to get around the bank lending limits) and by transferring credit risk to the books of their foreign parents (thanks to an accounting loophole).

The speed limit regulation was replaced in July 2004 by a capital control on domestic banks—the marginal reserve requirement (MRR)—which required them to make additional non-interest bearing deposits with the CNB if their foreign liabilities increased above their value recorded at end-June 2004. The MRR rate was increased through time, and the CNB continuously refined the regulation to close loopholes exploited by banks (e.g., by applying the MRR to affiliated leasing companies, off-balance sheet items related to the selling of credit risk, and to debt securities issued). By 2008, banks were required to place 72% of the increase in foreign liabilities with the CNB, or in liquid foreign assets, while the remaining 28% was disposable for lending to clients. In spite of extremely high reserve requirements, banks' domestic lending continued to increase.

Capital adequacy rules were also tightened. As of mid-2006, risk weights applied to bank loans in foreign exchange and to loans in kuna indexed to foreign currency but granted to unhedged clients, were set above the minimum Basel II standards. Yet, the combination of higher bank reserve requirements and capital adequacy requirements failed to curtail capital inflows or domestic lending.

To reduce the buildup of external vulnerabilities associated with the rapid growth of domestic lending, the CNB reintroduced a speed limit to bank lending in 2007, but this time so that its regulation also covered the selling of credit portfolios and credit risk. As bank lending is an important source of household credit, limiting it caused a significant decline in household credit growth. On the other hand, credit availability to enterprises remained high because borrowing from local banks was replaced by direct foreign borrowing.

In 2008, the CNB introduced minimum capital requirements that were differentiated by credit growth rates. Banks with credit growth below 12% per annum had to satisfy a minimum capital adequacy rate of 12%, while banks growing faster faced higher capital adequacy requirements. In addition, risk weights and minimum retained earnings ratios were increased for fast-growing banks. Higher risk weights applied to bank loans in FX and to those in kuna indexed to FX and granted to unhedged clients.

The Croatian experience shows that it can be very difficult to curtail credit growth associated with a surge in capital flows without economy-wide capital controls. Croatia was not in a position to use exchange rate policy to stem capital inflows. Prudential measures had some success in reducing the growth of bank credit, and they also reduced capital inflows for a short time. However, the availability of credit remained high as domestic bank credit was partially replaced by direct lending from abroad, thereby altering the structure of capital inflows to channels not covered by the prudential policies or the capital controls on banks.

We turn now to the case where flows bypass the regulated financial institutions (Figure 3(b)). Two sets of risks stand out, notably because of the potential externalities (e.g., fire sales of assets) in the event that domestic entities are unable to service their obligations.

- *Nonfinancial entities (firms or households) take on an excessively risky external liability structure* (FX-denominated debt, especially of short duration). Often, the external effects of such a structure are not internalized by atomistic borrowers (Korinek, 2010), amplifying fragilities. Limiting such risky flows, and the maturity risk they create on balance sheets, potentially calls for the use of capital controls, since prudential rules targeted to RFIs will have little effect in reducing capital inflows. While it is possible in principle to regulate the borrowing of the non-financial sector in a manner that does not discriminate between resident- and non-resident sources of funds (and thus avoids capital controls), such measures may take too long to implement or be too costly to administer.

Figure 3(b) Choice of Instruments to Mitigate Risks Associated with Flows through the Unregulated Financial Sector 1/

1/ Assuming macro policy options have been exhausted, and taking due account of multilateral considerations.

- *Private non-financial balance sheets have excessive currency risk*. Even if there is not excessive borrowing in aggregate, borrowers may be tempted by lower interest rates into taking on excessive FX risk. For borrowers which are unhedged (i.e., entities—firms or households— without significant foreign exchange earnings), capital controls may be appropriate—particularly on the riskier forms of liabilities. An alternative is an FX-related measure—say such as prohibiting borrowing in FX (e.g., for mortgages)—by domestic (nonfinancial) entities.

- *Direct borrowing from abroad by non-financial entities fuels asset price inflation, and possibly bubbles*. Since such borrowing bypasses the domestic banking system, neither monetary policy nor prudential regulation will likely have much traction, and capital controls on foreign borrowing (and complementary instruments) could be needed.[14]
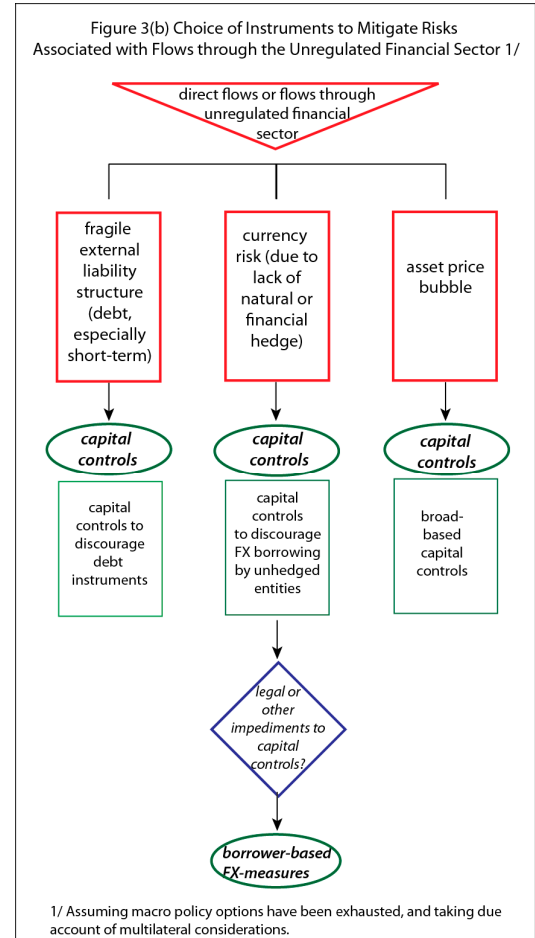
A key takeaway is that for flows by-passing the regulated financial system, the case for using capital controls is much stronger, since the flows are outside the usual perimeter of prudential

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[14] If information is available on the extent of direct borrowing abroad by non-financial entities, prudential regulations could discourage borrowing abroad by limiting access to local loans—for example, by setting higher reserve requirements on local bank loans to firms with large external indebtedness.

policies.[15] *While the perimeter of regulation could in principle be extended in a manner that does not discriminate between residents and non-residents (thus avoiding capital controls), this may be impractical in many cases given legal arrangements and administrative capacity.*

What are the exceptions? The main one relates to international obligations, which may prohibit or constrain the use of capital controls (e.g., the EU treaty, the GATS, the OECD, or various bilateral investment treaties).[16] Box 5 discusses a number of constraints on the use of capital controls arising from such obligations. Box 2 illustrates, using the example of Korea, how international obligations may constrain the response to inflows in practice, and how prudential tools can help to limit the risks posed by inflows while safeguarding the stability of the banks and reducing currency risks taken on by nonfinancial corporates.

To summarize, there are a number of considerations that need to be taken into account when choosing between capital controls and prudential measures (that may act much like capital controls). As the discussion makes clear, it is difficult to come up with hard-and-fast rules since much depends upon the specific circumstances. But the basic principle is to use instruments (or combinations of instruments) that best achieve the policy objectives at minimum national and multilateral cost. When measures are being taken to address financial-stability concerns, the objective is to reduce the risks, preferably without reducing the volume of inflows. To the extent that prudential measures would be effective (e.g., flows do not bypass RFIs) and help reduce risks without affecting the volume of inflows, they may be preferable to capital controls (though, even here, the distortionary costs to the domestic economy of the alternative tools need to be taken into account).[17] When measures are being contemplated for macroeconomic reasons, the objective is to reduce the aggregate volume of inflows (without necessarily affecting its composition); there is no multilateral reason to choose between prudential measures and capital controls—so the choice between them will depend on their relative effectiveness and distortionary cost to the domestic economy[18]—and it is all the more imperative that macroeconomic policy options be exhausted first.

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[15] Even though non-financial entities can borrow directly from abroad, the flows will still need to be intermediated by the (regulated) local banks, which facilitates the enforcement of controls on those flows. In countries where contracts need to be settled in local currency, the exchange of foreign currency for local provides another "choke point" for the imposition of controls.

