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The Indian Experience

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Capital Flows and the Impossible Trinity: The Indian Experience*

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Abstract

In this paper we devise quantitative techniques to analyze the management of foreign capital flows in India over the past three decades. The paper argues that India′s overall approach towards liberalization of the capital account can be characterized as gradualist and calibrated, whereby certain agents and flows have been accorded priority in the liberalization process, from the viewpoint of ensuring financial stability. A cross country analysis indicates that the calibrated approach has resulted in India being ranked towards the lower end of the spectrum in terms of capital account openness. We analyze the extant regulations governing different types of foreign capital flow, and highlight the evolution of various types of capital flows over the recent period. To evaluate Indian macroeconomic management in the face of capital flows, we quantify the various policy options under the classic problem of "impossible trinity". We find that India, like other emerging markets, has also been confronted with the various alternatives under "impossible trinity" and has chosen to adopt an intermediate regime, juggling the objectives of monetary independence, exchange rate stability, and an open capital account as per the needs of the economy.

JEL Classification: F36; F41 and E52

Keywords: Capital Flows, Impossible Trinity, Macroeconomic Management

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1 Introduction

During the past few years, emerging market countries have witnessed a sharp upheaval in capital flows with net private capital flows to these countries dropping from a high of $1.3 trillion in 2007 to $530 billion in 2009, and are estimated to rise to $746 billion in 2011. Such sharp swings in capital flows create several problems for a country′s macroeconomic management, and have once again ignited the debate on the extent to which emerging markets should be subject themselves to the vagaries of capital flows. It is widely agreed that the sharp volatility in capital flows in recent years had very little to do with developments in developing markets. The initial 'flight to safety' of international capital from emerging markets in 2008 was due to sharp decline in the risk appetite of the global investors in the aftermath of the collapse of financial institutions in the United States. Ironically, this decline in risk appetite pushed the investors to park their money in United States treasury bonds, which witnessed an absolute decline in yields.

In contrast, the recent inflow of capital into developing countries is driven by a widening interest rate differential due to extremely low interest rates prevailing in the industrialized countries. Some of these flows are likely to see a partial reversal once monetary easing in industrialized countries is reversed.

Emerging market economies desire effective management of the capital flows for primarily two main reasons. Unbridled capital flows can exacerbate some existing financial fragility and thereby lead to a crisis. Prasad and Rajan (2008) contend that in an underdeveloped financial system, foreign capital is likely to be channeled to easily collateralized non-tradeable investments like real estate, leading to asset price booms, with subsequent busts severely disrupting the economy. Foreign portfolio investment into shallow equity markets can also cause sharp valuation swings. Moreover, a number of studies including Rajan and Subramanian (2005), Johnson et al. (2007) and Prasad et al. (2007) show that massive unintended capital inflows could result in rapid real exchange rate appreciation, which can hurt exports of emerging markets. In some cases even a short-term appreciation can have lingering implications in the form of permanent loss of export market share and reductions in manufacturing capacity. Alternatively, if the central bank intervenes to prevent the exchange rate from appreciating, it is likely to lead to an increase in money supply, fueling inflationary pressures.

In response to these concerns and learning from some of the crisis episodes in Latin America and East Asia in the 1980s and 1990s, India adopted a calibrated approach towards capital account liberalization. While the capital account has been progressively liberalized, the liberalization has not been undertaken in an uniform manner. Certain types of flows and certain

economic agents have been accorded priority in the liberalization process.

In this paper we undertake a review India′s approach towards liberalization focusing on the policy regime affecting the different types of capital flows. We also compare India′s extent of capital account openness with some of the other emerging markets. We are primarily interested in the kind of monetary policy and exchange rate response the calibrated approach towards capital account liberalization has entailed. In other words, we intend to analyze how has India managed the conundrum of the Impossible Trinity? In doing so, we depart from the existing literature by quantifying the various policy objectives under the impossible trinity. In doing so, we primarily follow the methodology outlined in Aizenman et al. (2010). We use fiscal years and cover a 30 year period from 1980-81 to 2009-10.

2 India′s Approach towards Capital Account Liberalization

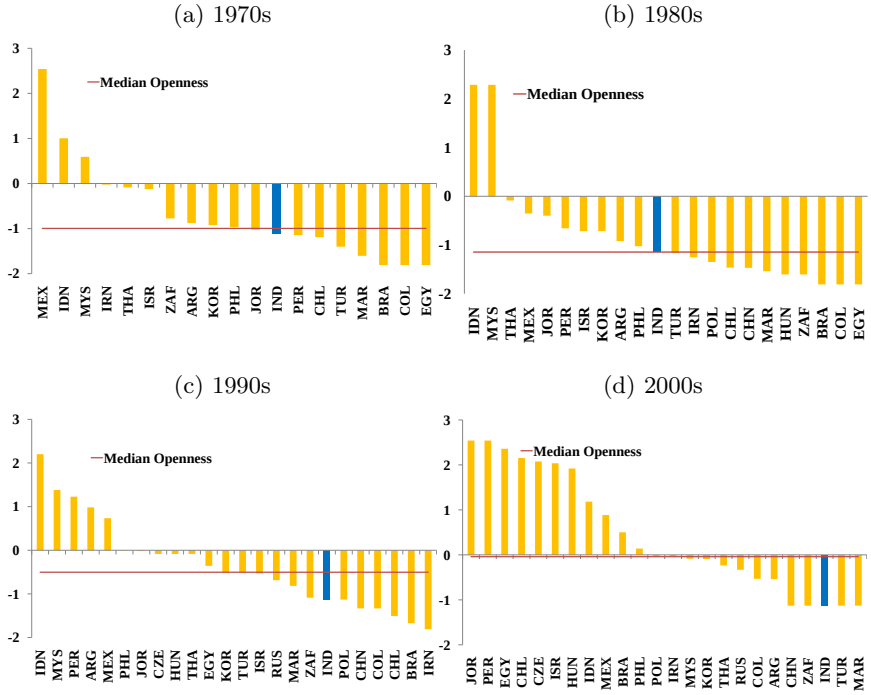
India′s overall management of capital flows can be characterized by its calibrated and gradualist approach towards capital account liberalization. With the Latin American debt crisis of the early 1980s fresh in mind, India prioritized certain kinds of flows and agents in the liberalization process. In particular, right from the onset of the liberalization process, the need to shift away from debt to non-debt creating flows, enforce strict regulation of ECBs, especially the ones with short-term maturity, dissuade volatile flows from NRIs and a gradual liberalization of outflows, was recognized.

