Once Bitten: The Effect of IMF Programs on Subsequent Reserve Behaviour

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September 28, 2009

Abstract

Traditional models have encountered problems in explaining the accumulation of international reserves, particularly in Asia, in the period since the late 1990s. One suggestion has been that countries have sought to self insure against future crises, either because of a perceived increase in the cost of crises or because of the perceived conditionality costs of using IMF credits. This paper offers an empirical investigation of these ideas, disaggregating across regions and across IMF facilities. Using both static and dynamic regression techniques we find that IMF programs have had a significant positive effect on subsequent reserve accumulation, allowing for other determinants, and that this effect endures over time. We also find that the effect differs between Latin America and Asia, and that it is not simply a phenomenon that is associated with the Asian crisis of 1997/98. The paper goes on to discuss the implications for the design of policy and for the reform of the IMF.

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Contents

List of Figures

List of Tables

1   Introduction

Part of the rationale for establishing the IMF was to pool international reserves and use them more efficiently at the global level. The logic ran as follows; reserves are an inventory held to minimize the impact of negative balance of payments shocks. The benefit of having reserves is that countries are able to avoid unnecessary economic adjustment in the event of temporary and self-reversing shocks or to select a preferred speed of adjustment where it becomes necessary. However, holding international reserves involves an opportunity cost since they carry only a relatively modest rate of return. Furthermore, since the global balance of payments is a zero sum game, not all countries will simultaneously experience current account deficits; indeed deficits in one part of the world must, in principle, be matched by surpluses elsewhere. It follows that not all countries will need to use their reserves at the same time. There will therefore be a welfare gain from pooling reserves.

The IMF was designed to act as a credit union with members making only temporary use of its resources. Countries' access to the IMF's unconditional reserve tranche counted as part of their owned reserves. Beyond this, access to credit tranche resources constituted an additional line of credit. These resources were not unconditional and depended on negotiating a program of policies with the IMF, but, in principle, they nevertheless represented an, albeit imperfect, substitute for owned reserves. The idea therefore was that the pool of IMF resources, and the option of borrowing them, would allow member countries to economize on their own independent holdings of reserves.

In the aftermath of the East Asian crisis in 1997/98, and following a period of rapid depletion, the IMF encouraged the affected countries to reconstitute their reserves. At the end of the 1990s there was a sharp accumulation of international reserves in Asian economies and elsewhere. Figure 1 shows this increase but also shows that there has been a more sustained increase in reserve holdings since 1980.

Conventional models of the demand for international reserves left a large part of the accumulation at the end of the 1990s unexplained (Aizenman and Marion, 2003, and IMF, 2003) and much of the recent literature has focused on trying to account for it (for example, Jeanne, 2007, and Obstfeld et al, 2008, 2009). It certainly did not seem that countries were merely bringing reserve levels back up to the levels that conventional models suggested as being ade-
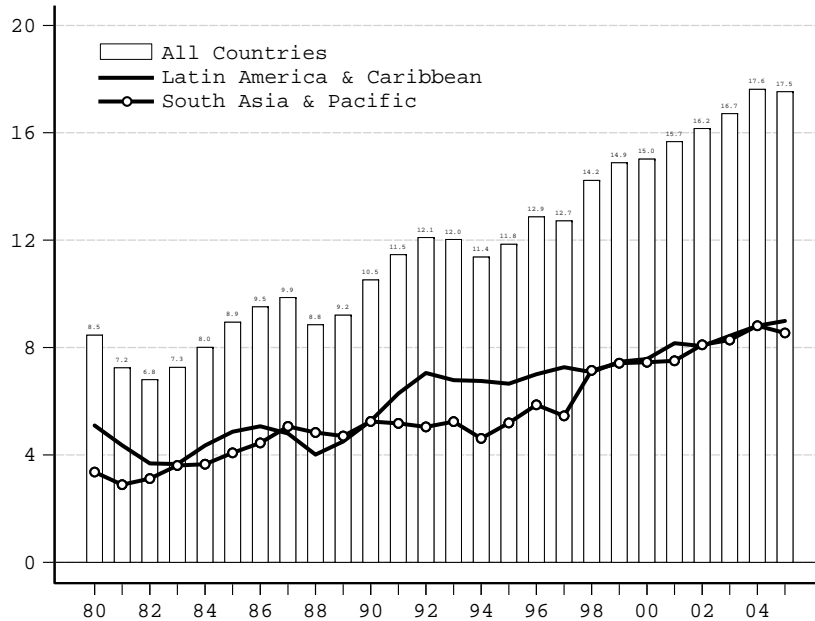
Figure 1: Reserves excl. gold (% GDP)

quate. The accumulation was going beyond this point. Similarly, reserves have been in excess of the levels suggested as being adequate by conventional ratios expressing reserves in relation to imports, and newer ones expressing them in relation to short-term external debt (Bird and Rajan, 2003). Optimizing and welfare models based on the costs and benefits of reserves also fall some way short of explaining the accumulation of reserves in Asia, either in terms of a desire to prevent crises or to mitigate their economically harmful effects (Jeanne, 2007). Obstfeld *et al.* (2008, 2009) claim greater success by returning to the long standing idea that it is concern about not only an external drain but also an internal drain that leads countries to accumulate reserves. The key issue here relates to financial openness; not only a sudden stop in capital inflows but also capital flight encourages countries to build up reserves as a way of mitigating the risks of currency depreciation.

Different explanations have different implications. One based on increased precautionary demand would imply an increase in risk aversity amongst Asian economies associated with an increase in the probability of future crises and /or an increase in the perceived cost of crises in both economic and political terms. It would also imply that reserve accumulation would cease once the new targeted level of reserves was acquired.

2

Another approach, which views the accumulation of reserves as a by-product of mercantilist trade policies, combined with a reluctance to allow undervalued exchange rates to appreciate results in surpluses on the current account of the balance of payments and intervention in foreign exchange markets to neutralize the effect on the value of the exchange rate. Under this approach, the constraint on persistent reserve accumulation relates to the extent to which the effects of intervention on the domestic money supply can be sterilized.

