Stock Market Openness and U.S. Portfolio Inflows: A Case Study of India

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Abstract: In this paper, we examine the link between stock market openness and U.S. portfolio inflows in the emerging market economy of India. Using monthly data for companies that are listed on the Indian stock exchange, we first construct share-weighted openness indices at the aggregate and sector levels. We employ an older data set for the period from December 1992 to November 2004 for which data is available. We perform a regression analysis and find that aggregate openness is not a key determinant of inflows. Instead, stock market behavior is. However, we identify one sector – utilities sector – for which openness has had a significant impact on U.S. portfolio inflows even after controlling for stock returns and interest rate differentials.

Keywords: Stock market openness; Aggregate and Sector indices; Portfolio inflows; Stock returns; Emerging market economies

JEL Classification: G14; G15

1. Introduction

Does stock market openness attract foreign capital inflows? It may or may not. Having a stock market that legally allows foreign investors to purchase and trade shares of domestic companies with few or no restrictions does not necessarily mean that foreign capital will flow in. Many factors including transparent markets that follow internationally accepted accounting standards and investor protection laws, and macroeconomic stability that includes economic, financial, and political stability are essential to attract foreign capital. If not, foreign investors searching for diversification benefits will be deterred even if liberalization policies have been widely implemented.

In this paper, we study the link between stock market openness and U.S. portfolio inflows in the emerging market economy of India. The Indian stock

market has been considered generally open since November 1992 when Foreign Investment Institutions (FIIs) were permitted to invest in primary and secondary markets with some restrictions.[1] Also in the early 1990s, India undertook many liberalization policies in the external financial sector that encouraged foreign capital flows. As Figure 1 illustrates, the cumulative U.S. portfolio inflows to India have in fact increased substantially in the first decade since market opening. The main research question that we ask is whether increased openness at the aggregate and sector levels has led to increased U.S. portfolio inflows in India. Our results will therefore shed light on whether U.S. investors have in fact responded to stock openness policies in India and whether some sectors were especially successful in attracting U.S. capital as they became more open to foreign investors within the first decade of market opening.

Much empirical work has been done on the effects of stock market liberalization policies in emerging market economies. See Beine and Candelon (2011), Bekaert and Harvey (1997, 2000), Bekaert et al. (2004, 2005), Ben Rejeb and Boughrara (2013), Chari and Henry (2001), Collins and Abrahamson (2006), Eizaguirre et al. (2009), Henry (2000a, b), Jayasuriya (2005), Kim and Singal (1993, 2000), Kim et al. (2005), Levine and Zervos (1998), Naghavi and Lau (2016), and Stulz (1999) for a select few. In existing work, determining stock market opening dates has been one of careful exercise based on policy decrees and the establishment of country funds and/or American Depository Receipts (ADRs). Some of the previous work also look for prominent structural breaks in the U.S. portfolio inflows series to determine proxies for market opening dates. It is therefore inherent in existing literature that there is a link between openness and foreign capital inflows in a given market.[2] However, to our knowledge, there is no study that specifically tests whether stock market openness in fact attracts foreign capital inflows and whether certain sectors attract more foreign capital than others.

Our analysis is based on an older data set for which monthly data is available both at the aggregate and sector levels from December 1992 to November 2004. Our objective is twofold. First, we construct stock market openness indices for the aggregate market as well as ten different sectors. The ten individual sectors are consumer discretionary, consumer staples, energy, financials, health care, industrials, information technology, materials, telecommunication services, and utilities. We construct the openness indices using stock investibility data at the individual stock level. Stock investibility indicates the openness of a given stock.[3] For example, an

investible weight of 10 percent for stock X indicates that 10 percent of stock X shares outstanding is available to foreign investors. The openness indices that we construct indicate not only how open, on average, the Indian stock market is but also which sectors are the most accessible to foreign investors.

Second, we estimate a least squares regression in which the dependent variable is the U.S. portfolio inflows and the key independent variable is the relevant stock openness index. A significant positive coefficient estimate on the stock openness index would imply that openness did attract U.S. portfolio inflows after controlling for other factors. The other factors that we add to the estimation model, which could help explain the inflow of foreign capital, include stock returns, the interest rate differential between the U.S. and India, industrial production, and a political stability index. Our results indicate that, at the aggregate level, openness is not a key determinant of U.S. portfolio inflows to India. Instead, the stock market returns is the main determinant. However, we do find that U.S. portfolio inflows to India are significantly correlated with the degree of openness in the utilities sector.

The remainder of the paper is as follows. Section 2 discusses some empirical work that has been done on portfolio flows to the emerging economy of India. Section 3 presents the estimation methodology. Section 4 discusses the data and some preliminary statistics. Section 5 documents the results. Finally, section 6 concludes.

2. Literature Review

In the early 1990s, India implemented policies that encouraged foreign portfolio flows to the country and undertook many liberalization policies in the external financial sector that could reap the benefits of increasing global financial integration. According to Prased and Habib (2004), the financial openness and integration status of India was far greater by the end of the 1990s compared to the beginning of the decade and it did attract a substantial amount of foreign capital since the mid 1990s. However, India remained relatively less open and integrated compared to other emerging economies in the East/Southeast Asian and Latin American economies.

A study by Gordon and Gupta (2003) confirm that portfolio flows to India are generally small compared to other emerging markets. However, these flows are less volatile and appear to be relatively more resilient. These authors also identify key determinants of portfolio flows to India that include both domestic and external factors. The main domestic factors are lagged stock returns and changes in credit

ratings, while the primary external factors are LIBOR and other emerging market stock returns.

In another study, Agarwal (1997) looks at the determinants of foreign portfolio investment and identifies four significant determinants, which are the inflation rate, real exchange rate, an index of economic activity, and the share of domestic to world stock market capitalization. The author also discusses the sustainability of foreign portfolio inflows in the longer term and suggests that both India and Indonesia have reached the limits of permissible debt ratios. Shah and Patnaik (2005) discuss foreign capital flows under a pegged exchange rate regime and show that a system of pegging has led to net capital outflows in India. The authors also discuss the difficulty of maintaining a sustainable current account deficit and its implications for raising investment in India.

