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ABSTRACT

A key challenge facing most emerging market economies today is how to simultaneously maintain monetary independence, exchange rate stability and financial integration subject to the constraints imposed by the Trilemma, in the era of deepening globalization. In this paper we study the Trilemma choices of the two key drivers of global growth, China and India. We overview and contrast the policy choices of the two, and test their Trilemma choices and tradeoffs. China's Trilemma configurations are unique relative to the one characterizing other emerging markets in the predominance of exchange rate stability, and in the failure of the Trilemma regression to capture any significant role for financial integration. One possible interpretation is that the segmentation of the domestic capital market in China, its array of capital controls and the large hoarding of international reserves imply that the "policy interest rate" does not reflect the stance of monetary policy. In contrast, the Trilemma configurations of India are in line with the regression results of other emerging countries, and are consistent with the predictions of the Trilemma tradeoffs. India like other emerging economies has overtime converged towards a middle ground between the three policy objectives, and has achieved comparable levels of exchange rate stability and financial integration buffered by sizeable international reserves.

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1. Introduction

The Great Recession that originated in 2008 has raised questions about the current international financial architecture as well as individual countries' international macroeconomic policies. Policy makers dealing with the current global crisis are confronted with the "Impossible Trinity" or the "Trilemma"- a potent paradigm of open economy macroeconomics, asserting that a country may not simultaneously target the exchange rate, conduct an independent monetary policy, and have full financial integration. A key message of the Trilemma is scarcity of policy instruments. Policy makers face a tradeoff, wherein increasing one Trilemma variable (for e.g. higher financial integration) induces a drop in the weighted average of the other two variables (i.e. lower exchange rate stability, or lower monetary independence, or a combination of the two). Analyzing and understanding the predictions of the Trilemma hypothesis under such mixed or hybrid regimes has now become a key challenge to policy makers and practitioners alike, especially as countries all over the world recover from the effects of the Great Recession.[1]

The rapid as well as massive financial globalization of most countries of the world over the past 20 years, and the fast deepening of domestic and international financial markets have modified the context of the Trilemma paradigm. Most emerging market economies in particular have opted for increasing financial integration. The Trilemma implies that a country choosing this path of higher capital mobility has to either forego exchange rate stability if it intends to preserve certain degree of monetary independence, or give up monetary independence if it wishes to retain exchange rate stability. As noted in Aizenman, Chinn and Ito (2008), over the last couple of decades emerging market economies have consistently pursued a balanced combination of the three macroeconomic policy goals along with a substantial amount of international reserve (IR) holding. Emerging markets have mostly opted for hybrid exchange rate regimes -

[1] See Obstfeld, Shambaugh, and Taylor (2010) for further discussion and references dealing with the Trilemma, and Aizenman, Chinn and Ito (2008, 2010b, 2010c, 2011) for testing a continues version of the trilemma tradeoffs. Related papers have discussed the possibility that a pegged exchange rate is a trap in the era of greater financial integration (e.g., Edwards and Levy-Yeyati, 2005; Aizenman and Glick, 2009).

managed exchange rate flexibility buffered by holding sizeable IR while increasing financial integration and reducing the importance given to monetary independence. In other words, among this group of countries, the three dimensions of the Trilemma configurations: monetary independence, exchange rate stability, and financial openness, are increasingly converging towards a "middle ground".

All of these issues are highly pertinent in the context of the two major emerging market economies, namely China and India, which together account for one third of the world population, rank among the front-runners of the global economy and are among the biggest and fastest growing developing countries. While China has the second largest economy in the world surpassing Japan, India has the eleventh largest in terms of exchange rates. Their success stories are defined by consistently high growth rates of both aggregate and per capita incomes in recent decades, competing aggressively in the global markets. Both countries have moved more and more towards market-driven economies through global integration and domestic deregulation accompanied by sound macroeconomic management. While economic liberalization and deregulation policies were introduced in India in the 1990s, China started receiving foreign direct investment from the mid 1980s onwards.

China has been pursuing the objective of greater financial openness albeit more cautiously than emerging economies elsewhere. As detailed in Glick and Hutchison (2008), in order to deal with the Trilemma policy trade-offs, China has recently allowed more exchange rate flexibility. However growing balance of payments surpluses through both current and financial accounts have put upward pressure on its currency -- the Renminbi. Chinese monetary authorities have been actively intervening in the foreign exchange market thereby accumulating massive amounts of IR, so as to prevent the currency from appreciating. Between 1990 and 2010, China's holdings of IR have risen from close to $29 billion (8.3 percent of GDP) to over $2.8 trillion (close to 50 percent of GDP).

As China continues to slowly liberalize its capital account while actively intervening in the foreign exchange market to stabilize its currency, it faces the key challenge of retaining domestic monetary policy autonomy and hence maintaining price stability. In

the recovery from the Great Recession of 2008-09, China has been facing serious credit-boom fueled inflationary concerns. Chinese monetary authorities have addressed this current challenge by raising banks' reserve requirement ratios. However, in the pursuit of higher financial openness and exchange rate stability, China is facing the crucial trade-off of having to give up monetary policy independence. Clearly, the extent to which China will successfully confront the Trilemma problem depends on achieving the right balance of policy objectives.

India too fits the general pattern of most emerging market economies operating in a range of partial financial integration and managed floating exchange rate regimes accompanied by massive accumulation of IR. Following a balance of payments crisis in 1991, a comprehensive series of liberalization, privatization and deregulation policies were implemented in the banking sector, trade sector as well as financial markets. Over the next couple of decades the Indian economy witnessed several structural changes (Shah, 2008; Mohan and Kapur, 2009; Hutchison, Sengupta, Singh, 2011). However, with regard to capital account liberalization, Indian policy-makers adopted a cautious stance from the very start (Hutchison, Kendall, Pasricha and Singh, 2010) as a result of which the process has been a continuous albeit a slow and gradual one.

The Indian economy was among the first to recover from the global crisis of 2008-09. While in the immediate aftermath of the crisis, capital outflows, higher exchange rate volatility and loss of reserves to limit exchange rate depreciation presented a contractionary influence on domestic monetary policy, the scenario has changed entirely in the last one year as improved growth prospects have been accompanied by a surge in capital inflows (Hutchison, Sengupta, Singh, 2011). Moreover, growing inflationary pressures (headline WPI inflation averaging around 10 percent) have forced the RBI to resort to rate hikes and hence a monetary policy tightening. All these economic developments and structural changes, both in domestic and international environments will influence the effective policy tradeoffs between the trilemma choices facing the Indian policy makers.

In this paper, we trace the evolution of the Financial Trilemma in China and India over time from 1990 to 2010 and analyze the extent of the trade offs faced by policy

makers in both countries, between financial integration, monetary independence and exchange rate stability. We calculate a Trilemma index for each of the two countries separately using a methodology developed for a cross-section of countries by Aizenman, Chinn and Ito-henceforth ACI (2008, 2010a, b and c, 2011). We also analyze the impact of the evolving Trilemma configurations on macroeconomic indicators such as inflation and examine the role of international reserves in the context of China and India's Trilemma. Finally we conclude with a comparative analysis of the macroeconomic situations and policy-trade offs in both countries given that they continue to be key contributors to the global growth rate.

We find that China's Trilemma configurations are unique relative to the one characterizing other emerging markets in the predominance of exchange rate stability and in the failure of the Trilemma regression to capture any significant role for financial integration. One possible interpretation is that the segmentation of the domestic capital market in China, its array of capital controls and the large hoarding of IR imply that the "policy interest rate" does not reflect the stance of monetary policy. In contrast, the Trilemma configurations of India are in line with the regression results of other emerging countries as reported in ACI (2008) and are consistent with the predictions of the Trilemma tradeoffs. India like other emerging economies has overtime converged towards a middle ground between the three policy objectives, and has achieved comparable levels of exchange rate stability and financial integration buffered by sizeable international reserves.

2. Data and Methodology

We follow the methodology of ACI (2008, 2010a, b and c, 2011), henceforth ACI, in constructing indices for each of the Trilemma policy objectives, namely, monetary independence, exchange rate stability and capital account openness. However, while ACI analyze the Trilemma configurations for a host of countries and study the implications thereof, we do so individually for two key emerging market economies, namely China and India and compare our results. In order to have more observations in our dataset and hence more time variation for a single country, we use quarterly data as opposed to

annual data used in their analysis. We also use a different measure of capital account openness than ACI.

For China, our data set extends from 1990Q1 to 2010Q4 spanning as many as 84 quarters. For the monetary independence index, we use weekly data on the lending rates in China and 3-month LIBOR rates in US to compute quarterly correlations, as described in the next sub-section. For the exchange rate stability index, we use the weekly series of Renminbi-Dollar exchange rates to compute quarterly standard deviations, again as delineated in the next subsection. All above-mentioned data are obtained from the International Financial Statistics (IFS) database of the International Monetary Fund. In order to compute the capital openness index we use data from the State Administration of Foreign Exchange (SAFE) on outward and inward FDI, Portfolio and Other types of capital flows as well as GDP data from IFS. Later on, for calculating China's inflation rate, we use consumer price index (CPI) data from Global Financial Statistics and compute the YoY inflation rate using the quarterly CPI data. Finally to examine the impact of IR we use quarterly data on foreign exchange reserves minus gold, from IFS and normalize it by quarterly GDP.

For India, our data ranges from 1990Q1 to 2010Q4. The data sources are the same as in Hutchison, Sengupta and Singh (2011). They study the evolution of the Trilemma for India from 1996Q2 to 2009Q3. For the Trilemma indices, we use quarterly data on GDP, foreign investment inflows and outflows, from the International Financial Statistics (IFS) database of the IMF. Same as for China, we use weekly exchange rate series to construct a quarterly index of exchange rate stability, as described below. The weekly, nominal Rupee-to-US dollar exchange rate series is from the Global Financial Database (www.globalfinancial data.com). From the same source, we use weekly 90-day rates on government/treasury securities for the US and India to calculate quarterly correlations used to create the monetary independence index. Later on we use quarterly data on wholesale price index (WPI) to calculate YoY inflation and data on foreign exchange reserves minus gold to analyze the impact of reserves management and trilemma indices on inflation, both series obtained from the IFS database.

