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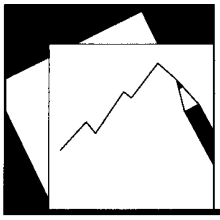

# IMF Working Paper

# Effects of Capital Flow Liberalization—What is the Evidence from Recent Experiences of Emerging Market Economies?

*Tahsin Saadi Sedik and Tao Sun*

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Monetary and Capital Markets Department

# Effects of Capital Flow Liberalization—What is the Evidence from Recent Experiences of Emerging Market Economies?

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## Abstract

This paper analyzes the experiences of emerging market economies (EMEs) that have liberalized capital flows over the past 15 years with respect to macroeconomic performance and risks to financial stability. The results of the panel data regressions indicate that greater openness to capital flows is associated with higher growth, gross capital flows, and equity returns and with lower inflation and bank capital adequacy ratios. The effects vary depending on thresholds. As a potential application of these findings, the paper explores the possible effects of liberalization on China by applying the coefficients of explanatory variables to the corresponding variables of China in 2012–16.

JEL Classification Numbers: C23, F32, G18, P43

Keywords: Capital flow liberalization, emerging market economies, China, dynamic panel data specification, simulations

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## I. INTRODUCTION[1]

A large body of literature has examined macroeconomic effects of capital flow liberalization.[2] Most of these studies have analyzed the long-term relationship between capital flow liberalization and growth by including a liberalization measure in the standard growth model regression. The results of these studies have been mixed. For example, Rodrik (1998) finds no clear relationship between financial openness and economic growth, whereas Quinn and Toyoda (2008) find that countries with open capital markets tend to grow faster. Eichengreen and others (2011) find that countries that have succeeded in avoiding crises have benefited from capital account liberalization, while countries that have not so succeeded have neither benefited nor suffered on average. Very few studies have analyzed the effects of capital flow liberalization during the transition period from restricted to liberalized capital flows.[3]

This paper contributes to the literature by drawing lessons from the global experiences during the transition period from restricted to liberalized capital flows. The paper analyzes short- to medium-term effects of liberalizing capital flows on macroeconomic performance and risks to financial stability. Unlike most studies, which focus on one indicator (e.g., growth), this paper analyzes the effects of liberalizing capital flows on several macroeconomic and financial indicators: economic growth, inflation, capital inflows, outflows and net flows, equity returns, and bank capital adequacy ratios, with the last two considered as proxies for the potential risks to financial stability. The sample of countries and the econometric strategy have been selected to capture the short- to medium-term effects. The sample includes 37 countries that have liberalized capital flows during 1995–2010.[4] Dynamic panel data

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[1]We would like to thank for valuable comments Karl Habermeier, Mark Stone, Annamaria Kokenyne, Bin Wang, and other colleagues at the IMF. Simon Townsend provided excellent research assistance. Remaining errors and omissions are our own responsibility.

[2] For a recent review of literature see IMF (2012a and 2012b). For earlier reviews of literature see Edison, Klein, Ricci, and Slok, 2002 and Kose, Prasad, Rogoff, and Wei, 2009.

[3] This is surprising given that some authors, for example Henry (2007), argue that capital flow liberalization has mainly a temporary growth effect on a country's transition to a new steady state. Liberalizing capital flows in a capital-poor country will temporarily increase the growth rate of its GDP per capita. Henry (2007) argues that testing for a permanent growth effect makes no sense because capital accumulation, which is subject to diminishing returns, is the only channel through which liberalization affects growth in the neoclassical model. This also can help to explain why tests for permanent growth effects may not come out significantly. However, foreign direct investment (FDI) could bring technology in addition to capital. If FDI brings new technology, it could generate knowledge spillovers that result in total factor productivity (TFP) growth. The literature has also identified several other potential indirect benefits of liberalization. In particular, liberalization can have "collateral benefits" as it tends to be associated with financial sector development, macroeconomic policy discipline, trade, and economic efficiency (Kose and others, 2009).

[4] The sample is dictated by the availability of data, in particular by our index of capital flow restrictiveness. However, as cross-border capital flows have trended upward over the past 15 years, they have become more

(continued…)

specifications are used to capture the possibility of partial adjustment towards the steady state. The relatively short time dimension is considered as the transition period from restricted to liberalized capital flows.

The paper also sheds light on the possible short-to medium-term effects of capital flow liberalization in China. Analyzing the effect of liberalizing capital flows on macroeconomic performance and financial stability in China is challenging. This is because the traditional global models are not suitable for this exercise (e.g., the financial sector is not well captured) and country specific regressions cannot be performed because of identification issues (i.e., insufficient variability in the capital flow liberalization measures). A possible econometric method that has been applied in this paper is to draw on the experiences of other countries that have liberalized in the past 15 years.[5]

Since China has some features that may not be fully captured by the 37 sample countries, the results for China should be interpreted with caution. Indeed, some factors may make the experiences of other economies less informative for China. For instance, the high saving and investment rates make the rate of return on savings and investment small. The long-existing low real deposit rates increase the probability of sizable outflows if liberalized. In addition, since China's investment rate has been already very high, more gains are likely to come from a better allocation of capital associated with the capital flow liberalization. Finally, China has been relatively more open to Greenfield FDI, which may imply relatively smaller gains compared with those with limited FDI at the time of liberalization.

The paper finds strong positive links between liberalization and gross capital flows, suggesting that liberalization of capital flows does encourage financial integration. However, the impact on net flows is not statistically significant. The paper also finds that liberalization of capital flows is associated with higher GDP per capita growth and lower inflation. It finds evidence that liberalization of capital flows is associated with higher equity returns and lower bank capital adequacy ratios, suggesting potential risks to financial stability. Since we apply the coefficients of explanatory variables in the panel specifications to the corresponding variables of China, the potential effects of liberalizing capital flows in China qualitatively mirror the above econometric results. However, their sizes depend upon the extent and pace of liberalization.

The rest of the paper is organized as follows: Section II presents two new measures of capital flow restrictiveness; Section III presents recent global trends in capital flow liberalization; Section IV describes the empirical strategy and results; Section V presents implications of

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volatile and riskier IMF (2011a and 2011b). Using a longer period would underestimate the effects of capital flow liberalization.

[5] An econometric approach was also used by Laurenceson and Tang (2007) and He and others (2012).

the econometric findings for China; and Section VI provides some concluding remarks and policy implications.

## II. Measuring Capital Flow Restrictiveness

This study uses two new de jure measures of capital flow liberalization.[6] The de jure measures are restrictiveness indices based on the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER). The de jure measures are computed for 185 countries over1995–2010.[7] Higher values indicate more controls.

- Our first de jure restrictiveness index of capital flows is similar to the Schindler index (Schindler 2009).[8] The restrictiveness index is based on the AREAER and comprises 21 categories of restrictions, including restrictions on equity, bond, money market and collective investment instruments, financial credit, and direct investment by direction. The index distinguishes between inflows (nonresidents' investments in the country) and outflows (residents' investments abroad). We constructed for each of the 21 categories a restrictiveness index for inflows, outflows, and net flows. The difference between the Schindler index and our restrictiveness index is that the former includes a limited qualitative assessment of controls. For example, if a measure requires only notification of the transaction, the control covers only a few sectors of the economy or they are maintained for anti-money laundering or security reasons, the Schindler index considers the transaction as not controlled. The two indices are highly correlated. For the period of the availability of the Schindler index, the correlation between the two indices is 0.92.

