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IS CAPITAL FLOW IN INDIA EXPANSIONARY OR CONTRACTIONARY?

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The standard model of open economy macroeconomics suggests that the capital inflow hurts the export of the country through the appreciation pressure. On the other hand, there is a vigorous belief that the capital inflow into the developing countries helps to mitigate the saving-investment gap, encourage the technology transfer, fuel the credit boom, liquidates the stock market and thereby finally increases the output. This paper aims to investigate whether the capital inflow in India is expansionary or contractionary. In doing so, we focus on the different typologies of capital inflow, components of GDP and the absorption capacity of the domestic economy. The empirical strategy adopted by the paper takes care of the issue of the non-linearity and also the endogeneity problem. Analysing the data from 1996 Q2 to 2019 Q4 we find that the capital flow into India could be expansionary as well as contractionary depending upon the nature of inflow and the absorption capacity. Net total capital inflow has no direct impact on growth. But it can accelerate the growth in conjunction with the higher financial depth of the economy, negative output gap, lower country risk and better stock market condition.

Keywords: Capital Flows, Economic Growth, Threshold Effect
JEL Classification: F21, F43

1. INTRODUCTION

Way back to 1991, India initiated a wide-scale reform program in the wake of a severe balance of payment crisis. The multipronged reform programme includes, inter alia, industrial sector reform, trade reform, financial reform, fiscal reform. The overriding intention of this liberalization drive was to open up the economy and thereby the global integration of Indian economy. Broadly speaking, an economy can integrate with the rest of the world through the channels of the current account and/or capital account. Current account liberalization or the trade liberalization is a well-settled matter in the realm of academic research and policymaking. There is no ambiguity in the benign effect of trade liberalization and India is not lagging behind in this front. India

has achieved full current account convertibility in 1994. In contrary to the current account liberalization, capital account liberalization has remained a heated topic of debate among the policymaker and the academicians. The complexity of the issue is well documented in the recent report of IMF (2015) 'The IMF's approach to capital account liberalization: revisiting the 2005 IEO evaluation'.

The proponents of financial liberalization are always sceptical about the expansionary effect of capital inflow[1]. Their arguments are as follows. The two-gap models highlight that developing countries usually suffers from the lack of domestic savings sufficient to finance their domestic investment. Capital inflow (or foreign savings) helps to bridge this gap and thereby induces the investment and hence, the growth. Second, the capital inflow into the developing countries can spur their growth through an increase in allocative efficiency and increased productivity due to the technology transfer, merger and acquisitions. Third, capital inflow enhances the depth of the domestic financial market, increases the liquidity and market discipline which stimulates the financial sector development. There is another line of theoretical argument that points towards the contractionary effect of capital inflow. Capital inflow puts an appreciation pressure on the domestic economy which in turn reduces the competitiveness of the exporting firms and dampens the export[2].

The empirical evidence is mixed and seemingly ambiguous. Rodrik 1998 fails to find any significant growth effect of capital inflow. Quinn (1997), Edison et al. (2002), Klein et al. (2008) tilted towards the positive growth effect. In contrary to this, Eichengreen (2001), Kose et al. (2009), Prasad et al. (2006), Nieminen (2017) have found that capital inflow is inimical to growth.

An introspective analysis of the past literature helps to identify the two fundamental aspects that determine whether capital inflow is growth-promoting or contractionary. The nature of inflows and the prevalent macroeconomic conditions of the domestic economy (or the absorption capacity of the recipient country)[3] are the two determining forces. Capital inflow consists of diverse categories of inflow, including the debt and non-debt creating flows; short term and long-term inflow, which have a different macroeconomic effect. Laureti et al. (2005), Kose et al. (2009), Choong et al. (2010), Aizenman et al. (2013) support that the growth effect of capital inflow varies among the different types of flows. Blanchard et al. (2016) has distinguished between bonds and non-bonds flow. They found that bond flows are contractionary while the non-bond flows are expansionary. Ghosh et al. (2016) has focused on the types of inflow as well as on the source of inflow[4] to distinguish between the effects of inflow. Another vain of

[1] The debate regarding the benefits of financial integration is well documented in Aizenman (2004).

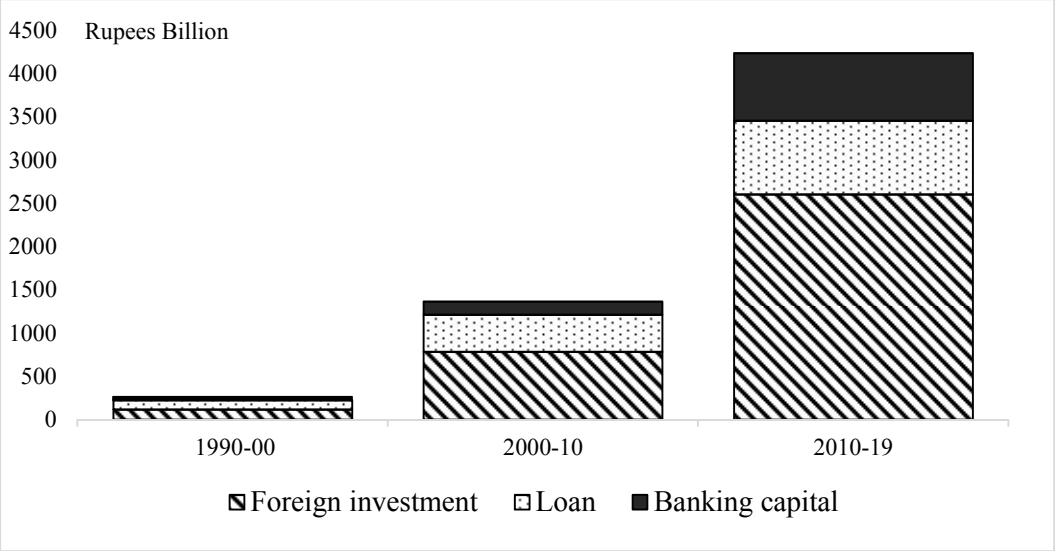
[2] Reinhart et al. 2008 has provided an encompassing view of capital flow bonanza in the developed as well as the emerging economies.

[3] Apart from these two key factors, the empirical measures of capital account openness have some influence on it.

[4] Whether the domestic agents repatriate the foreign assets or the foreign agents invest in the country.

literature claims that there is no direct and unambiguous effect of capital inflow on growth. It depends on the absorptive capacity of the domestic economy. Durham (2004), Prasad et al. (2006), Agbloyor et al. (2014), Baharumshah et al. (2015) belong to this group of literature.

At the present juncture, India's capital account is reasonably open though it does not have full capital account convertibility. Over the last two-and-a-half-decade Indian economy has witnessed a rapid transformation. Ranging from the liberalization drive to the steady growth performance and the prudent macroeconomic fundamentals, India has emerged as one of the prominent economies in the globe. A conscious attempt to capital account liberalization has successfully resulted in the influx of capital flow and there is no sign of tiredness to this trend. Increased inflow has occurred with a noticeable change in the composition of inflow. Official flows and debt flows are now dominated by private and equity flows.

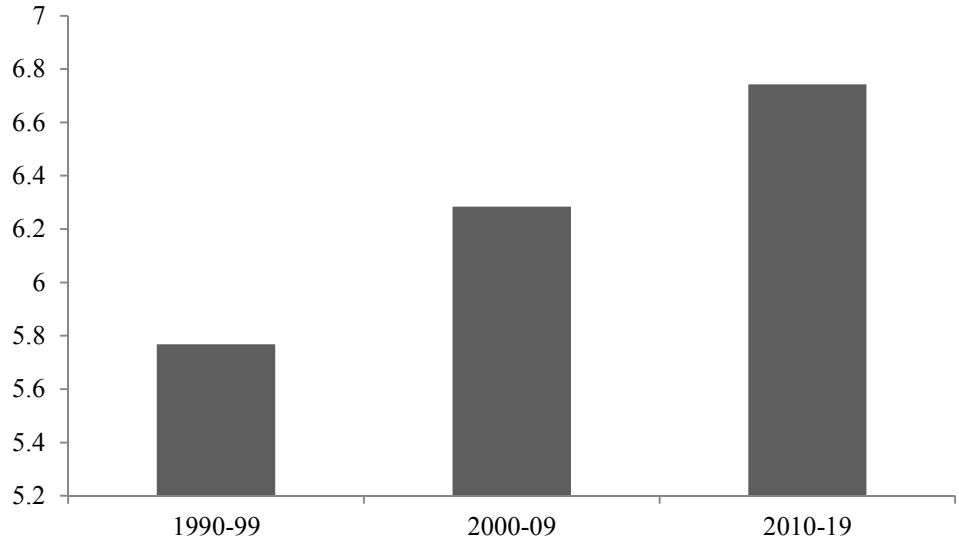


Source: RBI database

Figure 1. Annual Average Net Capital Inflow and Its Components in India

Figure 1 shows the average volume of net total capital inflow and its components over the last two and a half decades. Net total capital inflow has leaped from the 264 billion rupees in the 1990s to 1353 billion in the decade of 2000, which has further witnessed an upsurge of 3981 billion in the next decade. Figure 1 depicts that the surge in total inflow has occurred with the aggressive hike in the proportion of foreign investment. Indian economy has also done well in the growth front. Breaking from the

traditional 'Hindu growth rate', the economy was able to achieve a steady and sustained growth rate. Growing at a rate of 9% and above over the three consecutive years from 2005, the average growth rate for the present decade is settled around 6.7%. Figure 2 shows that the average annual GDP growth rate in India has gradually improved over the last three decades.