From within the literature, and in particular the strand relating to the increase in the precautionary demand for reserves, it has been suggested that it was the experience with the involvement of the IMF that enhanced the perceived cost of the crises. According to this view, Asian economies wanted to avoid circumstances in which they would need to draw on the IMF for financial support in the future. An example of this line of argument may be found in Stiglitz (2006) where he claims that East Asian countries 'boosted their reserves in part because they want to make sure that they won't need to borrow from the IMF again.' (p. 248).

If this is the case, fundamental questions are raised about the role of the IMF, since it would seem to be at odds with the basic notion of reserve pooling.

Although empirical studies have attempted to examine the extent to which reserve accumulation is associated with the desire to mitigate the incidence of crises and reduce their costs (Jeanne, 2007), as far as we are aware only Bird and Mandilaras (2008) have made an attempt to examine the direct effect of IMF involvement, and even there the focus of the paper is to investigate the contemporary relevance of Mrs Machlups Wardrobe Theory of international reserves.[1] This current paper represents an extension of this earlier work. Our purpose is to examine whether having a program with the IMF exerts a statistically significant impact on future reserve behaviour and whether this effect is positive or negative. A positive and significant effect would be consistent with the claim concerning the impact of the Fund's part in the Asian crisis. However, it is also feasible, in principle, that the effect might be negative as countries reassess downwards the perceived cost of having a program with the IMF in the light of experience. If this is the case, while some reserve reconstitution may follow an IMF program, countries would reduce their desired stock of owned reserves relative to other key determinants following actual

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[1]In essence, this 'theory' postulates that a country can never have enough reserves.

involvement in an IMF program.

We set out in this paper to examine empirically the effect of IMF programs on subsequent reserve behaviour. We do this by estimating a fairly conventional model of international reserves that incorporates the variables normally seen as influencing them. But we also incorporate dummy variables to capture the effects of crises and IMF programs. We then disaggregate our data in various ways to see whether the effect of the IMF differs between Latin America and Asia, between stand by arrangements, extended loans and concessionary loans, and over different time periods. We cover the period since 1980, but also test to see whether the Asian crisis had a discernible impact on reserve accumulation. We exclude from our sample advanced economies that have not used IMF resources since the mid 1970s.

The paper is organized in the following way. In section 2 we discuss the factors that influence a country's demand for international liquidity and its choice between holding and using owned reserves or drawing conditional resources from the IMF when a balance of payments need arises. This provides an informal analytical framework. Section 3 explains the data and methodology used. Section 4 reports our results. Section 5 discusses some of the policy implications of our findings. Finally, Section 6 offers a few concluding remarks.

2   Analytical Framework

For as long as countries can attract international capital they may be able to sustain a deficit in the current account of their balance of payments. However, in the event of a crisis that erodes the confidence of international capital markets, the situation can rapidly change and the balance of payments becomes unsustainable. Governments then have to react in some way. Their reaction can, in principle, involve different degrees of adjustment intensity. They may opt to move quickly to try and reduce the current account deficit and re-invigorate capital inflows. This approach is likely to involve exchange rate depreciation and tighter fiscal and monetary policy. Rapid adjustment will probably focus on compressing aggregate demand, especially where the output gap is small. In these circumstances, increasing aggregate supply is unlikely to be a short run option and adjustment will then carry a significant cost in terms of reduced contemporary consumption, lower economic growth

and rising unemployment.

For these reasons, governments may prefer to moderate the short run intensity of adjustment and put greater emphasis on financing the overall balance of payments deficit. In principle, they can do this in three ways. First, they can engage in sovereign borrowing. But, in practice, and the midst of a capital account crisis, this option may be unavailable. After all, it is probably the weakening capital account that has contributed to causing the crisis in the first place.

The second option is that of running down international reserves. The decumulation of reserves will, in effect, finance net imports and/or capital outflows. Third, and finally, countries may borrow from the IMF. They will be able to raise loans from the Fund even at times of impaired access to international capital markets. In reality, therefore, governments often have to choose between the last two options. However, the choice will only be available to them if they have sufficiently large holdings of reserves at the time the crisis hits. Without reserve holdings, there is likely to be no alternative other than to borrow from the Fund.

Countries may decide to accumulate reserves in order to retain the option of running them down when confronted with a crisis. Reserves have an option value. They provide a form of insurance against an uncertain future. Set against this benefit, building them up involves an economic cost. In essence this is because, during the process of accumulation, domestic consumption will be less than domestic output. The mirror image of reserve accumulation will be a surplus on the current account of balance of payments. Once accumulated, there will be an opportunity cost associated with holding reserves, since they generate a relatively low rate of return. There is no equivalent opportunity cost associated with retaining the option of drawing resources from the IMF. In the case of the credit tranches, these are not resources that can be unconditionally spent, and in order to have access to them countries have to demonstrate a balance of payments need.

A slightly different approach presents countries as exhibiting a demand for international liquidity. They can meet this by borrowing from private capital markets, or by holding owned reserves, or by borrowing from the IMF. The first of these options involves a large measure of uncertainty especially in the midst of a crisis, and as a consequence countries may discount it as a way

of dealing with crises. Running down reserves or using IMF credit are in a broad sense alternative ways of financing an overall balance of payments deficit or protecting the value of the currency. But countries are unlikely to be indifferent between them. Access to credit from the IMF is certainly not a perfect substitute for owned reserves.

This informal discussion suggests that there are a number of influences on a country's decision as to whether to accumulate owned reserves or rely on IMF resources when the need arises. Owned reserves and IMF lines of credit may be distinguished from one another in terms of various underlying characteristics, and it will be a government's preferences between these characteristics that determine how they respond to the possibility of future crises.