The monetary independence (MI), exchange rate stability (ES) and capital account openness (KO) indices are constructed as follows for each of the two countries:

MI Index

Adapting the same approach as in ACI (2008), we measure MI as the reciprocal of the correlation of interest rates in the home country (here China and India, respectively) and the base country (the United States). We calculate quarterly correlations using weekly interest rate data. The precise formula is as follows:

$$MI = 1 - \frac{corr(i_i, i_j) - (-1)}{1 - (-1)}$$

By definition the index lies between 0 and 1. The highest value indicates the greatest degree of monetary independence.[2] The plots of the MI indices for China and India respectively are shown in Figures 1 and 2.[3]

ES Index

We calculate the ES index using quarterly standard deviations of the weekly change in the log of the LCU-US Dollar exchange rate (in this case the RMB-USD exchange rate for China and the Rupee-USD exchange rate for India). The formula used for the construction of the index is as follows:

$$ES = \frac{0.01}{0.01 + stdev(\Delta(\log(exch\_rate))}$$

[2] The index is smoothed out by applying the three-quarter moving averages encompassing the preceding, concurrent, and following quarters (t – *1, t, t+1)* of observations.

[3] We note one important caveat about this index. In the case of China for some years, especially early in the sample, the interest rate used for the calculation of the MI index is often constant throughout a year, making the annual correlation of the interest rates between the China and USA (base country) undefined. Since we treat the undefined correlation the same as zero, it makes the MI index value 0.5. A constant home country policy interest rate could reflect the possibility that the home country uses other instruments to implement monetary policy, rather than manipulating the interest rates (for e.g., manipulation of required reserve ratios or financial repression etc). It is impossible to fully account for these issues in the calculation of the MI index. Therefore, assigning an MI value of 0.5 for such a case appears to be a reasonable compromise following ACI (2008).

Like the MI Index, by definition the ES index ranges from 0 to 1 and the higher the value the greater is the exchange rate stability. The evolution of the ES indices for China and India during our sample period are shown in Figures 3 and 4, respectively.

KO Index

We depart from ACI(2008) for the construction of the KO index in that instead of using the Chinn-Ito index (that gives a number between 0 and 1 for a country's financial openness), we use a simple de-facto measure of capital account openness. We define the KO index as the ratio of the sum of inward and outward foreign investment flows to GDP, and we consider three types of capital flows-FDI, Portfolio and Others, as reported by SAFE for China and the IFS for India.

During our sample period, slow and gradual changes have been taking place as regards the capital account openness policy of both China and India and the Chinn-Ito index may not necessarily capture these continuous changes very well. One drawback of our measure is that the KO index is not bound between 0 and 1 by construct. However, for our sample period for both countries, this restriction of lying between 0 and 1 is easily met, given the slow approach to financial globalization adopted by both economies. As a robustness check, we also construct a second KO index measure wherein we weigh the different types of capital flows by their respective annual volatility. The time-series evolution of the KO indices using both the weighted and un-weighted definitions for China and India have been presented in Figures 5-8.

The Trilemma represents a binding trade-off between three policy objectives. Accordingly, the main principle governing the methodology of the Trilemma estimation is that an increase in any one of the three indices has to be balanced by a corresponding decrease in one or two of the other indices, so that the constraint can be a binding one. However, policy makers can choose to attain a combination of the three policy goals as well subject to the constraint that neither of the indices reaches its maximum value. If all three goals are simultaneously desirable, then whichever index has a higher value represents the policy objective that authorities or central bankers want to focus on more. This principle can be empirically captured using the methodology from ACI (2008).

Since there is no specific functional form of the policy trade-offs or the linkages of these three policy goals, following ACI (2008) we test the simplest functional specification for the three Trilemma indices and examine whether the three Trilemma policy goals are linearly related. Thus the approach we use here for the estimation is to regress a constant (in our case, two) on all three indices at the same time, omitting the constant term on the right hand side of the regression equation. Specifically we examine the goodness of fit of the following linear regression:

$$2 = a_i MI_{i,t} + b_i ES_{i,t} + c_i KO_{i,t} + \varepsilon_t \qquad (1)$$

where i= China or India. The estimated coefficients in the above regression should give us some approximate ideas regarding the weights attached by policy makers to the three policy goals. Moreover, if we find that the goodness of fit for the above regression model is high, it would suggest that a linear specification is rich enough to explain the trade off faced by policy makers among the three policy objectives. Thus, unlike ACI (2008), here we use a time series for a single country to estimate the Trilemma configurations. Since both China and India underwent several changes in their respective exchange rate regimes during the sample period, we first identify these sub-periods and then use dummy variables to account for the structural breaks. Baseline estimations for both countries are reported in Tables 1-4 and results are discussed in detail in the next section.

3. Empirical Results: Trilemma Policy Stance

The baseline estimation results for China are reported in Table 1. Other than the three policy indices namely MI, ES and KO, we also incorporate dummy variables to account for changes in China's exchange rate regimes during the sample period (1990-2010). In particular we progressively add three dummy variables to control for three distinct regime changes: (i) Between December 1989 and end of 1993, Chinese RMB went through a phase of devaluation. Then on January 1994, official and swap markets were unified which amounted to a massive devaluation against the USD. Accordingly dummy1 takes the value 1 for the quarters 1993q4 and 1994q1 and 0 for all other quarters. 1994 was an important break point in the exchange rate regime, based on actual events rather than

statistical tests so far; (ii) when the two rates were unified in 1994, the currency was revalued till October 1997. From November 1997 to July 2005 (before the initiation of the reforms), RMB fluctuated vis-à-vis USD in a very narrow range. Accordingly dummy2 takes the value 1 for the quarter 1997Q3-Q4 and 0 for all other quarters; and finally (iii) in July 2005, China switched to a new exchange rate regime wherein the rate was set with reference to a basket of currencies thereby signifying a shift away from a dollar peg. The currency was allowed to 'float' more freely. Accordingly dummy3 takes the value 1 for the quarters 2005Q2 and 2005Q3 and 0 for all other quarters.

As can be seen from Table 1, in all regressions the one result that unanimously stands out is the consistent statistical significance as well as relatively higher magnitudes of the estimated coefficients of the ES index implying that China has clearly been placing more priority on minimizing exchange rate fluctuations as a tool for macroeconomic management. While the MI index also has statistically significant coefficients, the weight attached to it is clearly less than the ES index as seen from the size of the coefficients. The exchange rate stabilization objective has been given more policy weight perhaps at the behest of monetary independence and especially capital account openness, as the latter does not come out to be statistically significant in our baseline estimations. The overall model-fit is also extremely good as reflected in the high R-squared numbers.[4] The adjusted R-squared for both the regressions with and without the dummy variables is found to be above 98 percent, which indicates that the three policy goals are linearly related to each other, that is, policy makers in China do indeed face the trade-off among the three policy goals.

In Table 2, we use a weighted version of the KO index wherein the different types of capital flows (FDI, portfolio and others) are weighted by their respective volatilities. We repeat the same exercise of adding the dummy variables and regressing a constant (here 2) on the three indices. The results are robust to the use of the weighted KO index- exchange rate stability once again turns out to be the dominating policy objective followed by monetary autonomy whereas capital openness does not seem to be given any

[4] Since there is no constant term on the right hand side, the R-squared is non-centered.

importance by the policy makers. The adjusted R-squared continues to be as high as in Table 1.

We report the baseline estimation results for India in Tables 3 and 4, using the un-weighted and weighted KO indices respectively. We include dummy variables sequentially, according to the different exchange rate regimes characterizing the Indian economy over the sample period from 1990 to 2010 as per Shah, Patnaik, Sethy and Balasubramaniam (2011). The findings are strikingly different than China. All three indices are consistently and statistically significant in all the regressions in both Tables 3 and 4. Going by the size of the estimated coefficients, financial integration is clearly given more importance followed by exchange rate stability and monetary autonomy. These results for India are overall consistent with those found in ACI (2008) for a broader group of emerging market economies: among this group the policy combination of exchange rate stability and financial openness has been the most dominant over the past two decades.

Putting the regression results in the broader perspective, China's Trilemma configurations are unique relative to the one characterizing other emerging countries both in the predominance of exchange rate stability, and in the failure of the Trilemma regression to capture a significant role for financial integration. In contrast, the Trilemma configurations of India are in line with the regression results of ACI (2008, 2010a, b and c, 2011), and are consistent with the predictions of the Trilemma tradeoffs. One possible interpretation is that the segmentation of the domestic capital market in China and the capital controls applied there implies that the "policy interest rate" is not reflecting of the stance of monetary policy. This would be the case if a large share of borrowing is allocated directly by the state banking system, with preferential treatment of the state owned enterprises (SOE), and if the supply of credit to the private sector is segmented. Another unique feature of China is a combination of more stringent capital controls and massive hoarding of IR. China has been increasing its IR/GDP relentlessly without signs of convergence to a target IR/GDP during the sample period. These policies may relax the Trilemma constraints in the intermediate run, as is suggested by ACI (2010b, c and d). Furthermore, the emergence of endogenous capital flows circumventing the controls

in China (including trade mis-invoicing) may reduce the explanatory power of the Trilemma variables in China. Needless to say, these conjectures need further investigations. In contrast, the Trilemma configurations of India and the tradeoffs among the policy goals there are in line with the results of other emerging markets. This is reflected both by the significant positive sign of the Trilemma variables, and by the "middle ground" choices of India, in line with the trend among most other emerging economies [see ACI (2010a, b and c)].