Source: World Bank

Figure 2. Average Annual Percentage Growth Rate of India's GDP at Market Prices Based on Constant Local Currency (Average Annual GDP Growth Rate (in %))

In short, over the past two decades, India has gradually attracted an increasing volume of capital inflow. Due to strong domestic macroeconomic fundamentals, a cautious and calibrated path to capital account openness, India has emerged as one of the preferred destinations among the emerging market for the global capital. On the other hand, India has also become increasingly dependent on this voluminous foreign capital to finance the current account deficit and easing the pressure on the exchange rate, stimulating the investment by complementing the domestic savings, strengthening the domestic stock market, and thereby finally stimulating the growth and employment of the economy. The crux of the problem is that if the capital flow is not managed properly, it may produce several adverse outcomes like overheating the economy. There is a dearth of literature that focuses on this problem specifically in the context of Indian economy. For instance, Laureti et al. (2005) have examined the effects of capital inflow on growth for the eleven Mediterranean Countries. Agbloyor et al. (2014) have focused

on fourteen African countries. Jawaid et al. (2017) have analysed the relationship between foreign capital inflow and economic growth in the context of Pakistan. Adams et al. (2017) has examined the nexus between capital flow and growth for the five Sub-Saharan countries.

Against this backdrop, the primary focus of this paper is to examine the effect of capital inflow on India's GDP growth in the post-liberalization era. Due to the heterogeneous nature of inflow, it is not wise to consider only the net inflow, which is an aggregative notion. Thus, to address the aforesaid agenda first we consider the capital inflow at the disaggregated level, namely, foreign direct investment (FDI); foreign portfolio investment (FPI); external commercial borrowing (ECB); short-term credit (STC); banking capital (BC) and NRI deposit[5]. Following the national income accounting identity[6], we decompose the GDP growth into consumption (C); investment (I); government spending (G); export (X) and import (M) growth. There is a possibility that supposes FDI inflow accelerates the investment growth while it dampens the consumption growth and hence, it leaves GDP growth unaffected. Moreover, to explore whether the capital inflow plays a benign or malign role in economic growth, we consider a set of macroeconomic variables including the financial depth, macroeconomic volatility, exchange rate flexibility, country risk, global financial stress, level of stock market development, RBI's (Reserve Bank of India) intervention that are sufficient to reflect the absorptive capacity of the home country. Hence, we explore the effect of net total capital inflow and its components on the growth of GDP and its components under diverse macroeconomic environment. For instance, does the FDI inflow always growth-inducing? Or the effect depends upon the absorption capacity of the home country?

This paper is especially important for the following reasons. The findings of this study are empirically more robust as we employ three different empirical strategies that take care of the issue of the non-linearity and also the endogeneity problem. Second, the paper is particularly relevant to the policymaker for designing an appropriate macroeconomic situation in the midst of rapid financial globalization which is conducive to appropriate the positive effect of capital inflow. Third, in order to analyse the growth effect of capital flow, most of the prior studies are confined to include only the FDI and non-FDI types of capital inflow with the very limited aspects of macroeconomic conditions namely the level of financial development. The present study supplements the existing literature by amalgamating the three pertinent aspects - different types of capital inflow with the different components of GDP in conjunction with the much broader

[5] Broadly speaking, the NRI fund in India can come through the two channels – remittance and deposit. Remittance is recorded in the current account while the NRI deposit is recorded in the capital account. Non-resident deposit is the major component of the foreign liabilities of commercial banks. NRI deposit is structurally different from the short-term debt as this can be withdrawn at any time.

[6] National income accounting identity says that $Y = C + I + G + X - M$. Hence, the growth in GDP should be originated from any one or more components of the right-hand side.

aspects of the macroeconomic conditions.

Rest of the paper is organized as follows. Section 2 depicts the process of capital account liberalization in India. Section 3 describes the theoretical relationship between capital flow and growth by focusing on the different channel of linkages. Section 4 discusses the data and empirical methodology. We present and discuss the empirical results in Section 5. Section 6 concludes the paper.

2. THE EXPERIENCE OF CAPITAL ACCOUNT LIBERALIZATION IN INDIA

The broad outline of the external sector reform in India was designed by the High-level Committee on Balance of Payments Chaired by Rangarajan. The committee recommendation encompasses the current account liberalization, restricting the volatile flow, a compositional shift in capital inflow in favor of non-debt creating flows, maintaining the adequate level of foreign exchange reserve among others. Soon after the initiation of the reform process, there was a sharp devaluation of the rupee in 1991 and the initiatives were taken to move from the pegged exchange rate to the market determined exchange rate. In March 1992 the Liberalized Exchange Rate Management System (LERMS) was introduced, initially with the dual exchange rate system for the interim period and finally, the unified exchange rate was put in place in March 1993. Finally, the Indian rupee was made fully convertible on current account in August 1994. This was done in compliance with Article VIII of the IMF's agreement. The Sodhani committee recommendation for the development of the foreign exchange market came in 1995. Following the Sodhani committee recommendation, RBI adopted the Basle committee norms, which included the adoption of an appropriate market intervention strategy, an extensive risk management scheme for the banks. Thereafter Tarapore committee was set up in 1997 with the objective of full capital account convertibility. Although the full current account convertibility was achieved in 1994, it was not the case for capital account. Till then the capital account convertibility was confined to the foreign direct and portfolio investors. Controls were there for the capital outflow by the domestic investors and the banks and non-banks financial flows.

Unlike others, India has adopted a slow, cautious and calibrated path to capital account openness[7]. Tarapore committee (1997, 2006) had recommended full capital account convertibility in the phased manner, only after the preconditions are achieved. The committee (2006) recommended for the period of five years over the three phases – Phase I (2006-07); Phase II (2007-09) and Phase III (2009-11). The committee recommendations were, inter alia, enhancing the ceiling for ECB, a limit for the corporate investment abroad, bank's borrowing ability from abroad; prohibiting Foreign

[7] Prasad (2009) has provided a detailed discussion on the evolution of India's capital account liberalization.

institutional investors to invest in participatory notes (PNs); non-resident corporates were permitted to invest in Indian stock markets.

Efforts to liberalize foreign investment were initiated as early in 1991. Foreign institutional investments (FIIs) have been allowed to invest in the Indian stock market since 1992, and the gilts market opened to FII investment in 1998 when they were allowed to buy and sell derivative contracts traded on a stock exchange. From 2003, FIIs could buy and sell equity shares-debentures of Indian companies, units of domestic mutual funds, and dated government securities and Treasury Bills through stock exchanges in India. Since the 1990s, the broad approach towards permitting FDI has been through two routes, that is, automatic and discretionary, with the ambit of the automatic route progressively expanding to include almost all sectors, coupled with higher sectoral caps stipulated for such investments. These sectoral caps have been revised upwards periodically. There was a large-scale revision of the existing sectoral guidelines and equity caps on FDI in 2004. The FDI limit in private banks was revised substantially under the automatic route and foreign banks were permitted to either have branches or subsidiaries. To remove the definitional ambiguity between FDI and FII, the government decided to follow the international practice and hence, in the Union Budget of 2013-14, it announced that the foreign investors with a less than 10 percent stake in a particular stock would be considered as FII and those with a greater than10 percent stake as foreign direct investors. Issuing the Masala bond in 2014 was a small step towards the target of achieving the full capital account convertibility of rupee in conjunction with the aim of internationalize and stabilize the Indian rupee. At present, there are hardly any restrictions on the FDI flow except for some selected sectors of strategic importance. FPI in equity investment is almost free from any restrictions. But that is not true for the case of FPI in debt flow. The entree to the sovereign as well as the corporate debt is still subject to some ceiling. In this context, the focus is on the maturity period to curb the intention of mere interest rate arbitrage. Restrictions on the maturity of the investment have been tighter in the aftermath of the taper tantrum at the end of 2013. Total FPI in domestic securities by Government securities and corporate bonds are limited to the amount of thirty-nine billion dollars and thirty-six billion dollars respectively. Presently the foreign currency denominated debt is entirely owned by the corporate sector. There are certain restrictions on short-term borrowings and also on the overall cost of borrowing. At present, the ceiling for ECB has been fixed at the volume of 160 billion dollars. To bring down the cost of borrowing the mandatory hedging provision has been slashed to the level of 70% for the loans with the maturity between three to five years.

3. CAPITAL FLOWS AND OUTPUT GROWTH: THEORETICAL MODEL

We consider an open economy effective demand model, to study the relation between capital flow and GDP growth. In a standard model with pure float, the exchange rate adjustment takes place to equalize the current account deficit (or surplus)

with the capital account surplus (or deficit). However, most of the countries including India follow the managed float where the Central bank makes direct or indirect intervention to prevent the exchange rate risk. Hence, we introduce the role of foreign exchange market intervention by the Central bank in our model. Moreover, we make a distinction between two types of investment. One which directly augments domestic investment, particularly of FDI type (denoted byI_{FDI}) from that of non-FDI type, including the FPI, NRI deposit. The model is represented by the following set of equations:

$$Y = C\left(Y - T, \frac{M}{Q}\right) + I_{FDI} + I\left(r, \frac{eP^*}{P}\right) + G + NX\left(\frac{eP^*}{P}, Y\right). \quad (1)$$

$$M/Q = L(Y, r). \quad (2)^8$$

$$NX\left(\frac{eP^*}{P}, Y\right) + \bar{K} + k\left(r - r^* - \frac{\dot{e}^E}{e}\right) + I_{FDI} = \delta(FEI). \quad (3)$$

Equation (1) represents the goods market equilibrium. Consumption (C) depends on both real balance ($\frac{M}{Q}$) and the disposable income ($Y - T$). Here Q is the consumer price index, which depends on the nominal exchange rate (e) and domestic price level (P). Foreign price level (P^*) is assumed to be unity i.e. $Q = Q(e, P)$; $Q_e = \frac{\partial Q}{\partial e} > 0, Q_P = \frac{\partial Q}{\partial P} > 0$

Here, $C_1 = \frac{\partial C}{\partial (Y-T)} > 0$, $C_2 = \frac{\partial C}{\partial (M/Q)} > 0$.