The principal attractions of owned reserves are to be found in their high degree of liquidity and their zero conditionality. Negotiating a program with the IMF may, on the other hand, take many months and will involve conditionality in the form of prior actions that the country has to undertake before a loan is approved, macroeconomic performance criteria that have to be met in order for subsequent instalments of the loan to be made available, and structural benchmarks that will be used to assess the progress of the program. The 1980s and 1990s exhibited an increase in the range and degree of conditionality. On top of this, evidence suggests that international creditworthiness and access to international capital markets is positively related to a country's holdings of international reserves, and that higher reserves reduce a country's vulnerability to economic crisis. Borrowing from the IMF may, by comparison, damage a country's international reputation for sound economic management and may have a negative effect on its access to other forms of international capital. (All these claims are evaluated with reference to the existing literature in Bird, 2007, so we do not examine them further here).

It may be anticipated therefore that governments will opt for accumulating reserves where they perceive a high probability of future economic crises, assess the costs of crises in terms of lost output as being high, and perceive the costs of IMF conditionality as being high, either because they believe that the Fund will effectively impose on them policies that they would much prefer to avoid or because they put a high value on retaining national sovereignty over the design of economic policy. On the other hand, in circumstances where governments see little chance of a crisis, believe that the cost of crises is modest and also

attach little cost to IMF conditionality, it is more likely that they will decide to avoid the opportunity cost of accumulating and holding reserves and instead opt to borrow from the IMF if and when it becomes necessary.

A country's actual experience with the IMF may also influence its views. Whatever the government's preconceived opinions, did conditionality actually turn out to be seen as excessive and invasive? Did the government feel that it was forced to cede the power over policy design to the IMF? In principle, the effects of IMF programs on subsequent reserve behaviour could work in a number of ways. In the aftermath of a crisis some restoration of reserves is probable. Once this has been achieved, governments that found the effects of IMF conditionality to be beneficial might be expected to economize on owned reserves. However, those finding IMF programs to carry a high cost, in either economic or political terms, might be expected to accumulate reserves to a degree that appears to be excessive in relation to conventional criteria.

In what follows we estimate a regression model that includes not only the conventional determinants of the demand for reserves, but also a proxy for economic crises. In addition we include an interactive dummy variable to capture the effect of IMF programs. While taking into account the effect of other variables on reserve holding, we set out to see whether IMF programs have a lasting effect on subsequent reserve behaviour. Is it the case that close proximity with the Fund in the form of a program encourages countries to pursue policies with respect to international reserves that are designed to make it less likely that future financial support from the IMF will be needed? Do countries that have had IMF programs opt to try and substitute out of future ones and into owned reserves?

3   Data and Methodology

Our data cover the period 1980 to 2005 and are of annual frequency. Most variables are from the *World Development Indicators* of the World Bank. Exceptions are the different types of IMF programs, which are directly taken from the IMF website; the exchange rate regime data, which are taken from the updated versions of Reinhart and Rogoff (2004); and the financial openness variable which comes from the updated version of Chinn and Ito (2002).

The focus of our empirical analysis is on the regions of Latin America & the

Caribbean (henceforth LAC) and South Asia & the Pacific (henceforth SAP). There are two main reasons behind our choice of sample: first, there have been several crisis incidents in both regions and this facilitates our effort to disentangle the effect of these crises from the effects of IMF programs on reserve accumulation; and second, several countries in both regions have implemented (or at least agreed to implement) a sufficient number of IMF programs. Additional reasons include the availability of data and the growing importance of particular emerging economies within the LAC and SAP regions for the world economy.

As mentioned above, we disaggregate the IMF data by type of program. We are interested in checking whether stand-by arrangements (SBAs) and Extended Fund Facility programs (EFFs) have a differential effect on reserve accumulation. Our *a priori* expectation is that EFFs should exert a greater influence on reserve holdings given the higher degree of structural conditionality that they entail. We also examine the impact of programs under the Poverty Reduction and Growth Facility (PRGF) anticipating that this may be rather less, since the opportunity cost of accumulating and holding reserves may be particularly high for low income countries.

A challenge is how to capture the effects of an IMF program on reserve accumulation. One way is to create a dummy variable that assumes the value of one for a number of periods following an agreement, e.g. Bird and Mandilaras (2008). The appeal of this approach is its simplicity and intuitiveness. The number of periods for which the dummy takes the value of one can be varied depending on the assumption made about the duration of an 'IMF effect'. However, it has the disadvantage that, if a long-term effect is conjectured, information from subsequent programs will be lost. In practice, a series of ones follows the first program until the end of the sample. The implication is that the dummy will be the same for two countries that have had their first program agreed on the same year but have a different number of programs agreed subsequently. This may be an unreasonable assumption. To address it, we have interacted the IMF dummy with the number of IMF programs. In the regression analysis we have assumed three different horizons for the potential IMF effect: four years, eight years and a 'permanent' effect.[2]

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[2]Space considerations prevent us from reporting the eight-year regression results. We have focused, instead, on reporting the 'short-term' effect (four years) and the 'permanent' effect of IMF programs.

The controls we use in our analysis are in line with the literature: population, GDP per capita, the interest rate (we use the deposit rate to maximize the number of available observations), imports of goods and services as a fraction of GDP, the level of short-term debt (as a proportion of GNI) and the current account –as a fraction of GDP. In addition, the analysis controls for the effects of crises, the exchange rate regime, the degree of financial openness, as well as the level of M2 to GDP. We briefly discuss these four factors in turn.

There are a number of ways to capture crises but the choice is constrained by the research question. For example, in spite of the fact that foreign exchange market pressure indices (e.g. Eichengreen *et al.*, 1996) are more informative than simple exchange rate indices, they cannot be used safely when the dependent variable features international reserves, as this could raise issues of endogeneity. In this paper, we primarily use a crisis variable based on real GDP contractions and define a crisis as a year-on-year drop of 5%. We place ones after a crisis has taken place and interact this variable with the number of crises in the sample (per individual country). To check our results further we have also constructed a crisis variable based on exchange rates: a crisis is deemed to have taken place if the rate of exchange rate depreciation exceeds the average rate of depreciation plus 1.5 times the standard deviation.[3] Again, a series of ones follows the first crisis in the sample (for each country) and the variable is interacted with the number of exchange rate crises.

