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Regulating capital flows in emerging markets: The IMF and the global financial crisis☆

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Abstract

In the wake of the financial crisis the International Monetary Fund (IMF) began to publicly express support for what have traditionally been referred to as 'capital controls'. This paper empirically examines the extent to which the change in IMF discourse on these matters has resulted in significant changes in actual IMF policy advice. By creating and analyzing a database of IMF Article IV reports, we examine whether the financial crisis had an independent impact on IMF support for capital controls. We find that the IMF's level of support for capital controls has increased as a result of the crisis and as the vulnerabilities associated with capital flows accentuate.
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Keywords: IMF; Emerging Markets; Capital Flow Management Measures

1. Introduction

Sometimes financial crises make policy-makers stop and rethink whether they know what they think they know about how economies work and what the proper economic policy responses should be to prevent and mitigate such crises. Was this time different? It has been well established that the International Monetary Fund (IMF) was generally skeptical for the regulation of cross-border financial flows from the 1980s to the run up to the global financial crisis (Abdelal, 2007; Chweiroth, 2009; Moschella, 2010; Gallagher, 2015).

In the wake of the crisis the IMF surprised many observers by openly embracing capital controls to both prevent and mitigate financial crises. The IMF supported the use of capital controls on inflows in a number of countries such as Brazil and South Korea (Gallagher, 2015). Most surprising to many was the IMF's outright advocacy for the use of capital controls on outflows in Iceland as part of that country's post crisis stand-by-agreement (Sigurgeirsdottir and Wade, 2015).

In some ways, advocating for the appropriate use of capital controls is new policy at the IMF. In 2012, the IMF adopted a 'new institutional view' on capital account liberalization and controls that states that capital account liberalization is not always optimal and that under certain conditions capital controls on inflows and outflows can be appropriate to prevent and mitigate financial instability (IMF, 2012). This shift has received a significant amount of attention, however there is yet to be a rigorous account of whether the IMF has put its new words into action. This paper sets out to do just that.

2. The IMF and the capital account: a literature review

A burgeoning literature has emerged on the role the crisis played in the shift of discourse at the IMF on this matter (Grabel, 2011; Chweiroth, 2013; Gallagher, 2015). It is clear that the crisis played an independent part in at least accelerating an incremental level of ideational change at the fund on this issue, though the seeds of change were planted after the wave of crises that ended the century. This paper takes such analyses one step further by analyzing the extent to which such changes in discourse related to the crisis were also associated with changes in official IMF advice on managing capital flows.

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A strand of theory in the international political economy literature postulates that during episodes of financial crises, firmly held ideas can be challenged by a rival set of ideas about how economies work and should be managed. Under the uncertainty that is rife in such episodes, certain key agents can be open to alternative ideas that help manage such uncertainty. The conduits for such change can be 'norm entrepreneurs' that cultivate 'pervasive struggles' to legitimize previously unaccepted views (Blyth, 2002; Seabrooke, 2007; Schmidt, 2008; Widmaier et al., 2007). In the global uncertainty following the global financial crisis a significant amount of research demonstrates that the IMF changed the way it talked about global capital flows and their benefits and risks.

In the 1990s the IMF underwent a paradigm shift and began to see capital account liberalization as an optimal policy for all countries, and thus saw capital controls as an unadvisable policy. Indeed, in the 1990s the IMF went so far as to introduce a formal change to its Articles of Agreement that would have mandated open capital accounts for its membership. As a result of the financial crises of the 1990s, and actions by the United States Congress, that proposal did not come to fruition. Subsequently, the IMF became more tolerant of the gradual liberalization of the capital account and of temporary, price-based capital controls as a last resort for emerging market and developing countries (Independent Evaluation Office, 2005; Abdelal, 2007; Chweiroth, 2009; Moschella, 2010).

A significant shift in mainstream economic thinking regarding the regulation of capital flows occurred around the time of the crisis as well. Mainstream economic thought generally saw capital account liberalization as an optimal policy in the long run for all countries and saw the regulation of capital flows as inherently distortionary from that optimum. Certain strands of economics from the Keynes, Minsky, and Lewis traditions had long seen the regulation of capital as necessary for maintaining monetary policy autonomy, preventing financial fragility, and as levers for structural transformation. These perspectives had fallen out of the mainstream by the 1980s (Gallagher, 2015).

Around the time of the global financial crisis a consensus among mainstream began to emerge on both the theory and the econometric evidence related to capital account liberalization and the regulation of capital flows. A number of theorists began to question the extent to which capital account liberalization is optimal, especially in the presence of information externalities. According to this research, externalities are generated by capital flows because individual investors and borrowers do not know (or ignore) what the effects of their financial decisions will be on the level of financial stability in a particular nation. This is a classic market failure argument and calls for a Pigouvian tax that will correct for the market failure and make markets work more efficiently.

These theoretical breakthroughs were further substantiated given that the vast majority of econometric analyses of capital account liberalization find no rigorous link between capital account liberalization and growth in emerging market and developing countries. Indeed, the consensus is that liberalization is often linked to banking crises (Jeanne et al., 2012). Finally, meta-reviews of the literature on the effectiveness as capital controls found that capital controls consistently had the desired effects of their policy-makers (Magud et al., 2011; Jeanne et al., 2012). An authoritative review of the literature on these matters concluded the following:

> "The international community should not seek to promote totally free trade in assets—even over the long run—because (as we show in this book) free capital mobility seems to have little benefit in terms of long-run growth and because there is a good case to be made for prudential and other non-distortive capital controls." (Jeanne et al., 2012: 5).

The IMF took an even larger step in accepting gradual capital account liberalization and the use of capital controls in the wake of the global financial crisis of 2008. First, it is important to note that the crisis was associated with significant surges and sudden stops in cross-border capital flows as Fig. 1 shows, there was a sudden stop in capital flows to emerging market and developing countries as a result of the crisis—with investors flocking to the 'safety' of industrialized markets.