[16] Under the IMF's Articles of Agreement, a member's right to impose capital controls under Article VI is qualified by its obligations under Article IV, including its obligation to collaborate with the Fund and other members to assure orderly exchange arrangements and promote a stable system of exchange rates.

[17] For example, a prudential measure that restricts banks' FX lending to unhedged borrowers (together with limits on banks' own open FX exposure) *could* reduce the risks without affecting the volume of external flows (if foreign creditors are willing to assume the currency risk). Note, however, that certain types of capital controls (for example, measures that tilt the composition toward longer maturity inflows) may also reduce the financial-stability risks without necessarily reducing the aggregate volume of flows.

[18] Since the purpose of the measures in this case would be to reduce the aggregate inflows, capital controls will be the more direct instrument.

Box 5. International Arrangements Restricting the Scope for Capital Controls

Several countries have assumed legal obligations to liberalize capital movements under different international arrangements. These obligations may constrain the country's ability to use capital controls, but prudential regulations that do not discriminate between residents and non-residents (and, as such, do not constitute capital controls) may still be available.

WTO/GATS: Members only incur obligations to remove restrictions on capital flows if they have made commitments in the financial services sector. But even then, these constraints are limited in scope, the commitments are subject to periodic rounds of negotiation, may be of a qualified nature, and there are prudential carve-outs. There is also a general balance-of-payments clause that allows the use of capital controls under specific circumstances.

Bilateral Investment Treaties (BITs) and Free Trade Agreements (FTAs): There are about 2,500 BITs, as well as bilateral and regional trade agreements that provide legal protection for foreign investments. These agreements usually liberalize inward investments and provide for the free repatriation of that investment. They typically include "most-favored nation" clauses. Most BITs and FTAs either provide temporary safeguards on capital inflows and outflows to prevent or mitigate financial crises, or defer that matter to the host country's legislation. However, BITs and FTAs to which the United States is a party (with the exception of NAFTA) do not permit restrictions on either capital inflows or outflows.

OECD: The OECD's *Code of Liberalization of Capital Movements* is the only legally binding instrument focusing comprehensively and exclusively on international capital movements. It covers all types of capital flows, but its framework enables members to remove restrictions on capital movements in a progressive manner. The members are permitted to lodge reservations with respect to specific transactions at the time of joining the OECD (and in the case of a number of transactions considered short-term in nature, these reservations can be reintroduced at any time). The Code also provides a very broad level of temporary derogation for capital flows (for reasons arising from "serious economic and financial disturbances" and for balance of payments reasons).

EU: Members of the EU are prohibited from imposing any restrictions on cross-border movements of capital among EU members and third countries. There are safeguards that allow for the temporary imposition of restrictions. But once an EU member joins the currency union, these safeguards may only be imposed by the EU Council and are limited to nonmembers.

V.   SOME EVIDENCE ON EFFECTIVENESS OF INSTRUMENTS IN MANAGING INFLOWS

Against the above discussion on risks and instruments, we now turn to some stylized facts on the relationship between inflow surges and credit booms, and the effectiveness of policy instruments in reducing the risks; further details are given in the Appendix. What follows is only a set of suggestive associations and should not be interpreted as implying causal relationships. Moreover, the findings regarding policy instruments comingle cases where the country has extensive controls or prudential measures in place with cases where the environment is largely liberalized or unregulated. Therefore, these findings may not capture fully the implications of introducing marginal measures in a largely liberalized or unregulated environment.[19] With these caveats in mind, the stylized facts suggest that:

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[19] That said, the results are robust to dropping countries or observations that represent mostly closed capital accounts. In other words, the results are not driven by a comparison between countries with mostly closed capital

(i) capital inflow surges are often associated with credit booms—including risky booms that end in bust—and greater reliance on FX credit in the economy; (ii) countries with capital controls tend to have a less crisis-prone external liability structure; (iii) countries with capital controls and FX-related prudential regulations have a lower reliance on FX-lending (while other prudential regulations are associated with a lower incidence of domestic credit booms); and (iv) countries with capital controls and FX regulations appear to have greater growth resilience during a sudden-stop episode.

i. ***Capital flows and credit booms.*** There is a strong association between capital inflows and both credit booms and FX lending by domestic banks (Figures 4a, b).[20] In a sample of 41 emerging market countries over 2003–07, and defining booms and surges as the top decile, half of credit booms are associated with a capital inflow surge, and these same booms are also those that ended in bust. Similar results are obtained if booms and surges are defined as the top quartile, in which case 90 percent of booms are associated with a surge in inflows, and of the 60 percent that ended in a bust, all were associated with a capital inflow surge.[21]

Figure 4. Domestic Credit and Net Capital Flows to GDP (in percent)

(a) Domestic Private Credit Boom*

Source: IMF staff estimates.
*PC=Change in domestic private credit to GDP over 2003-07 (in percentage points); PKF=Pre-crisis net private capital flows to GDP averaged over 2003-07; Control var includes the initial condition (private credit to GDP in 2003) and average real GDP per capita (in PPP) in 2003-07.

(b) Foreign Currency Credit*

Source: IMF staff estimates.
*FX=Forex credit to GDP in 2007 (in percent); PKF=Pre-crisis net private capital flows to GDP (in percent) is the average over 2005-07; Control var includes private sector credit to GDP in 2005 and a dummy variable indicating the exchange rate regime in 2007 (1=de facto peg, 0=otherwise).

PC=-10.57+2.06***PKF+Control var

FX=-1.55+1.03***PKF+Control Var

accounts versus countries with largely liberalized capital accounts—but rather by the differences in performance between countries with largely liberalized and those with fully liberalized capital accounts.

[20] Other papers with consonant findings are: Kaminsky and Reinhart (1999), Demirguc-Kunt and Detragiache (2002), Barajas et al. (2007), Mendoza and Terrones (2008), and Rosenberg and Tirpak (2008).

[21] Results obtained from a panel dataset of EMEs over the period 1995–2008 support these findings, with net capital inflows significantly associated with domestic credit booms. Overall, about one-half of credit booms are associated with a capital inflow surge, and of those that ended in a crisis, about 60 percent are associated with an inflow surge.

ii. *Policy measures and capital flows.* In line with the findings of previous studies, capital controls—particularly on bond inflows and on the financial sector's borrowing abroad—are associated with a lower proportion of debt liabilities in total external liabilities (Figure 5). There is also some evidence that FX-related prudential measures are associated with a smaller proportion of debt liabilities (FX-related prudential measures lose their significance, however, if capital controls are also included as a regressor).

Figure 5. Debt Liabilities and Policy Measures*

Source: IMF staff estimates.
*Debt liabilities is the residual (including constant) obtained after regressing the share of debt liabilities in total external liabilities in 2007 (in percent) on a (lagged) composite external vulnerability index. Policy indices are averages over 2000-05 except for the macroprudential measures index, which pertains to 2005. *,**,*** indicate signficance at 10, 5 and 1 percent, respectively.

iii. *Policy measures and credit booms.* Controls on capital inflows are associated with reduced FX lending, but do not affect lending booms generally (Figure 6 and Appendix 1). FX-related prudential measures—especially limits on banks' open FX positions and regulations regarding domestic lending in FX—are strongly associated with a lower reliance on FX-denominated lending, but the effect of such measures on general lending booms is weak. Prudential measures—especially sectoral limits on banks' lending and reserve requirements—are associated with a reduced frequency of general lending booms, but are not significantly associated with the extent of FX lending.

Figure 6. Domestic Private Credit and Policy Measures

(a) Domestic private credit boom*

Source: IMF staff estimates.
* Private credit boom is the residual (including constant) obtained after regressing change in private credit to GDP over 2003-07 on private credit to GDP in 2003. Policy indices are averages over 2000-02 except for the macroprudential measures index, which pertains to 2005. ** indicates significance at 5 percent level.