Investment (I) depends on the real interest rate (r) and real exchange rate. Here we assume the price level to be fixed. Thus, the nominal interest rate and the nominal exchange rate is the same as the real interest rate and real exchange rate respectively.

$I_r < 0$ and $I_e < 0$ is due to the balance sheet effect, mainly driven by the external commercial borrowing. $I = I_{FDI} + I\left(r, \frac{eP^*}{P}\right)$, I_{FDI} is a part of foreign capital inflow that directly augments to the domestic investment. The Government expenditure (G) is assumed to be fixed. NX is the net export. $NX_e > 0, NX_Y < 0$.

Equation (2) shows the money market equilibrium. Right-hand side of Equation (2) depicts the money demand. Demand for money depends on the income (Y) and interest rate (r). $L_Y > 0$, $L_r < 0$.

Equation (3) represents the balance of payment condition. We consider a part capital inflow is assumed to be autonomous and another part of inflow depends on interest rate

[8] It can be easily extended to a model with three assets – domestic money, domestic bond and foreign bond, where the domestic bond and the foreign bonds are imperfect substitute.

differential. r^* is the foreign rate of interest assumed to be fixed and $\frac{\dot{e}^E}{e}$ is the expected rate of depreciation of the home currency in terms of foreign currency. $k' > 0$. The parameter δ measures the degree of responsiveness of foreign exchange market intervention by the Central bank with respect to the net of current account and capital account surplus. FEI represents the foreign exchange intervention. For example, the purchase of foreign currency by the Central bank. δ is assumed to take the value from 0 to 1, $0 \leq \delta \leq 1$, where $\delta = 0$ represents pure float while under fixed exchange rate $\delta = 1$.

Here we are not intended to provide the explicit comparative static exercise. Rather the focus is to explore the alternative mechanism through which the capital flow can affect the GDP.

Observation 1: An increase in FDI inflow may or may not increase the domestic output. An increase in FDI inflow augments the domestic investment as well as dampens the export through the appreciation pressure. The final effect on output depends on the relative strength of the two opposing factors.

Observation 2: An increase in FPI inflow may or may not stimulate the GDP growth. An increase in FPI will lead to the appreciation of the home currency and from equation (2) there will be a rise in money supply through the rise in Q. The interest rate will decrease to restore the money market equilibrium. Finally, from Equation (1), there will be an increase in consumption and investment through the real balance effect and the decrease in interest rate, exchange rate respectively. On the other hand, an appreciation of the exchange rate will reduce the net export.

Observation 3: Both the FDI and FPI inflow can induce the domestic output but through the two different channels. FDI can stimulate the output through the channel of investment while FPI can be expansionary through the consumption.

4. DATA AND METHODOLOGY

4.1. Data

This section describes the dataset employed in this analysis. We use the quarterly time series data from 1996Q2 to 2019Q4. The detailed description of the data series is given in Table 1.

Since this study aims to examine the effect of capital inflow on growth, the focal variables are the GDP growth and the net capital inflow. Besides GDP, we also consider the consumption, government spending, investment, export and import expenditure growth. Apart from the net total capital inflow, the paper includes six different types of inflow, including the FDI, FPI, ECB, STC, BC, NRI deposit. In order to explore the effect of capital inflow on growth, we consider a set of variables which are able to capture the absorptive capacity of the home economy. The summary statistics are provided in Table 2.

Table 1. Data Description

Variable	Description	Source
GDP growth (Y)	Q-o-Q growth rate of GDP at Market Price (Constant Price), in % form	RBI
Consumption growth (C)	Q-o-Q growth rate of Private Final Consumption Expenditure at Market Price (Constant Price), in % form	RBI
Govt Spending growth (G)	Q-o-Q growth rate of Government Final Consumption Expenditure at Market Price (Constant Price), in % form	RBI
Investment growth (I)	a) Investment is calculated by adding the Gross fixed capital formation and change in stock. Both are calculated at market price (constant price). b) Investment is calculated by adding the Gross fixed capital formation, Change in stock and Valuables. Both are calculated at market price (constant price).	RBI
Export growth (X)	Q-o-Q growth rate of the export of goods and services at Market Price (Constant Price), in % form	RBI
Import growth (M)	Q-o-Q growth rate of the import of goods and services at Market Price (Constant Price), in % form	RBI
Total capital inflow (NI)	Net total capital inflow as % of GDP	RBI
Inflow of Foreign direct investment (FDI)	Net FDI inflow as % of GDP	RBI
Inflow of Foreign portfolio investment (FPI)	Net FPI inflow as % of GDP	RBI
Inflow of Commercial borrowing (ECB)	Net Commercial borrowing as % of GDP	RBI
Inflow of Short-term credit (STC)	Net Short-term credit to India as % of GDP	RBI
Inflow of Banking capital (BC)	Net Banking capital inflow as % of GDP	RBI
Inflow of Non-Resident Deposits of Commercial Banks (NRI)	Net Non-Resident deposit of commercial banks as % of GDP	RBI
Trade Openness (TO)	(Export + Import) / GDP	Calculated by author
US GDP growth rate (USG)	Q-o-Q US GDP growth rate, in % form	FRED
Population growth rate (PG)	Yearly total population data has been converted into the quarterly data to calculate Q-o-Q population growth, in % form	World Bank
Financial Depth (FD)	Bank credit to commercial sector / GDP	RBI
	Broad money (M3) / GDP	RBI

Table 1. Data Description (con't)

Variable	Description	Source
Macroeconomic Volatility (MV)	sd of WPI inflation rate	Calculated by author
	Output gap as % of GDP	Calculated by author
Exchange rate flexibility (ERF)	$ERF1 = \frac{\%\Delta e_t}{\%\Delta e_t + \%\Delta Reserve_t + \%\Delta Int\ rate_t}$	Calculated by author
	Δe_t is the absolute value of the change in INR/USD nominal exchange rate	
	$\Delta Reserve_t = Absolute(\frac{Reserve_t - Reserve_{t-1}}{Base\ money_{t-1}})$	
	$ERF2 = \frac{\%\Delta e_t}{\%\Delta e_t + \%\Delta Reserve_t}$	Calculated by author
Country Risk (CR)	Foreign currency asset / Import	Calculated by author
	Total reserve / Import	Calculated by author
Global financial condition (GFC)	Kansas City Financial Stress Index (KFSI)	FRED
Stock market development (SM)	Market capitalization / GDP	RBI
RBI intervention in foreign exchange market (RBII)	Net Purchase of Foreign currency as % of GDP	RBI

Table 2. Descriptive Statistics

	Y	C	G	I[a]	I[b]	X	M
Mean	2.04	0.01	0.05	0.16	0.16	-0.70	0.03
Median	1.47	0.002	0.05	0.03	0.03	0.13	0.02
Max	4.49	0.26	1.01	8.95	8.95	4.70	0.23
Min	-1.35	-0.09	-0.5	-0.74	-0.74	-3.38	-0.15
s.d.	8.21	0.07	0.29	1.11	1.11	4.11	0.08
n	95	95	95	95	95	95	95
	NI	FDI	FPI	ECB	STC	BC	NRI
Mean	2.54	0.89	0.68	0.33	0.23	0.40	0.35
Median	1.92	0.55	0.40	0.22	0.14	0.30	0.29
Max	8.77	3.82	4.64	2.28	1.77	3.91	5.33
Min	-1.37	-0.22	-2.52	-1.30	-1.14	-2.01	-4.12
s.d.	1.97	0.75	1.22	0.65	0.51	1.02	0.81
n	95	95	95	95	95	95	95

Notes: [a] I = (GFCF + Change in stock + valuables); [b] I = (GFCF + Change in stock).