The primary form of non-debt creating flows include equity flows under FDI and portfolio investment. The policy for foreign direct investment (FDI) and portfolio inflows has been significantly liberalized over the past two decades. Currently, barring a few sectors including some sensitive sectors and sectors that require an industrial license, FDI is universally allowed. While certain sectors are subject to sectoral caps, these caps have also been progressively liberalized. As a result, FDI inflows to India have steadily increased from $2.1 billion in 1995-96 to $37.2 billion in 2009-10. Globally, India′s share in inward FDI among developing countries has gone up from 1.3 percent during 1990 to 2000 to 7.2 percent in 2009. India has been more cautious in terms of liberalizing portfolio investment. Only registered foreign institutional investors (FIIs) regulated by the Securities and Exchange Board of India (SEBI) and non-resident Indians (NRIs) and Persons of Indian Origin (PIOs) can undertake portfolio investments. There are separate investment caps on sub accounts of FIIs, individual FII and aggregate FII investment in a company. Even NRIs and PIOs are subject to caps at an aggregate and an individual level. Despite these restrictions, portfolio investment inflows have

gone up from $2.7 billion in 1995-96 to $32.4 billion to 2009-10, although they have experienced higher volatility during this period compared to direct investment.

India has been much more conservative in terms of liberalizing debt flows. External commercial borrowings (ECBs) are highly regulated with both borrowers and lenders having to satisfy several eligibility criteria. Moreover, all ECBs need to have a maturity of 3 years and in some cases 5 years. There is also a cap on the all-in-cost payments that a corporate can make. Finally, funds raised through these ECBs can be used to finance only certain activities like import of capital goods, new projects, modernization/expansion of existing production units etc. ECB inflows registered a sizeable jump during the past few years, primarily due to the attractive global interest rates, and have gone up from $5 billion in 2003 to over $30 billion in 2007.

Figure 1: Cross Country Comparison of De Jure Openness



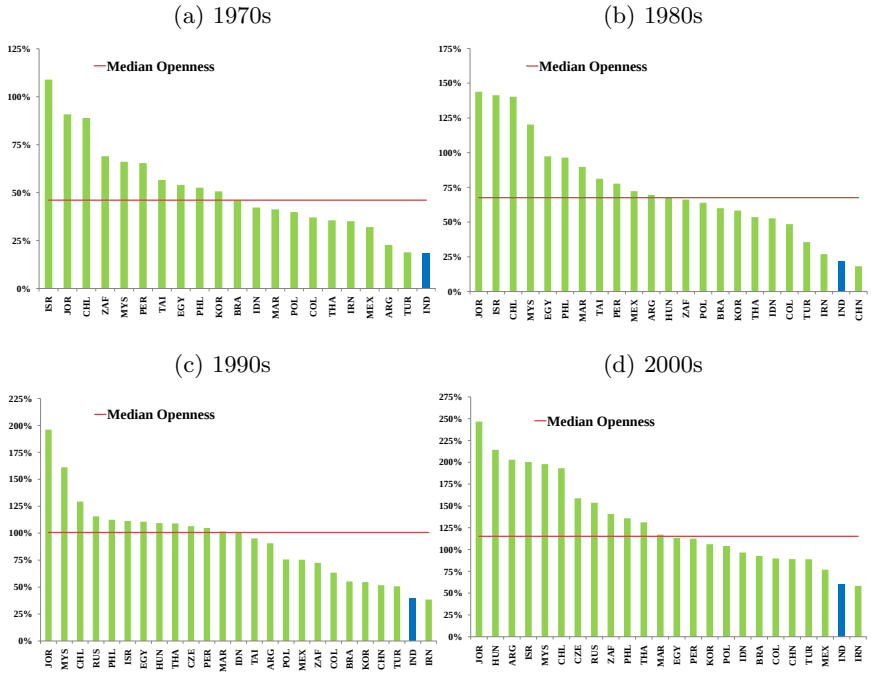
Source: Chinn and Ito (2008)

The sharp increase in capital inflows in the years prior to the global financial turmoil also provided the policymakers the confidence to liberalize outflows. However, Indian again adopted a gradualist approach and liberalized in an incremental manner. The extent of outward direct investment were constrained by an upper limit for automatic approval and the share of net worth of firm that could be invested abroad. Similarly, there also

exists a cap in terms of a percentage of the net worth of a firm that can be invested abroad in the form of portfolio investment. These caps along with some others that regulate outward foreign investment by mutual funds and registered venture capital funds have been progressively liberalized over the last two decades.

As a consequence of this cautious and gradualist approach towards capital account liberalization, India′s extent of liberalization has been relatively low compared to other emerging markets according to some of the standard measures. The extent of capital account liberalization can be based on the laws governing the movement of capital in or out of the country (de jure measure) or by the quantum of these flows (*de facto* measure). Figure 1 indicates the decadal average de jure openness, developed in Chinn and Ito (2008), of some key emerging market economies. It is evident that over the last four decades there has been a significant increase in the extent of capital account openness indicated by the upward shift of the median line. However, India has failed to keep pace with the liberalization process and consequently has shifted from middle of the distribution of countries, ranked according to their openness, during the 1970s and 1980s towards the more restrictive end of spectrum in the last two decades.