The exchange rate regime under which a country operates should have implications for reserve accumulation. In theory, countries with fixed exchange rates should accumulate reserves in order to maintain the peg whenever this is threatened (e.g. by sizeable current account deficits and/or capital outflows). They would also accumulate reserves if they have a positive official settlement balance. Countries with flexible exchange rates should not worry about reserves, since they leave the value of the exchange rate to be freely determined in the foreign exchange market. In reality, few countries in our sample are free floaters even if they claim to be such. We use the Reinhart and Rogoff (2004) 'coarse' *de facto* classification index to determine a country's actual exchange rate regime. We convert the index into a dummy variable that registers a zero if the country has some sort of fix including crawling pegs and bands (narrower

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[3]Setting the formula to generate a crisis whenever the depreciation exceeds the average plus two times the standard deviation –as would be statistically more reasonable to do– does not capture important crisis incidents, e.g. the southeast Asian crisis of 1997/98.

than $\pm 2\%$) and ones if the exchange rate regime involves freely falling, free floating, managed floating or a de facto crawling band narrower than $\pm 5\%$.

Our measure of financial openness (KAOPEN) comes from Chinn and Ito (2002). It is based on the IMFs Annual Report on Exchange Arrangements and Exchange Restrictions and basically captures the degree of capital account openness. This is a potentially significant determinant of reserve holding given the increased risks that financially more open economies face.[4] Another aspect of this is the financial depth of an economy. Larger liquid liabilities (that can potentially be converted to foreign currency) should increase demand for reserves; see Obstfeld *et al.* (2008, 2009). We use the level of M2 as a fraction of GDP to proxy the degree of financial maturity.

We use a least squares dummy variable (LSDV) regression to estimate a model of the form

$$y_{it} = \alpha + \beta X'_{it} + \gamma_i + \epsilon_{it}.$$

The LSDV estimation allows for country fixed effects and the errors are robust to cross-country correlation. In addition, to control for 'persistence' in reserve holding, we introduce the lagged dependent variable in the right-hand-side of the equation. Taking first differences eliminates the country specific effect and allows the use of GMM estimation of the resulting equation:

$$\Delta Y_{it} = \rho \Delta Y_{it-1} + \Delta X'_{it}\beta + \Delta \epsilon_{it}.$$

In the next section, we discuss the findings from our static and dynamic panel estimations.

4   Regression Results

Since the early 1980s the IMF has been active in extending credits to member countries. The different types of programs come with varying degrees of conditionality. Table 1 shows that 90 SBAs and 14 EFFs have been agreed with LAC countries during the sample period. Argentina, Ecuador and Uruguay have been the most frequent recipients of IMF assistance in Latin America. The total number of programs (inclusive of programs in low income countries) is 120. Table 2 shows that the numbers of SBAs and EFFs for SAP countries

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[4]E.g. currency mismatches, bank runs, flight of capital.

are 22 and 4, respectively. The Philippines has been the most frequent recipient of assistance in this region but the IMF has generally been more active in the LAC region than in the SAP one. There were 24 PRGFs in our sample –15 in LAC and 9 in SAP.

The higher degree of IMF involvement in Latin America can be partly explained by the higher incidence of crises: 64 in LAC compared to 40 in SAP. The definition of a crisis is not a straightforward exercise. It might be reasonable to assume that IMF involvement implies a crisis and to use data on IMF programs as crisis indicators. However, this would prevent us from focusing on the direct effect of IMF intervention controlling for crises. Our GDP measure is superior to an exchange rate measure in that it captures well-documented crisis incidents, such as the Mexican crises in 1984 and 1986 and the Asian crisis in 1997. It is also –to some extent– uncorrelated to the IMF variables: not all crises are accompanied by the IMF's involvement.

In our attempt to capture the effect of IMF programs on subsequent reserve behaviour we estimate our static panel equation for all countries in the sample, as well as for two separate subsamples: the LAC region and the SAP region. Results are presented in Tables 3, 4 and 5. For the entire sample, GDP per capita, imports (%GDP), the current account (%GDP), financial depth (M2 % GDP) and financial openness (KAOPEN) all have statistically significant coefficients with the expected sign. Also the IMF's involvement is a significant determinant of reserve behaviour: SBAs, EFFs and PRGFs all have a positive effect on reserve holding.

On the other hand, economic crises do not appear to trigger higher reserve accumulation levels. The exchange rate regime, somewhat surprisingly, appears to be insignificant. However, this result is not necessarily counter-intuitive. The average current account deficit in flexible regime observations (-2.58%) is substantially lower than in less flexible regimes (-6.44%), and this could lead to a negative correlation of the exchange rate dummy with reserves (something that happens in the SAP sample). Population, the interest rate and the level of short-term debt are not statistically significant.

These results hold in the main for the LAC region with the notable exception of the financial depth variable. The latter is significant at the 10% level in two of the regressions (using the permanent measures for SBAs and the total number of IMF programs) but its performance is not convincing. Naturally we

would expect it to be highly significant in the SAP countries, which is indeed the case. Turning to the other results for the SAP region, imports and occasionally the interest rate they are variables that possess significant explanatory power. The rest of the variables, including the IMF programs, do not enter the equation with significant coefficients. These sharp differences between Latin America and Asia highlight the importance of assuming a regional focus and an acceptable level of disaggregation in large sample studies.

In some of our estimations, not reported here, we tested to see whether reserve behaviour is affected by a governments degree of nationalism and whether right wing or left wing orientation makes a difference.[5] No clear picture emerged, although it seemed that in Latin America nationalistic governments tend to hold lower reserves given other factors while the opposite is the case in Asia.