Table 2. Descriptive Statistics (con't)

	TO	USG	PG	Bank Credit to Commercial Sector/GDP	Broad Money/ GDP	sd of WPI	Output gap as% of GDP
Mean	0.22	3.29	0.38	0.40	2.25	0.60	-0.30
Median	0.20	3.33	0.38	0.30	1.98	0.40	-0.30
Max	0.49	7.54	0.47	3.91	4.09	3.34	9.03
Min	0.07	-3.19	0.19	-2.01	0.75	0.04	-13.12
s.d.	0.15	2.11	0.09	1.02	1.03	0.52	5.61
n	95	95	95	95	95	95	95
	ERF1	ERF2	Foreign Currency Assets / Import	Total Reserve / Import	KFSI	Market capitalization / GDP	Net Purchase of Foreign Currency as % of GDP
Mean	0.14	0.39	9.50	10.31	0.11	1.99	1.06
Median	0.10	0.31	9.55	10.37	-0.22	1.97	0.54
Max	0.81	0.95	14.64	15.28	5.59	3.81	6.57
Min	0.001	0.002	5.63	6.74	-0.98	0.46	-3.11
s.d.	0.14	0.28	2.38	2.35	1.07	1.19	1.91
n	95	95	95	95	95	95	95

4.2. Methodology

This section contains a detailed discussion on the empirical strategy of the paper. The study primarily aims to explore the effect of different forms of capital flows on the growth rate of GDP and its components. In addition to this, we intend to examine whether this effect of capital flow on growth depends on the absorption capacity of the economy. Accordingly, the analysis is performed in three phases. First, we estimate the effect of different types of capital flows on the growth rate of GDP and its components using the following regression framework. We regress the GDP growth on capital flows and set of other control variables. The control variables are the trade openness, population growth rate and US GDP growth rate. The estimation is done by the OLS technique with HAC estimator to correct for the problem of heterogeneity and autocorrelation.

$$Y_t = \alpha + \beta_1 X_t + \beta_2 TO_t + \beta_3 PG_t + \beta_4 USG_t + \varepsilon_t. \quad \text{(A)}$$

Model (A) is our baseline regression model. Here, Y_t is the growth rate and X_t is the capital inflow. Model (A) is estimated separately for the different forms of capital flows as well as for the different components of GDP.

In the next step, our motive is to explore whether the effect of capital inflow on growth depends on the prevailing macroeconomic conditions. In doing so, we define the threshold relationship in terms of linear interaction between capital inflow and the

macroeconomic variable[9]. This type of model specification allows us to capture that the marginal effect of capital inflow on growth is higher (or lower) at a higher level of the threshold variable Z that is used as a proxy for the particular dimension of the macroeconomic condition. Thus, in the next step, we augment the model (A) with the variable Z and the interaction term $X_t Z_t$.

$$Y_t = \alpha + \beta_1 X_t + \beta_2 TO_t + \beta_3 PG_t + \beta_4 USG_t + \beta_5 Z_t + \beta_6 X_t Z_t + \varepsilon_t. \quad \text{(B)}$$

We estimate model (B) by OLS technique with HAC estimator. The coefficients of interest are β_1 and β_6. Two plausible econometric limitations of the model (B) are as follows: *1) Here threshold is selected exogenously and 2) The endogeneity problem.*

Accordingly, in the third phase we design our empirical strategy to mitigate the possibility of the two above mentioned econometric limitations. The interaction model like the model (B) is a linear model. In this model, there is a-priori assumption that the marginal effect of capital inflow on growth depends monotonically on the variable Z. This assumption seems to be impractical in this context. In order to overcome the first limitation, we employ the threshold regression (Hansen, 2000) that allows us to determine the threshold endogenously. The threshold model is a genre of a non-linear model. Here we apply the following threshold regression with two regions defined by the threshold variable Z and the threshold value of γ.

$$Y_t = \alpha + \beta_1 X_t + \beta_2 TO_t + \beta_3 PG_t + \beta_4 USG_t + \varepsilon_t, \quad if -\infty < Z_t \leq \gamma,$$

$$Y_t = \alpha' + \beta_1' X_t + \beta_2 TO_t + \beta_3 PG_t + \beta_4 USG_t + \varepsilon_t, \quad if\ \gamma < Z_t < \infty,$$

where Z_t is the threshold variable. Here γ is estimated endogenously by minimizing the residual sum of squares. We define the above model as the model (C). Here we assume that only the intercept and the slope coefficient associated with the capital flows differ over the two regimes. We use the AIC criteria to determine the optimal number of threshold.

The issue of endogeneity stems from the fact that the growth rate is considered to be an important pull factor behind the capital inflow (Fernandez-Arias, 1996; Stiglitz, 2000). A random shock that affects the growth rate may also affect the capital inflow and hence, we violate the exogeneity assumption. To mitigate this problem, we apply the two-stage least square (2SLS) method. The model specification is as follows.

$$X_t = \pi_0 + \pi_1 TO_t + \pi_2 PG_t + \pi_3 USG_t + \pi_4 IV_t + \varepsilon_t, \quad \text{Stage (1)}$$

$$Y_t = \alpha + \beta_1 \widehat{X_t} + \beta_2 TO_t + \beta_3 PG_t + \beta_4 USG_t + \beta_5 Z_t + \beta_6 Z_t IV_t + \varepsilon_t, \quad \text{Stage (2)}$$

[9] For the robustness of the result, we have also considered a model specification that allows for the non-linear effects of the threshold variable by including a quadratic interaction term. However, the quadratic interaction terms are found to be statistically insignificant.

The above model is named as the model (D). Model (D) is also estimated by OLS. Here IV_t is the instrumental variable and Z_t captures the dimensions of the macroeconomic condition. When X_t is an endogenous variable, Z_t is an exogenous variable and IV_t is a valid instrument, $Z_t IV_t$ will be a valid instrument for the interaction term (Balli and Sørensen, 2013). For the robustness of the result, we use two alternative instruments-lagged value of capital inflow and INR/USD nominal exchange rate. Estimation of the model (D) is followed by a set of robustness test. First, we perform Wu-Hausman test to identify whether X_t is statistically significantly endogenous or not. Moreover, we also conduct the test for the relevance of the chosen instrument. The test is done on the basis of the stage (1) estimation of the model (D). The null hypothesis is as follows.

H_0: All coefficients corresponding to the instrumental variables are simultaneously zero.

The decision rule is as follows. If $F_{calculated} > 10$, we conclude that the instrument is valid.

5. EMPIRICAL ANALYSIS

In this section, we present and discuss the estimation results[10] of our empirical analysis. The entire regression analysis is based on the stationary data[11]. First, we discuss the result of our baseline model (i.e. model (A)) and model (B). Estimation results of models A and B are presented in Table 3. Table 3 depicts the effect of net total capital inflow on GDP growth. In Table 3, the dependent variable i.e. the Y variable is the GDP growth rate. Each column shows the estimation of a separate regression model with different Z variable. We also report the robust standard error together with R^2, Adjusted R^2 and F statistic with its significance level.

The first column depicts the baseline result. It points out that the capital inflow has no significant direct impact on growth. In contrary to this, the output from the model (B) entails that the capital flow may become expansionary when it is coupled with the appropriate macroeconomic condition. It shows that the capital inflow can significantly accelerate the GDP growth rate in presence of higher financial depth of the home country or when the domestic output is below its potential level. Moreover, it shows that the capital inflow in conjunction with a higher degree of global financial stress is growth promoting. This particular finding is apparently inconsistent with the conventional literature[12].

[10] Due to the paucity of space, we have reported only the key estimation results. All other estimation results are available upon request.

[11] The results of the unit root test are provided in Table A1 in the Appendix.

[12] This apparently conflicting result from Model B is observed due to the fact that the Model B suffers from two major econometric problems. This is confirmed from the estimation result of Model C and Model D where the particular effect turns out to be statistically insignificant.

Table 3. Estimation Result of Model A and Model B for GDP Growth and Net Total Capital Inflow

	Dependent variable							
	Y	Y	Y	Y	Y	Y	Y	Y
Constant	0.09 (0.02)	0.02 (0.05)	-0.003 (0.036)	-0.04 (0.08)	-0.02 (0.04)	0.07 (0.09)	-0.02 (0.04)	-0.02 (0.06)
TO	-1.50*** (0.37)	0.32 (0.27)	-0.87*** (0.40)	-1.54*** (0.37)	-2.51*** (0.44)	-1.95*** (0.29)	-1.34*** (0.33)	-1.61*** (0.30)
PG	5.41 (6.44)	1.90 (9.81)	9.12 (7.89)	1.55 (1.13)	1.18 (1.21)	-2.41 (1.19)	8.29 (7.99)	1.03 (1.03)
USG	0.08 (0.99)	-0.87 (0.63)	-0.64 (0.69)	0.07 (0.91)	0.10 (1.15)	-1.46 (1.04)	0.35 (0.89)	-0.30 (1.04)
NI	0.006 (0.007)	0.0008 (0.002)	0.0006 (0.005)	0.003 (0.004)	0.0009 (0.005)	-0.003 (0.006)	0.002 (0.005)	0.002 (0.006)
FD		-0.015*** (0.003)						
NI×FD		0.005*** (0.0007)						
MV			0.02* (0.001)					
NI×MV			-0.0009** (0.0005)					
ERF				0.13 (0.08)				
NI×ERF				-0.02 (0.09)				
CR					-0.04*** (0.02)			
NI×CR					0.002 (0.005)			
GFC						-0.04*** (0.005)		
NI×GFC						0.02*** (0.001)		
SM							-0.02 (0.06)	
NI×SM							0.002 (0.06)	
RBII								-0.004 (0.009)
NI×RBII								0.0002 (0.004)
n	95	95	95	95	95	95	95	95
R^2	0.29	0.78	0.58	0.30	0.41	0.36	0.30	0.31
$\overline{R^2}$	0.24	0.76	0.55	0.24	0.36	0.31	0.24	0.25
F	7.92***	44.9***	18.9***	5.66***	8.49***	7.02***	5.64***	6.01***

Table 4. Estimation Result of Model A and Model B for the Components of GDP Growth and Net Total Capital Inflow