Figure 2: Cross Country Comparison of De Facto Openness



Source: Lane and Milessi-Ferreti (2007)

India has also been on the lower end of the spectrum when capital account

openness is measured according to the extent of capital flows. Figure 2 shows that most of the Latin American as well as East Asian countries have experienced far greater degree of integration on the basis of the Lane and Milessi-Ferreti measure. Even China, which was lagging behind India in the 1980s, has overtaken India during the last two decades.

3 India′s Tryst with the Impossible Trinity

3.1 Quantifying the Impossible Trinity

While India′s extent of capital account openness has lagged that of other emerging markets it has increased considerably since early 1980s. The ratio of gross capital flows to GDP has increased from 4.5 percent in 1980-81 to a peak of 62.4 percent in 2007-08 before declining to 46.2 percent in 2009-10. The increased integration with global financial markets has created several policy challenges. In particular, India had to grapple with the concept of "impossible trinity", which points out that it is not simultaneously possible to have an completely open capital account, an independent monetary policy and a managed exchange rate. Only two of the three objectives can be obtained at a particular point in time. A country can obtain a stable exchange rate regime with an open capital account by giving up monetary independence. The monetary authority can no longer independently vary the domestic interest rate, which will have to follow the foreign interest rate.

Alternatively, a country can retain monetary independence and an open capital account but will have to forgo exchange rate stability. Exchange rate movement will be dictated by the interest rate differential and quantum of international capital flows. Finally, the imposition of capital controls breaks the link between the interest rate and the exchange rate and allows a country to retain exchange rate stability with monetary independence.

India, like other emerging markets, would like to achieve each of three above objectives with varying degrees. While capital flows aid growth by providing external capital to sustain an excess of investment over domestic savings, a competitive exchange rate helps maintain a sustainable current account balance and an independent monetary policy stabilizes the economy in the face of domestic and exogenous shocks.

India did not face the various tradeoffs under impossible trinity prior to the 1990s as India′s extent of capital account openness was extremely low till then and hence there was no dichotomy between stabilizing the exchange rate and retaining monetary independence. It is mainly in recent years when with a rise in capital account integration, India has been forced to juggle the various conflicting objectives. To analyze the extent pursuit of one of

the objectives has entailed giving up of the other two objectives we need to quantify the various objectives of the impossible trinity. We do this, largely, following the methodology outlined in Aizenman et al. (2010). We cover a 30 year span from 1980-81 to 2009-10.

Monetary Independence

We measure the extent of monetary independence as the inverse of the annual correlation of the monthly interest rates between India and the United States. The United States is taken as the base country following Aizenman et al. (2010) and Shambaugh (2004) who argue that Indian monetary policy through this period was most closely linked to the United States. We use the money market rates for the interest rates. In India, the Reserve Bank of India (RBI) uses a number of monetary policy tools like the repo rate, reverse repo rate, reserve ratio etc. Changes in any of these are going to have an impact on the money market rate. Following Aizenman et al. (2010) the index for extent of monetary independence is given by

$$MI = 1 - \frac{corr(i, i^*) - (-1)}{1 - (-1)} \tag{1}$$

where i refers to the Indian money market rate and i^* indicates the US money market rate. This index can take a maximum value of 1 and a minimum value of 0. By construction a higher value of the index implies greater monetary independence. While data on Indian money market rates are taken from the Reserve Bank of India, data on United States' rates are obtained from the International Financial Statistics (IFS).

Exchange Rate Rigidity

The index for Exchange Rate Rigidity is calculated using the annual standard deviations of the monthly exchange rate between India and the United States.

$$ERR = \frac{0.01}{0.01 + \sigma(\Delta(\epsilon))} \tag{2}$$

where σ indicates the standard deviation and Δ is the first difference operator and ϵ is log of the bilateral exchange rate between the Indian Rupee and the US Dollar. Again, the way the index is created it will lie between 0 and 1 with a higher number indicating a more rigid exchange rate regime. Aizenman et al. (2010) point out that a mechanical application of this index can exaggerate the degree of flexibility in cases where the exchange rate moves within a narrow band but gets devalued or revalued infrequently. In such instances, the average value of the monthly change in the exchange rate would be so small that even small changes would lead to a large standard deviation resulting in a small value of the ERS. To prevent these downward

biases, we apply a threshold to the exchange rate movement. If the rate of monthly change in the exchange rate is within ± 0.33 percent bands, the exchange rate is assumed to be fixed and the ERS index takes a value of 1.

Capital Account Openness

While constructing an index of capital account openness we deviate from Aizenman et al. (2010) who use the *de jure* measure developed in Chinn and Ito (2008). For India, this might not be the most appropriate measure as according to it India′s extent of openness remained virtually unchanged since the 1970s due to India′s retention of some minimal controls even in case of flows, which have been significantly liberalized. Moreover, it is the actual quantum of flows that creates a conflict between monetary independence and exchange rate stability. A country with high *de jure* openness can have low capital flows and hence be able to simultaneously stabilize exchange rate and retain monetary autonomy. Alternatively, a country with low *de jure* openness can experience large flows due to low enforcement of capital controls, and face a trade-off between ensuring monetary independence and exchange rate stability. Thus a *de facto* measure seems conceptually more appropriate.

We construct an index of capital account openness, Cap Open, based on net capital flows. The index is constructed as the ratio of absolute value of net capital flows to GDP. The focus on net capital flows is based on the fact that it is the capital account balance that is crucial for the impossible trinity. If capital inflows in a country were to be matched by an equal quantum of capital outflows, the central bank can still have the option of retaining monetary independence with a stable exchange rate. To make this index comparable with ERS and MI indices, we normalize this index to lie between 0 and 1.[1]

$$CapOpen = \frac{|NetFlows|}{GDP} \tag{3}$$

Table 1 provides the main summary statistics for the three conflicting policy objectives. As can be seen there has been a wide range of variation on all the three indices during the 30 year period under study.