In a more recent study, Garg and Dua (2014) analyze the macroeconomic determinants of portfolio inflows to India for the period 1995 - 2011. The authors find that a well-performing domestic equity market, a greater interest rate differential, an appreciating exchange rate, greater output growth, and increased risk diversification opportunities all lead to greater capital inflows. In contrast, increased domestic currency risk and relatively higher equity returns in other emerging markets result in decreased capital inflows.

Bae et al. (2006) examine the link between market openness to foreign equity investment and the information environment that result from increased access to the domestic market by foreign investors. The study is implemented for a group of emerging markets for which data is available and for a case study of individual Korean firms from 1987-2001. The authors use a range of openness measures based on liberalization and cross-listing events, the fraction of local market capitalization that is legally available to foreign investors, and the size of portfolio flows reported between a particular emerging market and the U.S. They find that increased openness is linked with greater information efficiency reflected in increased firm-specific information, analyst coverage, and analyst value-added and that, in particular, foreign analysts contribute to the domestic information environment after market openness increases. In addition, the results from the firm-level case study indicate that the link between openness and the quality of the investment environment is not as strong for firms that tend to be poorly governed.

In a similar study, Dollar et al. (2004) use firm-level survey data to examine the relationship between openness and the investment climate for a group of eight

developing countries including India. Their measures of openness are based on probit estimations, which provide the probability that a randomly chosen firm is foreign-invested and that a randomly chosen firm is an exporter. The investment climate measure is based on survey questionnaires on how firms experience bottlenecks and delays in infrastructure. These authors find that international integration is much higher in the presence of a favorable investment climate that includes good infrastructure and a sound regulatory environment. Gooptu (1994) uses quarterly data for a group of eight emerging markets including India and find that developing countries have experienced a surge of foreign portfolio flows in the 1990s but these countries have competed for the flows. The results highlight the importance of a favorable investment climate in attracting foreign portfolio flows that are sustainable in the long run. If not, one may observe portfolio inflows in the form of portfolio switching from one emerging market to another among foreign investors but not necessarily long term sustainable flows.

3. Methodology

We first construct aggregate and sector level openness indices using investibilty data at the individual stock level. We then use the openness indices in a regression analysis to test whether openness, both at the aggregate and sector levels, has affected U.S. portfolio inflows to India.

Aggregate and sector level openness

We obtain individual stock level data for Indian companies from the Standard & Poor's (S&P)/International Finance Corporation's (IFC) Emerging Market Database. Each stock belongs to one of ten sectors – consumer discretionary, consumer staples, energy, financials, health care, industrials, information technology, materials, telecommunication services, and utilities. We also know the date on which each stock was listed and the date, if applicable, on which the stock was no longer listed on the stock exchange. In addition, we are given the number of shares outstanding and the investible weight for each stock at any given point in time. An investible weight gives the percentage of shares outstanding of a particular stock that is available to foreign investors. Suppose stock X has 200 shares outstanding and it is assigned an investible weight of 0.10 at time *t*. This would imply that 10 percent of X shares outstanding or, in other words, 20 shares of stock X are available to foreign investors at time *t*. Using these data, we construct an *aggregate* openness index as follows:

$$(Openness\_ShareWeighted)_t = \frac{\sum_{i=1}^{n}(Shares\_Outsanding_{it} * Investible\_Weight_{it})}{\sum_{i=1}^{n}Sahres\_Outsanding_{it}} \quad (1)$$

That is, at time t for stock i we multiply the number of shares outstanding with the investible weight. We repeat this exercise for the n different stocks listed on the exchange at time t. We then sum up the numbers as indicated by the numerator in equation (1). Next, we divide by the total number of shares outstanding for the n stocks at time t. Essentially, we are constructing a share-weighted openness index that accounts for all stocks listed on the stock exchange regardless of the sector each stock belongs to. To obtain share-weighted openness indices for each of the ten different sectors, we use the computation in equation (1) categorized by sector. For instance, we now include sector j in the computation as follows:

$$(Openness\_ShareWeighted)_{t,j} = \frac{\sum_{i=1}^{n}(Shares\_Outsanding_{it,j} * Investable\_Weight_{it,j})}{\sum_{i=1}^{n}Shares\_Outsanding_{it,j}}$$

$$(2)$$

We also obtain an alternative *aggregate* openness index as shown in equation (3). In this case, we ignore the number of shares outstanding. Instead, we obtain a simple arithmetic average of the n different stock's investible weights at time t. This gives us an equally-weighted aggregate openness index. The two aggregate openness indices should be similar unless the number of shares outstanding for each stock at time t is substantially different from one another. In the share-weighted case, the investibility of stocks that have relatively more shares outstanding is given more weight. For example, if the stocks that have more shares outstanding are also the ones that are more investible the aggregate index will reflect a more open stock market as opposed to the equally-weighted case.

$$(Openness\_Equally.Weighted)_t = \frac{\sum_{i=1}^{n}Investible\_Weight_{it}}{n} \quad (3)$$

Regression estimations

We estimate an Ordinary Least Squares (OLS) regression to formally test the effect of openness on foreign capital inflows, in particular the U.S. portfolio inflows. The dependent variable in our regression model is therefore the amount of U.S.

portfolio flows coming into India. We use not the cumulative inflows but rather the percentage change in the inflows. The main independent variable is the relevant openness index, which is either the aggregate index or one of the sector level indices. Here, we use the change in the openness index in order to better capture the effect of openness on portfolio inflows. We include a host of other independent variables that are potentially good determinants of foreign capital inflows including returns in the Indian stock market, the interest rate differential between India and the U.S., and several variables that reflect the domestic economic conditions including industrial production, real exchange rate (RER), inflation rate, and a political stability index. Ideally, we would like to include qualitative factors that can affect portfolio inflows such as market transparency and the existence of investor protection laws but we are unable to do so due to data restrictions.[4] We also include a time trend in our model to capture any inherent trending behavior of U.S. portfolio inflows to India over time. See equation (4) for a specification of our regression model.