(b) Forex credit*

Source: IMF staff estimates.
*Forex credit is the residual (including constant) obtained after regressing forex credit to GDP in 2007 on private credit to GDP in 2005 and a binary variable indicating the de facto exchange rate regime in 2007 (equal to one if fixed and zero otherwisw). Policy indices are averages over 2003-05 except for the macroprudential measures index which pertains to 2005. ** and *** indicate significance at 5 and 1 percent levels, respectively.

iv. ***Policy measures and crisis resilience.*** The "natural experiment" afforded by the 2008–09 global financial crisis (which represented a common, exogenous crisis trigger to emerging market countries) is suggestive of greater growth resilience in countries that had either capital controls (especially on debt liabilities) or prudential measures in place in the years prior to the crisis (Figure 7). Regressing the change in real GDP growth during 2008–09 (relative to the country's growth performance over 2003–07) yields positive and statistically significant coefficients in individual regressions on (i) capital controls (especially economy-wide controls on debt liabilities); (ii) FX-related prudential regulations; and (iii) other prudential measures (especially reserve requirements and restrictions on concentration of lending to individual sectors). When capital controls and FX-related prudential measures are introduced in the regression simultaneously, the former retains its statistical significance; when capital controls and macro-prudential measures are introduced together, both remain individually significant (Table A4). This suggests some degree of substitutability across capital controls and FX-related prudential measures and complementarity between the former and prudential tools in enhancing growth resilience in the face of capital inflow boom-bust cycles.

Figure 7. Crisis Resilience and Policy Measures*

Source: IMF staff estimates.
*Crisis resilience is the residual (including constant) obtained after regressing the difference between real GDP growth rates averaged over 2008-09 and 2003-07 on trading partner growth and terms of trade change. Policy indices are averages over 2000-02 except for the macroprudential measures index, which pertains to 2005. * and ** indicate significance at 10 and 5 percent levels, respectively.

VI. DESIGNING CAPITAL CONTROL INSTRUMENTS

The discussion above points to different situations in which capital controls may be indicated, but leaves open a number of questions regarding their design.[22] While specifics will depend on country circumstances, the goal is to design controls that are *effective* (achieve their intended aim and are not easily circumvented) and *efficient* (minimize distortions and scope for non-transparent or arbitrary enforcement).[23] It needs to be borne in

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[22] Issues related to the use and design of prudential policies to address systemic risks, including those stemming from capital flows, are taken up in IMF, "Macroprudential Policies: An Organizing Framework," forthcoming.

[23] See Ostry et al. (2010) for a survey of studies on the effectiveness of capital controls, which suggests that controls are more effective in altering the composition of inflows than the aggregate level (however, the plausibility of full offset—a dollar less inflow of one type leading to a dollar more of another type in response to a targeted control—is dubious). When controls are imposed for financial-stability purposes, of course, the aim is usually to affect the composition of inflows (and not necessarily the aggregate volume); indeed, altering the composition while leaving aggregate volumes unchanged may allow the country to benefit from the inflows while avoiding some of the risks. Effectiveness must also be judged against objectives of the instrument used. For example, Colombia's URR (2007–08) is often judged to have been ineffective inasmuch as there was little visible impact on the rate of currency appreciation. But the measure was a URR on foreign borrowing and portfolio inflows (together with limits on currency derivative positions of banks) and did not cover other flows such as FDI, which made up the bulk of flows. While aggregate inflows indeed rose in the period after the imposition of the URR (suggesting ineffectiveness of the controls), non-FDI borrowing and portfolio flows—on which controls had been applied—fell substantially. This change in the composition may also reflect circumvention of the URR through the unregulated financial sector.

mind that in many circumstances capital controls will not be needed at all, since judicious use of macroeconomic policies and prudential tools (that are not as discriminatory as capital controls) will suffice to address the risks. Equally, it is important in thinking through the measures not to let the perfect become the enemy of the good; a number of tools are likely to be needed, and focusing on the perfect design of only one of them is likely to be counterproductive. In the remainder of this section, we answer a number of questions concerning the design of controls.

Should controls be imposed only in the face of flows that are expected to be temporary? In Ostry et al. (2010), we emphasized that controls for macroeconomic reasons should only be used in the face of capital inflows that are expected to be temporary, on grounds that the exchange rate should adjust to permanent shocks.[24] For prudential concerns, the distinction between transitory and persistent flows is less pertinent as both may pose financial stability risks—indeed, persistent flows will arguably be more dangerous in terms of fuelling asset price booms. Since the key concern is a surge that might overwhelm the normal regulatory framework, both capital controls and prudential measures can be strengthened or imposed to counter the credit cycle—remaining in place until the flows have abated or reversed. One possibility, which is easier to implement for price-based measures, is to keep the administrative apparatus/institutional arrangements permanently in place to be able to implement a tax or URR when appropriate, reducing the rate (possibly to zero) when no longer required. This could be helpful administratively by avoiding the need to set up an apparatus from scratch when inflows surge, but it must be recognized that adjusting the URR or tax rate should not be an automatic response given the need to ensure that the policy prerequisites for controls are met.

Should controls be broad or targeted at the riskier flows? This depends on the purpose for which controls are being contemplated. When imposed for macroeconomic reasons, controls should be applied broadly across types of inflow, since it is the aggregate inflow that matters for the exchange rate and competitiveness. (A more targeted approach is possible if most flows happen to be of a certain type, but the likelihood of an endogenous shift in the type of flows needs to be borne in mind.) For financial stability concerns, controls can be targeted more narrowly on the riskiest forms of inflows (generally, short-term, foreign-currency denominated debt, some types of portfolio flows). However, there is a tradeoff in terms of effectiveness in applying controls narrowly because circumvention can then occur more easily through exempt transactions, relabeling, or derivative markets (see below).

How can circumvention be limited? Unrestricted current transactions and liberalized capital transactions are often used to circumvent capital controls. Nonresidents selling goods in a country may receive the payment in local currency and invest it locally, thus avoiding controls on inflows. If controls are imposed only on the inflow of capital, or if only the conversion from

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[24] Of course, it is hard to determine in real time whether a capital inflow will be temporary, but inflows that push the exchange rate away from equilibrium may be more "temporary" since they would presumably be subject to reversal in the future as overshooting unwinds. In determining the likelihood that the exchange rate has overshot, it is important to allow for the impact of changes in fundamentals on the equilibrium exchange rate; see also the IMF's *Global Financial Stability Report* (April 2010) on factors affecting capital flows and their likely persistence.

foreign currency to local currency is taxed, the investment proceeds can be transferred abroad without being affected by the controls.

Since foreign direct investment is generally viewed as beneficial to the economy, it is often exempt from controls.[25] But this gives an important avenue for avoidance by "relabeling" of flows. When controls have narrow coverage (e.g., only on debt), foreign investors can try to enter the country in the form of tax-exempt inflows (e.g., equity investments). Once inside, they can purchase the debt instruments through a local shell company, or sell the equity locally and use the proceeds to purchase debt—thus avoiding the control. (However, at least large institutional investors are likely to be deterred from trying to evade controls, as it would limit their recourse to the domestic legal system to enforce obligations.) Residents' repatriation of foreign exchange may also need to be subject to the controls to prevent circumvention via transactions between residents and nonresidents abroad.

Another avenue for circumvention may be the use of derivative markets, in the case of EMEs where those markets are deep and liquid. A foreign investor who wants a certain amount of exposure to domestic assets without paying the tax on the full amount could purchase a derivative instrument (so that the flows into the country are just the required margin rather than the full desired exposure). While this would reduce the revenue collected, the capital control would achieve its purpose of reducing the aggregate inflow. However, to the extent that the local counterparty to the derivative transaction (such as a local bank) tries to hedge, this will require the same flow (but now between the local bank and, usually, another foreign party). If the latter transaction is not taxed, then the use of derivatives essentially allows circumvention of the control on the inflow.[26] But if it is taxed at the same rate as the original inflow would have been, then the local bank must charge correspondingly more for the derivative transaction, and the foreign investor faces the same cost as if he had paid the tax on the original instrument rather than buying exposure in the derivatives market. Brazil's experience with its IOF tax is instructive in this regard—suggesting that specific design features not inherent to a capital inflows tax indeed provided a significant loophole which undermined the effectiveness of the measure (Box 6); that said, many EMEs currently do not have such large derivatives markets, so at least the onshore markets may not give as much scope for circumvention.

In sum, capital controls may need broader coverage (than would otherwise be desirable) to reduce the scope for circumvention; even then, some circumvention is inevitable as long as the incentives for doing so exceed the costs. In countries with sophisticated financial markets, the design of the control must take account of possible loopholes through the use of derivatives. Considerable administrative capacity involving significant costs will usually be required to ensure effectiveness. Thus it is important to weigh the benefits of limiting circumvention against the costs of such measures, which will be borne not only by the authorities but also by the banks, which are usually required to help implement the controls.