Dependent Variable	C	C	C	C	C	C	C	C
NI	0.001 (0.005)	0.003 (0.002)	0.002 (0.005)	0.008 (0.009)	0.004 (0.008_	0.0002 (0.006)	0.002 (0.007)	0.005 (0.009)
NI×FD		0.002** (0.0007)						
NI×MV			-0.002 (0.0006)					
NI×ERF				-0.04 (0.05)				
NI×CR					-0.005 (0.006)			
NI×GFC						0.002 (0.008)		
NI×SM							0.002** (0.004)	
NI×RBII								-0.002 (0.008)
n	95	95	95	95	95	95	95	95
R^2	0.11	0.35	0.17	0.14	0.24	0.12	0.14	0.13
$\overline{R^2}$	0.05	0.28	0.11	0.07	0.19	0.06	0.08	0.05
F	2.30*	6.88***	2.76**	1.84*	4.19***	1.73	1.85*	1.69
Dependent Variable	G	G	G	G	G	G	G	G
NI	-0.005 (0.012)	-0.01 (0.04)	-0.002 (0.04)	0.007 (0.017)	0.003 (0.02)	-0.002 (0.06)	0.005 (0.09)	0.004 (0.05)
NI×FD		0.008** (0.001)						
NI×MV			-0.002 (0.008)					
NI×ERF				-0.073 (0.087)				
NI×CR					-0.02 (0.07)			
NI×GFC						0.001 (0.05)		
NI×SM							-0.006 (0.08)	
NI×RBII								-0.02 (0.006)
n	95	95	95	95	95	95	95	95
R^2	0.02	0.09	0.19	0.03	0.03	0.05	0.06	0.1
	0.01	0.01	0.13	0.01	0.02	0	0.01	0.03
F	0.54	1.38	2.71**	0.55	0.49	0.49	0.55	1.39

Note: In parenthesis we report the standard error. Here *(**)[***] indicates significant at 10(5)[1]% level.

Table 4. Estimation Result of Model A and Model B for the Components of GDP Growth and Net Total Capital Inflow (con't)

Dependent Variable	I	I	I	I	I	I	I	I
NI	-0.001 (0.03)	-0.013 (0.027)	-0.007 (0.027)	-0.02 (0.08)	-0.05 (0.09)	-0.01 (0.03)	0.04 (0.06)	0.06 (0.09)
NI×FD		0.02* (0.01)						
NI×MV			-0.020** (0.009)					
NI×ERF				0.21 (0.07)				
NI×CR					0.01 (0.07)			
NI×GFC						0.03 (0.21)		
NI×SM							0.03 (0.21)	
NI×RBII								0.005 (0.005)
n	95	95	95	95	95	95	95	95
R^2	0.07	0.17	0.15	0.06	0.1	0.09	0.08	0.07
$\overline{R^2}$	0.02	0.1	0.08	0.01	0.02	0.009	0.006	0.001
F	1.33	2.56**	2.32**	0.88	1.44	1.21	1.32	0.99
Dependent Variable	X	X	X	X	X	X	X	X
NI	-0.001 (0.004)	-0.004 (0.007)	-0.001 (0.005)	0.008 (0.02)	-0.004 (0.006)	-0.008 (0.005)	0.01 (0.03)	-0.007 (0.008)
NI×FD		0.0001 (0.0007)						
NI×MV			0.0002 (0.006)					
NI×ERF				-0.02 (0.05)				
NI×CR					0.003 (0.005)			
NI×GFC						0.015*** (0.003)		
NI×SM							-0.02 (0.07)	
NI×RBII								0.001 (0.001)
n	95	95	95	95	95	95	95	95
R^2	0.03	0.1	0.14	0.05	0.02	0.08	0.06	0.03
$\overline{R^2}$	0.01	0.03	0.06	0.01	0.001	0.007	0.01	0.01
F	0.47	1.44	1.99*	0.51	0.35	1.09	0.77	0.51

Note: In parenthesis we report the standard error. Here *(**)[***] indicates significant at 10(5)[1]% level.

Table 4. Estimation Result of Model A and Model B for the Components of GDP Growth and Net Total Capital Inflow (con't)

Dependent Variable	M	M	M	M	M	M	M	M
NI	0.004 (0.003)	0.004** (0.002)	0.005 (0.003)	0.03** (0.01)	0.002 (0.003)	0.0002 (0.003)	0.007** (0.003)	0.004 (0.009)
NI×FD		0.001 (0.0004)						
NI×MV			0.0007 (0.0005)					
NI×ERF				-0.02 (0.04)				
NI×CR					0.003 (0.003)			
NI×GFC						0.008* (0.002)		
NI×SM							-0.0009 (0.005)	
NI×RBII								0.0007 (0.0008)
n	95	95	95	95	95	95	95	95
R^2	0.11	0.25	0.16	0.19	0.25	0.18	0.14	0.13
$\overline{R^2}$	0.07	0.17	0.08	0.09	0.19	0.11	0.07	0.05
F	2.57**	4.01***	2.26**	2.41**	3.77***	2.78***	2.08*	1.81

Note: In parenthesis we report the standard error. Here *(**)[***] indicates significant at 10(5)[1]% level.

Next, in the Table 4, we present the estimation results at the disaggregated level. Table 4 shows the results of the impact of capital inflow on the growth rate of the different components of GDP. Here dependent variables are the growth rate of consumption, government spending, investment, export and import respectively and the dependent variables include the net total capital inflow. Our main focus is on the coefficients of the capital inflow and the interaction term. In Table 4 we report only the coefficients of the capital inflow and the interaction term along with their t values, R^2, adjusted R^2 and F statistic. Similar to the previous result, it shows that the net total capital inflow has no significant direct effect on any of the components of GDP growth. However, capital inflow induces consumption, government spending and investment

with a higher degree of financial depth of the domestic economy. Also, it stimulates consumption growth with a developed stock market. Capital inflow crowd in domestic investment in presence of a negative output gap. In other words, foreign capital inflow stimulates investment when the actual output is below its potential level.

The effects of the different components of capital inflow on GDP growth are presented in Table 5[13]. Here the dependent variable is the GDP growth for each regression, while the explanatory variable is the FDI, FPI, ECB, STC, BC and NRI deposit respectively. Only the coefficients of capital flows and the interaction terms are reported here. We find that the inflow of FDI, STC, banking capital and NRI deposit are growth-promoting only in presence of higher financial depth of the economy and negative output gap. On the other hand, FPI and ECB have no significant influence on GDP growth. We do not arrive at the final conclusion only on the basis of the above findings as model B might be affected by some econometric disses.

Table 6 shows the estimation results of the model (C). Here GDP growth is the dependent variable and the explanatory variables include the net total capital inflow for each of the regression[14]. Similar to the result of the model (B), here we find that the net total capital inflow enhances the GDP growth in presence of a higher degree of financial depth and the negative output gap. FDI inflow augments the domestic investment and thereby spurs the output growth. This particular channel of linkage has been explored in section 3. FPI inflow in conjunction with better domestic stock market conditions leads to consumption-driven economic growth. This drives to the findings of column 6 in Table 6. The infusion of portfolio flow makes the domestic stock market bullish. Thus the value of existing stock increases and hence, the people become wealthier and consume more. This is exactly similar to the real balance effect that we have discussed at a length in the second proposition in the third section. The estimation result also points towards the fact that the FDI and FPI inflow can induce the domestic output but through the two different channels. FDI can stimulate output through the channel of investment while FPI can be expansionary through consumption. This confirms our third proposition derived from the model in the third section. Moreover, we find that the capital inflow amid of lower country risk encourages growth by boosting up the investment. This is due to the ECB only. The higher country risk will encourage the expected depreciation of the home currency and consequently, that will enhance the cost of repayment and hence that will dampen the investment through the channel of balance sheet effect. None of the other components has any significant role in this regard. In addition to these two new observations, we also find that the global financial condition has no significant influence on this capital inflow-growth nexus.

[13] We have also estimated the effect of the different types of capital inflow on the growth rate of the different components of GDP. However, the detailed results are not reported here, but available upon request.

[14] We have also estimated the effect of net total capital inflow on each component of GDP growth. Moreover, we also estimate the effect of each type of capital inflow on GDP growth and each component of GDP growth.

Table 5. Estimation Result of Model A and Model B for the GDP Growth and the Components of Capital Inflow

Dependent Variable	Y	Y	Y	Y	Y	Y	Y	Y
FDI	-0.01* (0.009)	-0.06* (0.05)	-0.06* (0.05)	-0.06* (0.05)	-0.06* (0.05)	-0.06* (0.05)	-0.06* (0.05)	-0.06* (0.05)
FDI×FD		0.02*** (0.01)						
FDI×MV			-0.01*** (0.006)					
FDI×ERF				-0.041 (0.065)				
FDI×CR					-0.01 (0.02)			
FDI×GFC						0.009 (0.010)		
FDI×SM							0.06 (0.07)	
FDI×RBII								-0.004 (0.01)
n	95	95	95	95	95	95	95	95
R^2	8.16***	0.26	0.31	8.16***	0.26	0.31	8.16***	0.26
$\overline{R^2}$	50.1***	0.73	0.80	50.1***	0.73	0.80	50.1***	0.73
F	19.9***	0.58	0.65	19.9***	0.58	0.65	19.9***	0.58
Dependent Variable	Y	Y	Y	Y	Y	Y	Y	Y
FDI	0.03 (0.004)	-0.002 (0.09)	0.005 (0.004)	0.005 (0.007)	-0.002 (0.004)	0.001 (0.004)	0.03** (0.004)	0.002 (0.004)
FDI×FD		0.0001 (0.0006)						
FDI×MV			-0.0004 (0.005)					
FDI×ERF				-0.011 (0.032)				
FDI×CR					0.003 (0.006)			
FDI×GFC						0.008* (0.002)		
FDI×SM							-0.0007 (0.01)	
FDI×RBII								0.0003 (0.005)
n	95	95	95	95	95	95	95	95
R^2	0.28	0.67	0.59	0.29	0.40	0.37	0.33	0.29
$\bar{}$	0.25	0.61	0.55	0.24	0.36	0.27	0.27	0.23
F	7.79***	25.1***	17.9***	5.35***	8.61***	6.52***	6.09***	5.26***

Note: In parenthesis we report the standard error. Here *(**)[***] indicates significant at 10(5)[1]% level.