Table 1: Summary Statistics of the Trilemma Policy Objectives

	Obs	Mean	Std.Dev	Min	Max
Monetary Independence	30	0.448	0.168	0.132	0.716
Exchange Rate Stability	30	0.515	0.203	0.154	1
Capital Account Openness	30	0.243	0.188	0	1

[1]The index based on net inflows is highly correlated with an index based on gross flows. In fact the normalized indices have a correlation coefficient in excess of 0.93

Before going further, one needs to analyze whether major domestic and international events have been associated with structural breaks in the index series. Two key important events that might have influenced the policy choices of the authorities are the economic reforms initiated after the 1991 crisis and the contagion from the East Asian crisis in 1997. To exclude the impact of the crisis we leave out the crisis year and the subsequent year.

Table 2 shows that on average monetary independence declined significantly after India initiated its reform process in 1991. In contrast, capital account openness index doubled in the post reform period compared to the pre-reform period. We get similar results when we consider a break due to the Asian crisis. In both cases there is a marginal change in the exchange rate stability, but the difference is not significant. This implies that in recent years the increase in capital flows have forced the authorities to relinquish some degree of monetary independence. In contrast, there has not been a significant change in flexibility of the Rupee against the US Dollar.

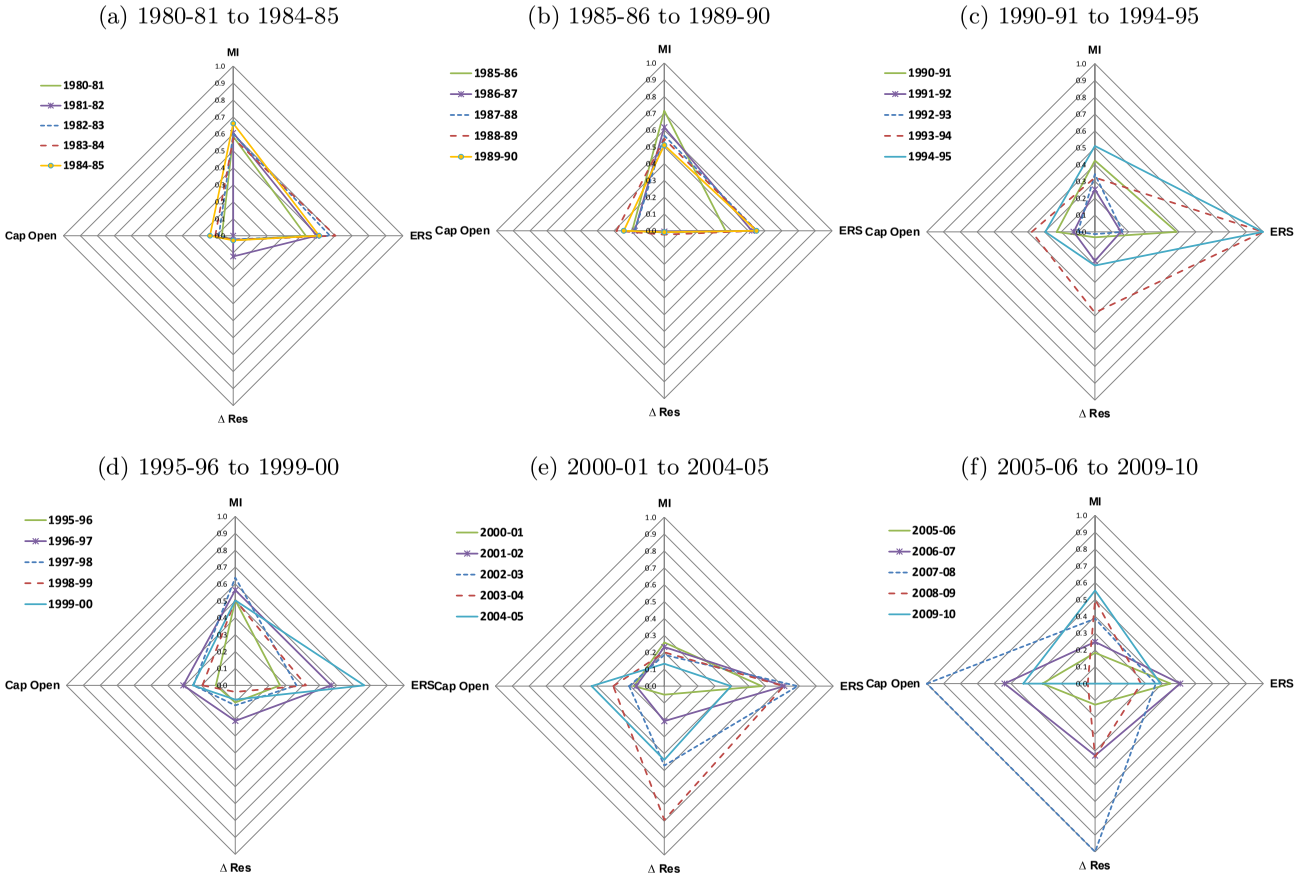
Table 2: Mean Equality Test

	1980-81 to 1990-91	1992-93 to 2009-10	1980-81 to 1996-97	1998-99 to 2009-10
Monetary Independence	0.599	0.376	0.524	0.324
Difference		0.222		0.2
t-stat		4.208		3.873
Exchange Rate stability	0.514	0.539	0.516	0.528
Difference		-0.025		-0.012
t-stat		-0.318		-0.158
Capital Account Openness	0.146	0.305	0.177	0.338
Difference		-0.159		-0.161
t-stat		-2.231		-2.41

A comparison of the evolution of these indices over time indicates the development of the payments regime in India. To do this, we resort to 'diamond charts' where we measure monetary independence, exchange rate stability and capital account openness on the three vertices. A possible way for the authorities to manage the dichotomy between monetary independence and exchange rate stability, over the short-run, is by accumulating or decumulating reserves. Consequently, following Aizenman et al. (2010) we focus on, ΔRes, the absolute change in reserves (as a share of GDP)[2]. To make it comparable with the other measures we also normalize this measure to be between 0 and 1. The origin in these diamond charts indicate completely floating exchange rate, zero monetary independence, zero net flows and no change in international reserves holding. Figure 3 highlights the evolution of these policy objectives for India during 1980-81 to 2009-10.