Empirical Results: Trilemma and Inflation

In this section we examine econometrically how various choices regarding the three policies affect inflation in both China and India. We empirically explore the linkages between inflation and our time-varying measures of the policy goals associated with the Trilemma configuration. In particular we estimate the following model:

$$y_{it} = \alpha_0 + \alpha_1 TLM_{it} + \alpha_2 (IR/GDP)_{it} + \alpha_3 [TLM_{it} * (IR/GDP)_{it}] + \varepsilon_{it} \qquad (2)$$

where, y_{it} is a measure for YoY inflation calculated using quarterly data, for country i (China or India) in year t[5]. TLM_{it} is a vector of any two of the three Trilemma indices, namely, *MI, ES,* and *KO. (IR/GDP)*$_{it}$ is the level of international reserves (excluding gold) as a ratio to GDP, and finally [TLM_{it} x ($IR/GDP)_{it}$] is an interaction term between the Trilemma indices and the IR/GDP. The effect of the interaction terms will help to identify whether IR complement or act as a substitute for other policy stances.[6] Our objective is to analyze the impact of the evolving Trilemma configurations on domestic inflation in both countries and to investigate how has the surge in IR accumulation affected this macroeconomic policy dynamics.

Results of the estimation are reported in Tables 5 and 6 respectively for China and India. Intriguingly, we don't find evidence that hoarding reserves by China and India

[5] While consumer price index is used for China, in case of India we use the wholesale price index to calculate inflation.

[6] Since output data is not available for sufficiently high frequencies to allow construction of a quarterly output volatility series, we focus on inflation and inflation volatility.

was associated with higher inflation. Apparently, throughout most of the sample, both countries managed to sterilize effectively, preventing spillover effects from hoarding international reserves to domestic prices. This is reflected in the insignificant coefficient of the IR/GDP in columns 1, 3 and 5, in the baseline regressions with no interaction terms [Tables 5 and 6]. Adding the interaction terms does not change this result: while the direct effect of IR/GDP is positive, evaluating the marginal impact of increasing IR/GDP on inflation, conditioning it on the sample levels of MI, ES, and KO indicates that the marginal impact of higher IR/GDP was close to nil.[7] This result may reflect the financial repression stance of both countries, where the authorities occasionally adjusted banks' reserve/deposit rates at times of abundance liquidity. Yet, this result should be taken with a grain of salt, as it reflects the average patters observed during sample period, and thereby is backward looking. As IR/GDP trends upwards in both countries, reaching more than 50 percent in China, past experience does not guaranty the success of future sterilization.

In the case of China, monetary independence seems to have no statistically significant effect on inflation. However, greater exchange rate stability, as well as capital market openness, seem to have come at the cost of higher inflation. This may reflect the real exchange rate appreciation induced by the rapid growth of the Chinese economy, where nominal exchange rate stability induces higher inflation rate.[8] For India, on the other hand, monetary autonomy is positively related to inflation. Similarly to China, greater exchange rate stability has been associated with higher inflation, possibly again due to the real exchange rate appreciation associated with rapid growth. Capital account openness does not seem to have a major effect on inflation in this case.

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[7] To illustrate, note that column 2 implies that $dy_{it} / d(IR/GDP)_{it} = \alpha_2 + \alpha_3 TLM_{it}$. Substituting the sample averages of the Trilemma indices into the regression results suggests that the marginal effect of raising IR/GDP on the inflation was practically nil.

[8] This interpretation suggests that greater exchange rate flexibility, allowing nominal appreciation, would reduce inflation in China. This view is consistent with the long run neutrality of exchange rate regimes. In a fast growing economy, choosing exchange rate stability shifts overtime the adjustment to appreciating real exchange rate from the nominal exchange rate appreciation to the domestic inflation.

4. Concluding Remarks

Economists, policymakers and practitioners in recent debates and discussions, make an inevitable comparison between China and India -- the two rising giants in Asia. In this paper we attempted to characterize the policy choices made by these two prominent economies with respect to the Financial Trilemma. We conclude our discussion by presenting a concise comparative analysis of the macroeconomic scenarios of these two economies within the framework of the Trilemma. Both China and India are the world's emerging super-powers displaying spectacular economic ascent over the past couple of decades. While India is the eleventh largest economy in terms of exchange rates, China occupies the second position surpassing Japan and after the US. Over the past decade including the duration of the Global Recession of 2008-09, China has grown at an average rate of 10 percent whereas India has been growing at an average rate of 7 percent.

While US and Europe are still reeling under the pressures of the housing market, banking and sovereign debt crisis in the aftermath of the Global Recession of 2008-09, domestic economies have not only recovered but have started booming again in both China and India. Rapid economic growth, sound macro economic management, phenomenal pace of institutional changes and rampant globalization in both countries has been helping to generate enormous consumer demand and raise per capita incomes thereby deeply influencing the recovery of the global economy from the Great Recession.

China and India are both large, poor countries facing similar challenges in developing their economies and both have benefited from greater integration into the world economy. In both countries, financial systems and markets were regulated and controlled for a long period of time and were largely dominated by publicly owned enterprises. In recent decades however, both countries have been liberalizing their capital accounts as well as trade. The advantages of these two countries in terms of attracting foreign investors and producers happen to be the same-abundant supply of cheap labor, booming middle classes eager to consumer, and hence growing markets. Both countries are competing aggressively in the world economy-China as the world's workshop since it

excels in mass manufacturing whereas India as the world's back office given its recent explosive growth in services.

Both the economies have benefited in recent times from foreign direct investments (FDI) and continue to attract high rates of investment even during the post-crisis period. However, while growth in India is largely fueled by domestic consumption demand and depends predominantly on domestic enterprises, in China, rapid export-led growth continues to be boosted by a rising ratio of FDI to GDP. According to UNCTAD annual World Investment Reports, India has emerged as the second most attractive destination for FDI after China and ahead of the US, Russia and Brazil. However, while India has experienced a marked rise in FDI inflows in the last few years, it still receives far less FDI flows than China. While net FDI accounts for more than 2 percent of GDP in China, for India this percentage is as low as 0.64. China dominates the emerging market world as the principal recipient of FDI, which effectively may complement domestic entrepreneurship, and hasten the transfer of technologies. FDI of 105 billion USD flowed into China in 2010 whereas India received FDI worth 24 billion USD.[9] According to a recent forecast by the Institute of International Finance (IIF) capital flows into the Asian region in 2011 account for more than 40 percent of the nearly 430 billion USD net private capital flows to emerging markets and these inflows are dominated by China, followed by India. More than half of the 150 billion USD of FDI flows are expected to go to China, with 36 billion USD going to India (Kohli, 2011).

More importantly, both China and India are fast becoming important sources of outward foreign direct investment (OFDI). China's annual FDI outflow has grown virtually from zero in 1979 to 4 billion USD in 1992. By the end of 1996, China's total stock of FDI outflows was over 18 billion USD. Since 2000, China's OFDI has grown at a staggering rate as a result of a switch in government policy that strongly encouraged Chinese enterprises to "go global". By the end of 2010, China's OFDI amounted to 68 billion USD. Compared to the developed economies, China was much less affected by the Global Recession of 2008-09. Boosted by high cash reserves and ample government support, Chinese multinational enterprises (MNEs) continued to expand their overseas

[9] Data from UNCTAD's World Investment Reports.

acquisitions in the aftermath of the crisis. In 2009 when global OFDI flows plummeted by 43 percent, OFDI from China actually went up by 1 percent. As pointed out by several researchers, backed by substantial official IR worth 2,454 billion USD in mid-2010, China has sufficient financial resources to support further acceleration of its OFDI growth.[10]

In recent years overseas investments and acquisitions by Indian firms has attracted considerable attention as well. The emerging competitiveness of Indian firms in the global markets can be traced back to the liberalization-cum-structural adjustment reforms initiated in 1991 that signaled the start of a gradual departure from a dirigiste economy. As a result of substantial improvements in domestic economic performance and the competitiveness of firms resulting from ongoing liberalization in OFDI policies, total FDI outflow from India increased from about 25 million USD in the early 1990s to nearly 14 billion USD in 2010. India however remains a net FDI recipient, even though the gap between outflows and inflows has been narrowing rapidly over the past few years. India is now the world's 21st largest outward investor, which is significant given its historically miniscule OFDI flows. The Great Recession of 2008-09 caused Indian OFDI flows to fall from their high of 18.8 billion USD in 2007 to 14.5 billion USD in 2009, largely because Indian multinational enterprises (MNEs) had borrowed heavily in dollars to finance cross-border acquisitions and were badly hit by the sharp rupee depreciation and tightened international credit conditions. However, given that the Indian economy like China, was relatively unaffected by the crisis, Indian MNEs have once again started to make sizeable foreign investments.

The Great Recession proved the resilience and sound macro policies of both China and India-the two fastest growing economies that kept the global growth engine moving despite stagnation in the developed world. Both countries however adopted divergent approaches to deal with the transmission of the Great Recession. China implemented a massive stimulus program comprising new infrastructure investment as well as tax breaks. Their two-year long, $585 billion package amounted to almost 6 percent of GDP per year. Moreover, China also encouraged a huge credit boost to spur the economy. The

[10] For a detailed analysis of China's OFDI, see Davies(2010).

amount of new loans made in 2009 nearly doubled from the year before to $1.4 trillion – representing almost 30 percent of GDP. The stimulus plan achieved the objective-growth did not falter much even though exports fell drastically. In India the government pretty much used the same tools as governments elsewhere, to hold up growth during the peak of the crisis. They slashed interest rates, offered fiscal stimulus in the form of tax breaks and increased fiscal expenditure, though at a much smaller scale than China. By an estimate Indian fiscal stimulus amounted to 3 percent of GDP, a modest stimulus in comparison to China.

One crucial difference between the crisis-response measures adopted by the two countries was that India's crisis response did not subject its banking system to elevated risks, unlike China. Compared to Chinese lenders, India's banks remained quite conservative through the downturn. Growth of credit in India was actually lower in 2009 than in 2008. And there has not been any imminent danger of Indian banks non-performing assets deteriorating substantially. China's banking system on the other hand is actually facing the adverse consequences of the credit boom. Uncertainty is looming large about the growing non-performing loans (NPLs) in the banking system triggered by the massive surge in credit. According to a recent report by UBS economist Wang Tao, if 20 percent of all new lending in 2009 and 10 percent of the amount in 2010 went bad over the next three to five years, the total amount of NPLs from China's stimulus program would reach a staggering $400 billion, or roughly 8 percent of GDP. Moreover, China's loose monetary policy is also feared to have fueled a real-estate bubble.