However, as nations such as the United States engaged in expansionary monetary policy, investment again began to surge into emerging markets. It is under this turbulent period that then managing director Dominique Strauss Kahn ignited a sense of new thinking within the Fund in hopes that it would revive interest in the IMF, given that global regard for the institution had waned significantly. Norm entrepreneurs within the research department seized that moment and published articles that found that those countries that deployed capital controls going into the crisis were among the least hard hit (Ostry et al., 2010). These findings were supported and promoted by the managing director and led to an eventual official re-evaluation of the IMF position on capital account liberalization and capital controls.

This re-evaluation was hotly contested within the board of the IMF, with the BRICS countries leading efforts to grant the most policy space possible for emerging markets to regulate capital flows (Chwieroth, 2014; Gallagher, 2015). In December 2012, IMF adopted a 'New Institutional View' on capital flow management (IMF, 2012). In the new view, the IMF now recognizes that capital flows carry risks and that the liberalization of capital flows before nations reach a certain threshold of financial and institutional development can accentuate those risks. The IMF also now acknowledges that under certain circumstances, cross-border capital flows should be regulated to avoid the worst effects of capital flow surges and sudden stops—and rebrands capital controls as 'capital flow management measures' (CFMs). These tenets were incorporated into a Staff Guidance note in 2013 and since that time are intended to guide official IMF policy advice on the matter (Grabel, 2011; Chwieroth, 2014; Gallagher, 2015).

While there is an emerging literature on the extent to which the IMF has changed its policy and discourse with respect to managing capital flows, there is yet systematic research that quantitatively examines the extent to which the IMF has actually changed its policy advice. There is a significant literature that attempts to quantify the extent to which the IMF has changed its behavior in other issues. Vreeland (2003), Pop-Eleches (2008), Thacker (1999), Bird and Rowlands (2009), and Presbitero and Zazzaro (2012) have all examined the quantitative determinants

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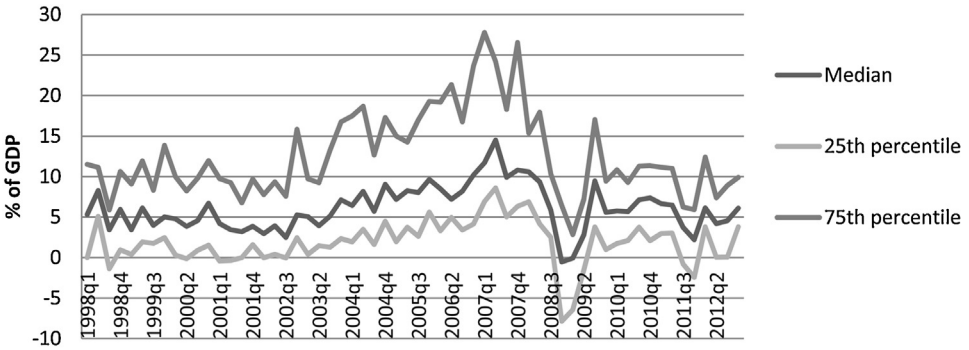

Fig. 1. All emerging market: gross capital inflows 1998–2012.

of IMF lending programs in different settings. There is also one article that empirically examines the relationship between the IMF and policy on capital flows. Joyce and Noy (2008) empirically examine the extent to which IMF country programs in the 1980s and 1990s were associated with policies to liberalize the capital account. The authors do indeed find evidence that IMF programs were correlated with capital account liberalization. Roy and Ramos (2012) examine Article IV reports to identify whether the IMF has changed its policy advice after the crisis. For their paper they read 26 reports in 2010 and did not see much of a change in IMF behavior. In the spirit of Joyce and Noy, our paper is the first to our knowledge that econometrically examines the extent to which the IMF has demonstrably changed its advisory behavior as manifest in official Article IV reports both before and after the global financial crisis.

3. Data and methodology

The specific research questions for this paper are: To what extent has the IMF changed the way it views capital flows, and to what extent has the IMF increased its level of support for capital controls in the wake of the financial crisis? This section of the paper describes the mechanics of the database that was created to answer our research question and outlines the econometric model and methodology for the research as a whole.

3.1. Database

Our study is based on a unique dataset created from IMF annual Article IV reports from 1998 to 2013. We built a database focusing on capital flow management and related policies for 31 emerging markets covering Asia, Latin America and Caribbean, Europe and Africa. This database includes coding IMF Article IV Consultation Reports and Public Information Notice as well as collecting country-specific macroeconomic data from the World Bank World Development Indicators database (IMF, 2013; World Bank, 2014[3]).

Our coding method is derived from the 2005 IMF Evaluation Report prepared by the Independent Evaluation Office titled *The IMF's Approach to Capital Account Liberalization* (IMF, 2005). In that report, though in a more qualitative manner and with a smaller set of countries, the IMF's Independent Evaluation Office (IEO) assessed the level of IMF support for capital account liberalization and capital controls in the wake of the financial crises in the 1990s. Juxtaposed with the new data we derive from IMF Article IV reports, we include macroeconomic data such as current account balance, domestic credit of the banking sector and external debt payments. Overall, our database includes 528 observations of 33 countries in 16 years (1998–2013).

For each Article IV report, we first code the IMF initial diagnosis by examining whether the IMF deems capital flows as an area of concern for a country undergoing an Article IV consultation. Keywords were searched and read for were those such as 'capital flow measures,' 'capital controls,' 'financial stability,' 'surge,' 'sudden stop,' 'unremunerated reserve requirement,' 'capital account deficit,' 'inflows/outflows,' 'exchange rate risk,' 'debts denominated in foreign currency,' and others.

Keywords of a capital flow issues include 'external shock,' 'external instability,' 'adverse shocks related to global stress,' 'adverse spillovers arising from the global turmoil,' 'contagion,' 'foreign exchange pressures,' 'rising external imbalance', 'external financial environment,' 'balance of payment pressure.'

Secondly, we code the IMF's policy recommendations to remedy concerns related to capital flows. We code each policy recommendation separately, corresponding with the measures coded by the IEO in their 2005: tighten fiscal policy, exchange rate flexibility, sterilization/intervention in the currency market, trade liberalization, tighten prudential regulation, capital flows management/capital controls.