- As a robustness check, we use a second de jure index, which is an average of binary indicators of restrictiveness in 62 categories of capital transactions. The categories include all capital transactions, foreign exchange and domestic currency accounts of residents and nonresidents, regulatory measures related to the financial sector and repatriation and surrender requirements. This broad restrictiveness index can have a value between zero and 1, and higher values represent more restricted cross-border

---

[6] For a detailed discussion on measures of financial openness and integration see Quinn and others (2011), and IMF 2012b. We also used a de facto openness measure, which is based on gross stocks of foreign assets and liabilities as a ratio to GDP. This includes FDI, equity, portfolio investment, external debt, and official reserves. The stock data up to 2007 were developed and described by Lane and Milesi-Ferretti (2007). Data for 2008–2010 are our updates using flows from the IMF Balance of Payments, not controlled for valuation.

[7] There is a structural break in AREAER data in 1995. Until 1995, the AREAER summarized a country's openness to capital flows using a binary dummy variable, where 1 represents a restricted capital account and zero represents an unrestricted capital account. Since 1995, the AREAER has utilized a more structured approach, providing detailed information on restrictions on capital transactions in a number of subcategories.

[8] The Schindler index is available only for 91 countries from 1995 to 2005.

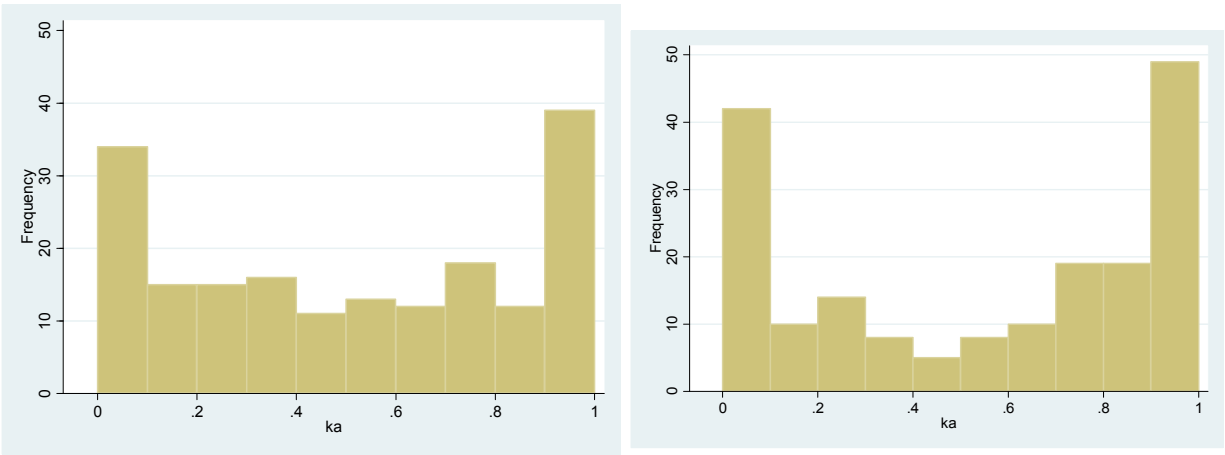
capital flows. Due to its more extensive coverage, it can measure liberalization or reversal of liberalization better than narrower indicators. The correlation between narrow index and broader index is 0.92 for the 185 countries and 0.90 for the sample used in the empirical part of this paper. The two indices are also highly correlated with other available de jure indices. [9] We computed the broader index only for aggregate capital flow restrictiveness.

## III. Recent Trends in Capital Flow Liberalization

The de jure index indicates that over the last 15 years, many emerging and developing countries have liberalized capital flows. An analysis of the distribution of the index indicates that in 2010, 17 out of 185 countries were fully open and 31 were fully closed (Figure 1, right side)[10] and about 50 percent of countries had an index lower than 0.5, compared to the mid-1990s where 19 out of 185 countries were fully open and 39 were fully closed (Figure 1, left side) and about 43 percent of countries had an index lower than 0.5.

Figure 1. Capital Flow Restrictiveness Index

(Mid-1990s) (2010)




Sources: Annual Report on Exchange Arrangements and Exchange Restrictions; and IMF staff estimates.

An analysis of the index's geographical distribution shows that most largely closed countries are in Asia and Africa (Figure 2).[11] While many countries have liberalized over the past

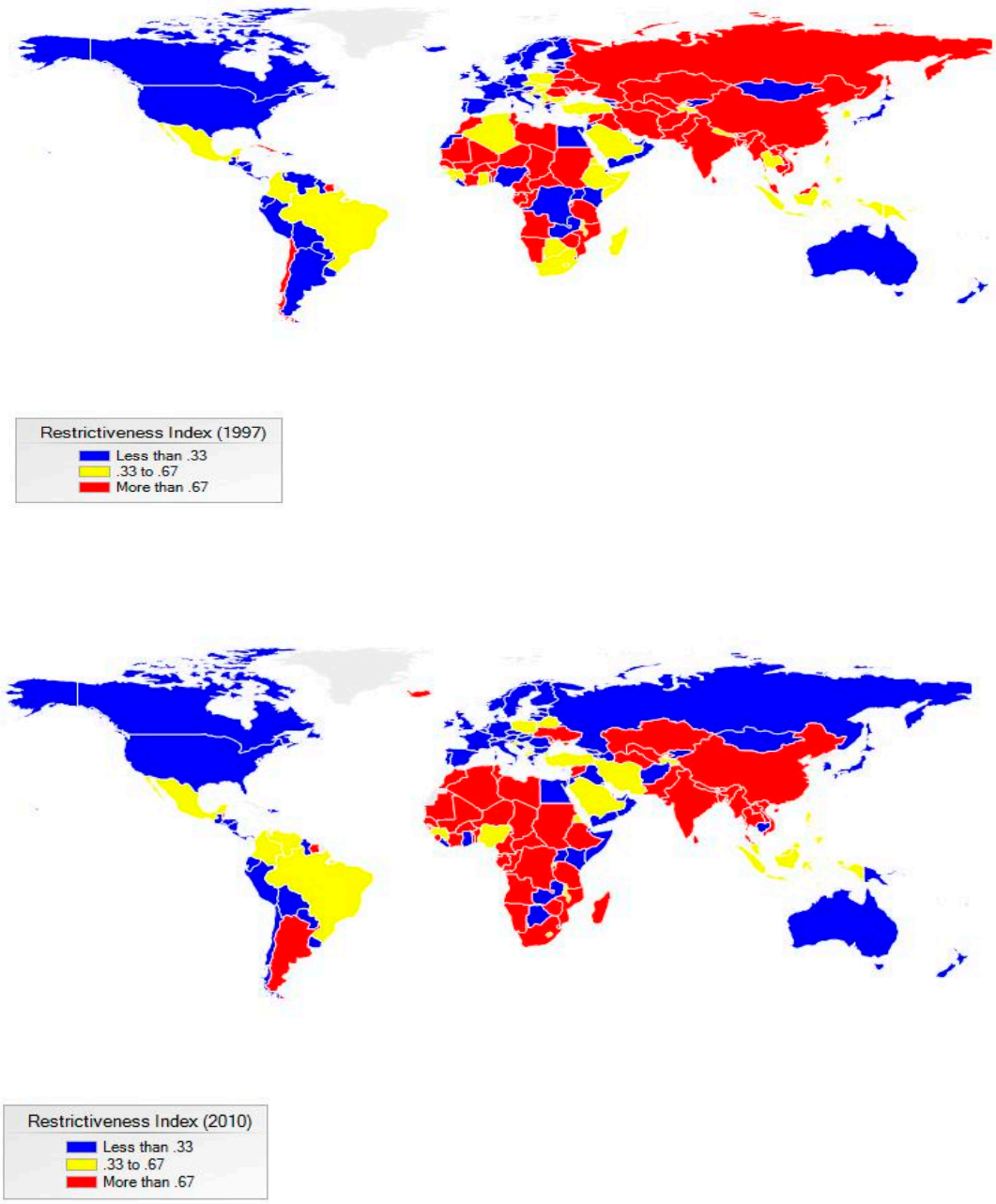
[9] The correlation with the Chinn-Ito (2008) index is 0.78 for the narrower index and 0.86 for the broader index for the period of availability of the Chinn-Ito index.