One major reason why India did not have to do as much as China in response to the recession is because the Indian economy is relatively less dependent on the rest of the world for selling its exports. While China's exports represented 29 percent of GDP in 2010, for India it was only 18 percent of GDP. Also, India's domestic economy provided a much greater cushion from adverse external shocks than China's did. Private domestic consumption accounts for more than 50 percent of GDP in India compared with only around 30 percent in China. Furthermore, the large current account surplus of China exposes it to greater volatility induced by the recessionary trends in the USA and the Euro zone, whereas the more balanced current account configuration of India makes it less vulnerable to the OECD demand trends. Another potential reason why India could

not spend as much as China did on fiscal stimulus packages to bring the economy back on the fast growth path could be because India has much lower fiscal space i.e. a higher public debt to GDP ratio than China and hence much less room for extensive fiscal expansions. As of 2010, India faces a public debt to GDP ratio of 71 percent as opposed to 19 percent in China. Moreover, the Indian government also faces a gaping fiscal deficit--6.7 percent of GDP in 2010.

India is also struggling with another set of problems in the aftermath of the Great Recession, the most worrisome being domestic inflation. In 2010, annual average WPI inflation was as high as 10.2 percent. The Reserve Bank of India has been raising interest rates consistently since November 2010 to counter inflation that went into the double digits fueled by growing consumer demand and increasing food and fuel prices.

On the other hand, China faces one major disadvantage in the coming decade or so, with regard to demographics. Chinese population and hence labor force is rapidly aging and hence shrinking fast with time. Due to its one-child policy, China's working-age population is projected to peak at 1 billion in 2015 and then shrink steadily. India on the other hand has a relatively young population and hence theoretically a large demographic dividend to benefit from. India has nearly 500 million people under age 19 and higher fertility rates. By mid-century, India is expected to have 1.6 billion people and 220 million more workers than China. Such favorable demographics not only helps by creating a large labor force but also leads to the accumulation of high national savings and hence huge investment possibilities. At the same time however, India is struggling to create more jobs to absorb the rising young labor force. Also compared to China, India suffers from a major lack of infrastructure investment that is crippling big projects both in public and private sectors. The demographic dividend for India can be massive over the next couple of decades if the government can provide opportunities for the growing masses.

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Appendix: Data Details and Sources

Variable Name	Description	Components	Data Sources
MI	Monetary Independence Index	Domestic and US interest rates	China: Weekly Lending rates from International Financial Statistics Database (IFS) India: Weekly 90-day rates on government securities from Global Financial Database (GFD) Interest rate (USA): 3 month LIBOR from IFS
ES	Exchange Rate Stability	Domestic Exchange Rate (LCU/USD)	China: Weekly RMB/USD exchange rate from IFS. India: Weekly Rupee/USD exchange rate from GFD.
KO	Capital Openness Index	FDI, Portfolio and Other inflows and outflows and GDP	China: Quarterly FDI, Portfolio and Other flows from the State Administration of Foreign Exchange (SAFE); GDP from IFS. India: Foreign investment inflows and outflows from IFS.
IR/GDP	International Reserves to GDP Ratio	Foreign Exchange Reserves minus gold and GDP	Reserves and GDP from IFS
Inflation	YoY Inflation	Consumer Price Index for China and Wholesale Price Index for India	China: CPI from GFD India: WPI from IFS

Figure 1: Monetary Independence Index in China (1990-2010)

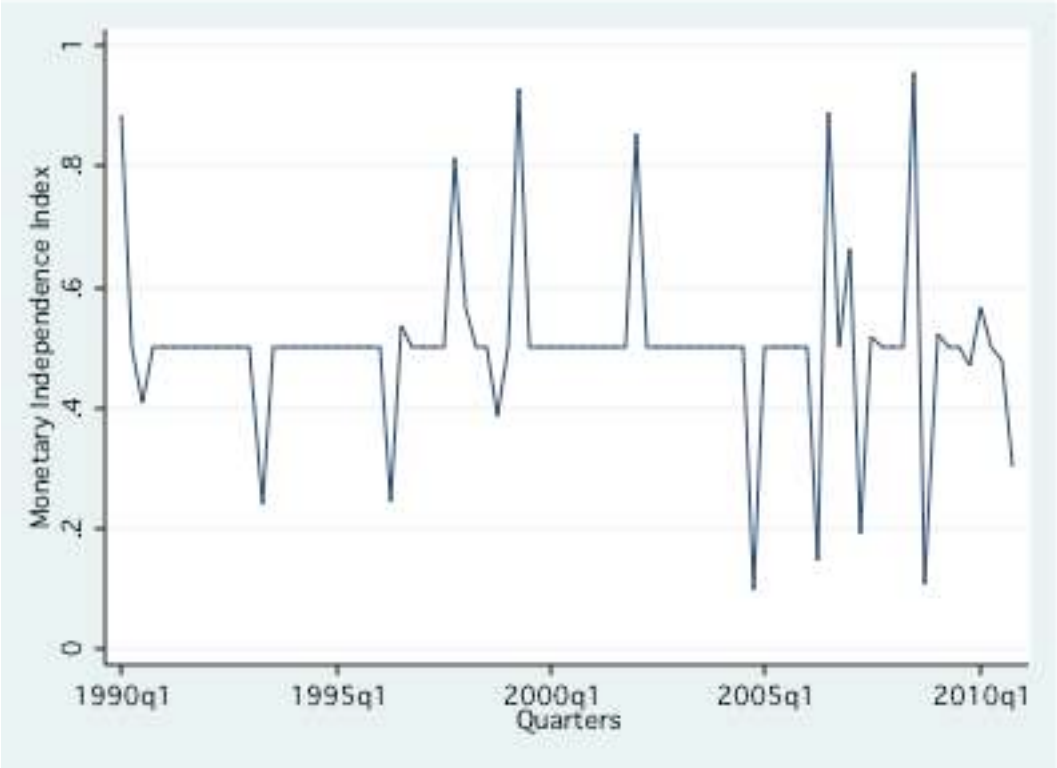


Figure 2: Monetary Independence Index in India (1990-2010)

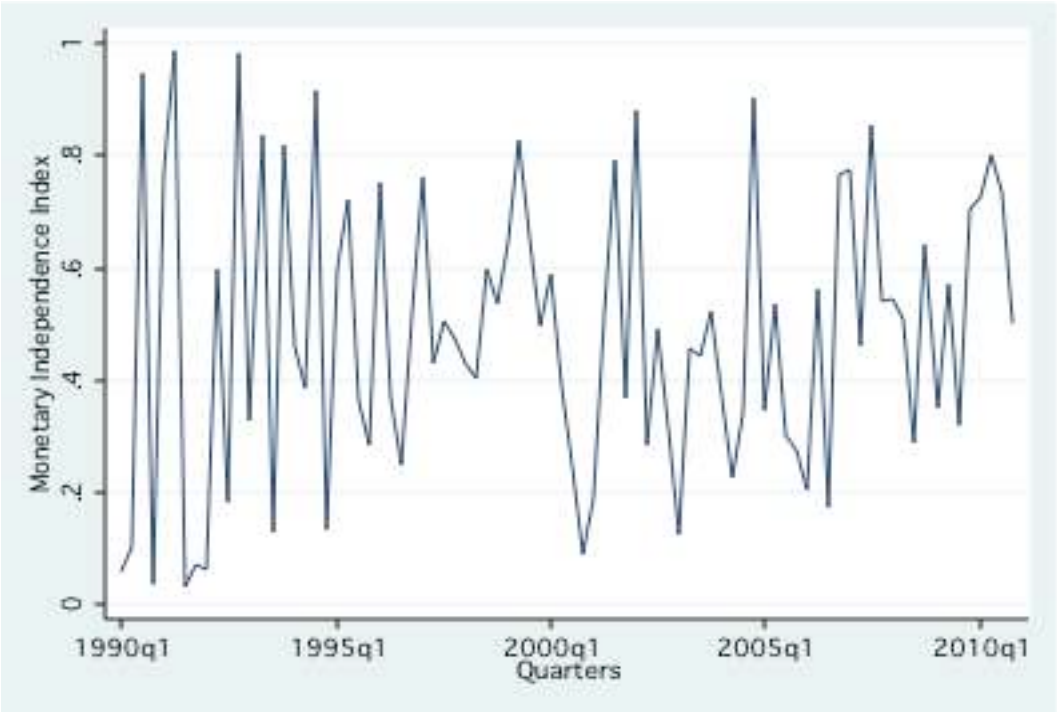


Figure 3: Exchange Rate Stability Index in China (1990-2010)

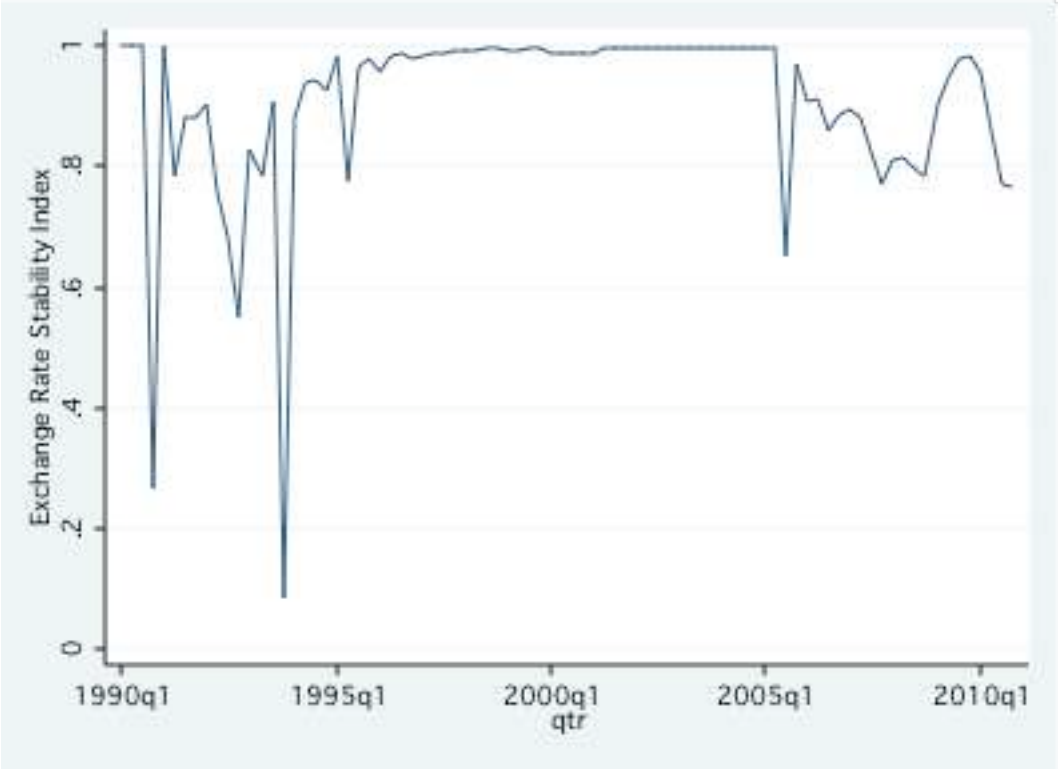


Figure 4: Exchange Rate Stability Index in India (1990-2010)