$US.Portfolio.Inflows_t =$
$\beta_0 + \beta_1\,Openness t + \beta_2 Stock.Returns + \beta_3 Interest.Rate.Differential$
$+ \beta_4\,Industrial.Production t + \beta_5 RERt + \beta_6 Inflation t + \beta_7 Political.Stability$
$+ Trend + \varepsilon_t$ 　　　　　　　　　　　　　　　　　　　　　　　　　　　　　(4)

We substitute the share-weighted aggregate openness index for the 'openness' variable in equation (4). Subsequently, we substitute each of the share-weighted sector indices in place of the aggregate index. By doing so, we intend to capture the effect of aggregate openness as well as sector openness of the Indian market on the inflow of U.S. portfolio capital. A positive significant coefficient estimate would suggest that openness did in fact result in increased U.S. portfolio inflows after controlling for other factors.

We hypothesize positive coefficient estimates for all other explanatory variables in our model. Generally, high stock returns would provide direct incentives for foreign investors to purchase and trade shares in the domestic market. Besides, stock market behavior often is a good indicator of economic performance. Strong returns typically imply a strong economy that should in turn attract foreign capital. We define the interest rate differential here as the difference between the Indian and U.S. interest rates. A relatively higher interest rate in India should act as a 'pull' factor that attracts foreign capital. As a result, we would expect to obtain a significant and positive. Also, we construct the real exchange rate so that an increase in the RER indicates a depreciation of the real exchange rate for India.

A higher real exchange rate therefore increases the external competitiveness of the economy via the trade balance and has a positive impact on aggregate income in the economy. Industrial production and inflation are also two variables that indicate the health of the economy and are potentially good determinants of foreign capital inflows. To the extent that higher inflation reflects increased consumer confidence and an expanding economy, we would expect to see a positive as well. Finally, political stability provides an environment that is conducive for foreign investment and act as a stimulus for foreign capital flows. For all estimations, we use White heteroskedasticity-consistent robust standard errors to account for heteroskedasticity in the model. We will also test for the existence of serial correlation in the model using a relevant Lagrange Multiplier (LM) test.

4. Data and preliminary statistics

All data are monthly. The U.S. portfolio inflows to India (millions of U.S. dollars) are from the U.S. Treasury Bulletin.[5] In particular, we focus on the gross sales of stocks by India to U.S. residents. Individual stock data for the Indian companies are all obtained from the S&P/IFC's Emerging Markets Data Base (EMDB). For our analysis, the primary data series that we utilize for the individual stocks are the number of shares outstanding and the investible weight for each stock. We also obtain sector information for each stock. Based on the individual stock data, we construct aggregate and sector level openness indices that span from December 1992 to November 2004.

Stock returns for India also come from the EMDB. In particular, we use return data from the *IFC Total Return Index* (U.S. dollar denominated). This index is based on the same set of stocks that belong to one of ten sectors, which we use to construct the openness indices. Data for the other variables except political stability are from the International Monetary Fund's (IMF's) International Financial Statistics (IFS) database. The political stability index is taken from the International Country Risk Guide (ICRG) database. It is measured on a scale of 0-100, with 0 indicating the highest risk and 100 the lowest. This data is available from January 1984 to April 2000. As a result, we are able to estimate our model only for a sub-sample when we include political stability as an explanatory variable.

Table 1 presents relevant data for each stock that was listed on the Indian stock exchange from as early as December 1975 to the end of year 2004. There is documented information for 218 individual stocks including the sector to which each security belongs. As a preliminary analysis, we compute a simple average for

Table 1: Openness by security

#	Security	Sector	Start	End	Months	Total Shares Outstanding	Average Shares Outstanding	Total Investible Weight	Average Investible Weight
1	ABB	Industrials	199301	200411	143	5197	36	29	0.20
2	ACC	Materials	197512	200411	348	5195	15	35	0.10
3	Alfa Laval	Industrials	199401	200410	130	5193	40	3	0.02
4	Andhra Cement	Materials	198604	199212	81	5192	64	0	0.00
5	Andhra Valley Power	Utilities	199501	200011	71	5190	73	3	0.04
6	Apollo Tyres	Consumer Discretionary	199112	200410	155	5188	33	9	0.06
7	Apple Industries	Financials	199301	199512	36	5185	144	0	0.00
8	Arvind Mills	Consumer Discretionary	199301	200411	143	5183	36	23	0.16
9	Ashok Leyland	Industrials	198604	200411	224	5181	23	21	0.09
10	Asian Paints	Materials	198901	200411	191	5178	27	40	0.21
11	Atlas Copco	Industrials	199301	199512	36	5176	144	0	0.00
12	Aventis Pharma	Health Care	199601	200411	107	5173	48	17	0.16
13	Bajaj Auto	Consumer Discretionary	197512	200411	324	5171	16	35	0.11
14	Ballarpur Ind.	Materials	199301	200411	143	5162	36	11	0.08
15	Bank of Baroda	Financials	199711	200411	85	5153	61	19	0.22
16	Bank of India	Financials	199711	200411	85	5143	61	11	0.13
17	Baroda Rayon	Materials	197512	199810	275	5134	19	0	0.00
18	Bharat Electronics Ltd.	Industrials	200211	200411	25	5125	205	6	0.24
19	Bharat Forge	Consumer Discretionary	199301	200411	143	5116	36	6	0.04
20	Bharti Tele-Ventures Ltd	Telecommunication Services	200311	200411	13	5107	393	6	0.47
21	BHEL	Industrials	199501	200411	119	5097	43	29	0.24
22	Biocon	Health Care	200411	200411	1	5088	5088	0	0.24
23	Birla Jute	Materials	199301	200010	94	5079	54	3	0.03
24	Bombay Dyeing	Consumer Discretionary	198604	200210	199	5070	25	20	0.10
25	BPCL	Energy	199401	200411	131	5060	39	31	0.24
26	BPL Ltd.	Consumer Discretionary	199811	200310	60	5051	84	12	0.19
27	Britannia	Consumer Staples	199301	200411	143	5042	35	20	0.14
28	Brooke Bond Lipton	Consumer Staples	198901	199703	99	5033	51	13	0.13
29	Cadbury	Consumer Staples	199301	200201	109	5024	46	9	0.09
30	Cadila Healthcare	Health Care	200411	200411	1	5014	5014	0	0.24