[10] Fully open means a de jure restrictiveness index equal to zero and fully closed an index equal to one based on our restrictiveness index. Figure 1 shows number of countries for different ranges of the index.

[11] For simplicity, we classified countries into three categories. "Largely open" means a de jure restrictiveness index smaller than or equal to 0.33, and "largely closed" an index greater than or equal to 0.67.

15 years, few countries have reinstalled significant restrictions on capital flows, for example Argentina and Iceland, as shown in Figure 2.

Figure 2. Liberalization of Capital Flows, 1997 and 2010




Sources: Annual Report on Exchange Arrangements and Exchange Restrictions, and IMF staff estimates.

The de jure index is used to identify the sample countries that have liberalized over the past 15 years. First, only those countries are retained that have liberalized by at least 0.1 point according to the index between 1995 and 2010.[12] Second, for a given country, only those years are retained following the start of liberalization where the index declines by at least 0.01 point. Therefore, the sample encompasses only countries that have liberalized and only those years when controls on capital flows were relaxed. About 37 countries (Table 1) satisfy the above criteria. For those countries, the mean of capital flow liberalization between 1995 and 2010 was 0.4; the maximum was 0.83; and the minimum was 0.1. Therefore, this sample of countries is used in the empirical analysis. However, the actual sample for each regression varies with data availability.

**Table 1. Countries that Liberalized During 1995–2010**

| Countries | | | | | | | |
|---|---|---|---|---|---|---|---|
| Afghanistan | Botswana | Chile | Haiti | Jordan | Papua New Guinea | São Tomé and Príncipe | Swaziland |
| Algeria | Bulgaria | Cyprus | Honduras | Korea | Romania | Senegal | Uganda |
| Armenia | Burundi | Dominica | Hungary | Malta | Russia | Seychelles | |
| Azerbaijan | Cambodia | Ghana | Iraq | Mauritania | Saint Kitts and Nevis | Slovakia | |
| Bosnia | Cape Verde | Guyana | Israel | Nigeria | Samoa | Slovenia | |

Source: IMF staff estimates.

Many of these countries have increased the flexibility of exchange rates and interest rates prior to capital flow liberalization. Specifically, more than half of the 37 countries had increased their exchange rate flexibility,[13] and a fourth had initiated interest rate liberalization before liberalizing capital flows.[14] This feature demonstrates that a sequencing—liberalizing exchange rates and interest rates before liberalizing capital flows—does prevail.

[12] A decline of 0.1 point represent the full liberalization of about six categories for the broader restrictiveness index and 2 categories for the narrower index.

[13] We used the IMF's de facto exchange rate classification to identify countries that have increased the flexibility of the exchange rate.

[14] Data for interest rate liberalization are only available until 2005, using the database by Abiad and others (2008). Therefore, countries that have liberalized from 2005 onward are not captured in this database.

## IV. EMPIRICAL STRATEGY AND RESULTS

This section describes the empirical strategy to investigate the impact of capital flow liberalization and summarizes the main empirical results of various panel estimations.

### Empirical strategy

Various panel data specifications are used to estimate the impact of liberalization on the following variables: capital outflows, inflows, net flows, real GDP per capita growth, inflation, equity returns, and bank capital adequacy ratios.[15] The general specification is:

$$Y_{jit} = \alpha_j + \beta_{j1} Y_{jit-1} + \beta_{j2} ka_{jit} + \beta_{j3} Z_{jit} + \mu_{ji} + \nu_{jit} \qquad (1)$$

Where the subscript i denotes the ith country (i=1, …,37), the subscript t denotes the t'th year (t=1995, …, 2010), and the subscript j denotes the specific equation for each indicator of interest ($y_j$ represents the specific equation for growth, inflation, capital flows, etc). The approach includes country fixed effects (FE), $\mu_i$, to take account of unobserved heterogeneity among countries;[16] v is the error term. The variable ka is the measure of capital flow liberalization, and Z is a set of control variables specific for each independent variable, based on the existing literature. Appendix I presents the definition and sources of variables used in the regressions.[17]

The dynamic specifications capture the potential inertia in the dependent variables. The presence of the lagged dependent variable in the equations means that the estimated coefficients represent short-run effects, which are the focus of the paper. The long-run effects can be derived by dividing each coefficient by one minus coefficient of the lagged dependent variable ($1-\beta_1$).

Two econometric issues arise in estimating the above equation. First, some independent variables may be endogenous because of potential simultaneity or reverse causality. Second, with a fixed-effect estimator, the lagged dependent variable is, by construction, correlated with the error term and is, therefore, endogenous.[18] As a robustness check, System Generalized Method of Moments (System GMM) estimators were also used with all right

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[15] Panel unit root tests for the variables used in our empirical models suggest that all series are stationary. The results are available upon requests.

[16] For example, the fixed effect takes account of all time-invariant country specific factors, including geography, climate, ethno-linguistic characteristics, and unchanging political and legal systems.

[17] The main data sources are the World Economic Outlook (WEO); International Financial Statistics (IFS); World Development Indicators; and Bloomberg L.P.

[18] The bias is negligible if the time horizon is long. See, for example, Baltagi (1995, Chapter 8).

hand variables treated as endogenous (Arellano and Bover, 1995; and Blundell and Bond, 1998).[19]

Following Kose and others (2009), the full sample is separated into two sub-samples using thresholds. Countries meeting these threshold conditions are presumed to be better able to reap the growth and stability benefits of financial globalization. Kose and others (2009) identified four groups of threshold conditions: financial market development, institutional quality and governance, macroeconomic policies, and trade integration. In this analysis, a composite threshold is created by first normalizing, then averaging the above four individual indicators: measures for financial development (ratio of market capitalization to GDP or private sector credit to GDP), quality of bureaucracy and corruption, ratio of fiscal balances to GDP, and trade openness (ratio of exports and imports to GDP.[20] Then, the median of the index is taken as a threshold to separate countries into two groups: those with an index higher than the median are "above threshold" countries and those with an index lower than the median are "below threshold" countries.

**Empirical results**

The econometric analysis (Tables 2 to 7), based on the sample of countries that have liberalized over the past 15 years, suggests that more liberalization is associated with:

- *Higher real GDP per capita growth.* The coefficients of liberalization are significantly negative (a decline in the index means liberalization of capital flows). The results indicate that a 0.1 point decline in the index implies about a 0.14 percentage points increase in real GDP per capital growth (Table 2).

- *Lower inflation rates*.[21] The coefficients of the liberalization index are significantly positive. A 0.1 point decline in the index implies about 0.7 percentage points decrease in inflation (Table 3).

[19] We control for endogeneity by using "internal instruments," that is, instruments based on lagged values of the explanatory variables. We adopt the assumption of weak exogeneity of the explanatory variables, in the sense that they are assumed uncorrelated with future realizations of the error terms. Thus, the lagged levels of the variables may be used as instruments in the regressions in difference and the lagged differences of the variables could be used as instruments in the regressions in level. We restrict the number of lags to a maximum of two. Then the effect of a given variable on the dependent variable is regarded as the association between the exogenous component of that variable and the dependent variable.

[20] To create a single indicator, first each variable is normalized as follows: Index = (actual value - minimum value) / (maximum value - minimum value). Then sub-indices are aggregated using the arithmetic mean.