Moving on to the dynamic specification, the results do not change much –see Table 6. For the entire sample, imports, the current account balance, IMF involvement and financial depth, along with the lagged dependent variable, are the main determinants of demand for reserves. A difference with the LSDV estimation results of the static model lies in the loss of significance of the financial openness variable and the emergence of the interest rate as a variable with significant effects, albeit quantitatively small.[6]

Figure 1 in section 1 has provided visual evidence that since the late 1980s reserves as a percentage of GDP have been growing, on average, in both the LAC and SAP regions. Did the 1997 Asian crisis accelerate reserve accumulation? The graph provides an insight into the answer, as the trend in the years 1998-2005 appears to be steeper than in previous years. The inclusion of a dummy that takes the value 1 post-1997 and zero between 1980–1997 in our static and dynamic models provides further evidence. The results reported in Table 7 are commensurate with a significant increase of reserve levels following the Asian crisis. This implies that while crises in general, according to our measures of them, have exerted an insignificant effect on reserve behaviour, the Asian crisis was rather different.

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[5]We used data from the updated Database of Political Institutions, see Beck *et al.* (2000).

[6]Estimations for Latin America & the Caribbean produced similar results. We could not estimate the dynamic model in South Asia & the Pacific due to the limited number of observations.

5 Discussion

Although possessing nuances when disaggregated across regions, the empirical results reported in the previous section suggest that overall there is a significant positive effect of IMF programs on subsequent reserve accumulation. This effect persists over time which suggests that it is not just a matter of countries following IMF advice to build up their reserves in the aftermath of a crisis that involved an IMF program. Crises on their own and in the absence of the IMF do not seem to have a similar effect, except in the case of the Asian crisis in 1997/98. The IMF effect is present across SBAs, EFFs and PRGFs, suggesting a broadly similar response irrespective of the nature of the program.

The decision by countries to meet the demand for international liquidity by building up owned reserves may be costly both for the individual countries and for the world economy as a whole. For individual economies, wealth will be tied up in relatively unproductive assets, and the use of sovereign wealth funds seems unlikely to immediately alter this. For the world economy, the accumulation of reserves will tend to go alongside current account surpluses and these may form an important part of an overall problem of global economic imbalances that can then contribute to international financial instability and financial crises. It is generally more efficient, beyond a certain point, for countries to be able to access financial assistance as and when needed than to hold reserves to cover the risk that access to liquidity may (but may not) be required in the future. Indeed, the accumulation of reserves to cover such risk may make future crises more likely if the policies pursued in order to achieve this create large and unsustainable global economic imbalances.

Policy design requires us to examine the motivations that lie behind a preference for owned reserves as opposed to access to IMF credit lines. The key appeal of owned reserves, as noted earlier, is that they do not involve conditionality and they possess a high degree of liquidity. The implication therefore seems to be that in order to increase the relative attractiveness of borrowing from the IMF, programs need to involve less conditionality than in the past, or at least less of the type of conditionality that may be at odds with the policy preferences of the relevant governments, and to allow resources to be disbursed more quickly. Moreover, there is a potential Catch 22 policy dilemma to resolve. If countries demonstrate a strong preference to avoid it, borrowing from the IMF will send out a negative signal. It may be taken as

a sign of economic desperation. If more countries are motivated to borrow from the Fund rather than accumulate excessive owned reserves, any stigma associated with having an IMF program may be removed or at least reduced. This may then encourage others to alter their preferences in favour of IMF credits.

Recent reforms within the IMF seem to be moving in the direction implied by the above observations. The streamlining of conditionality upon which the Fund embarked at the beginning of the 2000s was an attempt to narrow its focus and increase the degree of country ownership. The major overhaul of conditionality in the aftermath of the 2008/09 financial crisis was designed to take this process even further under the auspices of the new quick-disbursing Flexible Credit Line. Under this reform, structural performance criteria that had often been a source of tension between governments and the IMF were discontinued, (Bird, 2009, provides a more detailed discussion of recent changes in IMF conditionality).

Such changes may entice countries to substitute out of owned reserves and into IMF credits. If so, then other important policy issues associated with the global macroeconomic effects of running down owned reserves will be encountered. There would be implications for global economic imbalances. There might also be important consequences for the values of individual currencies as countries seek to reduce their holdings of them. It might be in this context that the move towards an international monetary system based on Special Drawing Rights rather that the US dollar could be engineered.

Even in the absence of such systemic change, the SDR could take on an expanded role. Where individual countries demonstrated some reluctance to sacrifice owned reserves in favour of access to conditional IMF credit, their demand for owned reserves could be met by additional allocations of SDRs. These would possess many of the qualities of other owned reserves in terms of liquidity and the absence of conditionality, but would not carry the costs associated with accumulating owned reserves by other means. An important issue would remain as to whether the SDR possesses the qualities of a good international reserve asset as compared to some national currencies. But, in a global economic environment where the demand for owned reserves remains strong, additional allocations of SDRs could be globally welfare enhancing.

Although interesting and important, these policy issues probably move us

too far away from the main theme of this paper, and certainly too far away from the issues on which our empirical investigation makes a direct contribution.

6 Conclusions

A feature of the period since 1997/98 that has received considerable attention in the literature has been the accumulation of international reserves in many countries and regions, particularly in some parts of Asia. The focus has been on whether this accumulation has led to countries holding excessive levels of reserves in terms of the factors conventionally seen as influencing the demand for them. If so, conventional models are missing something. Perhaps countries have been seeking to self insure against future economic crises. But if this is the explanation, a related issue is why they have chosen to do this when, in the event of a crisis, they could instead turn to the IMF for financial assistance. After all, part of the justification for establishing the Fund was to derive the benefits from pooling international reserves. Potentially it could be that, while acknowledging the opportunity costs of holding large and excessive levels of owned reserves, countries have been attaching a higher cost to the use of IMF resources, largely because of the conditionality that is embodied in IMF programs, their lack of liquidity and the perceived loss of national sovereignty over the design of economic policy.