Table 5. Estimation Result of Model A and Model B for the GDP Growth and the Components of Capital Inflow (con't)

Dependent Variable	Y	Y	Y	Y	Y	Y	Y	Y
ECB	-0.002 (0.013)	0.005 (0.009)	-0.0006 (0.009)	0.008 (0.02)	-0.0004 (0.03)	-0.004 (0.03)	-0.002 (0.014)	-0.0007 (0.016)
ECB ×FD		0.0004 (0.0009)						
ECB ×MV			-0.006 (0.001)					
ECB ×ERF				-0.07 (0.09)				
ECB ×CR					0.008 (0.02)			
ECB ×GFC						0.01 (0.02)		
ECB ×SM							0.041 (0.037)	
ECB ×RBII								0.0004 (0.006)
n	95	95	95	95	95	95	95	95
R^2	0.28	0.67	0.58	0.30	0.41	0.24	0.30	0.28
$\overline{R^2}$	0.24	0.64	0.54	0.24	0.35	0.07	0.25	0.23
F	7.70***	25.9***	17.1***	5.39***	8.61***	5.38***	5.58***	5.09***
Dependent Variable	Y	Y	Y	Y	Y	Y	Y	Y
STC	0.03 (0.07)	-0.01 (0.08)	0.007 (0.007)	0.004 (0.02)	0.01 (0.02)	0.006 (0.008)	0.012 (0.010)	0.009 (0.02)
STC ×FD		0.01*** (0.001)						
STC ×MV			-0.001** (0.001)					
STC ×ERF				0.01 (0.07)				
STC ×CR					-0.007 (0.007)			
STC ×GFC						0.04*** (0.001)		
STC ×SM							-0.041 (0.028)	
STC ×RBII								0.003 (0.007)
n	95	95	95	95	95	95	95	95
R^2	0.29	0.78	0.58	0.30	0.42	0.37	0.31	0.31
$\overline{R^2}$	0.24	0.71	0.55	0.24	0.37	0.29	0.26	0.24
F	7.94***	34.9***	17.67***	5.36***	8.77***	6.65***	5.77***	5.51***

Note: In parenthesis we report the standard error. Here *(**)[***] indicates significant at 10(5)[1]% level.

Table 5. Estimation Result of Model A and Model B for the GDP Growth and the Components of Capital Inflow (con't)

Dependent Variable	Y	Y	Y	Y	Y	Y	Y	Y
BC	-0.003 (0.005)	0.002 (0.004)	-0.003 (0.004)	-0.0006 (0.006)	0.002 (0.0006)	-0.001 (0.02)	-0.001 (0.005)	-0.006 (0.006)
BC×FD		0.002*** (0.0006)						
BC×MV			-0.0009*** (0.001)					
BC×ERF				-0.007 (0.02)				
BC×CR					-0.002 (0.005)			
BC×GFC						0.03*** (0.007)		
BC×SM							-0.029 (0.018)	
BC×RBII								0.003* (0.001)
n	95	95	95	95	95	95	95	95
R^2	0.28	0.73	0.59	0.29	0.40	0.39	0.31	0.29
$\overline{R^2}$	0.25	0.70	0.55	0.24	0.35	0.28	0.25	0.24
F	7.75***	33.4***	17.8***	5.29***	8.47***	8.72***	5.69***	5.31***
Dependent Variable	Y	Y	Y	Y	Y	Y	Y	Y
NRI	-0.008* (0.004)	0.013 (0.02)	-0.006 (0.004)	0.0003 (0.006)				
NRI×FD		0.007*** (0.0004)						
NRI×MV			-0.01** (0.002)					
NRI×ERF				-0.069 (0.048)				
NRI×CR					-0.010 (0.009)			
NRI×GFC						-0.04** 0.01		
NRI×SM							-0.002 (0.006)	
NRI×RBII								-0.0009 (0.002)
n	95	95	95	95	95	95	95	95
R^2	0.30	0.72	0.62	0.30	0.44	0.36	0.30	0.29
$\overline{R^2}$	0.25	0.68	0.55	0.25	0.35	0.28	0.24	0.24
F	7.98***	31.1***	18.6***	5.51***	8.71***	9.15***	5.49***	5.27***

Note: In parenthesis we report the standard error. Here *(**)[***] indicates significant at 10(5)[1]% level.

Table 6. Estimation of Model C for GDP Growth and Net Total Capital Inflow

Threshold Variable		Dependent variable						
		Y	Y	Y	Y	Y	Y	Y
	TO	-1.02***	-0.94***	-1.61***	-1.98***	-1.72***	-1.11***	-1.62***
		(0.11)	(0.13)	(0.26)	(0.23)	(0.22)	(0.20)	(0.22)
	PG	-2.09*	-8.01	2.61	1.26	-4.24*	3.16**	1.23
		(1.11)	(1.39)	(1.78)	(1.78)	(1.92)	(1.52)	(1.78)
	USG	0.59	-1.74***	0.34	0.22	0.51	0.71	-0.04
		(0.88)	(0.62)	(0.93)	(1.11)	(1.10)	(0.84)	(1.25)
FD	C1	0.29***						
		(0.07)						
	NI1	-0.02**						
		(0.009)						
	C2	0.08*						
		(0.03)						
	NI2	0.001						
		(0.002)						
MV	C1		0.01					
			(0.07)					
	NI1		0.006**					
			(0.005)					
	C2		0.19***					
			(0.04)					
	NI2		-0.01**					
			(0.006)					
ERF	C1			-0.16*				
				(0.08)				
	NI1			0.007				
				(0.004)				
	C2			-0.04				
				(0.09)				
	NI2			-0.004				
				(0.004)				
CR	C1				0.04			
					(0.08)			
	NI1				-0.01			
					(0.02)			
	C2				-0.04			
					(0.07)			
	NI2				0.004**			
					(0.002)			
GFC	C1					0.05		
						(0.07)		
	NI1					-0.01		
						(0.003)		
	C2					0.03		
						(0.19)		
	NI2					0.01		
						(0.03)		

Note: In parenthesis we report the standard error. Here *(**)[***] indicates significant at 10(5)[1]% level.

Table 6. Estimation of Model C for GDP Growth and Net Total Capital Inflow (con't)

Threshold Variable		Dependent variable						
		Y	Y	Y	Y	Y	Y	Y
SM	C1						-0.05	
							(0.10)	
	NI1						-0.003	
							(0.007)	
	C2						-0.16**	
							(0.09)	
	NI2						0.01***	
							(0.008)	
RBII	C1							0.004
								(0.07)
	NI1							0.008
								(0.03)
	C2							0.02
								(0.11)
	NI2							0.002
								(0.006)
n		95	95	95	95	95	95	95
AIC		-497.3	-478.9	-435.2	-437.9	-430.1	-456.9	-427.1

Note: In parenthesis we report the standard error. Here *(**)[***] indicates significant at 10(5)[1]% level.

Table 7 shows the estimation result of the model (D), where the dependent variable is GDP growth and X is the net total capital inflow[15]. Table 7 contains not only the estimated coefficients and the standard error, but also the Wu-Hausman test statistic, F statistic from the first stage regression and Wald chi-square statistic for each regression.

Table 7. Estimation of Model D (Lagged Capital Inflow is the Instrument) for GDP Growth and Net Total Capital Inflow

	Dependent variable							
	Y	Y	Y	Y	Y	Y	Y	Y
Constant	-0.25	-0.01	-0.10	-0.30*	0.40	-0.19	-0.14	-0.52
	(0.21)	(0.08)	(0.17)	(0.22)	(0.31)	(0.19)	(0.12)	(0.53)
TO	-1.68***	0.28*	-0.93***	-1.16***	-2.12***	-1.74***	-1.21***	-1.96***
	(0.30)	(0.15)	(0.16)	(0.21)	(0.51)	(0.32)	(0.30)	(0.46)
PG	5.54**	1.57	3.31	6.51**	9.01*	4.34	3.70	1.14
	(3.26)	(1.15)	(2.91)	(3.03)	(5.81)	(3.98)	(2.93)	(8.57)
USG	-0.65	-0.27	-1.02	-0.15	-0.42	-0.56	0.25	-2.50
	(1.41)	(0.76)	(1.01)	(1.31)	(1.75)	(1.19)	(1.41)	(2.62)

[15] We have also estimated the effect of net total capital inflow on each component of GDP growth. Moreover, we also estimate the effect of each type of capital inflow on GDP growth and each component of GDP growth.