[21] Similar results were obtained by Gruben and McLeod (2002) and Gupta (2008). Using an illustrative model, Gupta, 2008 shows that opening the capital account significantly lowers policy maker's incentive to generate an inflationary shock. Theoretical and empirical evidence suggest a strong negative relationship between financial openness and inflation.

- *Higher equity returns.* The coefficients of the equity liberalization index are significantly negative. A decline in the index of 0.1 point implies about 2.9 percentage points increase in equity returns (Table 4).

- *Lower bank capital adequacy ratios.* A decline in the index of 0.1 point implies a decrease in the capital adequacy ratio of about 0.3 percentage points. This may be due to a higher credit and asset expansion associated with the liberalization of capital flows. Furthermore, an increase in riskier assets following the liberalization of capital flows may put downward pressure on capital ratios (Table 5).

- *Higher capital inflows and outflows*. The coefficients of liberalization are significant. A 0.1 point decline in the index implies a 1.2 percentage points increase in inflows and a 0.8 percentage points increase in outflows (Table 6 and 7). However, the effect of liberalization on net flows is not statistically significant.

**Thresholds**

Panel regressions, using the sub-samples of countries "above threshold" and "below threshold" are run to capture the possible differences in countries with various level of financial and institutional development:

- For countries "above threshold," the main findings in the full sample are generally confirmed, with a few differences. For example, the coefficients of liberalization are larger than those in full samples, indicating a larger role of capital flow liberalization in countries "above threshold." In other words, countries that have reached certain thresholds of development, with respect to the financial and institutional setting, benefit the most from capital flow liberalization.

- For countries "below threshold," the coefficients of liberalization are not significant in most regressions, including in the growth regression, indicating a limited role of liberalization of capital flows for those countries.

**Robustness checks**

The results are robust to using alternative estimation approaches or different capital flow liberalization measures:

- Several other econometric specifications of panel data were estimated; including system GMM. The results are broadly similar to those obtained with the fixed effects estimator.[22]

[22] Also, similar results were obtained when using clustered standard errors (at the country level).

- Using our broad restrictiveness index of capital flows leads to similar results.

- A further robustness test is implemented to investigate whether the effects of capital flow liberalization depend on the size of the country, since our sample includes small countries and large countries. To ensure that our conclusions are unaltered in larger countries, we run pooled weighted least squares (WLS) estimation, whereby each observation is weighted by countries' GDP in U.S. dollar. This approach assigns more weight to the larger economies, without eliminating the small countries. Compared to pooled (unweighted) least squares (LS),[23] the results are broadly similar. The results for real GDP per capita growth are presented in the last two columns in Table 2. Therefore, this suggests that our results are also valid for larger countries.

## V. Simulation of the Effects of Capital Flow Liberalization on China

While many countries have extensive capital controls, China stands out owing to its size and systemic importance (Figure 3). China is the largest country (both in terms of population and GDP) that retains extensive controls on capital flows according to the de jure index.[24] India is the second largest country that still has extensive capital controls. There are other EMEs with similar restrictiveness, but they are not systemic for the global economy. While the main conclusions are useful for other countries that have still significant controls on capital flows, this section focuses on the possible internal impact of capital flow liberalization in China.

Few studies have analyzed the potential effects of capital flow liberalization in China.[25] The Chinese authorities have voiced an aspiration to achieve full capital account convertibility and currency internationalization in the long term. In February 2012, a People's Bank of China staff research paper proposed a phased reform process that envisaged greater Chinese investment abroad; acceleration of overseas lending in renminbi, particularly to support trade transactions; and greater scope for foreigners to invest in Chinese equities, bonds, and property (Sheng, 2012). The final step to be taken would be full convertibility of the renminbi, although restrictions would remain on speculative capital flows and short-term foreign borrowing. Liberalization in China is expected to have substantial domestic and multilateral effects. As recognized by the authorities, further liberalization would be beneficial based on the implementation of the authorities' liberalization plan and more rapid progress on supporting reforms, particularly in the financial sector.

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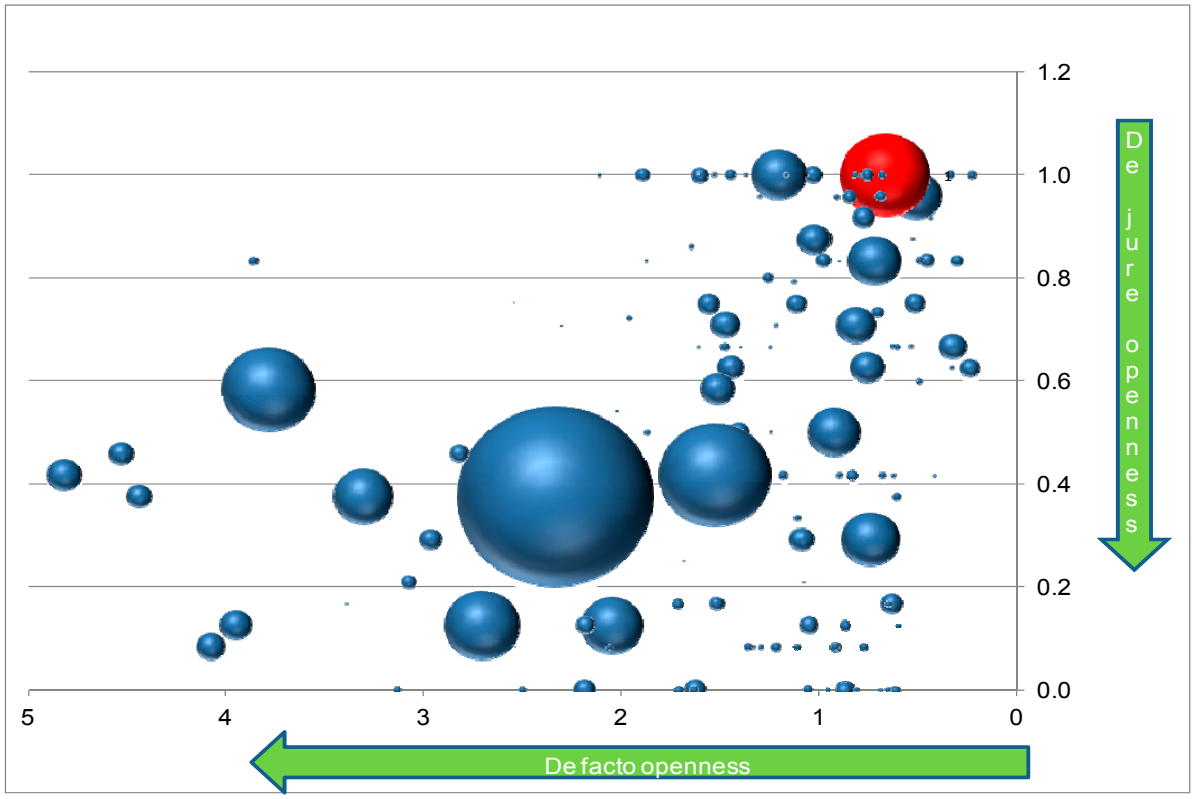
[23] These techniques are not yet well developed for dynamic panel estimations; therefore the results can only be compared to pooled least squares estimations.

[24] Similar results were obtained when using other available indices.

[25] Laurenceson and Tang (2007) and He and others (2012) are two exceptions.

Figure 3. De Jure and De Facto Measures of Liberalizing Capital Flows (2010)




Sources: Annual Report on Exchange Arrangements and Exchange Restrictions, and staff calculations.