Our investigation builds on existing theoretical and empirical analysis and sets out to test for the existence of an IMF effect on the subsequent accumulation of international reserves. We find broad support for the claim that the experience of having an IMF program is associated with countries accumulating subsequent reserve levels that are above those that conventional determinants would imply, and that this IMF effect persists over relatively long time periods. However, it may be noted that if the strategy is to avoid future recourse to the Fund, it does not always work. As the literature on IMF lending shows there are significant elements of recidivism in the incidence of IMF programs (Bird et al, 2004). Moreover, while the IMF effect is significant in Latin America, it is not in Asia. To the extent that IMF programs have the effect of inducing countries to accumulate excessive reserves, there is an inconsistency with one of the basic purposes of the Fund to pool international reserves. Indeed, the Fund may be having a perverse effect.

Our results, unlike some others reported in the literature, suggest that economic crises have not generally been a significant factor in explaining the accumulation of reserves, although the Asian crisis of 1997/98 was an exception. The results provide further evidence that vulnerability to both an external drain and an internal drain may be significant in explaining reserve behaviour, but also provide a more complete explanation than is available elsewhere.

Since there are significant welfare costs associated with holding excessive owned reserves both for the individual countries concerned in terms of the high opportunity cost, and for the world economy in terms of the related global economic imbalances, we also examine the policy changes that might reverse the trend towards a revealed preference for owned reserves as opposed to IMF credits by modifying IMF conditionality and by enhancing the speed of access to IMF resources. We further relate these changes to contemporary reforms to the IMF and the design of the international monetary system. In particular, we briefly discuss the new Flexible Credit Lines and the role of Special Drawing Rights. A potential cause for concern is that our results suggest that countries have a powerful and long lasting memory of their involvement with the IMF, and reforms need to be sufficiently significant to address this.

A final observation relates to the concept of tiers of international liquidity discussed elsewhere by us (Bird and Mandilaras, 2005). This paper has examined two of these tiers in terms of owned reserves and IMF credits. However, regional funds may constitute a middle tier potentially possessing less conditionality and a higher speed of access than IMF credits but more conditionality and a slower speed of access than owned reserves. Broader debate about international monetary reform may also need to address the respective roles of these means of meeting the financing needs of individual countries and groups of countries and the role of a regional as opposed to a multilateral approach to the provision of international liquidity.

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Table 1: Latin America & the Caribbean: Some Numbers 1980–2005

Country	Number of SBAs	Number of EFFs	Number of PRGFs	Total IMF Programs	Number of Crises	GDP per capita (USD)	Reserves to GDP (%)
Argentina	8	2	0	10	6	7005	6
Belize	1	0	3	1	0	2659	9
Bolivia	2	0	0	5	2	951	7
Brazil	5	1	0	6	3	3255	5
Chile	2	1	0	3	2	3759	17
Colombia	2	1	0	3	1	1879	11
Costa Rica	6	0	0	6	2	3462	10
Cuba	0	0	0	0	NA	NA	NA
Dominica	2	0	1	4	0	3057	10
Dominican Republic	5	1	0	6	1	1862	4
Ecuador	9	0	0	9	2	1339	6
El Salvador	6	0	0	6	3	1839	8
Grenada	0	0	0	0	1	3212	14
Guatemala	5	0	0	5	2	1575	6
Guyana	1	0	4	5	2	806	25
Haiti	4	0	1	5	5	568	3
Honduras	1	0	3	4	0	916	10
Jamaica	6	1	0	7	1	2946	9
Mexico	3	2	0	5	3	5298	5
Nicaragua	1	0	3	4	2	822	8
Panama	5	1	0	6	2	3513	6
Paraguay	1	0	0	1	2	1468	13
Peru	4	3	0	7	4	2023	11
St. Kitts and Nevis	0	0	0	0	0	5617	13
St. Lucia	0	0	0	0	3	3582	11
St. Vincent and the Grenadines	0	0	0	0	0	2443	13
Suriname	0	0	0	0	5	2151	8
Uruguay	10	0	0	0	3	5396	8
Venezuela, RB	1	1	0	2	7	4992	13
All	90	14	15	120	64	2796	10

Table notes: SBA is a stand-by arrangement; EFF is an extended funding facility; PRGF is a poverty reduction and growth facility. "Total" is the sum of SBAs, EFFs and PRGFs. Crises are real GDP contractions by 5 or more percent. GDP is in current USDs. Reserves exclude gold.

Table 2: South Asia & the Pacific: Some Numbers 1980–2005

Country	Number of SBAs	Number of EFFs	Number of PRGFs	Total IMF Programs	Number of Crises	GDP per capita (USD)	Reserves to GDP (%)
American Samoa	2	0	0	2	NA	NA	NA
Cambodia	0	0	2	2	0	272	12
China	1	0	0	1	0	620	11
Fiji	0	0	0	0	4	1934	17
Indonesia	1	2	0	3	1	674	9
Kiribati	0	0	0	0	6	467	NA
Korea	3	0	0	3	1	7806	10
Lao PDR	0	0	2	3	0	278	6
Malaysia	0	0	0	0	1	3015	28
Marshall Islands	0	0	0	0	3	2351	NA
Micronesia, Fed. Sts.	0	0	0	0	0	1996	41
Mongolia	1	0	3	4	4	405	16
Myanmar	0	0	0	0	NA	NA	NA
Northern Mariana Islands	0	0	0	0	NA	NA	NA
Palau	0	0	0	0	0	6091	NA
Papua New Guinea	4	0	0	4	4	609	12
Philippines	4	2	0	6	2	944	9
Samoa	2	0	0	2	3	1202	28
Solomon Islands	1	0	0	1	4	763	16
Thailand	2	0	0	2	1	1596	17
Timor-Leste	0	0	0	0	2	385	NA
Tonga	0	0	0	0	0	1361	25
Vanuatu	0	0	0	0	4	1217	18
Vietnam	1	0	2	3	0	318	11
All	22	4	9	36	40	1521	17

Table notes: Same as in table 1.