Finally, if the IMF has a policy recommendation with respect to capital flow management (CFMs) measures or capital controls, we code the IMF's level of support for such measures. A common response to managing capital flows is to tighten fiscal policy. Exchange rate flexibility is also advocated by the IMF and others as tool to temper swings in capital flows. A flexible exchange rate can be a shock absorber in the event of capital inflow surge. For sterilization/intervention in the foreign exchange markets, we read for endorsements of a reserve build-up, higher reserve levels would help guard against capital account shocks, intervention in FX markets to smooth volatility and enhance liquidity, reserve accumulation, purchases of foreign exchange.

[3] https://openknowledge.worldbank.org/handle/10986/20093.

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We also code IMF recommendations with respect to CFMs. The key words includes: capital controls, capital flow measures, CFM, unremunerated reserve requirement, impact of capital controls/ineffectiveness, capital account regulation of a prudential nature, and so forth.

There are numerous kinds of CFMs or capital controls, such as taxes on the inflow or outflow of capital, quantitative measures on the repatriation of portfolio investments, exit levies,; prohibition of foreign purchase or holding of domestic assets; requirements to obtain administrative permission for a foreign bond issue; minimum maturity period for foreign bond issues; taxes on purchases of domestic assets by foreigners or on investment income earned by foreigners; reserve requirements on deposits held by foreigners and others (Gallagher, 2015).

We quantify the level of support for capital controls (or CFMs) into four groups: **not supportive** (phase out controls, controls are ineffective, drawbacks, elimination of controls as a positive step, negative effects of capital controls), **not mentioned, partially supportive** (management of temporary surge, could be an option, part of a transitory response) and **fully supportive.** We code these as −1, 0, 1, and 2, respectively. See Tian and Gallagher (2015) for a fuller discussion of the coding.

3.2. Econometric methodology

Given the dataset coded from Article IV Reports, we apply OLS regression in a reduced-form econometric model to examine the extent to which the IMF has changed its diagnoses of the role of capital flows and whether the IMF has significantly changed its level of support for CFMs as a result of the crisis. Thus, our model is built to analyze whether the IMF's view on capital flows is affected by the financial crises and the vulnerability of the economy. It also takes the country fixed effect into consideration and runs the robust regression on the panel dataset from 2000 to 2013.

The reasons for choosing the time period after 2000 in the regressions are: on one hand, IMF policy response to capital flows for the 1998–2000 periods is influenced by the Asian Financial Crises; on the other hand, during the 1998–2000 periods, most of the data is based on Public Information Notice while after 2000 most are full Article IV reports. Thus, to have a more reliable data information pre and post 2008 Financial Crises, it makes sense to choose the analysis period after 2000.

3.2.1. Model equations

The research question is to examine the extent to which the IMF policy advice on capital flows after the financial crises. In other words, did the 2008 global financial crises change the IMF initial diagnosis of capital flows issues for emerging markets? Are the capital flow management measures mentioned more frequently after the crises happened? If the emerging market has a capital flow issue, how does the IMF's level of support for CFMs vary?

Based on these research questions, the regression models are built on the following equations in the reduced forms:

$$IMFdiagnosis_{it} = \alpha_{it} + \beta_{it} Crises_t + \gamma_{it} X_{it} + \in_{it} \quad (1)$$

$$MentionCFM_{it} = \alpha_{it} + \beta_{it} Crises_t + \gamma_{it} X_{it} + \in_{it} \quad (2)$$

$$Levelofsupport_{it} = \alpha_{it} + \beta_{it} Crises_t + \gamma_{it} X_{it} + \in_{it} \quad (3)$$

$IMFdiagnosis_{it}$ is coded from the Article IV report of country i at year t on whether there is a mentioned issue of capital flows. $MentionCFM_{it}$ is coded on the appearance of CFMs after there is an initial diagnosis from the report. $Levelofsupport_{it}$ measures quantitatively the attitude of IMF towards the CFM policies. $Crises_t$ is the dummy variable, which takes 1 after 2008.

X_{it} represents the macroeconomic fundamentals that measure the capital vulnerability of the emerging markets. Since different emerging markets have different economic situations, we include a list of macro fundamental measures as the fixed effects in the econometric regression. Our selection of macro variables is based on the Economist 2013 Capital Freeze Index (Economist, 2013[2]). We make a modified selection of the variables and pick first three key elements: current-account balance as % of GDP (CAB), short-term gross external debt plus external debt payments as % of foreign-exchange reserves (EDP), and domestic banking-sector credit as % of GDP (DBC).

Current-account balance is defined by the sum of the value of imports of goods and services plus net returns on investments abroad, minus the value of exports of goods and services. When a country's current account balance is positive (surplus), the country is a net lender to the rest of the world. When a country's current account balance is negative (deficit), the country is a net borrower, making the domestic economy more vulnerable and dependable on the global economy.

For example, South Africa's current account deficit is high relative to that of other EMEs and is financed by relatively volatile capital inflows. Foreign direct investment has typically been smaller than in other emerging markets, averaging just over 1% of GDP in the past ten years compared to around 3% of GDP for the median of EMEs. Instead, South Africa has been more reliant on portfolio flows, which are volatile in comparison to other EMEs. There are, nevertheless, other important mitigating factors. External debt is low (26% of GDP at end-2008), over 40% of which is denominated in rand. Banks, corporations, and households have limited foreign currency balance sheet exposure. Capital inflows are predominantly in the form of equity, and hence denominated in rand, while the exchange rate floats. Should capital outflows reemerge, foreign investors would share the adjustment burden—as they did in late 2008 when the stock market declined and the rand depreciated sharply.

External debt is that part of the total debt in a country that is owed to creditors outside the country. The more debt the country owes the outside markets, the higher risk the economy bears and the less reliable the economy is. Domestic credit provided by the financial sector includes all credit to various sectors on a gross basis. The banking sector includes monetary authorities and deposit money banks, as well as other banking institutions where data are available. Examples of other banking institutions

[2] The Economist has combined four factors into an index measuring the vulnerability of 26 emerging markets to a capital freeze (http://www.economist.com/blogs/graphicdetail/2013/09/daily-chart-3).

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are savings and mortgage loan institutions and building and loan associations. It's a measure of the health of the banking sector of the economy and highly related with the vulnerability of the capital markets.