Table 7. Estimation of Model D (Lagged Capital Inflow is the Instrument) for GDP Growth and Net Total Capital Inflow (con't)

	Dependent variable							
	Y	Y	Y	Y	Y	Y	Y	Y
NI	0.06*	0.007	0.01	0.04	0.04	0.02	0.02*	0.06
	(0.06)	(0.009)	(0.01)	(0.02)	(0.03)	(0.06)	(0.01)	(0.07)
FD		-0.02***						
		(0.006)						
NI×FD		0.001***						
		(0.004)						
MV			0.02***					
			(0.001)					
NI×MV			-0.001***					
			(0.0009)					
ERF				0.58*				
				(1.13)				
NI×ERF				-0.12				
				(0.09)				
CR					-0.005			
					(0.03)			
NI×CR					0.02**			
					(0.01)			
GFC						-0.003		
						(0.03)		
NI×GFC						0.003		
						(0.006)		
SM							-0.11**	
							(0.03)	
NI×SM							0.0003***	
							(0.011)	
RBII								-0.006
								(0.009)
NI×RBII								-0.006
								(0.005)
n	95	95	95	95	95	95	95	95
Wu-Hausman	3.95**	2.87	1.78	2.64*	4.78**	2.01	3.09**	3.81**
1st stage F	10.9***	10.7***	11.6***	10.18***	9.99**	4.81**	18.9***	6.45**
Wald chi2	27.2***	25.8***	99.1***	29.1***	27.1***	34.1***	35.8***	15.8***

Note: In parenthesis we report the standard error. Here *(**)[***] indicates significant at 10(5)[1]% level.

Results are similar to the model (C). Hence, it confirms the robustness of our findings. The statistically significant F values indicate the validity of our instrument. For the sake of robustness, the INR/USD nominal exchange rate has been used as another instrument. The results are depicted in Table 8. These findings are qualitatively similar to that of our previous findings.

Table 8. Estimation of Model D (Nominal INR/USD Exchange Rate is the Instrument) for GDP Growth and Net Total Capital Inflow

	Dependent variable							
	Y	Y	Y	Y	Y	Y	Y	Y
Constant	-0.11	-0.02	-0.03	-0.21**	-0.11	-0.10	-0.11	-0.13
	(0.12)	(0.10)	(0.11)	(0.11)	(0.14)	(0.29)	(0.10)	(0.15)
TO	-1.62***	0.23	-0.92***	-1.45***	-2.46***	-1.81***	-1.11***	-1.86***
	(0.26)	(0.22)	(0.20)	(0.21)	(0.43)	(0.29)	(0.27)	(0.21)
PG	3.20	1.71	1.93	4.04**	3.20	2.52	2.79	4.53
	(2.48)	(1.40)	(1.75)	(2.13)	(2.89)	(2.42)	(2.26)	(2.99)
USG	-0.38	-1.02	-0.80	-0.08	-0.06	-0.81	0.32	-1.13
	(1.31)	(0.75)	(0.96)	(1.32)	(1.16)	(1.63)	(1.30)	(1.59)
NI	0.02	0.009*	0.006	0.02*	0.01	0.01	0.015	0.04
	(0.02)	(0.007)	(0.009)	(0.02)	(0.009)	(0.009)	(0.009)	(0.15)
FD		-0.02***						
		(0.001)						
NI×FD		0.003***						
		(0.0003)						
MV			0.02**					
			(0.005)					
NI×MV			-0.002***					
			(0.008)					
ERF				0.32**				
				(0.19)				
NI×ERF				-0.06				
				(0.07)				
CR					-0.03**			
					(0.06)			
NI×CR					0.003**			
					(0.004)			
GFC						-0.009		
						(0.01)		
NI×GFC						0.007		
						(0.004)		
SM							-0.03*	
							(0.03)	
NI×SM							0.002***	
							(0.01)	
RBII								-0.005
								(0.006)
NI×RBII								-0.002
								(0.002)
n	95	95	95	95	95	95	95	95
Wu-Hausman	2.79*	2.88*	1.65	2.67*	1.98	3.77***	1.87	3.24**
1st stage F	21.1***	19.2***	18.3***	25.2***	23.1***	24.1***	26.4***	14.7***
Wald chi2	31.3***	27.7***	21.1***	34.8***	41.2***	40.3***	35.6***	31.1***

Note: In parenthesis we report the standard error. Here *(**)[***] indicates significant at 10(5)[1]% level.

Robustness of the Results

A battery of robustness tests has been applied to check the strength of the result.[16] First, the estimation results do not suffer from the autocorrelation and the heteroscedasticity problem. We perform the Ljung-Box test and the White test for autocorrelation and heteroscedasticity respectively. Second, the Jarque-Bera and the Doornik-Hansen test for multivariate normal test ratify the absence of non-normality. Third, Seasonal dummies were included in the model. However, none of them turns out to be statistically significant. Fourth, statistically speaking, over the entire sample period, the global financial crisis (GFC) can act either as a structural break or outlier. Accordingly, we have considered the role of GFC in our analysis. We have introduced the GFC dummy in all four model specifications (Model A, B, C and D). The estimation results of the effect of net total capital flow on GDP growth with GFC dummy variable in all four model specifications are provided in Table A2 in the Appendix. We have performed the similar exercise with the various forms of capital flows and the different components of the GDP. However, these results obtained from the disaggregated analysis are not explicitly reported here but available upon request. We define the GFC dummy as $D_i = 1$ for the period before 2008 and zero otherwise. Also, to check the robustness of the results related to the GFC, instead of introducing the GFC dummy, we have estimated all the models after omitting the crisis year 2008 and we compare it with the full sample results. Results are qualitatively similar. GFC factor turns out to be statistically insignificant across all the case. Fifth, to check the sensitivity of the results with respect to the Asia financial crisis, we have estimated all the models after omitting the crisis year 1997 and 1998 and we compare it with the full sample results. Results are qualitatively similar. We fail to find any significant impact of Asian crisis on the growth-capital flows nexus.

6. CONCLUSION

The paper aims to explore the effect of capital inflow on the growth rate of India in the post-liberalization era. In doing so, it emphasizes the absorption capacity of the domestic economy and also considers the different typologies of capital inflow due to their heterogeneous nature. Moreover, we decompose the GDP growth into consumption, government spending, investment, export and import and scrutinise the impact of capital inflow on each of these components. Our conclusion is extracted from the robust and rigorous econometric analysis which is able to capture the endogenously determined threshold effect and also free from the endogeneity problem.

[16] The results are not reported due to the brevity of the paper but available upon making a formal request to the authors.

At a broader level, this paper finds that the capital flow in India could be expansionary or contractionary depending upon the nature of inflow and the prevailing macroeconomic environment in general and the absorption capacity in particular. An attempt to explore the direct effect of capital inflow on growth, snubbing the absorption capacity leads to the omitted variable bias and we hardly find any significant results in these cases. Conversely, we find that the net total capital inflow accelerates the growth in conjunction with the higher financial depth of the domestic economy, negative output gap, lower country risk and better stock market condition. However, this result at the aggregative level does not unfold the entire working of the process. Disaggregated analysis delineates that the different typologies of capital flow induce the growth through the different channels and components of GDP and also requires different macroeconomic conditions. FDI inflow coupled with the higher financial depth or negative output gap fosters the GDP growth by boosting up the domestic investment while FPI leads to consumption-driven growth in conjunction with the better stock market performance. ECB complements domestic investment when country risk is at a low level. On the other hand, STC inflow bundled with the significantly deep financial market is conducive to export growth.

Hence, managing capital mobility and extracting the expansionary effect of capital inflow requires selective and targeted policies. Moreover, the proper working of the policy also depends on the prevailing macroeconomic conditions and hence, needs to be evaluated at a regular interval. Due to the limited availability of Indian data on institutional quality, political stability, and regulatory changes at a regular interval, we are unable to include these pertinent dimensions into our empirical analysis.

APPENDIX

Table A1. Results of Unit Root Test

Variable	ADF	PP	Decision
Q-o-Q growth rate of GDP at Market Price (Constant Price), in % form (Y)	-5.92***	-14.9***	I(0)
Q-o-Q growth rate of Private Final Consumption Expenditure at Market Price (Constant Price), in % form (C)	-28.2***	-31.5***	I(0)
Q-o-Q growth rate of Government Final Consumption Expenditure at Market Price (Constant Price), in % form (G)	-18.0***	-18.4***	I(0)
Investment is calculated by adding the Gross fixed capital formation and change in stock. Both are calculated at market price (constant price). (I)	-10.7***	-10.6***	I(0)
Investment is calculated by adding the Gross fixed capital formation, Change in stock and Valuables. Both are calculated at market price (constant price). (I)	-10.7***	-10.5***	I(0)

Table A1. Results of Unit Root Test (con't)

Variable	ADF	PP	Decision
Investment is calculated by adding the Gross fixed capital formation, Change in stock and Valuables. Both are calculated at market price (constant price). (I)	-10.7***	-10.5***	I(0)
Q-o-Q growth rate of the export of goods and services at Market Price (Constant Price), in % form (X)	-8.02***	-14.2***	I(0)
Q-o-Q growth rate of the import of goods and services at Market Price (Constant Price), in % form (M)	-8.84***	-8.88***	I(0)
Net total capital inflow as % of GDP (NI)	-5.11***	-5.12***	I(0)
Net FDI inflow as % of GDP (FDI)	-3.98***	-4.22***	I(0)
Net FPI inflow as % of GDP (FPI)	-5.74***	-5.79***	I(0)
Net Commercial borrowing as % of GDP (ECB)	-6.38***	-6.62***	I(0)
Net Short-term credit to India as % of GDP (STC)	-4.78***	-5.74***	I(0)
Net Banking capital inflow as % of GDP (BC)	-8.70***	-8.73***	I(0)
Net Non-Resident deposit of commercial banks as % of GDP (NRI)	-4.01***	-4.12***	I(0)
Q-o-Q US GDP growth rate, in % form (USG)	-4.88***	-5.01***	I(0)
sd of WPI inflation rate	-7.87***	-8.15***	I(0)
Output gap as % of GDP	-3.92***	-12.3***	I(0)
ERF1	-6.67***	-6.69***	I(0)
ERF2	-7.22***	-7.32***	I(0)
Kansas City Financial Stress Index	-3.81***	-5.80***	I(0)
Net Purchase of Foreign currency as % of GDP	-5.89***	-6.13***	I(0)