[2]From 1997-98 onwards the measure is based on the actual intervention by the RBI to exclude valuation changes. However, for the period before April 1997, due to data constraints the reserve accumulation includes valuation changes.

Figure 3: Configuration of Trilemma and International Reserves



Source: Authors' Calculation

Figure 3a and 3b, show that during the 1980s there was limited amount of international capital movement with the Cap Open and ΔRes index fluctuating between 0 and 0.24 and 0 and 0.1, respectively. This allowed the policymakers to simultaneously retain monetary independence and maintain exchange rate stability. While the MI index varied between 0.51 and 0.71 the ERS index fluctuated between 0.33 and 0.69. Towards the end of the decade, India′s macroeconomic health began to deteriorate significantly. The current account deficit increased to 0.9 percent of GDP in 1983-84 to 2.3 percent in 1989-90, due to liberalization of imports, a sharp spike in oil prices due to the Gulf crisis and economic deterioration in India′s major export markets such as the Middle East and erstwhile Soviet Union. To finance the deficit some of the capital controls were relaxed, and the current account deficit started being financed by non-resident remittances and borrowings at commercial terms.

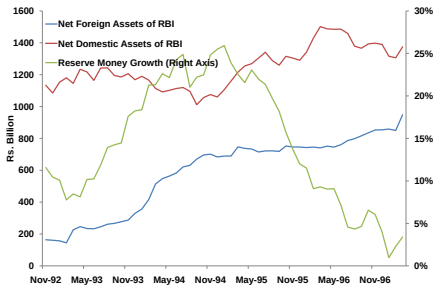
India witnessed one of its first confrontations with the impossible trinity during 1993-94 and 1994-95. There was a surge of capital inflow aided by newer profit opportunities arising due to the economic reforms and lower global interest rates. The Cap Open index increased to an average of 0.34 during these years, compared to an average of 0.14 during the 1980s. Consequently, there was a choice between either allowing nominal exchange rate to appreciate and giving up exchange rate stability or managing the exchange rate and allowing the money supply to change, thereby relinquishing monetary independence.

Figure 4b shows that India opted for a stable exchange rate regime with the Rupee-Dollar rate remaining steady at 31.4 from April 1993 to August 1995, resulting in an ERS index of 1 during 1993-94 to 1994-95. The associated intervention in the forex market caused RBIs net foreign assets to increase from Rs.153 billion in February 1993 to over Rs.770 billion in 1996 causing the ΔRes index to rise to 0.48 in 1993-94 and 0.32 in 1994-95. A paucity of instruments and an illiquid bond market prevented an effective sterilization of the foreign inflows, reflected in a marginal decline in net domestic assets. Consequently, reserve money growth accelerated to over 20 percent, contributing to a rapid increase in inflation. The loss of monetary independence is reflected in Figure 3c with a drop in the MI index to 0.32 in 1993-94 and 0.445 in 1994-95 from an average of 0.6 in the 1980s.

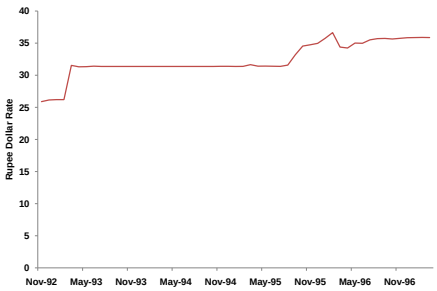
There was a sharp reversal of situation in the second half of the 1990s. Several domestic and external factors contributed to a slowdown in capital flows. Inflow of foreign capital to India was adversely affected following contagion from countries in East Asia and Latin America, which were impacted by a series of financial crises. The situation was exacerbated with the imposition of economic sanctions on India after it had conducted nuclear tests in May 1998. Furthermore, this was also a period of political instability as the coun-

Figure 4: Reserve Accumulation, Sterilization & Exchange Rate: 1992-96

(a) Sterilization & Reserve Money



(b) Exchange Rate



Source: RBI Handbook of Statistics 2010

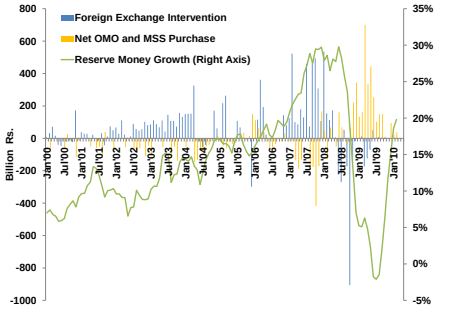
try faced three general elections and four prime ministers between 1996 and 1999. Finally, in the developed countries there was a decline in economic activity due to the bursting of the dotcom bubble in the early 2000s. As a result, in Figure 3d, the Cap Open index hovered between 0.11 and 0.25 during 1995-96 to 2001-02 (except for 1996-97 when it took a value of 0.31) with an average value of 0.19. These events led to sporadic downward pressure on the Indian Rupee during this period, in response to which the RBI allowed the Rupee to depreciate moderately. The Rupee weakened against the US Dollar by 12 percent between July 1995 and February 1996 (Mexican crisis), another 11 percent between August 1997 and January 1998 (East Asian crisis), and finally 7.5 percent between May 1998 and August 1998 (nuclear tests and the Russian crisis). Thus the ERS index indicates a relatively low value during 1995-96 to 1998-99, ranging between 0.27 and 0.41. During 1999-2000 and 2001-02, the volatility in the exchange rate declined significantly, although there was a general trend of depreciation to offset the inflation differential and to maintain a stable real effective exchange rate. This allowed the ERS index to fluctuate between 0.57 and 0.75 during this period.