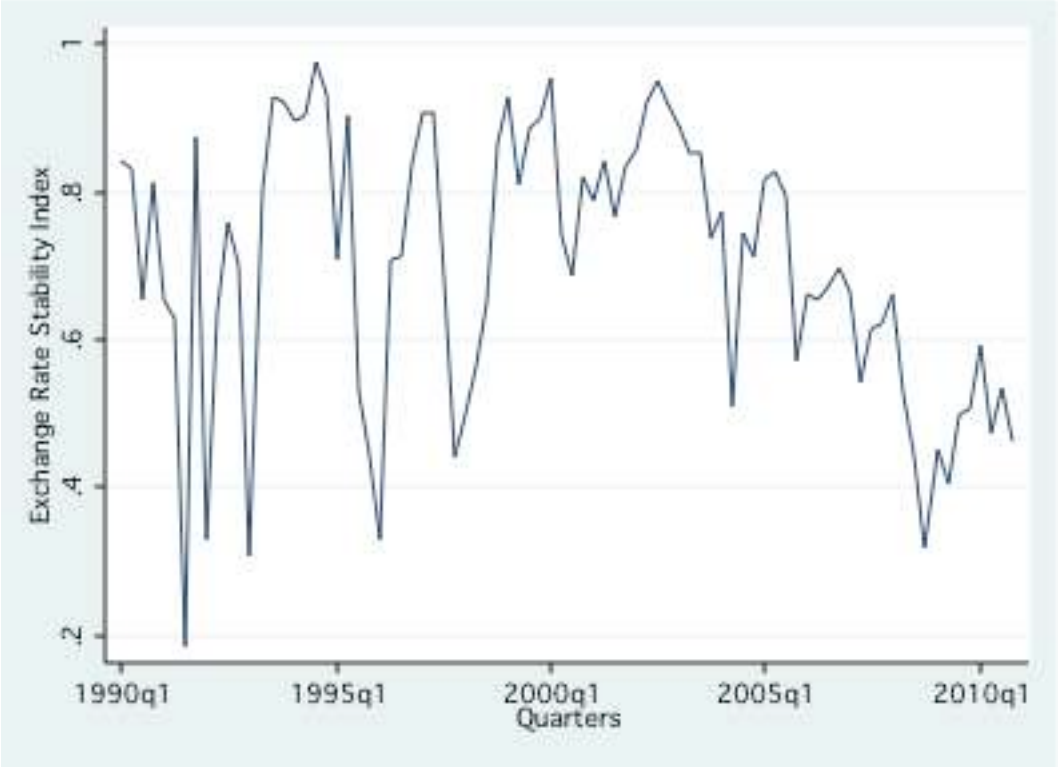


Figure 5: Capital Account Openness in China (Un-weighted: 1990-2010)

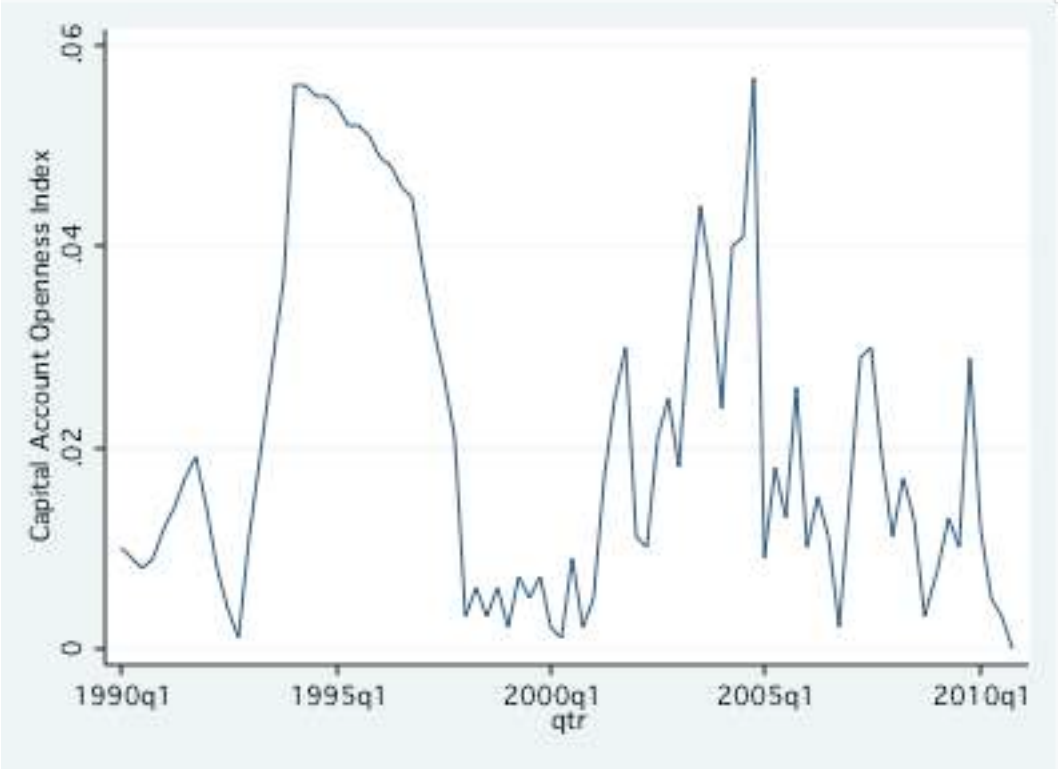


Figure 6: Capital Account Openness Index in India (Un-weighted: 1990-2010)

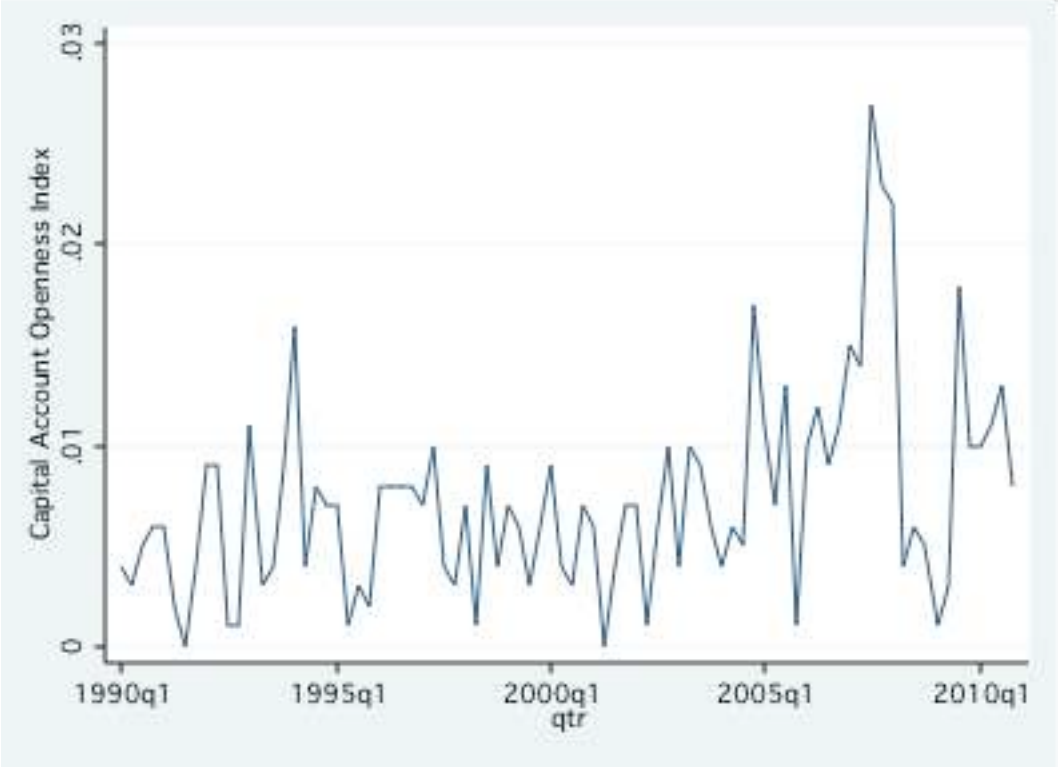


Figure 7: Capital Account Openness in China (Volatility Weighted: 1990-2010)