Note: The horizontal axis shows de facto openness (Lane and Milesi-Ferretti, 2007, updated). The vertical axis shows the index of de jure openness. The size of bubble is the GDP of the countries in U.S. dollar. The red bubble represents China.

A successful capital flow liberalization would lay a solid foundation for the international use of renminbi. However, larger flows could give rise to financial stability risks that also have multilateral repercussions (IMF, 2012a).

This section explores the potential effects of liberalizing capital flows on China by applying the coefficients of explanatory variables from the previous section to the corresponding variables of China during 2012–16. We created two scenarios: one without capital flow liberalization (equation 2) and one with capital flow liberalization (equation 3). Then the differences between the two scenarios is considered as the possible additional effects of capital flow liberalization on China.

$$\hat{Y}^{C}_{CHNjt} = \hat{\alpha}_{j} + \hat{\beta}_{j1}\hat{Y}^{C}_{CHNjt-1} + \hat{\beta}_{j2}ka^{C}_{CHNjt} + \hat{\beta}_{j3}Z^{C}_{CHNjt} \quad (2)$$

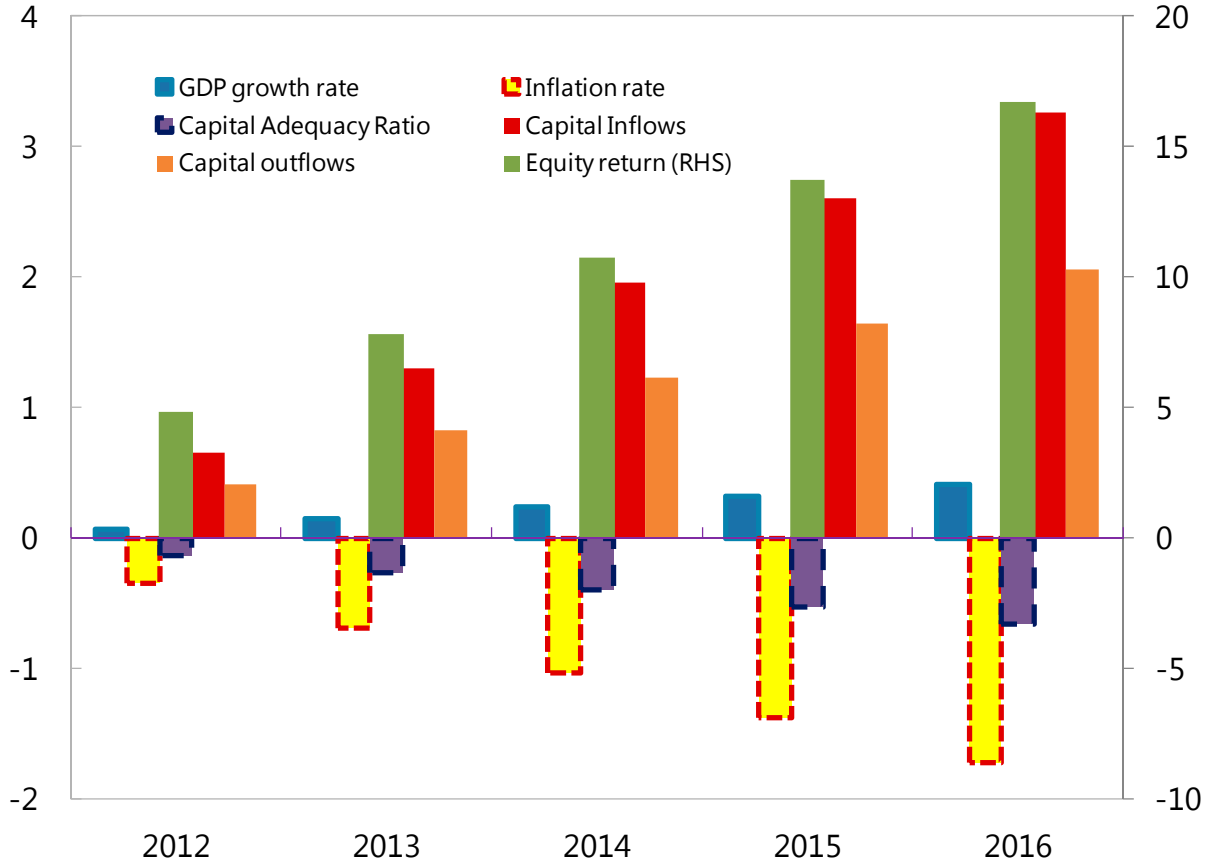
$$\hat{Y}^{O}_{CHNjt} = \hat{\alpha}_{j} + \hat{\beta}_{j1}\hat{Y}^{O}_{CHNjt-1} + \hat{\beta}_{j2}ka^{O}_{CHNjt} + \hat{\beta}_{j3}Z^{O}_{CHNjt} \quad (3)$$

The superscript O denotes variables with capital flow liberalization and the superscript C denotes variables without capital flow liberalization. The constant term for each equation

($\hat{\alpha}_j$) is set to fit the actual 2011 data. While it is useful to compare our simulations to WEO projections, this would have no impact on the results since we are interested in the differences between the two scenarios. The coefficients of independent variables ($\hat{\beta}_j$) come from the regressions in the previous section. Capital flows in China are assumed to be gradually liberalized to reach the 2010 average level of G-20 in 10 years.[26] Therefore, the liberalization is assumed to be partial, but significant. The other assumptions used are summarized in Appendix II.

Figure 3 summarizes the potential effects of liberalizing capital flows in China on its respective macroeconomic performance, capital flows and risks to the financial stability. The results are the differences between equation 3 and equation 2.

Figure 3. Effects of Capital Flow Liberalization on China (In percent)




Source: IMF staff estimates.

[26] For 2010 the average for G-20 countries was 0.5; coincidently, this is also the average for the 185 countries.

The simulation results show that capital flow liberalization in China might have the following macroeconomic and financial effects:

- *More gross capital inflows and outflows*. For instance, inflows and outflows may increase by 3.3 percentage points and 2.1 percentage points in 2016, representing a net increase of US$380 billion and US$240 billion in 2016, respectively. Therefore, liberalization would have a substantial impact on gross capital flows. However, the effect on net capital flows would depend on the particular measures and sequencing, for example, it would depend upon (among other factors) the extent and pace of liberalization of inflows compared with outflows.

- *Higher GDP per capita growth rates compared to growth rates in the no liberalization scenarios.* For instance, the GDP growth rate in 2016 may increase by 0.4 percentage points.

- *Lower inflation rates.* For instance, the inflation rate in 2016 may decrease by 1.7 percentage points.

- *Higher equity returns.* For instance, the equity return in 2016 may increase by 17 percentage points.

- *Lower bank capital adequacy ratios.* For instance, capital adequacy ratio in 2016 may decrease by 0.7 percentage points.

## VI. Conclusions and Policy Implications

Using panel data techniques, this paper analyzes the experiences of EMEs that have liberalized capital flows over the past 15 years with respect to macroeconomic performance and risks to financial stability. The paper finds support for the argument that liberalization of capital flows can explain macroeconomic performance and risks to financial stability, at least partially. In particular, the paper finds strong positive links between liberalization and gross capital flows, suggesting that liberalization of capital flows does encourage financial integration. The paper also finds that liberalization of capital flows is associated with higher GDP per capita growth and lower inflation. Moreover, it finds evidence that liberalization of capital flows is associated with higher equity returns and lower bank capital adequacy ratios, suggesting potential risks to financial stability. Consistent with the literature, the paper also finds that countries meeting threshold conditions are better able to reap the growth and stability benefits of financial globalization.