Here we first use current account balance, domestic banking-sector credit, and external debt payment separately. Second, we generate a composite of these three components called Capital Vulnerability Measure (CVM) following the rule of Capital Freeze Index (CFI). Then use CVM as one single independent variable in our regressions. Third, we add the multiplication term of the control variables and the crises dummy in the regression. This aims at investigating the response reasons of the IMF changes after the crises.

The regression equation is

$$Y_{it} = \alpha_{it} + \beta_{it} Crises_t + \gamma_{it} X_{it} + \delta_{it} X_{it} \cdot Crises_t + \in_{it} \quad (4)$$

Where Y_{it} stands for capital flow diagnosis, CFM mention or support for capital controls. δ_{it} measures how likely IMF is to respond to the specific economic indicator X_{it} with Y_{it} after the 2008 crises.

The reason we exclude financial openness (Chinn and Ito, 2008) in our measure CVM is that there exists a co-linearity between CAB/EDP and financial openness. As a measure of financial openness, Chinn–Ito index is a summary of IMF's questions on countries about their capital accounts which includes the current account balance of the country and other related variables. Without loss of generality, we also adopt the Chinn–Ito capital openness index separately as an indicator of the economy's capital openness to see the impacts on IMF's institutional view.

Last but not least, we run the regression for different regions separately. We divide the emerging markets into four groups: emerging Asia, emerging Latin America and Caribbean, emerging Europe and emerging others. Cross-border capital flows are easier and more frequent inside the group than between groups. This region separation can be regarded as the regional effects in capital flow liberalization.

3.2.2. *Expected results*

The model is to test whether the crises had an effect on IMF advice to emerging markets. If the IMF had changed its advice as a result of the crisis we would expect to observe more diagnoses on capital flow issues after 2008 and IMF's attitudes towards CFMs are more supportive than before. The 2008 global financial crises have a tremendous influence on the emerging markets, especially for the cross-border capital flows. IMF's change in CFM advice will result in significant policy changes in the developing countries. Our research results are expected to give solid quantitative evidence on the IMF policy shifts and institutional view switches.

The coefficient of Crises measures not only the direction of the changes but also the magnitude of the effect. We test on whether it's significantly different from zero and interpret as a shift of regime after the crises. A comparison between whether to include the macro fundamentals is helpful in understanding these changes and seeking the underlying mechanism which causes these changes. In addition, the decision on the choice of macroeconomic variables shed light on how different channels interrupt with each other and which part affects the cross-border capital flows more significantly.

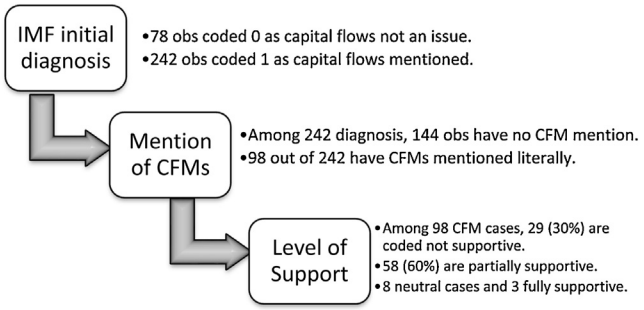


Fig. 2. Summary statistics of coding on capital flows.

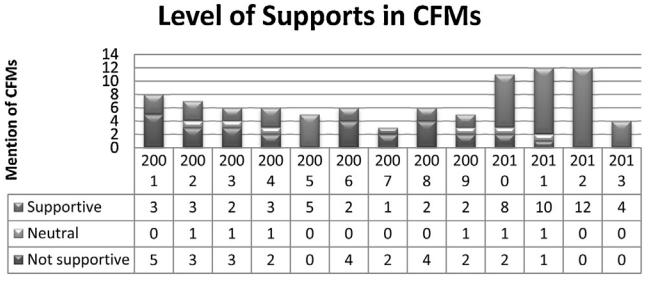
Controlling for the vulnerability of the economy improves the fitness of the model though there is a loss on the number of observations. The more vulnerable the emerging market is (the larger the Capital Freeze Index), we would expect a higher chance to be diagnosed of capital flow issues initially, the less likely there is a mention of CFM due to the instability of economy. Otherwise, the coefficients of CVM are insignificantly different from zero. The R-square indicates the goodness to fit of the econometric model. Due to the small size of the dataset as well as that crises might not be the major reason for IMF's change in the capital flow issue; we might expect a small R-square.

The regression results will give useful suggestions to analyze the IMF's institutional view with respect to the capital flow liberalization policy, taking the economy vulnerability index into account. Volatile international capital flows has cross-border financial shocks which influenced the boom-and-bust cycle as well as domestic banking credit. It's necessary to keep a consistent record of the capital flow management policies and learn from the history lessons after the financial crises.

4. Results

4.1. *Summary statistics*

We present summary statistics for the dataset in a flow chart in Fig. 2. Fig. 3 presents summary statistics for the key variables used in the analysis. Figs. 4 and 5 demonstrate the



	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Supportive	3	3	2	3	5	2	1	2	2	8	10	12	4
Neutral	0	1	1	1	0	0	0	0	1	1	1	0	0
Not supportive	5	3	3	2	0	4	2	4	2	2	1	0	0

Fig. 3. Proportions of level of support in terms of total mention of CFMs.