Variable	ADF		PP		Decision
(Export+Import)/GDP (TO)	Level	1.98	Level	1.99	I(1)
	First difference	-4.57***	First difference	-8.77***	
Yearly total population data has been converted into the quarterly data to calculate Q-o-Q population growth, in % form (PG)	Level	-0.60	Level	-1.22	I(1)
	First difference	-3.90***	First difference	-5.22***	
Bank credit to commercial sector/GDP	Level	-2.10	Level	-2.16	I(1)
	First difference	-4.10***	First difference	-9.78***	
Broad money (M3)/GDP	Level	-1.45	Level	-2.52*	I(1)
	First difference	-6.51***	First difference	-11.7***	
Foreign currency asset / Import	Level	-1.26	Level	-1.98	I(1)
	First difference	-9.27***	First difference	-9.32***	
Total reserve / Import	Level	-1.01	Level	-1.51	I(1)
	First difference	-9.46***	First difference	-9.63***	
Market capitalization / GDP	Level	-0.99	Level	-1.88	I(1)
	First difference	-7.84***	First difference	-8.02***	

Notes: Here *(**)[***] indicates significant at 10(5)[1]% level. I(0) represents integrated of order zero i.e. stationary process. I(1) indicates that integrated of order one.

Table A2. Estimation Results of the Effect of Net Total Capital Flow on GDP Growth with GFC Dummy

Estimation result of Model A and Model B								
	Dependent variable							
	Y	Y	Y	Y	Y	Y	Y	Y
Constant	1.01**	0.98*	-0.96**	-1.03***	-0.98*	1.15***	-0.85**	-1.06**
	(0.02)	(0.05)	(0.001)	(0.10)	(0.04)	(0.07)	(0.009)	(0.11)
TO	-1.56***	0.30	-1.01***	-1.65***	-2.48***	-1.98***	-1.48***	-1.68***
	(0.37)	(0.56)	(0.46)	(0.34)	(0.42)	(0.29)	(0.39)	(0.32)
PG	5.22	1.46	7.36	1.55	1.21	-2.40	5.01	2.98
	(6.44)	(5.78)	(8.81)	(1.22)	(1.79)	(1.98)	(7.26)	(5.03)
USG	0.08	-0.65	-0.60	0.09	0.11	-1.35	0.41	-0.31
	(1.32)	(1.22)	(0.88)	(1.91)	(2.12)	(1.35)	(1.02)	(1.04)
D_i	0.63	0.96	0.88	0.76				
	(2.36)	(3.12)	(3.35)	(3.48)				
NI	0.004	0.0008	0.0004	0.006	0.0009	-0.004	0.002	0.003
	(0.007)	(0.009)	(0.005)	(0.07)	(0.05)	(0.08)	(0.008)	(0.006)
FD		-0.12***						
		(0.003)						
NI×FD		0.005***						
		(0.0007)						
MV			0.02*					
			(0.001)					
NI×MV			-0.0009**					
			(0.0004)					
ERF				0.11				
				(0.16)				
NI×ERF				-0.02				
				(0.11)				
CR					-0.09***			
					(0.03)			
NI×CR					0.004			
					(0.09)			
GFC						-0.08***		
						(0.004)		
NI×GFC						0.40***		
						(0.001)		
SM							-0.007	
							(0.08)	
NI×SM							0.002	
							(0.09)	
RBII								-0.002
								(0.02)
NI×RBII								0.001
								(0.008)
n	95	95	95	95	95	95	95	95
R^2	0.30	0.79	0.60	0.33	0.44	0.37	0.33	0.35
$\overline{R^2}$	0.22	0.74	0.53	0.21	0.32	0.28	0.22	0.22
F	8.21***	45.6***	19.2***	5.98***	8.89***	7.62***	5.98***	6.21***

Table A2. Estimation Results of the Effect of Net Total Capital Flow on GDP Growth with GFC Dummy (con't)

Estimation result of Model C

Threshold Variable		Dependent variable						
		Y	Y	Y	Y	Y	Y	Y
	TO	-1.09***	-1.04***	-1.85***	-2.01***	-1.81***	-1.22***	-1.59***
		(0.12)	(0.12)	(0.55)	(0.30)	(0.26)	(0.29)	(0.29)
	PG	-2.12*	-5.23	2.02	1.11	-4.11*	3.05***	1.10
		(1.19)	(1.88)	(2.14)	(1.92)	(2.12)	(1.64)	(2.12)
	USG	0.44	-1.89***	0.26	0.23	0.55	0.79	-0.06
		(1.22)	(0.61)	(1.08)	(1.78)	(1.36)	(0.88)	(1.29)
	D_i	1.16	1.01	1.13	0.98	1.02	1.12	0.92
		(6.53)	(5.65)	(6.45)	(4.96)	(5.12)	(6.89)	(4.87)
FD	C1	0.39***						
		(0.06)						
	NI1	-0.04**						
		(0.009)						
	C2	0.07*						
		(0.02)						
	NI2	0.001						
		(0.08)						
MV	C1		0.06					
			(0.07)					
	NI1		0.05**					
			(0.04)					
	C2		0.56***					
			(0.06)					
	NI2		-0.01**					
			(0.007)					
ERF	C1			-0.14*				
				(0.05)				
	NI1			0.009				
				(0.02)				
	C2			-0.04				
				(0.09)				
	NI2			-0.004				
				(0.02)				
CR	C1				0.05			
					(0.28)			
	NI1				-0.009			
					(0.08)			
	C2				-0.05			
					(0.09)			
	NI2				0.004**			
					(0.003)			

Table A2. Estimation Results of the Effect of Net Total Capital Flow on GDP Growth with GFC Dummy (con't)

Estimation result of Model C

Threshold Variable		Dependent variable						
		Y	Y	Y	Y	Y	Y	Y
GFC	C1					0.07 (0.09)		GFC
	NI1					-0.002 (0.008)		
	C2					0.03 (0.31)		
	NI2					0.02 (0.08)		
SM	C1						-0.07 (0.26)	
	NI1						-0.004 (0.02)	
	C2						-0.26** (0.10)	
	NI2						0.03*** (0.006)	
RBII	C1							0.006 (0.09)
	NI1							0.02 (0.12)
	C2							0.04 (0.32)
	NI2							0.001 (0.008)
n		95	95	95	95	95	95	95
AIC		-499.2	-483.1	-439.2	-440.3	-436.7	-459.1	-429.2

Estimation result of Model D

	Dependent variable							
	Y	Y	Y	Y	Y	Y	Y	Y
Constant	-0.55 (1.23)	-0.26 (0.99)	-0.16 (1.16)	-0.32* (0.24)	1.23* (0.13)	-0.88 (0.46)	-1.16* (0.19)	-0.50 (1.12)
TO	-1.69*** (0.23)	0.33* (0.85)	-0.99*** (0.11)	-1.39*** (0.25)	-2.26*** (0.46)	-1.70*** (0.29)	-1.25*** (0.42)	-1.98*** (0.38)
PG	5.21*** (2.60)	1.26 (1.87)	2.26 (3.06)	6.13*** (2.87)	7.03** (3.12)	4.01* (5.18)	3.01 (3.30)	1.10 (6.70)
USG	-0.52 (1.98)	-0.26 (0.86)	-0.95 (1.26)	-0.16 (1.39)	-0.40 (1.98)	-0.56 (1.56)	0.22 (1.78)	-2.01 (2.87)
NI	0.06* (0.07)	0.007 (0.02)	0.008 (0.03)	0.05 (0.16)	0.01 (0.09)	0.03 (0.09)	0.08* (0.02)	0.05 (0.67)

Table A2. Estimation Results of the Effect of Net Total Capital Flow on GDP Growth with GFC Dummy (con't)

Estimation result of Model D								
	Dependent variable							
	Y	Y	Y	Y	Y	Y	Y	Y
D_i	0.22 (3.33)	0.31 (4.12)	0.26 (4.69)	0.56 (5.13)	0.31 (5.65)	0.16 (3.16)	0.44 (6.12)	0.13 (5.10)
FD		-0.06*** (0.002)						
NI×FD		0.03*** (0.007)						
MV			0.04*** (0.001)					
NI×MV			-0.01*** (0.005)					
ERF				0.41 (2.03)				
NI×ERF				-0.16 (0.87)				
CR					-0.002 (0.09)			
NI×CR					0.06** (0.01)			
GFC						-0.002 (0.08)		
NI×GFC						0.003 (0.007)		
SM							-0.15** (0.04)	
NI×SM							0.008*** (0.04)	
RBII								-0.002 (0.01)
NI×RBII								-0.002 (0.008)
n	95	95	95	95	95	95	95	95

Notes: Here *(**)[***] indicates significant at 10(5)[1]% level. I(0) represents integrated of order zero i.e. stationary process. I(1) indicates that integrated of order one. Here D_i is the GFC dummy variable.

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