Table 1: Openness by security (continued)

#	Security	Sector	Start	End	Months	Total Shares Outstanding	Average Shares Outstanding	Total Investible Weight	Average Investible Weight
31	Canara Bank Ltd.	Financials	200311	200411	13	5005	385	3	0.20
32	Castrol	Energy	198604	200411	224	4996	22	34	0.15
33	CEAT	Consumer Discretionary	199301	200210	118	4983	42	3	0.02
34	Century Enka	Materials	197512	200310	311	4970	16	9	0.03
35	Century Textile	Industrials	197512	200411	348	4957	14	23	0.07
36	CESC	Utilities	199601	200010	58	4944	85	0	0.00
37	Chambal Fertilizers	Materials	199601	200411	107	4931	46	5	0.05
38	Chennai Petroleum	Energy	199601	200411	107	4919	46	14	0.13
39	CIPLA	Health Care	199601	200411	107	4906	46	26	0.24
40	Coats Viyella	Consumer Discretionary	198901	199512	84	4893	58	0	0.00
41	Colgate-Palmolive	Consumer Staples	197903	200411	309	4880	16	35	0.11
42	Container Corporation Of	Industrials	200211	200411	25	4867	195	0	0.01
43	Corporation Bank	Financials	199811	200411	73	4854	66	13	0.18
44	Crompton Greaves	Industrials	199301	200410	142	4841	34	6	0.04
45	Cummins India	Industrials	198901	200411	191	4828	25	27	0.14
46	Deepak Fertilizers	Materials	198604	199212	81	4815	59	0	0.00
47	Dena Bank	Financials	199711	200010	36	4802	133	3	0.08
48	Digital GlobalSoft Ltd	Information Technology	199811	200403	65	4790	74	16	0.24
49	Dr. Reddy's	Health Care	199811	200411	73	4766	65	25	0.34
50	DSQ Software	Information Technology	200011	200210	24	4743	198	3	0.12
51	East India Hotels	Consumer Discretionary	199301	200411	143	4720	33	31	0.22
52	Escorts	Industrials	198901	200410	190	4697	25	3	0.02
53	Essar Shipping	Industrials	199301	199810	70	4673	67	9	0.12
54	Essar Steel	Materials	199301	200410	142	4650	33	20	0.14
55	Excel Industries	Materials	199301	200110	106	4627	44	9	0.08
56	Exide	Consumer Discretionary	198901	199512	84	4603	55	0	0.00
57	FACT	Materials	199501	199512	12	4580	382	0	0.00
58	Finolex Cables	Information Technology	199301	200410	142	4557	32	17	0.12
59	Finolex Industries	Materials	199601	200410	106	4534	43	0	0.00
60	GAC	Materials	199112	200411	156	4510	29	40	0.26

Table 1: Openness by security (continued)

#	Security	Sector	Start	End	Months	Total Shares Outstanding	Average Shares Outstanding	Total Investible Weight	Average Investible Weight
61	GAIL (India) Ltd	Utilities	200211	200411	25	4487	179	6	0.23
62	Garware Nylons	Materials	198604	199512	117	4464	38	0	0.00
63	Garware Polyester	Materials	198604	200010	175	4441	25	3	0.02
64	GESCO	Energy	197512	200411	276	4417	16	23	0.08
65	Glaxo Smithkline Consumer	Consumer Staples	198901	200411	191	4394	23	29	0.15
66	GlaxoSmithkline Pharm	Health Care	198604	200411	224	4371	20	35	0.16
67	Global Trust Bank	Financials	199501	200407	115	4348	38	0	0.00
68	GNVF	Materials	198604	200411	224	4324	19	9	0.04
69	Godrej Soaps	Consumer Staples	199401	199512	24	4301	179	6	0.24
70	Grasim	Materials	197512	200411	348	4279	12	35	0.10
71	GSFC	Materials	197512	200310	335	4258	13	9	0.03
72	GTL Limited	Information Technology	200011	200411	49	4236	86	28	0.56
73	Gujarat Alkalies	Materials	198604	200010	175	4214	24	9	0.05
74	HCL Infosystems	Information Technology	199911	200411	61	4192	69	9	0.14
75	HCL Technologies Ltd.	Information Technology	200111	200411	37	4170	113	9	0.23
76	HDFC	Financials	199301	200411	143	4148	29	53	0.37
77	HDFC Bank Ltd.	Financials	200111	200411	37	4126	112	15	0.40
78	Hero Honda	Consumer Discretionary	199811	200411	73	4104	56	21	0.29
79	Hexaware Technologies	Industrials	200411	200411	1	4082	4082	1	0.62
80	Himachal	Information Technology	200011	200410	48	4060	85	20	0.41
81	Hind. Lever	Consumer Staples	198604	200411	224	4038	18	41	0.18
82	Hindalco	Materials	197512	200411	348	4016	12	36	0.10
83	Hinduja TMT Ltd.	Information Technology	200211	200410	24	3994	166	6	0.24
84	Hindustan Motors	Consumer Discretionary	197512	200010	299	3972	13	11	0.04
85	Hindustan Zinc	Materials	199601	200411	107	3950	37	0	0.00
86	HPCL	Energy	199401	200411	131	3929	30	31	0.24
87	Hughes Software Systems	Information Technology	200111	200411	37	3907	106	9	0.25
88	ICI India	Materials	199301	200410	142	3885	27	3	0.02
89	ICICI	Financials	199301	200203	111	3863	35	29	0.26
90	ICICI Bank	Financials	199711	200411	85	3841	45	21	0.24