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[25] See "Reaping the Benefits of Financial Globalization," IMF Occasional Paper No. 264 (2008), on the medium-run benefits for economic growth from FDI.

[26] Note that if bank borrowing (e.g., from a parent or subsidiary) is not taxed, this in itself provides a loophole to capital controls; however, the bank's ability to exploit this loophole may be limited by regulation on its open FX position. In the example considered here, the bank closes its derivative FX position by borrowing abroad.

Box 6. Effectiveness of Capital Controls: Brazil and Colombia

Both Brazil and Colombia have used controls on inflows to address external competitiveness concerns and increase monetary policy independence. There are similarities, but also important differences, in the experiences of the two countries (besides the use of a tax vs. a URR; Box 7). While initially the URR covered only foreign borrowing in Colombia, ultimately in both countries the controls targeted portfolio flows—fixed income and equity, the latter, in part, to prevent foreigners entering through the equity market and converting to fixed income instruments. Colombia exempted the issuance of stocks through American Depository Receipts (ADRs). Brazil did the same initially, but later imposed a tax on the issuance of ADRs, since the conversion from ADRs to local stocks could be used to circumvent the controls.

In both countries, the on-shore and off-shore derivatives markets were sufficiently developed to provide avenues for circumvention. In the case of Colombia, this circumvention strategy was curtailed by a prudential measure that limited the bank's overall gross position in currency derivatives (although there was a substantial increase in off-shore derivative trading by pension funds, which were not subject to those limits)—an example of prudential policies complementing capital controls. Rather than be subject to the full tax on the notional amount of exposure to a local asset, the foreign investor could:

On-shore

- Transact in the ***on-shore*** derivatives market where it would only be subject to the tax/URR on the margin requirement (much smaller than the notional exposure). For example, the foreign investor could sell dollars forward, benefiting from any appreciation of the local currency beyond the interest rate differential.

- In this case, the tax would be effective in that only a small fraction of the notional amount would enter as a capital inflow, with correspondingly smaller impact on the exchange rate.

- However, if the counterparty to this derivative position is a local bank, it will typically hedge its exposure, and in so doing generate the same capital inflow (as the notional amount). For example, the bank would borrow dollars from its foreign operations, convert to local currency and invest in a local asset, deliver the local currency to the foreign investor, and use the dollars delivered by the foreign investor to repay the dollar loan. Since transactions between a bank's domestic and foreign operations were not covered by either the Brazilian tax or the Colombian URR, this provided an important loophole. (The bank could not engage in this carry trade without a counterparty in the derivatives market, as this would expose it to currency risk and violate open FX limits.)

Off-shore

- The foreign investor could sell dollars forward on the ***off-shore*** (outside the capital control's jurisdiction).

- If the counterparty is also offshore, there is no capital inflow. Typically, the counterparty is likely to be a local bank (or a foreign bank with a local presence) in order to be able to deliver local currency.

- The local bank could hedge its exposure by borrowing dollars offshore, selling them spot, investing them, and then delivering local currency to the foreign investor upon receipt of FX which would be used to repay the dollar loan. Again, because transactions between the bank's foreign and domestic operations were not covered the Brazilian or Colombian measures, the derivatives market provided an important loophole.

Table 1. Colombia: Net private capital flows before and after capital controls (weekly avg flows in US$ mln.)

Category	Before	After	Change (after-before)
Total	99.6	104.9	5.3
Total non-FDI	3.7	-32.8	-36.4
Borrowing	-10.8	-17.1	-6.3
Portfolio (non-residents)	25.2	-3.6	-28.8
Portfolio (residents)	-4.7	-18.1	-13.3
FDI	95.9	137.7	41.8

Source: Clement and Kamil (2009).

*Before represents average flow for the period 6th July 2006 to 6th May 2007; After represents average flow for the period 7th May, 2007 to 4th July, 2008.

The transactions costs involved in these derivatives transaction are non-negligible, thus discouraging some inflows, but tend to be much smaller than the tax/URR on capital inflows (and do not generate revenues/gains to the government, only fees to the banks involved). While restrictions on gross currency positions can potentially limit hedging for legitimate reasons, this must be weighed against the benefit of closing the loophole.

The Colombian URR appears to have been successful at reducing the targeted portfolio inflows, although overall inflows actually went up due to a large increase in FDI (Table 1). Much of this change in composition could have been driven by a "relabeling" of flows (including financial-FDI being used to circumvent the controls on portfolio flows).

Should controls be administrative (quantity-based) or price-based? Controls may be price-based (e.g., a tax or URR—see Box 7), or administrative (quantitative)—ceilings/limits (e.g., based on capital), authorization requirements, or outright prohibitions on certain flows.[27] Economists' instinct, based on the trade literature, is that while it is always possible to find equivalent price and quantitative controls, the former are preferable because they are less opaque and/or subject to arbitrary enforcement.[28] Price-based measures may be easier to adjust cyclically and certain forms are simpler to administer, but when the authorities face information asymmetries and uncertainty about the private sector's response, it can be difficult to calibrate the price-based measure appropriately (Weitzman, 1974). Information asymmetries are particularly relevant in the financial sector, where authorities do not have access to information acquired by lenders about the creditworthiness of borrowers.[29] Therefore, a rule of thumb could be that price-based measures are preferable in general, whereas administrative measures (e.g., limits on certain flows)—provided they can be made transparent and rules-based—may be more appropriate for prudential purposes, particularly when applied to the financial sector.

Figure 8. Capital Controls: Design Considerations 1/

macroeconomic concerns

financial-stability risks

–applied only to temporary flows
–price-based
–broad, limited exemptions

–applied to temporary or persistent flows
–quantity-based (especially when on financial sector)
–targeted, taking account of circumvention possibilities

1/ Assuming macro policy space has been exhausted and multilateral considerations have been taken into account

What other considerations need to be taken into account? Beyond the considerations discussed above (and summarized in Figure 8), an often-determining factor in the design of capital controls is the administrative ease of imposing particular measures, given the country's institutional setup.

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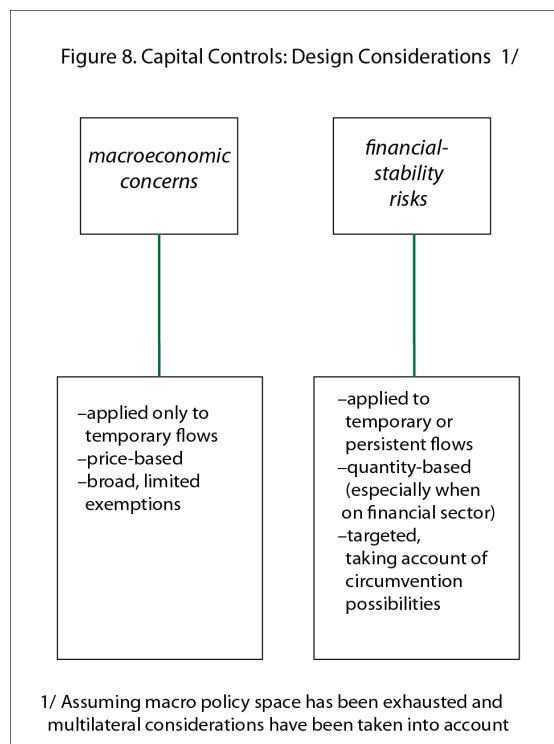
[27] In practice, countries often introduce price and quantitative measures simultaneously. For example, Colombia (2004), Russia (2004), and Thailand (2008) adopted quantitative restrictions along with a URR. A few other countries, such as China and India, strengthened administrative controls in response to the pre-crisis surge, but their experience is less revealing because they already had an extensive system of quantitative controls in place.

[28] In part this is because in international trade, tariffs automatically generate revenues for the government, while quantitative restrictions generate rents that accrue to whoever holds the quota (though the government can try to recapture those rents by auctioning the quota instead of allocating it; see Schuknecht, 1999). By analogy, taxes on inflows generate revenues; this is a double-edged sword, however, as a government reliant on those revenues may be reluctant to remove the tax when it is no longer necessary for prudential purposes. See also Magud et al. (2006) on the (non)-equivalence of price- and quantity-based measures.