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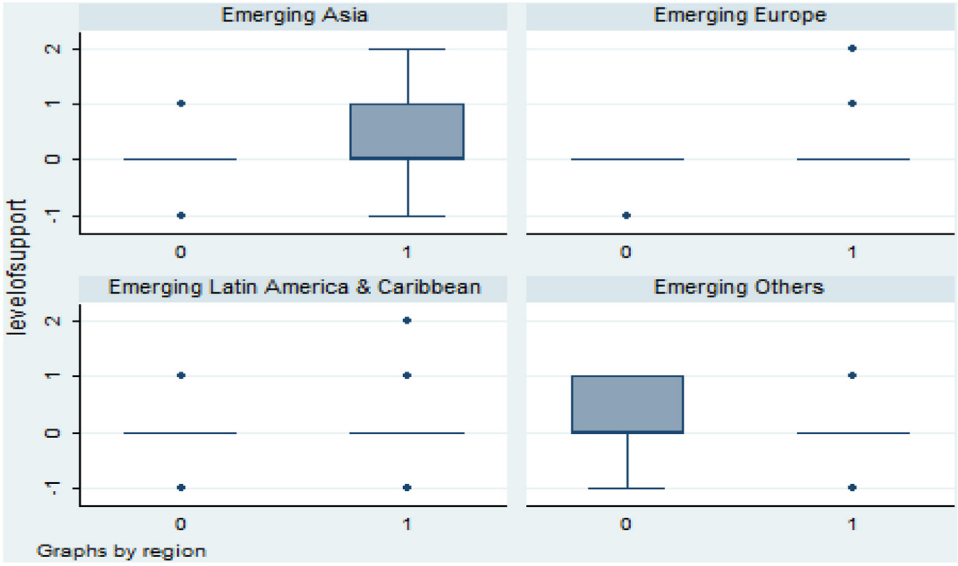

Fig. 4. Comparison of box distribution of level of support before and after crises.

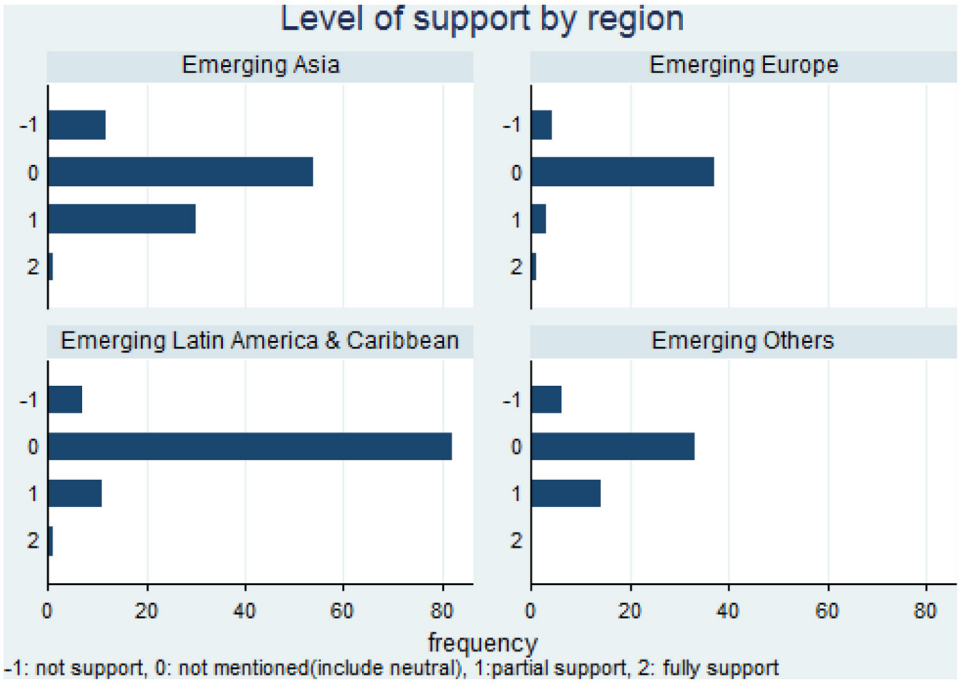

Fig. 5. Statistics of level of support by region including all observations.

level of supports through a breakdown by region and crises event.

An important issue is the representativeness of the sample. We adopt the country list posted by IMF authority and compare our coding statistics with the IMF dataset[1] between 1998 and 2000. Our dataset mirrors with their summary table by 90%. The results show that our sample is fairly representative in terms of all dimensions (country, region and coding criteria).

4.1.1. Flow chart

Among all 320 available observation of IMF initial diagnosis during 2001–2013, 75.6% of Article IV reports mentioned capital flows as an issue of concern for the country. Besides, CFMs are a major suggestion as 40.5% of the IMF initial diagnosis. Though capital flow management is considered to be an issue, it often comes along with macro prudential policies and sterilization/intervention in foreign exchange markets. Therefore, CFM not mentioned for a diagnosis is not equivalent to the CFM's ineffectiveness but other policies alone can work out during the current period.

[1] 2012 IMF new institutional view, Chapter 4.

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With a mention of CFM, 61 out of 98 cases gain supportive advice from the IMF with 3 special cases of fully support. There are only 8 neutral cases in level of support, which indicates IMF's CFM policies usually come with a degree of either supportive or not supportive. It's of interest to see the distribution of level of support in different years. The changes in the structure of level of support are signals of IMF's policy switches therefore help understand the global evolvement of capital flow liberalization.

From Fig. 3, we can summarize that:

- Mention of CFMs (the total number of all IMF initial diagnosis with CFM mentioned) became more frequent since 2008.
- The level of support in capital flow liberalization is increasing tremendously, transferring from not supportive to partially supportive or even fully supportive.
- Neutral cases, which represent no attitude toward capital flows given CFM mentioned, are rare. (2002–2004 Chile, 2009 South Africa, 2011 Venezuela).
- The level of support is more relevant after 2010 when the IMF starts its New Institutional View. Capital controls are open in 2005 and 2012.

The number of countries that have Article IV reports before and after crisis has been balanced. Before the crisis, 12.2% of the countries observed gain partial support for capital controls from the IMF, 11.6% of the countries observed gain total support, while after the crisis the proportions are 22.3% and 7% respectively.

Table 1 reports correlation coefficients among different types of IMF advice on capital flows. To things stand out that our relevant to this study. First, exchange rate flexibility comes along with sterilization/intervention in the FX market and tightening prudential regulations. Second, mention of CFMs is most related with macro prudential regulation policy.

4.1.2. Examples from reports

The major concern about the coding process is the difficulty to narrow down or categorize the IMF's views as expressed in Article IV reports. For example, the report might make a reference to the "liberalization of the trade and exchange system," which may or may not include capital account liberalization. On the other hand, the absence of an explicit reference does not mean that the IMF never expressed a view during the policy dialog meeting process.