Table 1: Openness by security (continued)

#	Security	Sector	Start	End	Months	Total Shares Outstanding	Average Shares Outstanding	Total Investible Weight	Average Investible Weight
91	IDBI	Financials	199601	200411	107	3819	36	26	0.24
92	IFCI	Financials	199601	200010	58	3797	65	14	0.24
93	I-Flex Solutions Ltd.	Information Technology	200311	200411	13	3775	290	7	0.57
94	INDALCO	Materials	199301	200310	130	3753	29	9	0.07
95	India Cement	Materials	199301	200410	142	3731	26	23	0.16
96	India Glycols	Materials	199301	199512	36	3709	103	0	0.00
97	Indian Dyestuff	Materials	197512	198612	133	3687	28	0	0.00
98	Indian Hotels	Consumer Discretionary	199301	200411	143	3665	26	31	0.22
99	Indian Oil	Energy	199811	200411	73	3643	50	7	0.09
100	Indian Organic	Materials	197512	199512	241	3621	15	0	0.00
101	Indian Overseas Bank	Financials	200411	200411	1	3600	3600	0	0.20
102	Indian Rayon	Industrials	197512	200411	348	3578	10	23	0.07
103	IndoGulf Corp.	Materials	198901	200302	170	3556	21	30	0.18
104	Infosys Tech.	Information Technology	199811	200411	73	3534	48	35	0.48
105	Ingersoll Rand	Industrials	198901	200410	190	3512	18	6	0.03
106	IPCL	Materials	199501	200411	119	3490	29	28	0.24
107	Ispat Industries	Materials	199301	200010	94	3468	37	3	0.03
108	ITC	Consumer Staples	198901	200411	191	3446	18	35	0.18
109	ITC Bhadrachalam	Materials	199601	200203	75	3424	46	8	0.11
110	J. K. Synthetics	Materials	197512	199810	275	3402	12	0	0.00
111	Jaiprakash Ind.	Industrials	199301	200402	134	3380	25	14	0.10
112	Jammu & Kashmir Bank	Financials	200411	200411	1	3358	3358	0	0.00
113	Jindal Strips	Materials	199301	199910	82	3336	41	11	0.13
114	Jindal Vijaynagar Steel	Materials	200411	200411	1	3314	3314	0	0.00
115	JK Corp. LTD.	Industrials	199301	200010	94	3292	35	8	0.09
116	JK Industries	Consumer Discretionary	199301	199810	70	3271	47	6	0.08
117	Kochi Refineries	Energy	199301	200411	143	3249	23	26	0.18
118	Kotak Mahindra	Financials	199601	200411	107	3227	30	0	0.00
119	Lakshmi Machine Wks	Industrials	199601	200210	82	3202	39	8	0.10
120	Larsen & Toubro	Industrials	198604	200411	224	3178	14	35	0.16

Table 1: Openness by security (continued)

#	Security	Sector	Start	End	Months	Total Shares Outstanding	Average Shares Outstanding	Total Investible Weight	Average Investible Weight
121	Lipton	Consumer Staples	199301	199402	14	3154	225	3	0.24
122	LML	Consumer Discretionary	199811	200310	60	3130	52	3	0.05
123	Lupin	Health Care	200411	200411	1	3106	3106	0	0.24
124	Lupin Labs	Health Care	199601	200106	66	3081	47	0	0.00
125	Madras Cements	Materials	199601	200410	106	3057	29	15	0.14
126	Mahindra	Consumer Discretionary	197512	200411	348	3033	9	35	0.10
127	Mangalam Cement	Materials	198604	199212	81	3009	37	0	0.00
128	Mangalore Chem.	Materials	199301	199512	36	2984	83	0	0.00
129	Maruti Udyog	Consumer Discretionary	200411	200411	1	2960	2960	0	0.24
130	Matrix Laboratories	Health Care	200411	200411	1	2936	2936	0	0.24
131	MICO	Consumer Discretionary	197512	200411	324	2912	9	26	0.08
132	Modi Rubber	Consumer Discretionary	197512	199512	241	2876	12	0	0.00
133	Moser Baer India	Information Technology	200411	200411	1	2840	2840	1	0.71
134	Mphasis BFL	Information Technology	199811	200411	73	2803	38	6	0.09
135	MRF	Consumer Discretionary	199601	200410	106	2767	26	15	0.14
136	MRPL	Energy	199401	200010	82	2731	33	11	0.13
137	MTNL	Telecommunication Services	199401	200411	131	2695	21	31	0.24
138	Mukand Ltd.	Materials	198604	199810	151	2662	18	14	0.10
139	Nagarjuna Fertilisers	Materials	199601	200010	58	2629	45	5	0.09
140	NALCO	Materials	199501	200411	119	2596	22	14	0.11
141	Nestle (India) Ltd.	Consumer Staples	198901	200411	191	2563	13	32	0.17
142	Neyveli Lignite Corporati	Materials	200411	200411	1	2531	2531	0	0.00
143	Nicholas Piramal India	Health Care	200411	200411	1	2498	2498	0	0.24
144	NIIT	Information Technology	199811	200410	72	2465	34	28	0.39
145	Nirlon	Materials	197609	199212	196	2456	13	0	0.00
146	Nirma	Consumer Staples	200411	200411	1	2448	2448	0	0.23
147	NOCIL	Materials	197512	200210	299	2439	8	20	0.07
148	Novartis India	Health Care	199301	200411	143	2430	17	23	0.16
149	NRC Ltd.	Materials	199401	199810	58	2422	42	6	0.10
150	ONGC	Energy	199811	200411	73	2413	33	4	0.05