[29] Most domestic financial regulation is quantitative (e.g., rules that limit open FX position of banks in relation to capital) or a combination of price- and quantity-based (e.g., capital adequacy requirements)—presumably because small misjudgments about the private sector's incentives and reaction can result in excessive risk, with adverse effects on financial stability. For example, large exchange rate movements can wipe out a bank's capital in the presence of sizable open FX positions, so it is understandable for the regulator to seek to cap the exposure rather than price that risk and charge it against the bank's capital. Some forms of lending are so risky that the regulator may decide to outright ban them (e.g., high LTV loans, or FX lending to households).

Box 7. Taxes vs. URRs

The "textbook" examples of price-based capital controls are taxes on inflows and unremunerated reserve requirements (URRs). URRs have a similar effect to taxes by requiring that part of the inflow be deposited in an unremunerated account for a period of time. Both types of controls place a larger burden on short-term flows (e.g., paying an entry tax has a larger impact on the net return on a one-year flow than on a ten-year investment). While URRs have an administrative (i.e., quantitative) element, it is straightforward to compute a tax-equivalent rate for the URR, which will be a function of the level of the URR as a proportion of the investment and the opportunity cost of those funds (in a low-interest rate environment, however, a substantial deposit may be required to be effective, possibly raising liquidity concerns). Examples are:

- **Chile** set up a URR in 1991 at a 20 percent rate (with varying length depending on the maturity of the credit). The rate was subsequently increased to 30 percent and the deposit period was set at one year, regardless of the credit's maturity. The coverage of the URR was also expanded. The rate was reduced to zero in 1998.

- **Colombia** applied a 40 percent-six month URR in 2007. Withdrawals before the six-month period were subject to substantial penalties. In June 2007, equities issued abroad were exempted; in December, the URR on IPOs was eliminated and early-withdrawal penalties were reduced. Persistent appreciation pressures led to an increase in the URR to 50 percent in May 2008. To prevent circumvention, a two-year minimum-stay requirement was implemented on inward FDI.

- **Thailand** implemented a 30 percent-one year URR in late 2006. Early withdrawals were subject to approval by the Bank of Thailand and were penalized by withholding one-third of the deposit, i.e., a 10 percent tax on the transaction value. Later on, debt flows that were fully hedged became exempt from the URR. Ultimately, the URR was eliminated in March 2008.

- **Russia** introduced a number of different URRs in 2004: a 3 percent, 365 days URR on foreign borrowing; a 20 percent, 365 days URR on transactions with government bonds; a 3 percent, 365 days URR for transactions with other securities; a 50 percent, 15 days URR for ruble denominated loans from residents and certain securities transactions; and a 3 percent, 365 days URR for ruble loans to residents and specified domestic securities transactions. The URR was lifted in 2006.

- **Brazil** implemented a tax (IOF) on certain capital inflows in March 2008, at a 1.5 percent rate. The tax was eliminated at the onset of the global crisis, but re-introduced in October 2009, with a 2 percent tax on foreign equity and fixed-income inflows and a 1.5 percent tax applied when foreign investors convert ADRs into receipts for shares issued locally. Subsequently, the tax rate was increased in two steps to 6 percent for fixed-income inflows and extended to derivatives.

URRs can create liquidity costs, since part of the funds are not available immediately to the investor, and the URR deposit is not useful as collateral to a counterparty other than the central bank. While this acts as a deterrent to capital flows, it involves a deadweight loss (in the sense that it would be more efficient to discourage flows through a higher tax rate than through illiquidity). On the other hand, URRs that are deposited in foreign exchange immediately reduce the exchange rate pressure by the amount of the deposit, while the tax, which is generally paid in local currency, requires conversion of FX into local currency, with the resulting exchange rate pressure. Given the similarity between URRs and inflow taxes, the choice between the two is usually driven by administrative considerations. Typically, the central bank has authority to impose a URR but does not have authority to levy taxes. That explains why most countries have adopted URRs. In the particular case of Brazil, the inflow tax had been created in the past, and the Ministry of Finance has authority to adjust its rate. Unlike a tax, a URR can usually be removed (or set to zero) more easily because the budget is not directly reliant on its revenues, but may be more burdensome to administer than a tax.

Controls consistent with existing practices can be inserted more quickly and seamlessly, and will be more effectively implemented, thus reducing circumvention. In some instances new measures to manage inflows are not necessary, only better implementation is required, for example by better monitoring of banks' compliance or by stepping up enforcement. Administrative capacity is thus critical, and countries should—other things being equal—opt for measures that play to their relative administrative strengths. For instance, if the foreign exchange administration capacity at the central bank is weak, then a tax on inflows implemented by the tax authority may be more effective. Consideration also needs to be given to the character and quality of the country's governance, since measures may be subject to dilution through lobbying on the one hand, or be administered in an arbitrary or corrupt way on the other.

In practice, financial institutions will often be the cornerstone of implementation of controls, requiring careful supervision to ensure compliance. This supervision is distinct from, and in addition to, normal prudential supervision, and can be performed by the supervisory authority, the central bank, and possibly the tax authority.

With respect to price-based controls, the choice between taxes on inflows and URRs may come down to whether parliamentary approval is required to introduce a tax (or change its rate), whereas the central bank typically has the authority to introduce or modify reserve requirements. The URR requires a relatively complex administration, however, because the deposited amount has to be returned to the investor after the expiry of the reserve period. The complexity increases with different reserve periods and URR rates, for example when the URR rates and reserve periods are adjusted and the banks must maintain reserves based on the previous conditions until their expiry. The administration of the tax appears to be easier. The tax can be levied at the time when FX is converted to local currency for the purposes which are subject to tax (see Box 7 on the Brazilian case). No additional follow up is needed, although documentation should be maintained to monitor compliance. Tax agents can be brokers in the stock exchange, securities depositaries or fund managers. A final consideration on the administrative side relates to international obligations, which may restrict the use of controls as a result of bilateral, regional, or multilateral agreements: see Box 5.

VII. CONCLUSIONS

Capital controls are an important part of the policy toolkit for managing surges in capital inflows, in addition to macroeconomic and prudential policies. A prerequisite for using capital controls is that domestic macroeconomic policies be appropriately set, and that non-discriminatory prudential policies have been adjusted to the extent possible. This requires that the exchange rate be consistent with its multilateral medium-run fundamental level; that fiscal and monetary policies are consistent with internal balance and public debt sustainability in the face of inflows; and that official reserves have been adequately built up from a country-insurance perspective. Once the macroeconomic prerequisites for invoking capital controls are met (but not before), and if prudential measures cannot suffice or are not effective, capital controls can be used to mitigate the risks associated with inflow surges.

The appropriate mix of prudential regulations and capital controls depends upon the channels through which inflows enter the economy, and thus on the specific risks to which the surges give rise. When risks are from direct foreign borrowing where the loans effectively bypass the regulated financial sector, capital controls may be the best tool to prevent a surge in risky external liabilities, and possible associated currency risk, given that it will often not be possible to expand the perimeter of prudential regulation in an efficient or timely manner. When RFIs intermediate the flows, excess borrowing by the banks (especially short-term debt), credit exposure to unhedged borrowers, currency risk on bank balance sheets, and broader economic risks associated with asset price increases are all relevant in designing the prudential package. Policies will need to target the specific risks but, given a variety of institutional constraints and country-specific factors, a set of complementary measures is likely to be needed rather than using a single instrument in a highly restrictive manner.

In designing the capital control component of the overall package to deal with inflows, it is necessary to take account of both the persistence and the volatility of capital inflows. An institutional setup that allows for cyclical variation in the restrictiveness of controls may be one option for moderating the impact of boom-bust cycles. Controls will likely need to be broad when macroeconomic concerns are paramount, but could be targeted to the riskiest flows when financial-stability concerns are foremost. In countries with sophisticated financial markets, controls and prudential regulations may need to be used together to close loopholes, including through derivatives markets. As far as the use of price- versus quantity- based measures is concerned, the former may be preferable when applied for macroeconomic reasons, whereas administrative measures (including prohibition of certain flows) may be appropriate when controls are used for financial-stability purposes, especially on the financial sector. Administrative measures, however, need to be transparent and rules-based to avoid potential rent-seeking behavior. Finally, a range of institutional features are relevant in designing inflow control measures, including where responsibilities lie for managing financial-stability risks in relation to capital inflows, as well as the nature of constraints from a country's commitments though international, regional, or bilateral investment agreements.