Table 3: LSDV Estimation Results: All Countries in Sample (by Type of IMF Program)

	SBA		EFF		PRGF		TOTAL	
	4Y	Perm	4Y	Perm	4Y	Perm	4Y	Perm
Population	0.16	0.03	0.21	0.07	0.23	0.04	0.15	−0.14
	(0.18)	(0.19)	(0.18)	(0.17)	(0.18)	(0.17)	(0.18)	(0.18)
GDP per cap.	0.55***	0.56***	0.53***	0.56***	0.53***	0.61***	0.59***	0.58***
	(0.13)	(0.13)	(0.13)	(0.13)	(0.13)	(0.12)	(0.14)	(0.13)
Int. Rate	−0.00	−0.00	−0.00	0.00	−0.00	−0.00	−0.00	−0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Imports to GDP	1.08***	1.07***	1.09***	1.05***	1.03***	1.00***	1.08***	1.08***
	(0.10)	(0.09)	(0.09)	(0.09)	(0.09)	(0.10)	(0.09)	(0.10)
Crisis	0.07	0.04	0.06	0.04	0.06	0.07	0.03	−0.02
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
IMF	0.01	0.04**	0.11***	0.17***	0.28***	0.31***	0.03**	0.07***
	(0.01)	(0.02)	(0.03)	(0.04)	(0.03)	(0.04)	(0.01)	(0.02)
Curr. Acc. to GDP	0.02***	0.02***	0.02***	0.02***	0.01**	0.01**	0.02**	0.02***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Regime	0.04	0.06	0.05	0.04	0.08	0.07	0.06	0.07
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.04)
M2 to GDP	0.23**	0.24**	0.21**	0.20**	0.19**	0.13	0.21**	0.25**
	(0.10)	(0.10)	(0.10)	(0.10)	(0.09)	(0.09)	(0.10)	(0.10)
Short Debt to GNI	−0.01	−0.02	−0.01	0.00	0.03	0.04	−0.01	−0.01
	(0.04)	(0.04)	(0.04)	(0.04)	(0.03)	(0.03)	(0.04)	(0.04)
Fin. Openness	0.12***	0.11***	0.12***	0.11***	0.08***	0.07***	0.12***	0.10***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Const.	−13.93***	−11.84***	−14.49***	−12.41***	−14.67***	−11.98***	−14.04***	−9.42***
	(2.46)	(2.50)	(2.44)	(2.37)	(2.48)	(2.40)	(2.41)	(2.38)
R-sq.				0.66−0.67				
Panels				37				
Obs.				680				

Table notes: Dependent variable: Reserves (minus gold) to GDP. All variables are in logs, except from the dummy variables (*Crisis, IMF, Regime* and *Fin. Openness*) and the current account. Numbers appear in two fixed decimals. For definitions of EFF, SBA, PRGF and TOTAL refer to table 1. 4Y and Perm are interaction dummies –see text for details. Estimation method is LSDV with country fixed effects and White cross section errors (in parentheses). (***) denotes statistical significance at the 1% level; (**) at the 5% level; and (*) at the 1% level.

21

Table 4: LSDV Estimation results: Latin America and the Caribbean (by Type of IMF Program)

	SBA		EFF		PRGF		TOTAL	
	4Y	Perm	4Y	Perm	4Y	Perm	4Y	Perm
Population	0.04	−0.11	0.13	0.02	0.12	−0.12	0.01	−0.32
	(0.23)	(0.23)	(0.23)	(0.23)	(0.25)	(0.23)	(0.23)	(0.22)
GDP per cap.	0.72***	0.71***	0.71***	0.67***	0.65***	0.75***	0.79***	0.73***
	(0.23)	(0.23)	(0.23)	(0.23)	(0.23)	(0.22)	(0.23)	(0.23)
Int. Rate	−0.00	−0.00	0.00	0.00	−0.00	−0.00	−0.00	−0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Imports to GDP	1.08***	1.06***	1.11***	1.07***	1.02***	0.97***	1.08***	1.06***
	(0.12)	(0.12)	(0.12)	(0.11)	(0.12)	(0.13)	(0.12)	(0.12)
Crisis	0.09	0.06	0.08	0.07	0.08	0.09	0.05	0.01
	(0.08)	(0.08)	(0.08)	(0.08)	(0.07)	(0.07)	(0.08)	(0.08)
IMF	0.01	0.04**	0.13***	0.17***	0.28***	0.31***	0.04***	0.07***
	(0.01)	(0.02)	(0.03)	(0.04)	(0.04)	(0.04)	(0.01)	(0.02)
Curr. Acc. to GDP	0.02***	0.02**	0.02***	0.02***	0.01**	0.01**	0.02**	0.02**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Regime	0.03	0.04	0.04	0.03	0.06	0.06	0.05	0.05
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
M2 to GDP	0.17	0.19*	0.17	0.17	0.12	0.05	0.15	0.21*
	(0.11)	(0.11)	(0.11)	(0.11)	(0.10)	(0.09)	(0.11)	(0.11)
Short Debt to GNI	−0.01	−0.01	−0.00	0.00	0.04	0.06	0.00	−0.01
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Fin. Openness	0.12***	0.11***	0.11***	0.11***	0.08***	0.08***	0.12***	0.11***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Const.	−13.38***	−10.85***	−14.75***	−12.68***	−13.66***	−10.43***	−13.33***	−7.95***
	(2.77)	(2.60)	(2.80)	(2.64)	(2.94)	(2.90)	(2.55)	(2.57)
R-sq.				0.61–0.65				
Panels				27				
Obs.				527				

Table notes: Same as table 3.