Table 1: Openness by security (continued)

#	Security	Sector	Start	End	Months	Total Shares Outstanding	Average Shares Outstanding	Total Investible Weight	Average Investible Weight
151	Oriental Bank	Financials	199601	200411	107	2404	22	18	0.17
152	Orkay	Consumer Discretionary	198901	199810	118	2396	20	0	0.00
153	Oswal Agro	Materials	198901	200010	142	2387	17	3	0.02
154	Parke Davis	Health Care	199301	200210	118	2378	20	6	0.05
155	Patni Computer Systems	Information Technology	200411	200411	1	2370	2370	0	0.24
156	Pentamedia Graphics	Consumer Discretionary	199811	200410	72	2361	33	39	0.54
157	Pfizer	Health Care	198604	200411	224	2352	11	17	0.08
158	Philips	Consumer Discretionary	199301	200011	95	2344	25	14	0.15
159	Polyolefins	Materials	198901	199503	75	2335	31	0	0.00
160	Ponds	Consumer Staples	199301	199812	72	2326	32	12	0.17
161	Premier Auto	Consumer Discretionary	198604	199810	151	2318	15	0	0.00
162	Procter & Gamble	Consumer Staples	199601	200410	106	2309	22	20	0.19
163	Punjab National Bank Ltd.	Financials	200311	200411	13	2301	177	3	0.20
164	Rallis	Materials	199301	200010	94	2292	24	0	0.00
165	Ranbaxy	Health Care	199301	200411	143	2283	16	36	0.25
166	Raymond	Consumer Discretionary	199301	200411	143	2275	16	28	0.20
167	Reckitt Benckiser (India)	Consumer Staples	199301	200301	121	2266	19	21	0.17
168	Reliance	Energy	197801	200411	323	2257	7	44	0.14
169	Reliance Capital	Financials	199811	200411	73	2258	31	12	0.16
170	Reliance Energy	Utilities	199301	200411	143	2259	16	35	0.24
171	Rolta India	Information Technology	199911	200410	60	2259	38	14	0.24
172	RPEL	Materials	199401	199503	15	2260	151	4	0.24
173	RPPL	Materials	199401	199503	15	2260	151	4	0.24
174	SAIL	Materials	199501	200411	119	2261	19	20	0.17
175	Satyam	Information Technology	199811	200411	73	2262	31	32	0.43
176	Saw Pipes	Materials	199601	200411	107	2262	21	5	0.05
177	SBI	Financials	199401	200411	131	2263	17	30	0.23
178	SCI	Industrials	199501	200411	119	2264	19	8	0.07
179	SCICI	Financials	199601	199704	16	2264	142	1	0.09
180	Scindia	Industrials	197512	198612	133	2265	17	0	0.00

Table 1: Openness by security (continued)

#	Security	Sector	Start	End	Months	Total Shares Outstanding	Average Shares Outstanding	Total Investible Weight	Average Investible Weight
181	Sesa Goa	Materials	199301	200411	143	2265	16	20	0.14
182	Siemens	Industrials	198901	200411	191	2266	12	35	0.18
183	Silverline Technologies	Information Technology	199911	200303	41	2267	55	14	0.33
184	SKF Bearings	Industrials	198901	200410	190	2267	12	6	0.03
185	Smithkline Beecham Pharm.	Health Care	199301	200109	105	2268	22	13	0.12
186	SPIC	Materials	198604	200010	175	2269	13	14	0.08
187	SSI Ltd	Information Technology	200011	200410	48	2269	47	13	0.28
188	Standard Industries	Consumer Discretionary	197512	199512	241	2270	9	0	0.00
189	Sterlite Industries	Materials	200411	200210	119	2270	19	29	0.24
190	Sterlite Optical	Information Technology	200009	200410	50	2271	45	9	0.18
191	Sun Pharmaceutical Indust	Health Care	200311	200411	13	2272	175	4	0.28
192	Tata Chemicals	Materials	198604	200411	224	2272	10	35	0.16
193	Tata Consultancy Services	Information Technology	200411	200411	1	2273	2273	0	0.13
194	Tata Motors	Consumer Discretionary	198604	200411	224	2273	10	35	0.16
195	Tata Power	Utilities	199301	200411	143	2274	16	34	0.24
196	Tata Tea	Consumer Staples	198604	200411	224	2275	10	35	0.16
197	Tata Teleservices	Telecommunication Services	200411	200411	1	2275	2275	0	0.24
198	TISCO	Materials	197512	200411	348	2276	7	35	0.10
199	Titan Industries	Consumer Discretionary	199301	200410	142	2277	16	3	0.02
200	TN Petroproducts	Materials	199301	200210	118	2277	19	0	0.00
201	Trent	Consumer Staples	199811	200310	60	2278	38	6	0.10
202	TVS Motor Company	Consumer Discretionary	200411	200411	1	2278	2278	0	0.00
203	Union Bank of India	Financials	200411	200411	1	2279	2279	0	0.20
204	Uniphos Enterprises	Materials	199601	200312	96	2280	24	14	0.15
205	United Phosphorus	Materials	200401	200411	11	2280	207	0	0.00
206	UTI Bank	Financials	200411	200411	1	2281	2281	0	0.20
207	VAM Organic	Materials	199301	199512	36	2282	63	0	0.00
208	Videocon	Consumer Discretionary	199301	200010	94	2282	24	6	0.06
209	Videocon Intl	Consumer Discretionary	199401	200410	130	2283	18	18	0.14
210	Voltas	Consumer Discretionary	199301	200310	130	2283	18	6	0.04

Table 1: Openness by security (continued)