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APPENDIX I. EMPIRICAL ANALYSIS

This appendix presents some empirics on the impact of capital controls and prudential policy measures on the composition of capital flows, credit booms, and crisis resilience to infer the effectiveness of different types of prudential tools in curtailing financial vulnerabilities associated with capital inflows. The sample consists of 41 EMEs, and the estimation pertains to cross-sectional data, which covers the most recent financial crisis as well as annual panel data for the period 1995–2008.[30]

A. Measuring Capital Controls and Prudential Policies

An empirical assessment of the effect of capital controls and prudential regulations to limit financial vulnerabilities, and enhance growth resilience during economic crises, requires a quantitative description of these policy instruments. Like most policy variables, capital controls and prudential measures are elusive concepts to measure. While in recent years—as financial globalization has gained momentum—efforts have been made to document de jure measures of capital account openness (for example, Chinn and Ito, 2008; Schindler, 2009), cross-countries studies have often resorted to using de facto gauges or outcome variables (for example, credit to GDP, loan to deposit ratio, etc.) to proxy for prudential regulations.

For a policy effectiveness analysis such as that conducted here, it is necessary to have information on both de jure measures as well as de facto outcomes. To create de jure measures of capital controls and prudential tools that would serve as inputs for our empirical analysis, we rely on the information contained in the IMF's AREAER and an in-house survey of country desks. Using this information, we construct three types of indicators to reflect different aspects of capital controls and prudential regulations: (i) capital controls on the financial sector (Fincont); (ii) FX-related prudential regulations (Fxreg); and (iii) other prudential measures on the financial sector (Domreg).

Specifically, our first index, Fincont, comprises controls specific to financial institutions on borrowing abroad, maintenance of accounts abroad, and the differential treatment of deposit accounts held by nonresidents. The second index, Fxreg, includes regulations on lending locally in foreign exchange, purchase of locally issued securities denominated in foreign exchange, differential treatment of deposit accounts in foreign exchange, and limits on open foreign exchange positions.[31] Finally, Domreg contains information on measures designed to restrict domestic credit such as loan to value ratio, reserve requirements, and limits on credit concentration in specific sectors. Each index is a simple average of the included components,

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[30] The full sample consists of 50 EMEs, but data limitations restrict the usable sample to 41 countries.

[31] If the limits on open FX positions differentiate between residents and nonresidents, they would constitute a capital control on the financial sector. However, disaggregated data on residents versus nonresidents open foreign exchange position limits is relatively limited, and where such information is available, there are only a handful of cases where limits existed on nonresidents' but not on the residents' assets and liabilities.

where each component is reflected as a binary variable with 1 indicating the existence of a regulation and 0 otherwise.[32]

In general, the constructed measures tend to be positively correlated with each other as well as with the measure of economy-wide capital account controls on inflows constructed by Schindler (2009) (Figure A1). Overall, however, the correlation tends to be higher between capital controls (both economy-wide and financial sector) and FX-related prudential regulations than among these measures and the domestic prudential index. A detailed pre-crisis cross-sectional snapshot of the EMEs reveals that most countries had more than one set of measures in place, with about one-third having measures pertaining to all the categories considered here—capital controls, FX-related prudential regulations, and other prudential measures (Figure A2).[33]

Figure A1. Correlation between policy measures*

Source: IMF staff estimates.
*Kai=Schindler's (2009) capital controls on inflow index in 2005. Fincont=mean of binary variables reflecting restrictions on financial sector's borrowing abroad, maintenance of accounts abroad, and differential treatment of accounts held by nonresidents in 2007. Fxreg=mean of binary variables reflecting restrictions on financial sector's lending locally in FX, differntial treatent of deposit accounts in fx, and limits on open fx positions in 2007. Domreg=mean of reserve requirements, restrictions on concentration in specific sectors, and LTV ratios in 2007.

All countries barring two (Bulgaria and Ecuador) had some form of FX-related prudential regulations in place, and several countries (for example, Chile, Costa Rica, Korea, and Israel) had imposed capital controls on the financial sector but not the economy wide capital controls.
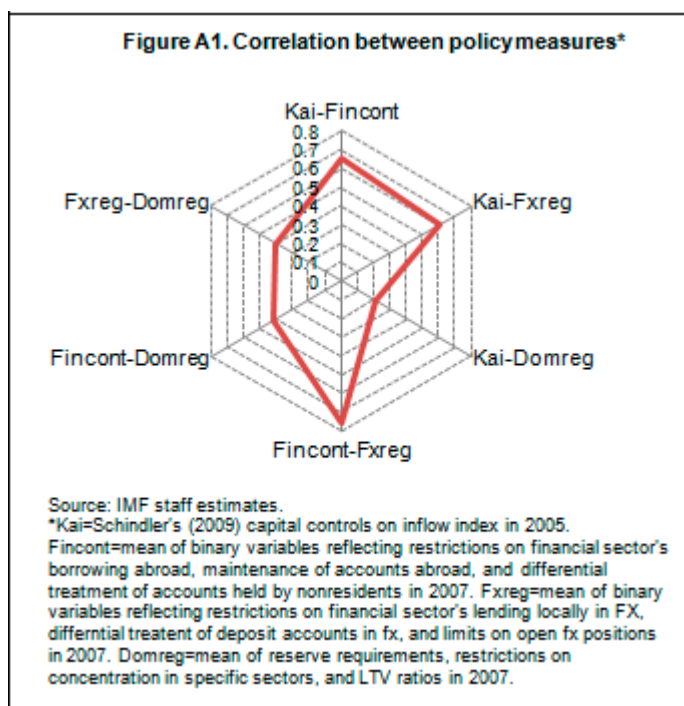
B. Estimation Results

Composition of external liabilities

Applying the constructed prudential indices along with Schindler's (2009) capital inflow controls index, we investigate if the existence of capital controls and prudential measures is in some way associated with the share of debt liabilities—considered as the riskiest form of liabilities (see Ostry et al., 2010)—in total external liabilities.[34] The cross-sectional results for the pre-crisis liability structure of EMEs, reported in columns (1) through (13) in Table A1,

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[32] For each index we create two versions—one a restricted version with selected components (indicated with the suffix 1), and the other a more comprehensive version including all components (indicated with the suffix 2). Thus, for example, Domreg1 is the average of binary variables reflecting the existence of credit concentration limits in specific sectors and reserve requirements, whereas Domreg2 also includes the LTV ratio.

[33] Only one country (Ecuador)—out of the 34 EMEs for which we had information on all policy measures—had no type of regulation in place in 2007.

[34] Data on debt liabilities (sum of portfolio debt and other investment) as a share of total external liabilities is obtained from an updated and extended version of the Lane and Milesi-Ferretti (2007) dataset.

show that the estimated coefficients for both capital controls and FX-related prudential regulations are individually and jointly statistically significant, indicating that higher restrictions in countries are associated with a smaller share of debt liabilities. Of the individual components underlying the indices, controls on bond inflows, banks' borrowing abroad, and lending locally in FX appear to have the strongest association.[35] The results obtained from the panel dataset (Table A1, columns 14–26) reinforce these findings, and countries with capital controls (both economy wide and financial sector specific) appear to have the composition of external liabilities tilted away from debt.[36]

Credit booms

The cross-sectional evidence from the recent crisis indicates that countries with both economy-wide capital controls and FX-related prudential regulations have lower domestic borrowing in foreign currency (as a ratio to GDP), although the association of the latter dominates when both are included together and the comprehensive measure of FX-related prudential regulations (Fxreg2) is used (Table A2, columns 1-13). Among the individual components in the Fxreg2 index, restrictions on lending locally in foreign exchange and limits on open forex positions statistically have the strongest association with reduced forex lending. Interestingly, however, for the panel dataset, we find that the indices for both capital controls and FX-related prudential regulations retain significance when included together— providing some evidence of complementing each other (Table A2, columns 14–26).