Limited capital flow and a rise in exchange rate flexibility allowed the RBI assert greater degree of monetary independence. Most of the depreciation episodes were associated with the RBI tightening monetary policy through raising interest rates and the reserve ratio as well as reducing refinance limits to prevent built up of inflationary pressure. As a result, the MI index ranged between 0.5 and 0.64 during 1995-96 to 1998-99. However, RBIs attempt to engineer a moderate depreciation in later years led to a drop in the index and it ranged between 0.25 and 0.42 during 1999-00 to 2001-02.

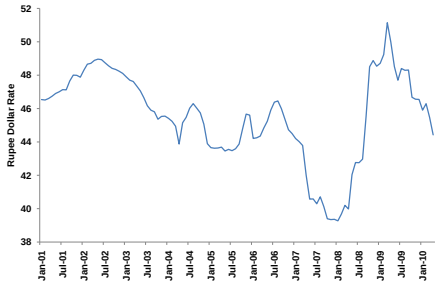
The various policy trade-offs under the impossible trinity got exacerbated since 2002 due to a steady increase in capital inflows, which was reflected in the Cap Open index rising from an average of 0.19 during 1999-00 to

Figure 5: Reserve Accumulation, Sterilization & Exchange Rate: 2001-10

(a) Sterilization & Reserve Money



(b) Exchange Rate



Source: RBI Handbook of Statistics 2010

2001-02 to marginally higher 0.21 in 2002-03 and further to 0.31 in 2003-04. Again, there was a dichotomy between preventing large scale volatility in the exchange rate and retaining monetary independence. The RBI again intervened in the foreign exchange market to prevent the Rupee form appreciating rapidly, which resulted in the ERS index taking a value of 0.79 and 0.70 during 2002-03 and 2003-04 respectively. Between April 2001 and April 2004, the RBI purchased more than $61 billion (Rs.2.3 trillion) of dollars. Despite the RBI trying to sterilize most of the intervention by depleting its stock of net domestic assets from Rs.1.9 trillion in April 2001 to Rs.0.19 trillion in April 2004, growth rate of reserve money doubled from around 5 percent in early 2000 to over 10.3 percent in March 2002. Hence, as shown in Figure 3e the MI index averaged around a low 0.2 between 2001-02 and 2003-04.

Towards late 2003, the RBI started to run out of government bonds for sterilization, and in January 2004, a new instrument for sterilization - Market Stabilization Scheme (MSS) bonds - was introduced. The RBI sold these MSS bonds on the behalf of the government to sterilize the impact of capital inflows. By August 2005, the amount of outstanding MSS bonds increased to Rs. 0.71 trillion. However, with a rising amount of outstanding MSS bonds, the fiscal cost of sterilization became a worrisome issue. Consequently, the RBI resorted to incomplete sterilization of the capital flows, which led to an increase in the growth rate of reserve money. In addition, it reduced its intervention in the foreign exchange market, which led to the Rupee appreciating by 6.5 percent between August 2004 and July 2005. As a result, the ERS index dropped to 0.39 and 0.44 in 2004-05 and 2005-06, respectively.

In 2006-07 and 2007-08, the surge in capital flow accelerated and the capital account registered a surplus of $46 billion and $107 billion, respectively resulting in the Cap Open index rising to 0.54 and 1.0. The RBI opted for an intermediate regime to manage the impossible trinity. It introduced

several measures to limit capital flows. These included imposing restrictions on ECBs curbing the use of Participatory Notes (PNs) and introducing measures to limit loans to both foreign and domestically held mutual funds operating in India. The RBI again resorted to heavy intervention and purchased over $95.4 billion (Rs.4.0 trillion) during this period resulting in ΔRes index rising to 0.43 and 1.0 in 2006-07 and 2007-08. While, despite a growing fiscal cost, fresh MSS bonds worth Rs. 1.5 trillion were issued between April 2006 and November 2007 to sterilize the purchases, it was not enough to completely sterilize the foreign inflows. The CRR was also raised by 200 basis points to suck out some of the injected liquidity. Finally, the Rupee was allowed to appreciate significantly over this period. The Rupee appreciated against the Dollar by 15 percent over this period, while the trade weighted REER appreciated by 10 percent between May 2006 and November 2007. As a result, in Figure 3f, the ERS index dropped to 0.44 and 0.36. These steps allowed the monetary authority additional degrees of freedom and as a result the MI index rose marginally to 0.25 in 2006-07 and 0.38 in 2007-08 from an average of 0.18 between 2003-04 and 2005-07.

The outbreak of the sub-prime crisis in the United States in late 2007 led to 'flight to safety' of foreign capital from emerging markets in. In India, while portfolio flows in 2008-09 turned negative and there was a net outflow of $14 billion, it was more than offset by net inflows through FDI ($17.5 billion) and loans ($8.7 billion) to register a net inflow of $7.2 billion. The sharp drop in net inflows compared to previous led to Cap Open index declining to 0.05 in 2008. The RBI responded to the drop in capital flows and declining exports by allowing the Rupee to depreciate sharply. During 2008-09, the Rupee weakened by nearly 21.2 percent against the US Dollar resulting in ERS index dropping to 0.27. Even the trade weighted REER depreciated by 14 percent. The decline in capital inflows and rise in flexibility of the Rupee allowed the authorities to pursue a more independent monetary policy, reflected by an MI index of 0.52, aimed at bolstering the Indian economy.[3]

Since April 2009, there has been a resumption of capital flow to emerging markets with India receiving net capital inflows of $53.6 billion during 2009-10. This resurgence in capital flow has once again forced India to make some tough policy choices. The RBI has tried to curb the inflow of capital by introducing certain restrictions. The all-in-cost ceilings, which were withdrawn in January 2009, to encourage ECBs, were reimposed in December 2009 with the reimposed ceiling being higher by 100 to 150 basis points from the pre-crisis levels. In addition, foreign currency convertible buybacks were