Despite their beneficial effects, liberalization of capital flows can pose challenges. Specifically, the benefits of liberalizing capital flows include reducing misallocation of resources, risk diversification, and deepening and development of financial markets. At the same time, liberalization can be associated with an increase in macroeconomic volatility and vulnerability to crises, and can complicate macroeconomic management as the real economy

may not be able to adapt to large swings in the capital flows, particularly in a fixed exchange rate regime. The increase in inflows can fuel a boom in domestic demand leading to overheating. Liberalization of capital flows may also lead to asset price bubbles and increase risks to the banking sector, and call for stronger prudential regulation.

Capital flow liberalization is a long-term objective of the authorities in China and many other EMEs that have still relatively strong restrictions on capital movements. Recognizing the potential benefits as well as the risks of more liberalized capital flows, the authorities in China have called for a gradual liberalization. The ultimate objective is to move forward with capital flow liberalization in a manner that harnesses the benefits of more open capital flows while mitigating the risks. The internationalization of reminbi will be a natural beneficiary of a smooth capital flow liberalization.

The effects of liberalizing capital flows on China qualitatively mirror the general econometric results. However, quantitatively, the effects depend on the pace and sequencing of capital flow liberalization. Although our econometric strategy and the 37 sample countries may not fully capture the unique features of China—such as its size and ongoing structural changes— it does shed some light on the possible short- to medium-term effects of capital flow liberalization in China.

The results highlight the potential benefits as well as the risks of more liberalized capital flows. Recent experience shows that gross flows among advanced economies embed risks with systemic stability implications.[27] Previous crises had led to a focus on net flows to EMEs, and on the composition of flows (short-term financing and exchange rate risk). Therefore, it is apparent that gross flows can lead to global financial instability and thus warrant close scrutiny.

[27] See IMF (2011a and 2011b).

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## Table 2. Panel Regressions—Real GDP Per Capita Growth

| | Full sample | | | | | | | | Above Threshold Sample | Below Threshold Sample | Full sample | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | FE | FE | FE | FE | FE | FE | System GMM | System GMM | FE | FE | LS | WLS |
| Capital flow restrictiveness index | -1.845** | -1.526** | -1.500** | -1.695*** | -1.385* | -1.387** | -1.382** | | -1.980** | 0.608 | -1.426** | -5.210*** |
| | (-2.249) | (-2.096) | (-2.031) | (-2.684) | (-1.955) | (-2.087) | (-2.199) | | (-2.218) | (-0.382) | (-2.155) | (-3.233) |
| Real GDP per capita (lag of growth) | | 0.222** | 0.224** | 0.212** | 0.172* | 0.189** | 0.508*** | 0.513*** | -0.094 | 0.173 | | |
| | | (-2.559) | (-2.533) | (-2.375) | (-1.796) | (-2.258) | (-6.414) | (-6.302) | (-0.641) | (-1.080) | | |
| Real interest rate | | | 0.014 | 0.048 | 0.030 | 0.025 | -0.003 | -0.004 | -0.061 | 0.171 | 0.076* | 0.089 |
| | | | (-0.325) | (-0.667) | (-0.517) | (-0.452) | (-1.412) | (-1.606) | (-1.117) | (-1.486) | (-1.814) | (-1.342) |
| REER (growth) | | | | 0.062 | 0.060 | 0.052 | 0.036 | 0.037 | -0.006 | 0.126** | 0.096*** | -0.014 |
| | | | | (-1.151) | (-1.135) | (-1.060) | (-1.018) | (-1.087) | (-0.100) | (-2.061) | (-3.017) | (-0.183) |
| Real credit to private sector (growth) | | | | | 0.050** | 0.047*** | 0.054*** | 0.055*** | 0.071*** | 0.016 | 0.125*** | 0.088*** |
| | | | | | (-2.492) | (-2.682) | (-2.715) | (-2.647) | (-3.031) | (-0.496) | (-4.127) | (-3.773) |
| Country risk (change) | | | | | | 0.093 | 0.180** | 0.180** | 0.015 | 0.051 | -0.047 | 0.067 |
| | | | | | | (-1.246) | (-2.044) | (-2.016) | (-0.210) | (-0.448) | (-0.571) | (-0.345) |
| Capital flow restrictiveness index (broader index) | | | | | | | | -1.709** | | | | |
| | | | | | | | | (-1.963) | | | | |
| Constant | 4.323*** | 3.410*** | 3.360*** | 3.266*** | 2.680*** | 2.639*** | 1.493*** | 1.523*** | 4.467*** | 1.841*** | 2.077*** | 2.721*** |
| | (-17.161) | (-8.710) | (-7.604) | (-6.949) | (-5.007) | (-4.979) | (-3.660) | (-3.235) | (-6.031) | (-3.019) | (-4.486) | (-3.103) |
| Number of countries | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 16 | 22 | | |
| Number of observations | 234 | 234 | 234 | 234 | 234 | 234 | 234 | 234 | 80 | 154 | 236 | 236 |
| R-squared | 0.006 | 0.376 | 0.375 | 0.364 | 0.446 | 0.456 | | | 0.058 | 0.412 | 0.259 | 0.342 |
| AR(1) test p-value | | | | | | | 0.004 | 0.004 | | | | |
| AR(2) test p-value | | | | | | | 0.304 | 0.299 | | | | |

Note: *** p<0.01, ** p<0.05, * p<0.1

Source: IMF staff estimates.

## Table 3. Panel Regressions—Inflation

| | Full Sample | | | | | | Above Threshold Sample | Below Threshold Sample |
|---|---|---|---|---|---|---|---|---|
| | FE | FE | FE | FE | System GMM | System GMM | FE | FE |
| Capital flow restrictiveness index | 7.970** | 7.277** | 6.830** | 6.816** | 17.294* | | 1.028 | 7.851*** |
| | (2.314) | (2.158) | (2.126) | (2.105) | (1.759) | | (0.237) | (3.032) |
| Inflation (lag) | | 0.017** | 0.018* | 0.018* | 0.034*** | 0.031*** | 0.015*** | 0.289*** |
| | | (2.142) | (1.812) | (1.817) | (3.635) | (3.396) | (2.707) | (2.594) |
| NEER (growth) | | | -0.117 | -0.115 | -0.019 | 0.024 | -0.021 | -0.238*** |
| | | | (-1.174) | (-1.151) | (-0.090) | (0.118) | (-0.193) | (-6.202) |
| Real GDP per capita (growth) | | | | -0.035 | -0.456 | -0.265 | -0.264 | -0.010 |
| | | | | (-0.389) | (-0.688) | (-0.415) | (-1.288) | (-0.076) |
| Capital flow restrictiveness index (broader index) | | | | | | 23.897** | | |
| | | | | | | (1.962) | | |
| Constant | 3.926*** | 4.005*** | 3.965*** | 4.081*** | 1.637 | -1.092 | 7.452*** | 1.299 |
| | (3.204) | (3.320) | (3.434) | (3.299) | (0.362) | (-0.213) | (3.854) | (1.006) |
| Number of countries | 37 | 37 | 37 | 37 | 37 | 37 | 24 | 36 |
| Number of observations | 447 | 447 | 447 | 447 | 447 | 447 | 154 | 293 |
| R-squared | 0.002 | 0.011 | 0.045 | 0.044 | | | 0.036 | 0.374 |
| AR(1) test p-value | | | | | 0.607 | 0.611 | | |
| AR(2) test p-value | | | | | 0.840 | 0.832 | | |

Note: *** p<0.01, ** p<0.05, * p<0.1

Source: IMF staff estimates.