Table A3 reports the results of the association between prudential policy measures and domestic credit boom—defined as the change in private credit to GDP ratio. Evidence from the recent crisis (columns 1–13) indicates that both FX-related prudential regulations and other prudential measures are strongly related with smaller credit booms. However, in the panel data analysis, we find a strong association of other prudential policy measures only.[37]

Crisis resilience

Economy-wide capital controls appear to be associated with improved growth resilience in crises. Columns (1) through (13) in Table A4 indicate that countries which had capital controls on inflows (particularly, bond inflows) fared better in terms of lower output decline—measured as average growth in 2008 and 2009 relative to the country's historical average (real GDP growth, 2003–07)—in the recent financial crisis.[38] While FX-related

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[35] The estimation results for individual components are not reported here, but are available upon request.

[36] In the panel regressions, controlling for country fixed effects captures the effect of policy measures since the latter are slow moving variables. Therefore, instead, we estimate a pooled model controlling for region and income group specific effects to capture time invariant factors specific to countries, and include year effects to control for shocks common across countries over time.

[37] The sample size drops drastically when the indices for other prudential measures (Domreg1 and Domreg2) are included, since for these measures the available data is for two years (2005 and 2007) only.

[38] This finding echoes the results reported in Ostry et al. (2010), where we examined the association between capital controls and extreme negative outcomes (defined as the bottom decile of GDP growth during the crisis relative to the country's historical average). Cline (2010), who finds no relationship between capital account openness and the output decline during the crisis, questions whether such a relationship exists (or whether it is

(continued…)

prudential regulations appear to have some effect when included on their own, the effect of capital controls tends to dominate when both are included together in the regression (column 11). Other prudential measures, particularly limits on sectoral lending and reserve requirements, however seem to complement the effect of capital account restrictions, with both measures retaining significance when included together. Evidence from past crises episodes supports the association of capital controls with growth resilience—specifically, we find that countries with higher economy-wide capital account restrictions fared better than the others when crisis occurred.[39]

driven by the experience of the Baltic countries in the EME sample, which he considers unrepresentative). Cline, however, uses a composite index of capital account restrictiveness, which does not distinguish between controls on inflows and controls on outflows, whereas our analysis, based on the Schindler index, distinguishes explicitly between inflow and outflow controls (so, for example, India and Turkey are similar in terms of their capital account restrictiveness as defined by the Quinn index; but differ considerably based on the Schindler inflows index). Another important difference is that Cline's analysis is based on a sample of just 24 EME countries, whereas ours covers 41 EMEs, including the Baltic countries, whose experience in the recent financial crisis we believe offers important insights. Excluding the Baltic countries from the sample weakens the statistical significance of the association between overall controls on inflows and the growth decline, but the association between the growth decline and capital controls on debt liabilities remains statistically significant.

[39] Past crises are those identified by the VEE database over 1995–2008. Growth decline for these crises cases is computed as the difference between real GDP growth rate in the crisis year and the average past 5 year growth rate. Domreg1 and Domreg2 are not included in the panel regressions because of insufficient observations.

Figure A2. Pre-Crisis Country Coverage of Policy Measures, 2007*

Table A1: Policy Measures and Debt Liabilities

	Recent crisis[a]													Panel data (1995-2008)[b]												
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Kai	-12.009***							-8.286*	-3.670	-7.020*	-8.784	-13.693***	12.324***	-10.904***							-10.075***	-4.665	-9.009***	-10.358***	-5.078	-2.385
	(3.852)							(4.134)	(5.946)	(4.000)	(5.884)	(4.055)	(3.943)	(2.132)							(2.631)	(2.904)	(2.529)	(2.772)	(5.892)	(6.135)
Fincont1		-11.605**						-6.980							-4.820**						0.111					
		(5.367)						(6.324)							(1.960)						(2.547)					
Fincont2			-16.047**						-13.300							-10.670***						-10.257***				
			(6.092)						(8.949)							(2.049)						(2.868)				
Fxreg1				-12.664**						-8.941							-3.726**						-4.489**			
				(4.783)						(5.713)							(1.646)						(2.140)			
Fxreg2					-13.645*						-7.120							-5.569***						-3.737		
					(7.056)						(10.054)							(2.077)						(2.907)		
Domreg1						-8.105						-7.308							-7.301						-6.813	
						(7.285)						(6.809)							(6.495)						(6.655)	
Domreg2							-13.391						-11.312							-5.663						-9.209
							(9.006)						(8.830)							(7.367)						(8.372)
Observations	38	35	35	37	37	32	30	35	35	37	37	32	30	476	502	499	541	507	79	75	409	406	446	427	67	63
R-squared	0.513	0.512	0.549	0.541	0.518	0.503	0.612	0.532	0.552	0.555	0.536	0.580	0.679	0.278	0.281	0.303	0.269	0.274	0.189	0.170	0.259	0.275	0.264	0.272	0.169	0.204

Source: IMF staff estimates.

a/ Dependent variable is share of debt liabilities in total liabilities in 2007 (in percent). Kai, Fincontrol, and Fxreg are averaged over 2000-05. Domreg pertain to the measures in place in 2005. Constant and a composite index of external vulnerability included as a control in all regressions. Robust standard errors in parentheses; *, **, and *** indicate signficance at 10, 5, and 1 percent levels respectively.

b/ Dependent variable is share of debt liabilities in total liabilities (in percent). Kai, Fincontrol, Fxreg and Domreg are lagged by one year. Domreg is available for 2005 and 2007 only. Constant, and region specific, income group specific and time effects included in all regressions. A composite index of external and internal vulnerability included as a control in all regressions. Robust standard errors in parentheses; *, **, and *** indicate signficance at 10, 5, and 1 percent levels respectively.

Kai is Schindler's (2009) capital controls on inflow index.

Fincont1 is the average of binary variables reflecting restrictions on financial sector's borrowing abroad, and differential treatment of nonresident accounts.

Fincont2 is the average of binary variables reflecting restrictions on financial sector's borrowing abroad, maintenanance of accounts abroad, and differential treatment of accounts held by nonresidents.

Fxreg1 is the average of binary variables reflecting restrictions on financial sector's lending locally in foreign exchange, and differential treatment of deposit accounts in foreign exchange.

Fxreg2 is the average of binary variables reflecting restrictions on financial sector's lending locally in foreign exchange, purchase of locally issued securities denominated in forex; differential treatment of deposit accounts in foreign exchange; and open FX

Domreg1 is the average of reserve requirements and restrictions on concentration in sectors.

Domreg2 is the average of reserve requirements, restrictions on concentration in specific sectors, and LTV ratios.

Table A2: Policy Measures and Foreign-Currency Lending

	Recent crisis[a]													Panel data (1995-2008)[b]												
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Kai	-28.891***							-26.538**	-27.831**	-26.986**	-18.265*	-14.527**	-14.771**	-13.755***							-12.576***	-10.701***	-11.494***	-9.868***	-11.528**	-11.697*
	(9.314)							(10.763)	(11.110)	(11.898)	(10.188)	(6.980)	(6.819)	(1.793)							(2.078)	(2.082)	(2.055)	(2.175)	(5.658)	(6.008)
Fincont1		-11.275						-1.956							-0.700						-3.735					
		(7.307)						(8.544)							(2.665)						(3.509)					
Fincont2			-15.117*						1.942							-5.999***						-7.115**				
			(7.582)						(7.325)							(2.289)						(3.366)				
Fxreg1				-15.956**						-2.587							-7.625***						-4.504*			
				(6.701)						(8.089)							(1.668)						(2.308)			
Fxreg2					-30.074***						-17.476**							-13.732***						-9.246***		
					(7.462)						(8.282)							(2.409)						(3.024)		
Domreg1						-3.629						-4.596							5.608						5.239	
						(7.482)						(7.703)							(5.538)						(6.014)	
Domreg2							-2.373						-4.035							5.187						7.923
							(6.178)						(6.454)							(7.244)						(10.483)
Observations	31	28	28	31	31	27	26	28	28	30	30	26	25	259	280	279	309	301	61	61	223	222	252	251	49	49
R-squared	0.467	0.321	0.338	0.326	0.457	0.223	0.290	0.502	0.502	0.470	0.513	0.369	0.451	0.440	0.414	0.426	0.390	0.412	0.459	0.456	0.500	0.509	0.449	0.456	0.494	0.494

Source: IMF staff estimates.

a/ Dependent variable is FX credit to GDP in 2007. Kai, Fincontrol, and Fxreg are averaged over 2003-05. Domreg pertain to the measures in place in 2005. Constant, a dummy variable equal to one if the country had defacto fixed exchange rate regime in place in 2007 and zero otherwise, and private credit to GDP in 2005 included as an initial condition in all regressions.Robust standard errors in parentheses; *, **, and *** indicate signficance at 10, 5, and 1 percent levels respectively.

b/ Dependent variable is FX credit to GDP. Kai, Fincontrol, Fxreg, and Domreg are lagged by one year. Domreg is available for 2005 and 2007 only. Constant, a dummy variable equal to one if the country had defacto fixed exchange rate regime in place, and region specific, income group specific, and time effects included in all regressions. Lagged private credit to GDP included as an initial condition in all regressions.Robust standard errors in parentheses; *, **, and *** indicate signficance at 10, 5, and 1 percent levels respectively.