[3]The RBI took a series of measures to counter the drop in liquidity in the aftermath of collapse of Lehman Bros. These included lowering of the key policy rates, Cash Reserve Ratio (CRR) and Statutory Liquidity Ratio (SLR), unwounding of MSS bonds, opening of new refinance windows, lowering of prudential norms in relating to provisioning and risk weights. For details see Mohan (2009)

discontinued. In this episode the RBI has refrained from intervening in the foreign exchange market to mitigate the pressures of appreciation. Between March 2009 and April 2010, the RBI actually sold around $2.6 billion of reserves. Such low levels of intervention caused the ΔRes index to drop down to 0. In contrast, the Rupee has been allowed to appreciate. It appreciated by nearly 17 percent between March 2009 and April 2010. Even, the 36 currency NEER appreciated by more than 9.3 percent.

RBI′s reluctance to intervene and sterilize can be attributed to RBIs preoccupation to manage record borrowing requirements of the government in 2009-10 and 2010-11. Sterilization of inflows can drive the interest rates up, which will have negative consequences for government borrowing. Furthermore, incomplete sterilization of the inflows would increase the money supply and exacerbate inflationary pressure, which the RBI is keen to prevent with inflation crossing 10 percent in March 2010. Finally, a strong currency is going to help moderate inflation by reducing the cost of importables. However, RBI has left the option of sterilization in the future open by agreeing to replenish the MSS bonds to the tune of Rs. 500 billion. A further increase in inflows may be countered by the use of these bonds.

3.2 Relationship between the Policy Choices under Impossible Trinity

In the above section we found that India has adopted an intermediate regime to manage the impossible trinity, and has juggled the objectives of exchange rate stability, monetary policy independence and opening up of the capital account as per the demands of the macroeconomic situation. In this section, we analyze whether the macroeconomic goals were binding on India i.e. if India faced trade-offs among the various policy choices. Aizenman et al. (2010) point out that a key obstacle in measuring the trade-offs under the impossible trinity is that the framework does not impose any obvious functional form on the nature of trade-offs. It is implied that an increase in one of the impossible trinity indices should induce a drop of the second or the third index, or a combination of the two. Following Aizenman et al. (2010) we test the validity of the linear framework i.e. whether the weighted sum of the three trilemma policy variables adds up to a constant. This is done by focusing on the following equation

$$1 = \alpha MI_t + \beta ERS_t + \gamma CapOpen_t \tag{4}$$

We run the above regression for the full sample as well as sub-sample periods identified earlier. A high goodness of fit indicates that the linear specification explains well the trade-offs among the policy dimensions. Table 3 shows that

the adjusted R-squares for the full sample as well as the sub-samples are in excess of 95 percent. Thus in India the three policy goals are linearly related to each other and there is a trade-off between the three policy options.

A division of the entire period on the basis of the 1991 balance of payments crisis and the Asian crisis indicates significant variation in coeffecients across different time periods implying that over time India has altered the weights on these policy options.

Table 3: Testing the Validity of the Linear Framework

	(1)	(2)	(3)	(4)	(5)
	1980-81 to 2009-10	1980-81 to 1991-92	1992-93 to 2009-10	1980-81 to 1997-98	1998-99 to 2009-10
Monetary Independence	1.010***	1.160**	1.028***	1.268***	0.886**
	[7.681]	[2.582]	[4.615]	[11.40]	[2.729]
Exchange Rate Stability	0.673***	0.381*	0.685***	0.386**	1.024***
	[4.987]	[1.616]	[4.843]	[2.398]	[7.905]
Capital Account Openness	0.582***	0.937*	0.546**	0.48*	0.418*
	[3.033]	[1.694]	[2.400]	[1.788]	[1.928]
R-squared	0.96	0.97	0.955	0.973	0.969

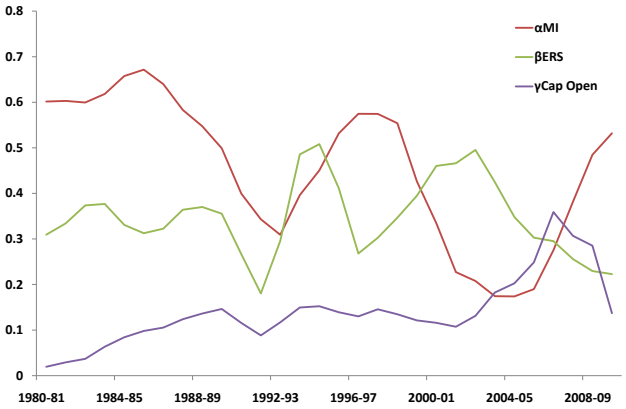
To look at the extent of the policy choice actually implemented by the policymakers we look at the predicted coefficients and the actual value of the variables i.e. $\hat{\alpha}$MI, $\hat{\beta}$ERS and $\hat{\gamma}$Cap Open. In Figure 6 we look at the contribution of each policy orientation over the last three decades. While Figure 6a is based on Column (1) of Table 3, Figure 6b and Figure 6c are drawn on Columns (2) to (5).

Despite being quantitatively different the above figures indicate a similar story qualitatively. During the early 1980s monetary policy independence was given the highest preference followed by exchange rate stability and financial openness. However towards the end of the 1980s there was a decline in the extent of monetary independence, which bottomed out in 1993-94. The decline in monetary independence was associated with an increase in preference for exchange rate stability and a marginal increase in the extent of the capital account openness during this period.