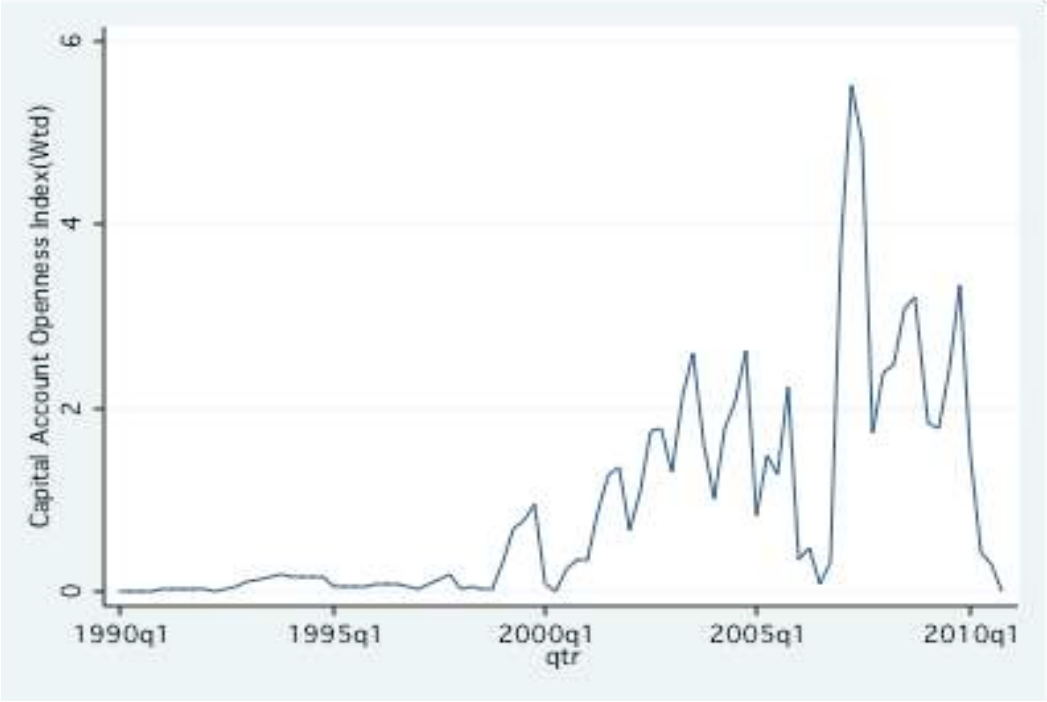


Figure 8: Capital Account Openness Index in India (Volatility Weighted: 1990-2010)

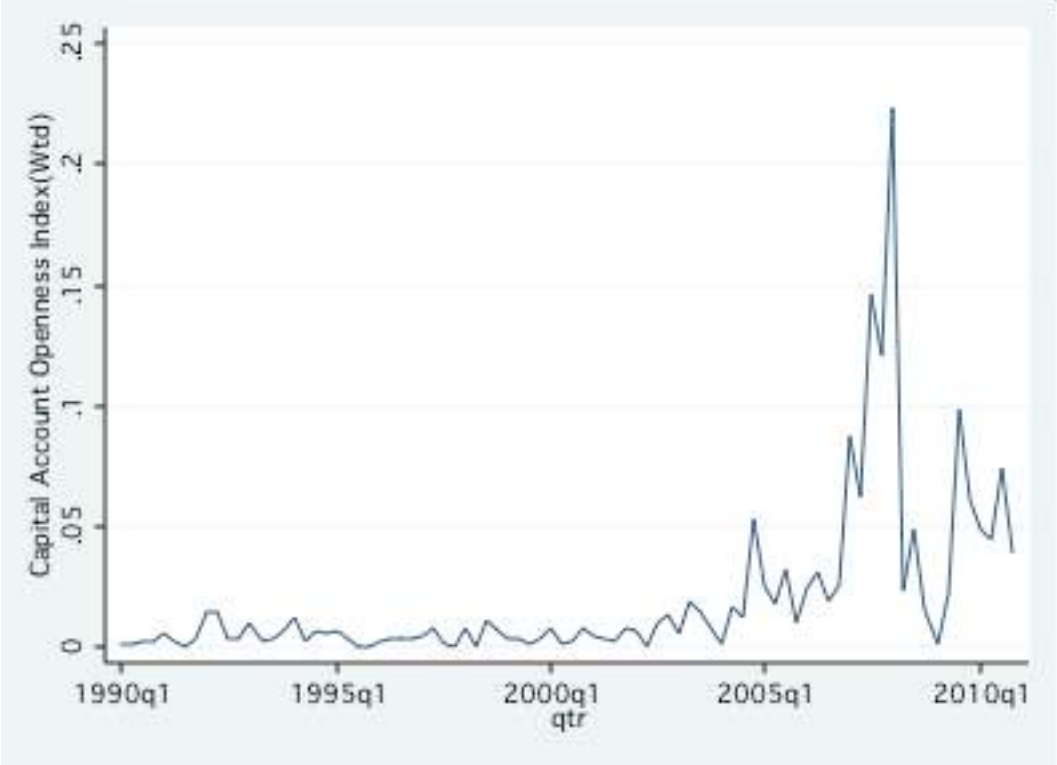


Figure 9: IR/GDP in China (1990-2010)

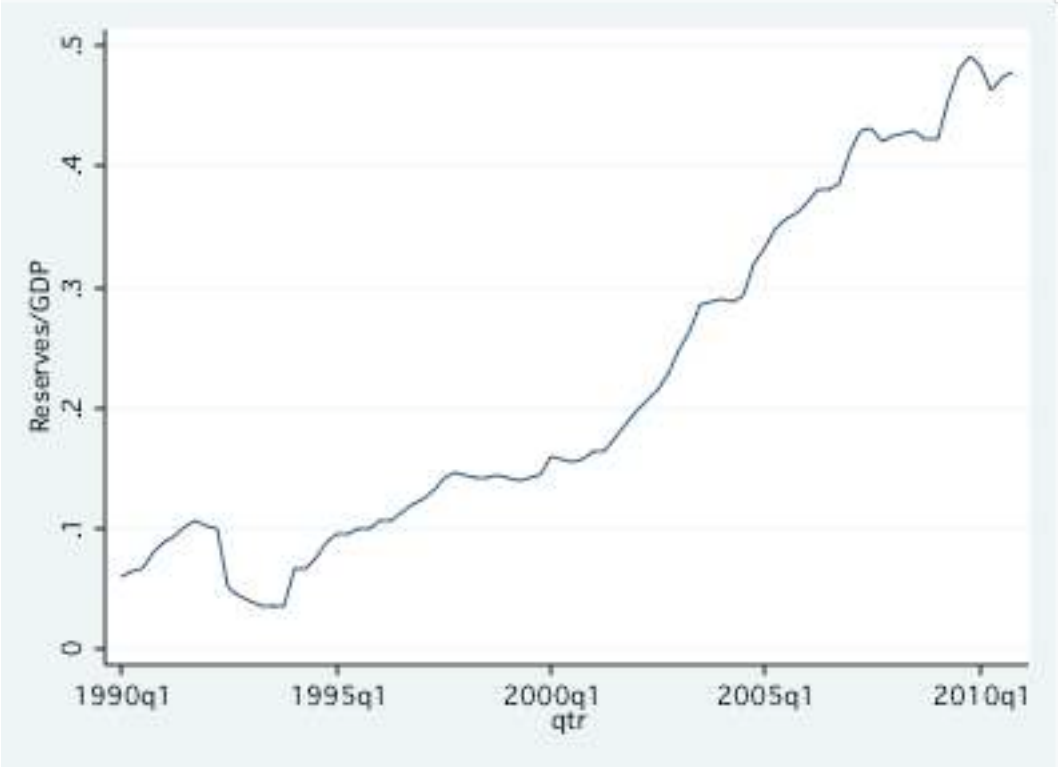
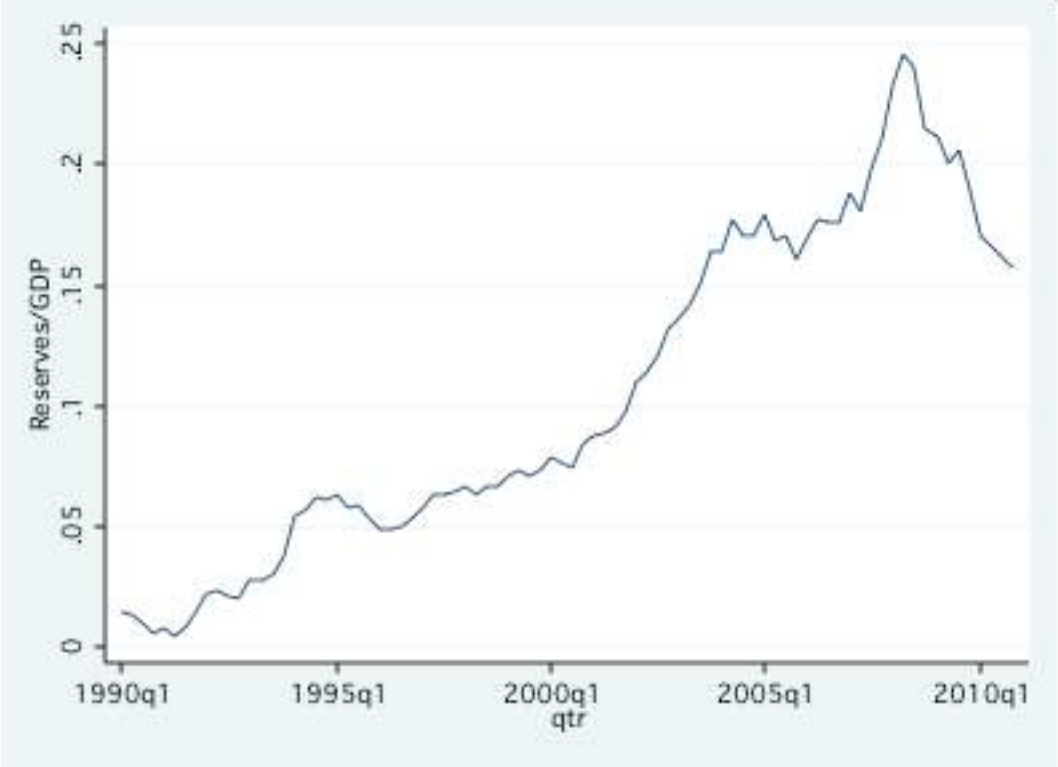


Figure 10: IR/GDP in India (1990-2010)



Charts depicting the time series evolution of some major macroeconomic indicators for China and India.