Table 5: LSDV Estimation results: South Asia and the Pacific (by Type of IMF Program)

	SBA		EFF		PRGF		TOTAL	
	4Y	Perm	4Y	Perm	4Y	Perm	4Y	Perm
Population	0.88	0.79	0.86	0.55	0.83	0.74	0.76	0.78
	(0.82)	(0.77)	(0.78)	(0.70)	(0.79)	(0.77)	(0.84)	(0.76)
GDP per cap.	−0.12	−0.12	−0.13	−0.01	0.05	0.07	−0.10	−0.12
	(0.32)	(0.32)	(0.32)	(0.35)	(0.25)	(0.21)	(0.32)	(0.32)
Int. Rate	−0.00	−0.00	−0.00*	−0.00***	−0.00	−0.00	−0.00	−0.00*
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Imports to GDP	0.93***	0.92***	0.93***	0.92***	0.87***	0.80***	0.92***	0.96***
	(0.26)	(0.26)	(0.26)	(0.24)	(0.25)	(0.24)	(0.25)	(0.26)
Crisis	−0.23	−0.25*	−0.26	−0.26*	−0.18	−0.12	−0.18	−0.35*
	(0.16)	(0.15)	(0.16)	(0.15)	(0.15)	(0.13)	(0.16)	(0.19)
IMF	0.04	0.05	0.11	0.17	0.33	0.55	−0.00	0.07
	(0.03)	(0.07)	(0.07)	(0.10)	(0.20)	(0.34)	(0.03)	(0.06)
Curr. Acc. to GDP	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Regime	0.05	0.07	0.03	0.01	0.10	0.05	0.05	0.07
	(0.11)	(0.12)	(0.12)	(0.12)	(0.12)	(0.10)	(0.12)	(0.12)
M2 to GDP	0.90***	0.88***	0.84*	0.75**	0.78***	0.72***	0.91***	0.82***
	(0.26)	(0.27)	(0.28)	(0.33)	(0.21)	(0.17)	(0.27)	(0.26)
Short Debt to GNI	−0.03	−0.02	−0.01	0.01	−0.07	−0.04	−0.03	−0.01
	(0.09)	(0.09)	(0.10)	(0.10)	(0.08)	(0.07)	(0.09)	(0.09)
Fin. Openness	0.00	−0.00	0.02	0.01	0.03	0.01	0.01	−0.00
	(0.08)	(0.08)	(0.08)	(0.08)	(0.07)	(0.06)	(0.08)	(0.08)
Const.	−23.44*	−21.74*	−22.69*	−17.59	−23.00*	−21.29*	−21.33	−21.40*
	(13.01)	(12.27)	(12.43)	(10.98)	(12.61)	(12.25)	(13.50)	(11.99)

R-sq.	0.8–0.81
Panels	10
Obs.	153

Table notes: Same as table 3.

23

Table 6: GMM Estimation results: Dynamic Panel (All Countries in Sample, Total IMF Programs)

	SBA		EFF		PRGF		TOTAL	
	4Y	Perm	4Y	Perm	4Y	Perm	4Y	Perm
Reserves, last period	0.57***	0.57***	0.57***	0.55***	0.55***	0.55***	0.57****	0.57***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Population	0.28	0.07	0.42*	0.35	0.34	0.24	0.27	0.03
	(0.24)	(0.24)	(0.23)	(0.23)	(0.23)	(0.24)	(0.23)	(0.24)
GDP per cap.	−0.11	−0.12	−0.13	−0.14	−0.09	−0.06	−0.08	−0.11
	(0.13)	(0.13)	(0.13)	(0.13)	(0.13)	(0.13)	(0.13)	(0.13)
Int. Rate	0.00*	0.00	0.00*	0.00**	0.00*	0.00*	0.00*	0.00*
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Imports to GDP	0.59***	0.57*	0.56***	0.52***	0.59***	0.58***	0.61***	0.60***
	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)
Crisis	−0.00	−0.04	0.01	−0.02	0.02	0.03	−0.01	−0.04
	(0.04)	(0.04)	(0.03)	(0.04)	(0.03)	(0.03)	(0.04)	(0.04)
IMF	0.02**	0.06***	0.08**	0.17***	0.09***	0.11***	0.02***	0.05***
	(0.01)	(0.01)	(0.03)	(0.05)	(0.03)	(0.04)	(0.01)	(0.01)
Curr. Acc. to GDP	0.02***	0.02***	0.02***	0.02***	0.02***	0.02***	0.02***	0.02***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Regime	−0.05	−0.02	−0.05	−0.05	−0.03	−0.04	−0.04	−0.02
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
M2 to GDP	0.12*	0.16**	0.11	0.11*	0.11*	0.10*	0.11	0.15**
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
Short Debt to GNI	0.02	0.01	0.02	0.03	0.03	0.03	0.02	0.02
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Fin. Openness	0.02	0.01	0.02	0.01	0.01	0.01	0.02	0.02
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Panels					36			
Obs.					643			

Table notes: Estimation method is 1-step GMM. Transformation applied is first differences. For variable information see Table 3 and text.

Table 7: The 1997 Asian Crisis Effect (All Countries in Sample, Total IMF Programs)

	LSDV		GMM	
Reserves, last period	–	–	0.58***	(0.03)
Population	–0.51**	(0.23)	–0.23	(0.28)
GDP per cap.	0.52***	(0.14)	–0.13	(0.13)
Int. Rate	–0.00	(0.00)	0.00**	(0.00)
Imports to GDP	1.10***	(0.10)	0.61***	(0.10)
Crisis	–0.02	(0.07)	–0.04	(0.04)
IMF	0.07***	(0.02)	0.06***	(0.01)
Curr. Acc. to GDP	0.01***	(0.00)	0.01***	(0.00)
Regime	0.05	(0.04)	–0.04	(0.05)
M2 to GDP	0.23**	(0.09)	0.13*	(0.07)
Short Debt to GNI	–0.01	(0.04)	0.02	(0.02)
Fin. Openness	0.09***	(0.02)	0.01	(0.02)
Post 1997	0.16**	(0.07)	0.08*	(0.05)
Const.	–3.39	(3.43)	–	–

Table notes: For variable information see Table 3 and text.