## Table 4. Panel Regressions—Equity Returns

| | Fulle Sample | | | | | | | | Above Threshold Sample | Below Threshold Sample |
|---|---|---|---|---|---|---|---|---|---|---|
| | FE | FE | FE | FE | FE | FE | FE | System GMM | FE | FE |
| Equyity flow restrictiveness index | -49.939*** | -48.057*** | -47.806*** | -36.612*** | -29.125* | -29.428* | -29.002* | -15.741** | -5.584 | -43.792*** |
| | (-4.178) | (-4.466) | (-4.081) | (-2.663) | (-1.907) | (-1.863) | (-1.923) | (-2.303) | (-0.151) | (-2.785) |
| Equity returns (lag) | | 0.037 | -0.021 | -0.119 | -0.130 | -0.154 | -0.192* | -0.161* | -0.142 | -0.303** |
| | | (0.323) | (-0.195) | (-1.190) | (-1.519) | (-1.568) | (-1.782) | (-1.876) | (-0.707) | (-2.417) |
| Credit to private sector (growth) | | | 0.869*** | 1.096*** | 1.159*** | 1.137*** | 1.156*** | 0.720*** | 0.476 | 1.135*** |
| | | | (2.807) | (3.285) | (3.428) | (3.215) | (3.475) | (3.579) | (0.604) | (2.954) |
| VIX (change) | | | | -4.143*** | -4.069*** | -4.049*** | -4.099*** | -3.930*** | -4.265*** | -4.078*** |
| | | | | (-7.518) | (-7.417) | (-6.961) | (-7.347) | (-7.547) | (-3.804) | (-6.212) |
| Real US interest rate | | | | | -3.014 | -3.046 | -3.337* | -3.647** | -7.936 | -1.341 |
| | | | | | (-1.519) | (-1.541) | (-1.724) | (-2.384) | (-1.615) | (-0.490) |
| Real GDP per capita (growth) | | | | | | 0.920 | 0.482 | 0.703 | 8.496* | -1.000 |
| | | | | | | (0.486) | (0.244) | (0.402) | (1.762) | (-0.421) |
| NEER (growth) | | | | | | | 0.596* | 0.705** | 0.201 | 0.952* |
| | | | | | | | (1.942) | (2.123) | (0.381) | (1.776) |
| Constant | 33.868*** | 32.593*** | 13.571 | 9.860 | 16.243** | 13.498 | 17.610* | 23.252*** | 4.940 | 25.007* |
| | (12.245) | (8.450) | (1.483) | (1.061) | (2.280) | (1.513) | (1.721) | (3.107) | (0.270) | (1.863) |
| Number of countries | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 8 | 13 |
| Number of observations | 121 | 121 | 121 | 121 | 121 | 121 | 121 | 121 | 36 | 85 |
| R-squared | 0.009 | 0.012 | 0.061 | 0.275 | 0.290 | 0.290 | 0.302 | | 0.353 | 0.305 |
| AR(1) test p-value | | | | | | | | 0.010 | | |
| AR(2) test p-value | | | | | | | | 0.831 | | |

Note: *** p<0.01, ** p<0.05, * p<0.1

Source: IMF staff estimates.

## Table 5. Panel Regressions—Capital Adequacy Ratios

| | Full Sample | | | | | | Above Threshold Sample | Below Threshold Sample |
|---|---|---|---|---|---|---|---|---|
| | FE | FE | FE | FE | System GMM | System GMM | FE | FE |
| Capital flow restrictiveness index | 4.207** | 2.378* | 2.568** | 2.513* | 3.458*** | | 3.175 | 3.854** |
| | (2.158) | (1.714) | (2.060) | (1.858) | (3.139) | | (1.405) | (1.996) |
| Capital adequacy ratios (lag) | | 0.502*** | 0.393*** | 0.361*** | 0.993*** | 0.995*** | 0.042 | 0.620*** |
| | | (3.448) | (3.079) | (2.711) | (25.303) | (22.102) | (0.171) | (3.893) |
| Nonperforming Loans (NPLs) | | | -0.177* | -0.194** | -0.108* | -0.119** | -0.296*** | -0.036 |
| | | | (-1.836) | (-2.091) | (-1.743) | (-2.088) | (-2.841) | (-0.464) |
| Real GDP per capita (growth) | | | | -0.067** | 0.007 | -0.014 | -0.107* | 0.022 |
| | | | | (-2.012) | (0.122) | (-0.215) | (-1.669) | (0.507) |
| Capital flow restrictiveness index (broader index) | | | | | | 4.383*** | | |
| | | | | | | (4.124) | | |
| Constant | 9.731*** | 4.937*** | 7.167*** | 7.856*** | 0.324 | 0.178 | 11.372*** | 3.761*** |
| | (24.360) | (3.500) | (4.413) | (4.599) | (0.678) | (0.254) | (3.947) | (3.597) |
| Number of countries | 17.0 | 17.0 | 17.0 | 17.0 | 17.0 | 17.0 | 11.0 | 9.0 |
| Number of observations | 135 | 135 | 135 | 135 | 135 | 135 | 72 | 63 |
| R-squared | 0.002 | 0.722 | 0.558 | 0.468 | | | 0.026 | 0.818 |
| AR(1) test p-value | | | | | 0.025 | 0.026 | | |
| AR(2) test p-value | | | | | 0.200 | 0.235 | | |

Note: *** p<0.01, ** p<0.05, * p<0.1

Source: IMF staff estimates.

## Table 6. Panel Regressions—Capital Inflows

| | Full Sample | | | | | | | | | Above Threshold Sample | Below Threshold Sample |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | FE | FE | FE | FE | FE | FE | FE | System GMM | System GMM | FE | FE |
| Capital flow restrictiveness index | -17.458*** | -12.653*** | -12.823*** | -12.808*** | -12.687*** | -12.938*** | -12.923*** | -9.802*** | | -21.679*** | -0.185 |
| | (-4.138) | (-3.042) | (-3.061) | (-3.052) | (-3.024) | (-2.974) | (-2.969) | (-3.155) | | (-2.939) | (-0.041) |
| Capital inflows, percent of GDP (lag) | | 0.317*** | 0.317*** | 0.317*** | 0.312*** | 0.312*** | 0.313*** | 0.510*** | 0.512*** | 0.264*** | 0.129 |
| | | (4.734) | (4.722) | (4.719) | (4.633) | (4.617) | (4.626) | (9.327) | (9.352) | (2.738) | (1.295) |
| Real interest rate | | | -0.048 | -0.052 | -0.052 | -0.058 | -0.054 | -0.011 | -0.011 | -0.118 | 0.185 |
| | | | (-0.408) | (-0.434) | (-0.439) | (-0.475) | (-0.440) | (-0.741) | (-0.746) | (-0.606) | (1.286) |
| Real GDP per capita (growth) | | | | 0.078 | 0.134 | 0.134 | 0.065 | 0.016 | 0.030 | -0.064 | 0.055 |
| | | | | (0.421) | (0.699) | (0.701) | (0.311) | (0.073) | (0.136) | (-0.165) | (0.341) |
| Country risk (change) | | | | | -0.237 | -0.239 | -0.268 | -0.527*** | -0.560*** | -0.162 | -0.177 |
| | | | | | (-1.139) | (-1.142) | (-1.265) | (-2.667) | (-2.837) | (-0.443) | (-1.000) |
| Real US interest rate | | | | | | 0.099 | 0.038 | -0.303 | -0.431 | -0.152 | -0.089 |
| | | | | | | (0.224) | (0.085) | (-0.926) | (-1.327) | (-0.188) | (-0.231) |
| Real world GDP (growth) | | | | | | | 0.357 | 0.652** | 0.651** | 0.856 | -0.347 |
| | | | | | | | (0.873) | (2.009) | (1.996) | (1.103) | (-1.093) |
| Capital flow restrictiveness index (broader index) | | | | | | | | | -9.824** | | |
| | | | | | | | | | (-2.566) | | |
| Constant | 12.628*** | 9.052*** | 9.203*** | 8.938*** | 8.821*** | 8.868*** | 7.946*** | 4.994*** | 4.833*** | 10.296*** | 5.284*** |
| | (9.012) | (5.885) | (5.807) | (5.235) | (5.161) | (5.139) | (3.927) | (3.258) | (2.963) | (2.669) | (2.868) |
| Number of countries | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 19 | 14 |
| Number of observations | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 141 | 111 |
| R-squared | 0.015 | 0.290 | 0.291 | 0.289 | 0.286 | 0.282 | 0.291 | | | 0.277 | 0.153 |
| AR(1) test p-value | | | | | | | | 0.000 | 0.000 | | |
| AR(2) test p-value | | | | | | | | 0.221 | 0.253 | | |

Note: *** p<0.01, ** p<0.05, * p<0.1

Source: IMF staff estimates.