Notes: Kai is Schindler's (2009) capital controls on inflow index

Fincont1 is the average of binary variables reflecting restrictions on financial sector's borrowing abroad, and differential treatment of nonresident accounts.

Fincont2 is the average of binary variables reflecting restrictions on financial sector's borrowing abroad, maintenanance of accounts abroad, and differential treatment of accounts held by nonresidents.

Fxreg1 is the average of binary variables reflecting restrictions on financial sector's lending locally in foreign exchange, and differential treatment of deposit accounts in foreign exchange.

Fxreg2 is the average of binary variables reflecting restrictions on financial sector's lending locally in foreign exchange, purchase of locally issued securities denominated in forex; differential treatment of deposit accounts in foreign exchange; and limits on open forex

Domreg1 is the average of reserve requirements and restrictions on concentration in sectors.

Domreg2 is the average of reserve requirements, restrictions on concentration in specific sectors, and LTV ratios.

Table A3: Policy Measures and Domestic Credit Booms

	Recent crisis[a]													Panel data (1995-2008)[b]												
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Kai	-13.084							-13.958	-18.480	6.524	1.619	-13.392	-10.972	-0.770							0.371	0.000	-0.126	-1.235	-3.056	-2.939
	(15.250)							(15.492)	(16.657)	(12.713)	(17.073)	(17.202)	(16.684)	(0.912)							(1.064)	(1.180)	(1.081)	(1.045)	(2.319)	(2.614)
Fincont1		-15.235						-8.399							-1.280*							-1.669				
		(11.272)						(10.941)							(0.746)							(1.085)				
Fincont2			-13.841						-0.425							-0.397							-0.468			
			(14.187)						(14.605)							(0.871)							(1.387)			
Fxreg1				-24.167*						-27.752**							-0.614						-0.351			
				(13.119)						(11.968)							(0.745)						(0.924)			
Fxreg2					-23.072						-24.381*							-0.132						1.482		
					(14.070)						(13.419)							(1.181)						(1.474)		
Domreg1						-31.612**						-31.421**							-3.263						-3.049	
						(14.747)						(14.834)							(3.262)						(3.474)	
Domreg2							-43.425*						-42.076*							-9.424*						-11.501*
							(22.843)						(20.941)							(5.530)						(6.445)
Observations	41	37	37	40	40	34	32	37	37	40	40	33	31	443	463	460	502	471	66	62	379	376	416	398	56	52
R-squared	0.042	0.083	0.067	0.140	0.080	0.148	0.183	0.105	0.096	0.144	0.080	0.176	0.202	0.160	0.198	0.195	0.149	0.152	0.507	0.551	0.206	0.203	0.162	0.169	0.528	0.593

Source: IMF staff estimates.

a/ Dependent variable is the change in private credit to GDP over 2003-07. Kai, Fincontrol, and Fxreg are averaged over 2000-02. Domreg1 and Domreg2 pertain to the measures in place in 2005. All regressions include a constant and private credit to GDP in 2003 to capture the initial conditions. Robust standard errors in parentheses; *, **, and *** indicate signficance at 10, 5, and 1 percent levels respectively.

b/ Dependent variable is the annual change in private credit to GDP. Kai, Fincont, Fxreg and Domreg are lagged by one year. Domreg is available for 2005 and 2007 only. All regressions include a constant, and region specific, income group specific and time effects, and lagged private credit to GDP to capture the initial conditions. Robust standard errors in parentheses; *, **, and *** indicate signficance at 10, 5, and 1 percent levels respectively.

Notes: Kai is Schindler's (2009) capital controls on inflow index.

Fincont1 is the average of binary variables reflecting restrictions on financial sector's borrowing abroad, and differential treatment of nonresident accounts.

Fincont2 is the average of binary variables reflecting restrictions on financial sector's borrowing abroad, maintenanance of accounts abroad, and differential treatment of accounts held by nonresidents.

Fxreg1 is the average of binary variables reflecting restrictions on financial sector's lending locally in foreign exchange, and differential treatment of deposit accounts in foreign exchange.

Fxreg2 is the average of binary variables reflecting restrictions on financial sector's lending locally in foreign exchange, purchase of locally issued securities denominated in forex; differential treatment of deposit accounts in foreign exchange; and limits on open forex positions.

Domreg1 is the average of reserve requirements and restrictions on concentration in sectors.

Domreg2 is the average of reserve requirements, restrictions on concentration in specific sectors, and LTV ratios.

Table A4. Policy Measures and Crisis Resilience

	Recent Crisis[a]													Past Crises (1995-2008)[b]								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Kai	5.543**							6.207***	7.336***	2.815	5.733*	4.152*	3.975	5.428***					5.947**	6.744***	5.248**	6.432***
	(2.187)							(2.263)	(2.529)	(2.586)	(3.185)	(2.245)	(2.583)	(1.860)					(2.122)	(1.848)	(2.061)	(1.995)
Fincont1		0.760						-2.568							-1.501				-1.629			
		(3.072)						(2.969)							(2.057)				(1.857)			
Fincont2			1.604						-3.964							-0.838				-3.262		
			(2.933)						(3.311)							(2.817)				(2.700)		
Fxreg1				5.457**						3.854							0.321				-0.170	
				(2.043)						(2.304)							(2.164)				(2.325)	
Fxreg2					4.716*						-0.214							1.493				-2.852
					(2.656)						(3.149)							(3.019)				(3.681)
Domreg1						4.928*						4.782*										
						(2.591)						(2.538)										
Domreg2							3.630						3.010									
							(2.187)						(2.312)									
Observations	41	37	37	40	40	34	32	37	37	40	40	34	32	31	32	32	33	32	28	28	29	28
R-squared	0.24	0.18	0.19	0.27	0.18	0.16	0.08	0.29	0.30	0.29	0.24	0.26	0.172	0.45	0.32	0.31	0.31	0.32	0.49	0.50	0.45	0.48

Source: IMF staff estimates.

a/ Dependent variable is the difference between real GDP growth rates averaged over 2008-09, and 2003-07. Kai, Fincont, and Fxreg are averaged over 2000-02. Domreg1 and Domreg2 pertain to the measures in place in 2005.

b/ Dependent variable is the difference between real GDP growth rate in the crisis year, and the average past 5 year growth rate. Kai, Fincont, and Fxreg are lagged by one year.

Notes: All regressions include a constant and control variables (growth in trading partners and terms of trade improvement). Robust standard errors in parentheses; *, **, and *** indicate signficance at 10, 5, and 1 percent levels respectively.

Kai is Schindler's (2009) capital controls on inflow index.

Fincontrol1 is the average of binary variables reflecting restrictions on financial sector's borrowing abroad, and differential treatment of nonresident accounts.

Fincontrol2 is the average of binary variables reflecting restrictions on financial sector's borrowing abroad, maintenanance of accounts abroad, and differential treatment of accounts held by

Fxreg1 is the average of binary variables reflecting restrictions on financial sector's lending locally in foreign exchange, and differential treatment of deposit accounts in foreign exchange.

Fxreg2 is the average of binary variables reflecting restrictions on financial sector's lending locally in foreign exchange, purchase of locally issued securities denominated in forex; differential treatment of deposit accounts in foreign exchange; and limits on open forex positions.

Domreg1 is the average of reserve requirements and restrictions on concentration in sectors.

Domreg2 is the average of reserve requirements, restrictions on concentration in specific sectors, and LTV ratios.