4.1.3. Comparison between regions

The evolution of level of support for capital controls varies by region. Country heterogeneity affects our model and causes variation in the results. These countries differ in geographical regions, income levels, macroeconomic fundamentals, political context, and the size of the country and so on. However, we notice that the general tendency is of an increase in the level of support over years. To see the regional heterogeneity, we carry a regional analysis of the change in level of support over the years in depth.

Furthermore, we compare the mean and quarters before and after the crisis among different regions. All variables are significantly different before and after the crisis with the exception of trade liberalization. Moreover, in general all variables are significantly different at the 1% level. It would be very interesting in further research to analyze the reasons behind the changes in different regions.

Fig. 4 shows the general distribution of level of support among different emerging markets. The box boundary represents the 25 quantiles and 75 quantiles. The lines are the 25%, 50% and 75% of the distribution with maximum and minimum value points. For emerging Asia, there is a significant spread in level of support after the crises. Emerging Europe has a significant shift from not supportive to fully supportive. Emerging Latin America markets are comparatively persistent on capital flow liberalization. Emerging others has mixed issues. All emerging markets receive more volatile level of support on capital flows from IMF.

We see that the IMF strengthens support for partial control of capital account significantly after the crisis. There is no substantial adjustment on the level for not supportive, neutral and totally supportive. However, without controlling for other vulnerability indices, it is not safe to claim that the financial crisis alters the IMF's support level for capital control. It is highly likely that the IMF changes its policy recommendation for capital controls based on the four vulnerability indices we introduced.

Fig. 5 gives a frequency graph of the levels of support. Here "zero" case not only includes a neutral attitude towards the level of support in capital controls, but also accounts or the cases of not mentioning CFMs as well as capital flow not diagnosed as an issue. We see a larger proportion of capital flow unclearness in the emerging Latin American and Caribbean. On the contrary, emerging Asia has the highest frequencies in both not supportive and supportive categories.

5. Regression results

5.1. Baseline model

We first run the simple regression of IMF initial diagnosis on the Financial Crisis Dummy variable. Results are summarized in Table 2 Panel 1. When we run the simple regression of IMF initial diagnosis on dummy variable, we obtain a positive and statistically significant coefficient for the dummy variable. Without control for other variables, there is a statistically significant change in IMF initial diagnosis due to the 2007–2008 financial crisis.

However, the conclusion we have reached by just running the previous regression does not control for any other variable that could have an effect on the significance of the "Dummy". It may be the case that it is not due to the 2008 financial crisis itself but to other elements such as the economic fundamentals of the emerging markets. Therefore, to further understand the relationship between the crises and IMF initial diagnosis we run further regressions.

As shown in Table 2, even if we control for macro fundamentals, which measures the vulnerabilities of the economy, into the regression, the dummy variable always has a statistically significant and positive impact on the IMF initial diagnosis.

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Table 1
Correlation between different policy suggestions.

Correlation	Fiscal policy	Exchange rate	Sterilization/ intervention	Trade liber- alization	Macro- prudential
Tighten fiscal policy	1.0000				
Exchange rate flexibility	0.2395	1.0000			
Sterilization/intervention	0.0531	0.2788	1.0000		
Trade liberalization	0.1018	−0.0494	−0.0774	1.0000	
Tighten macroprudential	0.2480	0.2778	0.2375	0.0267	1.0000
Mention of CFMs	0.1131	0.1909	0.1971	0.0820	0.1981

Table 2
Regression results.

	Part I: IMF initial diagnosis					
Crises (2007)	0.229[c]	0.250[c]	0.246[c]	0.195[b]	0.188[c]	0.219[c]
Current account balance (% of GDP)		0.003			−0.003	
Domestic banking-sector credit (% of GDP)			0.00028		0.00006	
External debt payment (% of foreign-EX reserve)				−0.00054	−0.00057	
Capital Vulnerability Measurement (normalized)						−0.027
Constant	0.697[c]	0.696[c]	0.678[c]	0.806[c]	0.0668[c]	0.762[c]
N	296	282	283	198	198	198
R-squared	0.0785	0.0916	0.0911	0.0882	0.0897	0.0769
	Part II: mention of CFMs					
Crises (2007)	0.138[b]	0.147[b]	0.095[a]	0.069	0.067	0.106
Current account balance (% of GDP)		0.003			−0.002	
Domestic banking-sector credit (% of GDP)			0.004[c]		0.0042[c]	
External debt payment (% of foreign-EX reserve)				(−) 0.0009[a]	(−) 0.00057	
Capital Vulnerability Measurement (normalized)						0.498[c]
Constant	0.273[c]	0.272[c]	−0.113	0.404[c]	0.0673	0.134[b]
N	296	282	283	198	198	198
R-squared	0.0209	0.0246	0.1568	0.0335	0.1887	0.0627
	Part III: level of support					
Crises (2007)	0.227[c]	0.210[b]	0.186[b]	0.154[a]	0.117	0.142[a]
Current account balance (% of GDP)		(−) 0.003			(−) 0.017[b]	
Domestic banking-sector credit (% of GDP)			0.0037[c]		0.0043[c]	
External debt payment (% of foreign-EX reserve)				0.00012	0.00025	
Capital Vulnerability Measurement (normalized)						0.853[c]
Constant	0.023	0.025	(−) 0.24[c]	0.0266	(−) 0.288[b]	(−) 0.263[c]
N	296	282	283	198	198	198
R-squared	0.0391	0.035	0.1187	0.0164	0.149	0.1234

[a] 90% confidence interval.
[b] 95% confidence interval.
[c] 99% confidence interval.

We plot the baseline regression model of the level of support of capital controls for different regions in Fig. 6. There are positive trends for emerging Asia and Europe. The gray area represents the 90% confidence interval for the slope.

5.2. Including Capital Vulnerability Measures

Our modification of the baseline model includes adding current account balance, domestic banking sector credit and external debt payment ratio separately as well as Capital Vulnerability Measures. Capital Vulnerability Measure is generated from the combination of three variables as discussed in the previous sector.