Figure 11: Bank nonperforming loans to total gross loans (%)*

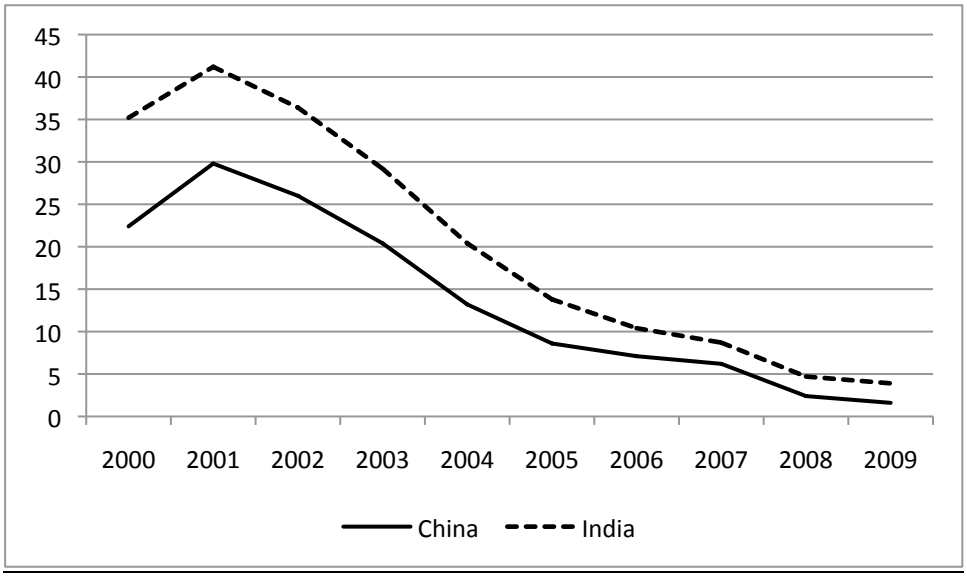


Figure 12: International Reserves/Short Term External Debt (%)*

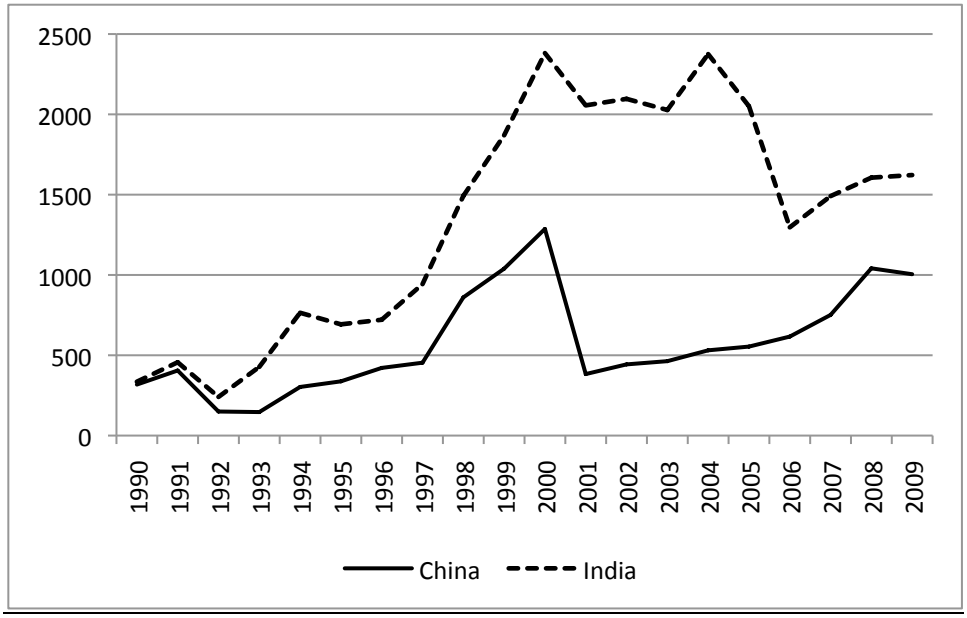


Figure 13: FDI/Gross Capital (%)*

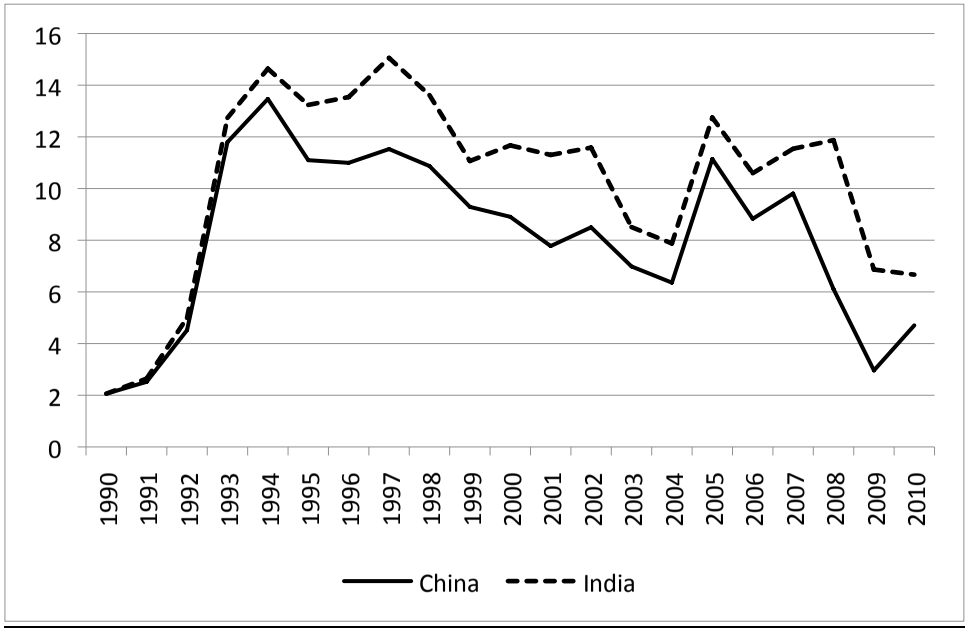


Figure 14: FDI/GDP (%)*

Figure 15: Net Portfolio Inflows (Equity)/GDP (%)*

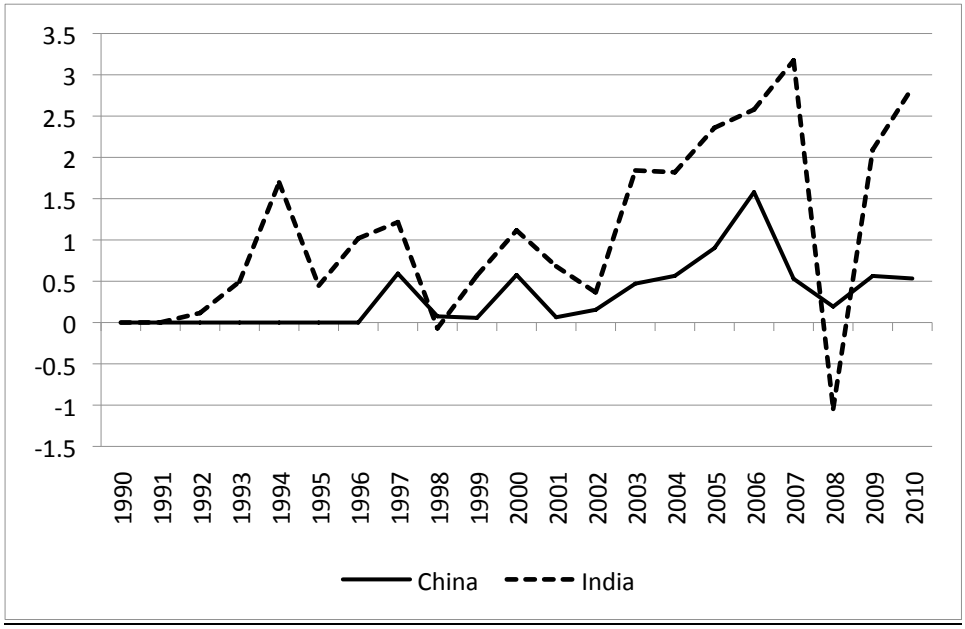
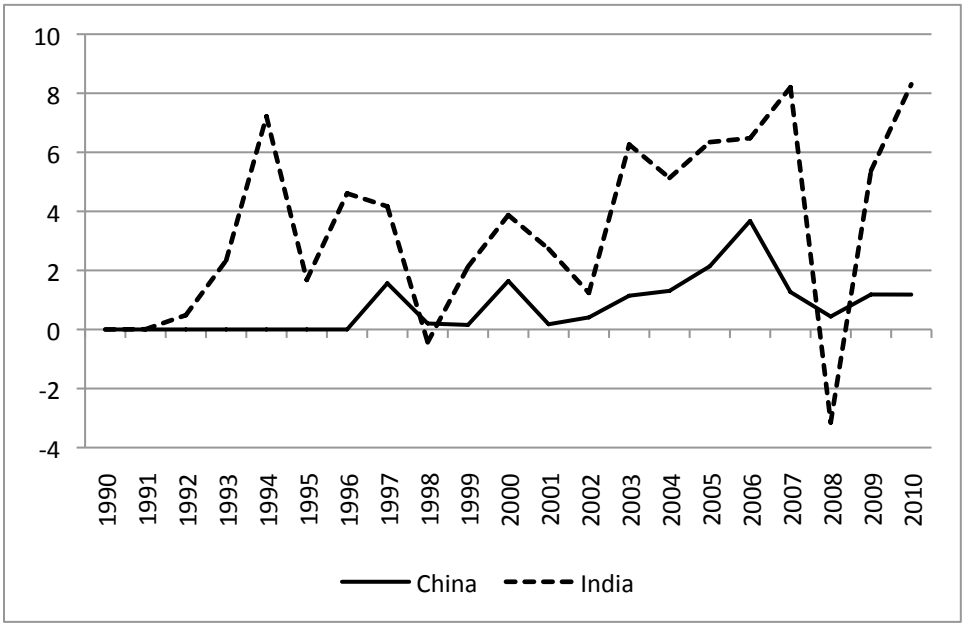


Figure 16: Net Portfolio Inflows (Equity)/Gross capital formation (%)*



* All data for Figures 11-16 are obtained from World Development Indicators (WDI) database.