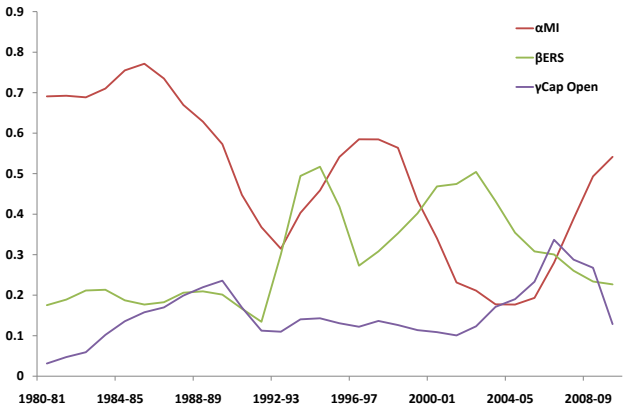
There was a reversal of trend in the mid 1990s with a resurgence of monetary independence associated with a dip in exchange rate stability. The late 1990s and the early 2000s witnessed a secular decline in monetary independence as the RBI managed the exchange rate to maintain a constant REER. The rise in net capital inflows from 2003-04 was initially associated with a decline in both monetary independence and exchange rate stability. However, from 2007 onwards several domestic and external events like overheating of the economy, commodity price shocks and the global financial crisis has resulted in the RBI asserting greater monetary independence, while at the same time allowing greater exchange rate flexibility.

Figure 6: Evolution of Policy Choices under Impossible Trinity

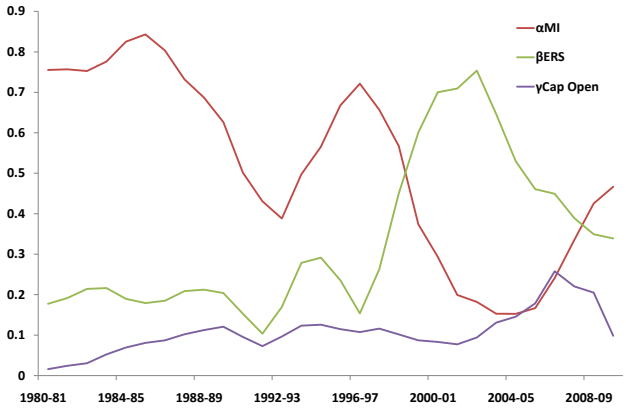
(a) Entire Period



(b) 1991 Crisis



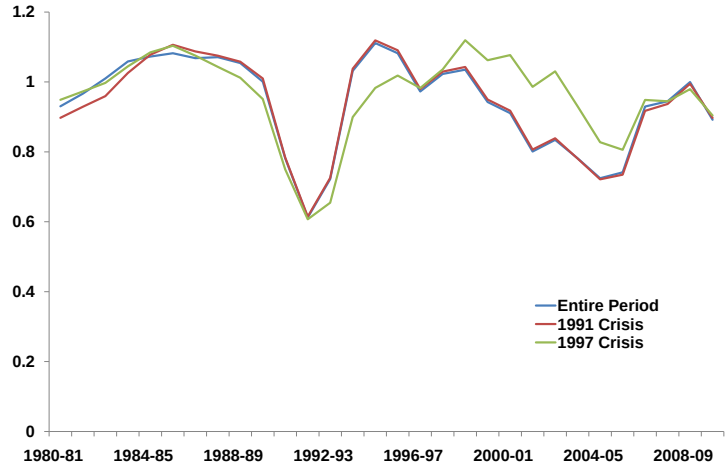
(c) 1997 Crisis



Source: Authors' Calculation

By comparing the predicted values based on the above regression i.e., $\hat{\alpha}$MI + $\hat{\beta}$ERS + $\hat{\gamma}$Cap Open over a time horizon, one can obtain some inferences about the extent to which the trilemma is "binding". A linear specification implies that the predicted value should be closer to 1. In Figure 7 we see that the predicted values hover around 1 for most of the period across the three specifications. During the early 1980s the prevalence of the policy combination of independent monetary policy and exchange rate stability pushed the predicted values close to unity. The balance of payments crisis in 1991 resulted in a sharp drop in the predicted values in 1991-92 and 1992-93 as there was a sharp drop in all the three indices. However, rising net capital flows and a quest for a stable exchange rate regime meant that the predicted values rapidly increased to close to 1 in the mid 1990s. Reduced capital flows as well as lower level of monetary independence meant that the impossible trinity was not binding for the Indian economy during the late 1990s and early 2000s and the predicted values were well below 1. It was only from 2003-04 onwards when rising capital account openness and a resurgence in monetary policy independence pushed the predicted values to be close to unity.

Figure 7: Cumulative Policy Orientation under Impossible Trinity



Source: Authors' Calculation

4 Conclusion

There is now an emerging consensus that countries need to actively manage their capital account to avoid vulnerabilities associated with financial crisis. While it is widely agreed that capital flows aid growth by providing external capital to sustain an excess of investment over domestic savings, in recent years, many emerging markets, including India, have received capital flows

that are far greater than their current account financing requirements creating macroeconomic management challenges. In such cases, excess capital flows tends to feed into real exchange rate misalignment, excesses in credit market, asset price booms, building up of inflationary pressure and overall financial fragility. In particular, unbridled capital flows result in problems for overall macroeconomic management by creating a dichotomy between pursuing an independent monetary policy and maintaining a stable exchange rate.

This brings in the need to actively manage capital flows. While capital controls can be effective they are generally not foolproof, and are vulnerable to leakages through financial engineering. In such circumstances, a gamut of policy measures has to be used to ensure financial stability of the economy. These would include exchange rate flexibility, holding of adequate reserves, intervention in the foreign exchange market, and overall development of the financial sector.

India has also resorted to the multiple instrument approach while dealing with capital flows. The overall policy architecture encompassed active management of capital flows, especially volatile and debt flows; a moderately flexible exchange rate regime with the RBI intervening at times to prevent excessive volatility; sterilization of these interventions through multiple instruments like MSS bonds and CRR; and building up of a stockpile of reserves. This intermediate approach has suited India well as it has been able to maintain a healthy growth rate, targeted monetary and credit growth rates, moderate inflation rate through most of the period and a sustainable current account deficit.

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