First, IMF's initial diagnosis changes significantly after the 2007 financial crises, with an increase of around 20% on the cross-border capital flow issues. There is no significant impact from the current account balance, domestic banking credit and external debt, neither separate nor simultaneous.

Second, mention of CFMs is significantly correlated with the domestic banking-sector credit: the higher the credit is, the more vulnerable the domestic banking sector is, therefore the more mention of CFMs as a warning advice. The Capital Vulnerability Measure generated from the three variables has a significant positive coefficient, meaning the more vulnerable the emerging market is, the higher probability (50% increases) of mentioning CFMs.

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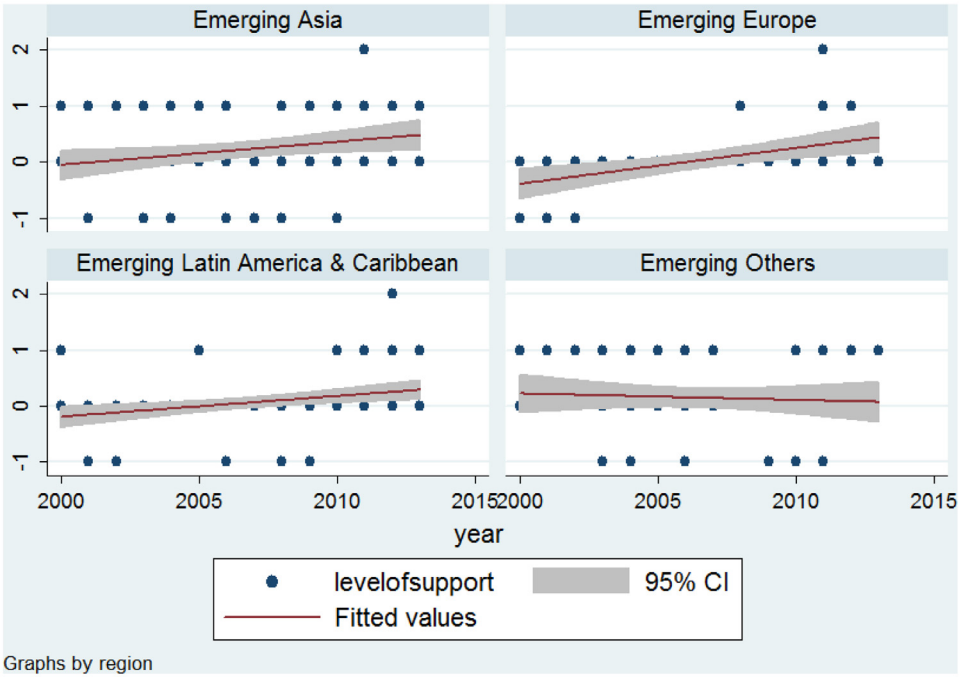

Fig. 6. Plot and fitted OLS for the level of support by region.

Third, level of support on capital flow liberalization changes after the crises, with more supportive arguments mentioned in the Article IV. The more severe the current account deficit (negative balance), the less supportive IMF is on capital flow liberalization. What's more, for the domestic credit from the banking sector, a high value of domestic credit implies a high development in capital market together with a high risk of capital vulnerability. In 2013, the country with the highest domestic credit in the world is Japan with a value of 341.69 while the lowest value in the world is Libya −65.93. We find the positive relationship between domestic credit and mention of CFMs because a boom in banking credit makes IMF realize that the country needs to restrict inflows. IMF is more cautious to the capital flows in the emerging markets, valuing domestic credit as a signal of economy's vulnerability.

Taking one step further, we generate Capital Vulnerability Measures from previous results and regard it as a general control variable of the economy's vulnerability. In the final regression, there is a positive correlation between the vulnerability of the emerging market and the supportive attitude of IMF. The more vulnerable the current economy is, the more changes in IMF's level of support on capital flows management measures. These changes can be from not supportive to neutral, from neutral to partially supportive, or from partially supportive to fully supportive.

The R-squares of our regression models are low because our sample is relatively small and has a short time horizon of 12 years. By adding more control variables, we see an increase in the model's goodness to fit. There are two kinds of effects by including more control variables: on one hand, it lowers the degree of freedom of the model; on the other hand, it avoids the model misspecification and improves the model explanation. More observations would be helpful to better explain the effects of financial crises on IMF's view of capital flows.

5.3. Including financial openness alone

Table 3 shows the results of adding financial openness alone in the regression model. When using Chinn–Ito Capital Openness as the control variable of the underlying economic fundamentals, there is a significant negative effect on both IMF's initial diagnosis and mention of CFMs. The coefficient can be interpreted as the influence of capital openness: the higher level of openness the current emerging market is, the less probability it's diagnosed by IMF with a capital flow issue and the less mention of CFMs in the IMF Article IV report of the same year.

5.4. Adding intersections

Beyond our baseline model, we generate five intersection variables by multiplying the controls with the crises dummy. There are *dummycurrentbalance*, *dummydomesticcredit*, *dummyexternaldebt*, *dummyfinancialopenness* and *CCompositeindex*. *CCompositeindex* is based on Capital Vulnerability Measures we created, which is the equally weighted composite index of current account balance, external debt and domestic banking-sector credit. By adding these *control variable × crises dummy* variables, we expect IMF is more likely to respond to specific economic indicators with a capital flow diagnosis, CFM mention as well as support for capital controls after the 2008 crises. There should be a positive significant coefficient for the intersection variables.

The main purpose of adding the intersection parts is to find out how IMF makes changes and adjustments in capital flow

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Table 3
Include Chinn–Ito financial openness only.

	IMF initial diagnosis		Mention of CFMs		Level of support	
Crises	0.229***	0.233***	0.138**	0.151**	0.226***	0.141*
Constant	0.697***	0.794	0.273***	0.434***	0.023	0.011
Capital openness		−0.189		−0.559***		0.124
N	296	198	296	198	296	198
R-squared	0.0785	0.0872	0.0209	0.0707	0.0391	0.0182

* 90% confidence interval.
** 95% confidence interval.
*** 99% confidence interval.

regulations after the 2008 financial crises. As we have already shown in our quantitative analysis, IMF does change its level of support to CFMs after the crises. But what are the key factors IMF's changes in its initial diagnosis, mention of CFMs and level of supports are based on? Which macro indicators influence IMF's change most after the crises? Are the changes in different decisions affects by the same factor significantly and consistently?