Table 1: Baseline Estimations: China: 1990-2010

Variables	With no dummy vars	Adding Dummy 1 for 1993Q4-1994Q1	Adding Dummy 2 for 1997Q3-1997Q4	Adding Dummy 3 for 2005Q2-2005Q3
MI	0.960**	0.760**	0.788**	0.777**
	(0.411)	(0.335)	(0.343)	(0.345)
ES	1.560***	1.715***	1.704***	1.704***
	(0.260)	(0.197)	(0.201)	(0.202)
KO	2.757	0.259	0.346	0.381
	(2.506)	(1.537)	(1.554)	(1.563)
Dummy(1993q4-1994q1)		0.780***	0.767***	0.771***
		(0.275)	(0.276)	(0.278)
Dummy(1997q3-q4)			-0.213***	-0.207***
			(0.074)	(0.074)
Dummy(2005q2-q3)				0.200*
				(0.114)
Obs	84	84	84	84
R-squared	0.980	0.982	0.983	0.983

Newey-West Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

MI: Index of Monetary Independence; ES: Index of exchange rate stability; KO: De-facto capital account openness.

Table 2: Baseline Estimations: China: 1990-2010 (Using Weighted KO)

Variables	With no dummy vars	Adding Dummy 1 for 1993Q4-1994Q1	Adding Dummy 2 for 1997Q3-1997Q4	Adding Dummy 3 for 2005Q2-2005Q3
MI	0.950**	0.773** (0.321)	0.795**	0.783**
	(0.411)		(0.329)	(0.331)
ES	1.599***	1.682***	1.677***	1.681***
	(0.210)	(0.164)	(0.167)	(0.168)
KO	0.031	0.033*	0.031	0.029
	(0.019)	(0.020)	(0.020)	(0.021)
Dummy(1993q4-1994q1)		0.796***	0.787***	0.792***
		(0.258)	(0.260)	(0.262)
Dummy(1997q3-q4)			-0.188**	-0.184**
			(0.079)	(0.080)
Dummy(2005q2-q3)				0.182
				(0.114)
Obs	84	84	84	84
R-squared	0.980	0.983	0.983	0.984

Newey-West Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

MI: Index of Monetary Independence; ES: Index of exchange rate stability; KO: De-facto capital account openness (sum of flows weighted by respective volatilities and divided by GDP).

Table 3: Baseline Estimations: India: 1990-2010

Variables	With no dummy vars	Adding Dummy 1 for 1994Q4-1995Q1	Adding Dummy 2 for 1998Q3	Adding Dummy 3 for 2004Q1-Q2	Adding Dummy 4 for 2007Q1-Q2
MI	0.594***	0.590***	0.588***	0.601***	0.600***
	(0.175)	(0.176)	(0.178)	(0.178)	(0.181)
ES	2.043***	2.048***	2.049***	2.027***	2.029***
	(0.109)	(0.111)	(0.112)	(0.112)	(0.115)
KO	25.166***	25.179***	25.117***	25.255***	24.985***
	(8.354)	(8.429)	(8.452)	(8.445)	(9.076)
Dummy(1994q4-1995q1)		-0.072	-0.071	-0.059	-0.059
		(0.061)	(0.061)	(0.061)	(0.062)
Dummy(1998q3)			0.091	0.096	0.098
			(0.069)	(0.070)	(0.075)
Dummy(2004q1-q2)				0.391***	0.391***
				(0.113)	(0.114)
Dummy(2007q1-q2)					0.042
					(0.148)
Obs	84	84	84	84	84
R-squared	0.952	0.952	0.952	0.953	0.953

Newey-West Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

MI: Index of Monetary Independence; ES: Index of exchange rate stability; KO: De-facto capital account openness. The dummy variables are according to the different exchange rate regimes characterizing the Indian economy over the sample period from 1990 to 2010 as per Shah, Patnaik, Sethy and Balasubramaniam (2011).

Table 4: Baseline Estimations: India: 1990-2010 (Using Weighted KO)

Variables	With no dummy vars	Adding Dummy 1 for 1994Q4-1995Q1	Adding Dummy 2 for 1998Q3	Adding Dummy 3 for 2004Q1-Q2	Adding Dummy 4 for 2007Q1-Q2
MI	0.626***	0.624***	0.619***	0.633***	0.631***
	(0.174)	(0.175)	(0.178)	(0.178)	(0.180)
ES	2.186***	2.189***	2.190***	2.169***	2.170***
	(0.100)	(0.103)	(0.103)	(0.104)	(0.105)
KO	3.327**	3.321**	3.341**	3.357**	3.302*
	(1.531)	(1.542)	(1.555)	(1.556)	(1.666)
Dummy(1994q4-1995q1)		0.043	0.041	0.029	0.029
		(0.064)	(0.065)	(0.065)	(0.065)
Dummy(1998q3)			0.170**	0.176**	0.177**
			(0.072)	(0.072)	(0.074)
Dummy(2004q1-q2)				0.388***	0.388***
				(0.120)	(0.121)
Dummy(2007q1-q2)					0.055
					(0.176)
Obs	84	84	84	84	84
R-squared	0.951	0.951	0.951	0.952	0.952

Newey-West Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

MI: Index of Monetary Independence; ES: Index of exchange rate stability; KO: De-facto capital account openness (sum of flows weighted by respective volatilities and divided by GDP). The dummy variables are according to the different exchange rate regimes characterizing the Indian economy over the sample period from 1990 to 2010 as per Shah, Patnaik, Sethy and Balasubramaniam (2011).

Table 5: Inflation, Trilemma Configurations and Reserves: China

Variables	(1)	(2)	(3)	(4)	(5)	(6)
IR/GDP	-0.112	0.838***	-0.081	0.064*	-0.058	0.701***
	(0.080)	(0.271)	(0.053)	(0.035)	(0.056)	(0.234)
MI	0.019	-0.060	0.027	-0.032		
	(0.026)	(0.039)	(0.026)	(0.039)		
MI*IR/GDP		0.118		0.089		
		(0.112)		(0.133)		
ES	0.062**	0.126***			0.004	-0.011
	(0.030)	(0.042)			(0.018)	(0.023)
ES*IR/GDP		-1.184***				-0.719**
		(0.376)				(0.316)
KO			2.331***	4.256***	2.463***	4.106***
			(0.651)	(0.971)	(0.728)	(0.992)
KO*IR/GDP				-12.413***		-9.648***
				(3.441)		(3.565)
Dummy(1993q4-1994q1)	0.172***	0.166***	0.088***	0.049	0.092***	0.031
	(0.015)	(0.017)	(0.029)	(0.030)	(0.030)	(0.032)
Dummy(1997q3-q4)	-0.047**	-0.037**	-0.051***	-0.045***	-0.044***	-0.042***
	(0.021)	(0.018)	(0.015)	(0.012)	(0.013)	(0.010)
Dummy(2005q2-q3)	-0.009	-0.034	-0.009	-0.008	-0.009	-0.028
	(0.010)	(0.021)	(0.010)	(0.009)	(0.010)	(0.020)
Obs	84	84	84	84	84	84
R-Squared	0.454	0.540	0.687	0.775	0.679	0.819

Newey-West Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6: Inflation, Trilemma Configurations and Reserves: India

Variables	(1)	(2)	(3)	(4)	(5)	(6)
IR/GDP	-0.036	0.647***	0.032	0.337***	-0.032	0.594***
	(0.088)	(0.227)	(0.095)	(0.084)	(0.121)	(0.193)
MI	0.029**	0.009	0.082***	0.065***		
	(0.014)	(0.014)	(0.013)	(0.018)		
MI*IR/GDP		-0.143 (0.138)		-0.418*		
				(0.211)		
ES	0.072***	0.116***			0.084***	0.112***
	(0.018)	(0.018)			(0.016)	(0.017)
ES*IR/GDP		-1.198***				-1.198***
		(0.341)				(0.339)
KO			1.388	6.748***	0.638	1.575
			(1.672)	(2.267)	(1.137)	(1.840)
KO*IR/GDP				-36.687***		-6.048
				(11.641)		(9.186)
Dummy(1994q4-1995q1)	0.037***	0.030***	0.063***	0.038***	0.033***	0.029***
	(0.010)	(0.009)	(0.007)	(0.009)	(0.012)	(0.010)
Dummy (1998q3)	0.004	-0.000	0.002	-0.017	0.008	-0.005
	(0.007)	(0.007)	(0.010)	(0.011)	(0.008)	(0.010)
Dummy(2004q1-q2)	0.007	0.006	0.019**	-0.002	0.004	0.011
	(0.009)	(0.010)	(0.009)	(0.009)	(0.013)	(0.010)
Dummy(2007q1-q2)	0.004	0.014	-0.018	0.005	0.005	0.009
	(0.010)	(0.011)	(0.013)	(0.008)	(0.009)	(0.009)
Obs	84	84	84	84	84	84
R-squared	0.752	0.821	0.651	0.749	0.743	0.823

Newey-West Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Comparative Analysis of China and India

Table 7: Summary Snapshot of the two countries: Annual averages from 1990 to 2010 (except where noted)

Variables in %	China	India	Correlations (of each series between the two countries over the time period 1990-2010)
IR/Short-term external debt(1990-2009)	575.40	771.84	0.20
IR/GDP	22.53	10.48	0.92
FDI (net)/Gross capital formation	8.11	2.12	0.13
FDI (net)/GDP	3.28	0.61	-0.11
Portfolio Equity(net inflows)/Gross capital formation	0.79	2.69	0.29
Portfolio Equity(net inflows)/GDP	0.33	0.78	0.41
Bank nonperforming loans to total gross loans (%) (2000-2009)	13.77	6.62	0.95
Bank capital to assets ratio (%) (2000-2009)	4.86	5.94	0.94
Money and quasi money (M2) as % of GDP	117.39	52.87	0.95