#	Security	Sector	Start	End	Months	Total Shares Outstanding	Average Shares Outstanding	Total Investible Weight	Average Investible Weight
211	VSNL	Telecommunication Services	199401	200411	131	2284	17	28	0.21
212	Wartsila	Industrials	199811	200210	48	2285	48	6	0.12
213	Wimco	Consumer Staples	198604	199512	117	2272	19	0	0.00
214	Wipro Ltd.	Information Technology	200111	200411	37	2259	61	6	0.16
215	Wockhardt	Health Care	199601	200411	71	2246	32	16	0.22
216	Zee Telefilms	Consumer Discretionary	199811	200411	73	2233	31	26	0.36
217	Zenith	Materials	198604	199512	117	2269	19	0	0.00
218	Zuari	Materials	197512	200210	323	2304	7	14	0.04

shares outstanding and investible weights for each stock for the time period it was listed on the stock exchange. This table therefore enables us to observe openness by individual security and subsequently allows us to identify stocks that were relatively more open to foreign investors. For example, Moser Baer India an information technology stock has been on average the most open with an investible weight of 0.71. Hexaware Technologies an Industrials stock, and I-Flex Solutions Ltd. an information technology stock are the next most open with average investible weights of 0.62 and 0.57 each.

Table 2 presents average openness categorized by sector. We obtain for a given sector the average shares outstanding and the average investible weight by computing a simple average of the investible weights across all securities in that sector. We note that none of the sectors is substantially open. However, the information technology sector is relatively the most open with an average investible weight of 0.30. This should not come as a surprise given that India has been particularly successful in information technology services in the global market. The telecommunication services sector follows closely with an average investible weight of 0.29. On the other hand, the materials and industrials sectors are on average the least open to foreign investors with investible weights of only 0.07 and 0.11 respectively.

Table 2: Openness by sector

#	Sector	Total Shares Outstanding	Number of Securities	Average Shares Outstanding	Total Investible Weight	Average Investible Weight
1	Consumer Discretionary	40624	33	1231	4	0.12
2	Consumer Staples	21750	17	1279	3	0.16
3	Energy	1363	10	136	1	0.14
4	Financials	77624	23	3375	4	0.17
5	Health Care	83710	17	4924	3	0.19
6	Industrials	19497	24	812	3	0.11
7	Information Technology	61889	22	2813	7	0.30
8	Materials	48592	63	771	4	0.07
9	Telecommunication Services	19948	4	4987	1	0.29
10	Utilities	1253	5	251	1	0.15

A preliminary look at the openness data therefore indicates varying degrees of sector openness for India. In the next section, we will obtain the share-weighted indices and observe how openness has evolved over time for the aggregate and

sector indices. We will be better equipped to examine the relationship between openness and capital inflows to India then. In particular, we will formally test if there is a significant link between aggregate openness and U.S. portfolio inflows. Subsequently, we will identify sectors that have had a relatively greater impact on U.S. portfolio inflows to India.

Table 3: Correlation among different openness indices (December 1992 – December 2000)

	Share-Weighted Openness	*Equally-Weighted Openness*	*EW_ smoothed*	*EW_ unsmoothed*
Share-Weighted Openness	1.00			
Equally-Weighted Openness	0.71	1.00		
EW_smoothed	0.60	0.01	1.00	
EW_unsmoothed	0.53	0.05	0.96	1.00

Table 4: Correlation among U.S. portfolio inflows and openness indices (December 1992 – November 2004)

	U.S. Portfolio Inflows	*Share-Weighted Openness*	*Equally-Weighted Openness*
U.S. Portfolio Inflows	1.00		
Share-Weighted Openness	0.53	1.00	
Equally-Weighted Openness	0.56	0.83	1.00

5.   Results

Aggregate and sector level openness

We compute the aggregate openness indices for India, both the share-weighted and equally-weighted, as described in section 3 and plot these in Figure 2. As can be expected, the two series display a similar trending pattern over time. They are especially alike in the two-year period starting at the end of 1998. For the most part, the share-weighted index indicates greater openness in the Indian stock market relative to the equally-weighted index. By construction, this means that the individual stocks with a greater number of shares outstanding are also the ones that are more accessible to foreign investors. This is in fact meaningful since some companies listed on the stock exchange are fundamentally better established and have better growth prospects than others. These companies are better able to finance their investment projects by gaining investor interest and issuing more equity than others. It should not come as a surprise that these are also the companies that are likely to be more open to foreign investors with or without restrictions.

Figure 3 plots share-weighted openness indices for three sectors – health care, information technology, and telecommunication services. We identified these to be the three most open sectors in India from our preliminary analysis in section 2.[6] We observe that, in the more recent years of the sample, the telecommunication services sector has been the most open followed by the information technology sector and then the health care sector. However, this has not always been the case. The telecommunication services sector has generally been about 25 percent open since early 1992. The information technology sector has been similar except that it has gradually increased its openness since late 1999. The health care sector, on the other hand, has experienced more fluctuation in terms of periods of both increasing and decreasing openness to foreign investors.

We also examine the correlation among the aggregate openness indices that we construct. In addition, we are interested in observing the correlation among the aggregate openness indices that we construct and those of Edison and Warnock (2003) who construct a measure of capital controls defined as the ratio of market capitalization of stocks available to foreign investors to the total market capitalization of stocks. The Edison-Warnock (EW) indices are essentially openness indices that use an alternative method based on the market capitalization of stocks that are available to foreign investors. These indices are available from December 1992 to December 2000 for a group of 29 emerging markets including India. For each market, the authors construct an unsmoothed version of the index and a smoothed version that accounts for asymmetric price shocks. Table 3 documents the relevant correlation coefficient estimates for all four indices.