The results are shown in Table 4. There are some interesting results we found through tens of regressions we run. Most regressions turn out to be not significant. However, there are improvements in the model's goodness to fit and some of the results come out to be exactly the same as our expectation.

We found significant positive response in the financial openness index to IMF's initial diagnosis after 2008 and negative for the level of support. There are more IMF initial diagnoses after the crises, which, with a higher probability, is due to the financial openness of the emerging markets. IMF's judgment on capital flows issues is mostly based on countries' financial openness. However, the mention of CFMs is more related to the current account balance. Both the external debt and financial openness have negative influence on IMF's levels of support to CFMs, which means IMF considers external debt and financial openness when giving opinions on the policy support.

For mention of CFMs, the current account balance matters more for such changes. External debt has a significantly negative impact on the level of support changes after the crises. The measure of capital vulnerability matters more for the IMF initial diagnosis after the crises

In fact, our Capital Vulnerability Measure turns out to offer a relatively consistent result, the same as what we expected in the beginning. The rest of the regression results are not significant from zero and hard to tell the sign of the coefficients.

5.5. Findings and robustness

We can conclude from the regression results that the financial crisis has a significant influence on the IMF's decision about level of support for capital control after controlling for the vulnerability measures individually. Domestic credit in the banking sector and the CVM index both alter IMF's support level for capital control significantly in the expected direction. The positive coefficient indicates that as the economy becomes more vulnerable, the level of support for capital control increases.

The result is especially meaningful for emerging market economies in Asia, which are mostly under development with credit issues in the banking sector. Capital flows can be associated with the domestic intermediary sectors such as banking. In particular, positive net flows can be used to finance current account deficits. In August 2013, India announced a new capital control to stop the cash flowing out of the country and to stem the decline of rupee. Since our regression results show that IMF has altered its policy recommendation after the financial crisis, India's imposition of the capital control should have gained support from IMF.

The coefficient on Capital Vulnerability Measure CVM is positive and significant, indicating that the openness of a country's capital account does have an impact on IMF's altitude about capital control. However, considering the fact that the Chinn–Ito index is just one method to describe certain facets of a country's capital account, we cannot say that in reality the openness of a country's capital account has no influence on IMF's policy recommendation.

The coefficient on vulnerability index "Current account balance" is negative but insignificant, which implies that we cannot reject the hypothesis that current account balance does not alter the IMF's attitude about capital controls. The coefficient on vulnerability index "External Debt Payment" is negative but insignificant, which implies that we cannot reject the hypothesis that the ability of a country to repay its debt does not alter the IMF's attitude about capital controls.

The interesting result is that the coefficient on the domestic banking-sector credit is negative and significant, which means that the domestic credit of a country in its banking sector alters the IMF's attitude about capital controls after the crisis. After the crisis, as the domestic banking credit evaluated by World Bank strengthens, the IMF would be more likely to increase its level of support for capital controls.

The results are robust and consistent under several modifications from the baseline model. Adding intersections and more controls improves the model's goodness to fit. The main results do not change and the corresponding coefficients remain significantly positive. The joint endogenous relationship between CFM mention and levels of support enhances the IMF institutional view changes after the Global Financial Crises. Our results shed light on the further research on what factors the good indicators of IMF changes are and seeking the underlying economic reasons for emerging market growth.

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Table 4
Add intersections.

	IMF initial diagnosis		Mention of CFMs		Level of support		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crises	0.208***	0.134*	0.073	0.198	0.226**	0.273**	0.463
Capital Vulnerability Measure (CVM)		−0.341*	−0.678**			0.327	
Crises*CVM		0.375	0.292			−0.502	
Financial openness	−0.080***				−0.006		
Crises*financial openness	0.070*				−0.093*		
Current account balance (CAB)				0.005			−0.0159*
Crises*CAB				−0.025*			−0.0139
Domestic banking credit (DBC)				0.004***			0.0049***
Crises*DBC				−0.000			−0.0014
External debt payment (EDP)				−0.0004			0.0005
Crises*EDP				−0.002			−0.0042**
R-squared	0.1365	0.0973	0.0745	0.2063	0.0343	0.0264	0.1702

* $p<0.05$.
** $p<0.01$.
*** $p<0.001$.

6. Summary and conclusions

This paper sought to add to the existing literature on the IMF and the capital account by econometrically testing whether the financial crisis was linked to a change in IMF policy advice on these matters. The IMF underwent a significant re-evaluation of its policy on capital account liberalization and the role of capital controls in the wake of the global financial crisis. Previous work has shown that this shift in thinking at the IMF, albeit an incremental one, was due to a number of factors (Chwieroth, 2010; Gallagher, 2014). This paper adds to that literature and finds that not only has the IMF changed what its view on capital flows, there is also evidence that the IMF has also changed its actual behavior on these matters as a result of the crisis.

Our results can be summarized as follows.

- The financial crises had a significant impact on IMF diagnosis of whether capital flows are a source of vulnerability in emerging markets. This finding is irrespective of the level actual capital flow vulnerability in specific economies however and thus signals an ideational change. 22.9% of more capital flow diagnosis appears after the crises.
- The IMF is more apt to out rightly discuss CFMs after the crises, especially when domestic banking sector credit appears to be concerning. By controlling the vulnerability of the economy, the effect of crises becomes insignificant. Our capital vulnerability index has a significant prediction of IMF mention of CFMs.
- The IMF is more apt to support the use of CFMs after the crisis, however the level of support changes after the crises becomes less significant when adding vulnerability controls. The more vulnerable the emerging market is, the more level of support on capital flow management measures are imposed.

This paper is not the last word on these matters. Our database will need to be updated on an. In so doing it will be interesting to examine the extent to which the IMF view remains a significant component of IMF advice as the 'salience' of the crisis wanes in future years. Pagliari (2013) has shown that policy-makers tend to be the most attuning to regulations during and in the immediate aftermath of crises but that such attention decreases as the public and policy-makers move on to other concerns.

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