## Table 7. Panel Regressions—Capital Outflows

| | Full Sample | | | | | | | | | Above Threshold Sample | Above Threshold Sample |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | FE | FE | FE | FE | FE | FE | FE | System GMM | System GMM | FE | FE |
| Capital flow restrictiveness index | 12.773*** | 7.319*** | 7.443*** | 7.379*** | 7.494*** | 7.920*** | 8.332*** | 7.733*** | | 17.349** | 0.003 |
| | (4.442) | (2.767) | (2.805) | (2.773) | (2.806) | (2.884) | (3.050) | (3.793) | | (2.274) | (0.001) |
| Capital outflows, percent of GDP (lag) | | 0.506*** | 0.504*** | 0.505*** | 0.505*** | 0.502*** | 0.492*** | 0.637*** | 0.599*** | 0.456*** | 0.396*** |
| | | (8.054) | (7.995) | (7.990) | (7.989) | (7.906) | (7.795) | (14.217) | (14.143) | (3.460) | (5.740) |
| Real interest rate | | | 0.060 | 0.062 | 0.063 | 0.074 | 0.071 | -0.002 | -0.016 | 0.104 | -0.066 |
| | | | (0.725) | (0.749) | (0.755) | (0.871) | (0.845) | (-0.182) | (-0.990) | (0.545) | (-0.702) |
| Real GDP per capita (growth) | | | | -0.058 | -0.038 | -0.041 | 0.066 | 0.031 | -0.016 | 0.031 | 0.111 |
| | | | | (-0.456) | (-0.287) | (-0.307) | (0.474) | (0.214) | (-0.123) | (0.043) | (1.244) |
| Country risk (change) | | | | | -0.090 | -0.088 | -0.029 | 0.034 | | -0.217 | 0.024 |
| | | | | | (-0.622) | (-0.610) | (-0.202) | (0.247) | | (-0.541) | (0.229) |
| Real US interest rate | | | | | | -0.204 | -0.107 | 0.205 | 0.216 | 0.332 | -0.263 |
| | | | | | | (-0.679) | (-0.354) | (0.937) | (1.364) | (0.316) | (-1.216) |
| Real world GDP (growth) | | | | | | | -0.607** | -0.646*** | -0.474*** | -1.798 | -0.414** |
| | | | | | | | (-2.190) | (-3.000) | (-3.078) | (-1.358) | (-2.466) |
| Capital flow restrictiveness index (broader index) | | | | | | | | | 7.828*** | | |
| | | | | | | | | | (3.623) | | |
| Constant | -7.769*** | -4.429*** | -4.600*** | -4.396*** | -4.470*** | -4.543*** | -3.097** | -2.176** | -2.576*** | -2.058 | -1.184 |
| | (-7.771) | (-4.515) | (-4.555) | (-3.973) | (-4.012) | (-4.054) | (-2.396) | (-2.183) | (-2.690) | (-0.365) | (-1.316) |
| Number of countries | 24.000 | 24.000 | 24.000 | 24.000 | 24.000 | 24.000 | 24.000 | 24.000 | 34.000 | 16.000 | 23.000 |
| Number of observations | 266 | 266 | 266 | 266 | 266 | 266 | 266 | 266 | 393 | 83 | 183 |
| R-squared | 0.004 | 0.532 | 0.532 | 0.532 | 0.532 | 0.524 | 0.524 | | | 0.442 | 0.659 |
| AR(1) test p-value | | | | | | | | 0.000 | 0.000 | | |
| AR(2) test p-value | | | | | | | | 0.779 | 0.735 | | |

Note: *** p<0.01, ** p<0.05, * p<0.1

Source: IMF staff estimates.

## Appendix I. Data Definition and Sources

| Series name | Description | Underlying Sources | Transformation |
|---|---|---|---|
| RGDPPC | Real GDP per capita | WEO | percentage change |
| NEER | Nominal Effective Exchange Rate | INS | percentage change |
| US interest rate 1/ | 3 month treasury yield | IFS | |
| NPLs | Non peforming Loans | WDI | |
| REER | Real Effective Exchange Rate | INS | percentage change |
| CPI | Inflation | WEO | percentage change |
| World GDP | Real world GDP | WEO | percentage change |
| Capital flow ratios | Capital inflows(outflows)/Nominal GDP | IFS | Ratio to GDP |
| Credit /2 | Claims on private sector | IFS | percentage change |
| Interest /1 | Interest rates | IFS | percentage change |
| Equity returns | Equity prices | WDI | percentage change |
| Capital flow liberalization index | Restrictiveness index | IMF | |
| CAR | Capital adequacy ratios | WDI | |
| Export | Export | IFS | |
| Import | Import | IFS | |
| Fiscal balance | The balance of a government's tax revenues, plus any proceeds from asset sales, minus government spending. | IFS | Ratio to GDP |
| VIX | The Chicago Board Options Exchange Market Volatility Index, a popular measure of the implied volatility of S&P 500 index options, as a measure of global risk. | Bloomberg | Difference |
| Country risk | A measure of country risk from International Country Risk Group. | ICRG | Difference |

1/ Variables in real terms are created as the diffrence between the variable and inflation.
2/ For real credit, the credit is divided by the CPI then the growth rate is created.

**Appendix II. Assumptions for Simulation of the Effects of Capital Flow Liberalization on China**

| Variables | Scenario without Liberalization | Scenario with Liberalization |
|---|---|---|
| Capital flow restrictiveness index | No changes | Decline by 0.05 each year over 2012–2016 |
| Real GDP per capita growth; inflation; CARs; inflows, and outflows. | Endogenous (computed) | Endogenous (computed) |
| VIX | Decline by 2 points annually from 2013 onward | Decline by 2 points annually from 2013 onward |
| REER | No changes | The misalignment, as computed by CGER in 2011 Article IV staff reports, disappears over the Medium Term. Simple average of the results of three approaches (ERER, ES, and MB) is used. |
| NEER | No changes | Calculated based on the REER and inflation differential between China and weighted trading partner during 2011–2016 |
| Country risk | Average of difference in country risk during 1995–2010 | Average of difference in country risk during 1995–2010 |
| Credit | WEO projections | WEO projections |
| Interest rates | Fixed at 2011 level | Fixed at 2011 level |
| U.S. interest rate | Fixed at 2011 level | Fixed at 2011 level |
| | | |
| NPL ratio | An increase of one percentage point every year from 2011 onward. | An increase of one percentage point every year from 2011 onward. |

Note: The NPL ratio in China is assumed to increase by one percentage point every year from 2011 to 2016 due to the recent credit expansion, including loans to local government financing platforms. This assumption is also in line with the market estimate.