As can be expected, the share-weighted and equally-weighted openness indices are highly correlated with each other as are the two EW indices for the sub period considered. We observe a very low correlation between the equally-weighted and each of the EW indices. However, the correlation between the share-weighted and the EW indices are reasonable with a higher correlation coefficient of 0.60 observed between the share-weighted and the EW smoothed index. We use the share-weighted openness and not the equally-weighted index for all our estimations given the reasonable correlation it has with the EW indices.

Table 4 examines the correlation between U.S. portfolio inflows and the two aggregate openness indices we constructed for India. First, note that the correlation coefficient estimate of 0.83 between the share-weighted and equally-weighted indices is higher for the entire sample than it is for the sub-sample. This implies

that the two have been relatively more correlated since December 2000 a point that could be observed informally in Figure 2. According to Table 4, we note that both indices are positively correlated with U.S. portfolio inflows. In particular, the share-weighted index is on average 53 percent correlated with the U.S. portfolio inflows. But we cannot make any firm conclusions about the impact of openness on U.S. portfolio inflows at this point. In Table 5, we examine the correlation between U.S. portfolio inflows and each of the sector indices. We identify three sectors for which the correlation is in fact negative implying that greater openness is associated with a decrease in inflows. This may indicate external factors irrespective of the degree of openness that could lead to lower inflows in these sectors. The highest correlation coefficient of 0.93 is reported for the information technology sector. This high correlation could imply that openness in the information technology sector was in fact an underlying reason for U.S. portfolio inflows into India. However, it is just as likely that external factors other than the degree of openness in this sector attract U.S. portfolio inflows. In our regression analysis that follows, we control for a host of explanatory variables that could affect portfolio inflows in order to isolate the relationship between openness and inflows.

Table 5. Correlation among U.S. portfolio inflows and share-weighted sector openness indices (December 1992 – November 2004)

	U.S. Portfolio Inflows
Consumer Discretionary	0.87
Consumer Staples	0.83
Energy	-0.30
Financials	0.72
Health Care	0.75
Industrials	-0.10
Information Technology	0.93
Materials	-0.66
Telecommunication Services	0.67
Utilities	0.32

Regression estimations

We estimate our model in equation (4) using OLS. An examination of the correlation coefficient matrix for the independent variables in the model indicates that there are no apparent signs of multicollinearity in the model. The two variables industrial production and the real exchange rate are the most correlated

with a correlation coefficient estimate of 0.48. First, we estimate our model using the share-weighted aggregate index as the openness variable. We then repeat our estimation by substituting each of the ten share-weighted sector indices as the openness variable in place of the aggregate index. Following a series of careful estimations, we are not able to find a significant effect of industrial production, real exchange rate, and inflation on the U.S. portfolio inflows. We also estimate our model for a sub-sample for which political stability data is available and find that political stability, too, has no significant impact on the inflows similar to the other macroeconomic variables mentioned above. We do, however, find a substantial effect of stock returns and the interest rate differential on the inflows. In Table 6, we present results for the best specification of our model that includes only the significant explanatory variables. For all estimations, we use robust standard errors to account for heteroskedasticity. We also perform serial correlation Lagrange Multiplier (LM) tests at lags 6 and 12 to test the null hypothesis of no serial correlation. We find that the null cannot be rejected at a conventional significance level of 5 percent in all cases. Our estimations, therefore, are free of serially correlated errors.

When we estimate our model with the share-weighted aggregate openness index as the only independent variable, we identify a positive relationship between openness and U.S. portfolio inflows that is significant at the 10 percent level.[7] However, when we account for the effects of stock return behavior and the interest rate differential we no longer observe any significance of openness on inflows. Therefore, the degree of market openness of the Indian stock market is not a key determinant of U.S. portfolio inflows. Instead, stock return behavior is the most important determinant with a positive coefficient estimate of 0.16 that is significant at the 1 percent level. In other words, a 1 percent increase in the aggregate market return leads to a 0.16 percent increase in U.S. portfolio inflows. Given inflows in millions of U.S. dollars, this percent increase in fact translates into a substantial increase in the magnitude of inflows. We also find a significant positive link between the interest rate differential and inflows albeit at the 10 percent level. The rationale here is that a higher interest rate in India relative to that in the U.S. reflects better rewards for saving and therefore attracts portfolio investment to India from the U.S. Lastly, we observe a significant negative trend in the change in U.S. portfolio inflows. Recall from Figure 1 that cumulative inflows have increased over time especially in the latter half of the sample. The negative trend here merely means that
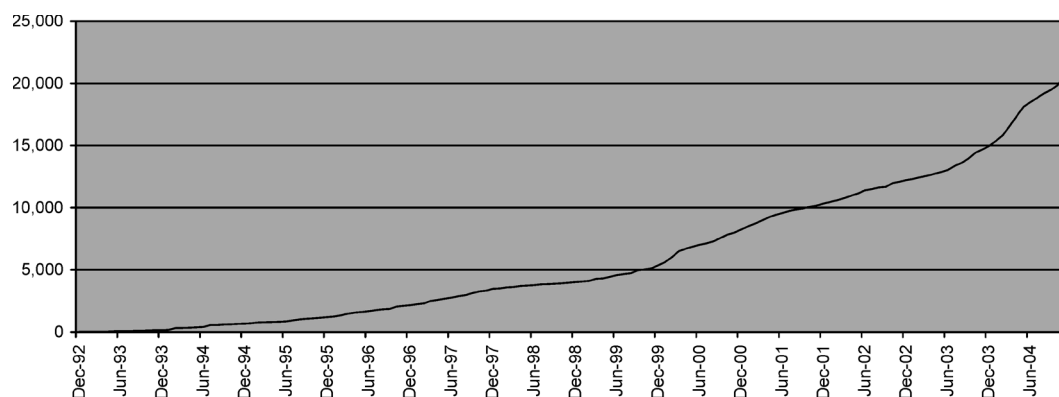
Figure 1: Cumulative U.S. Portfolio inflows (millions of USD) to the emerging market of India (December 1992 – November 2004)
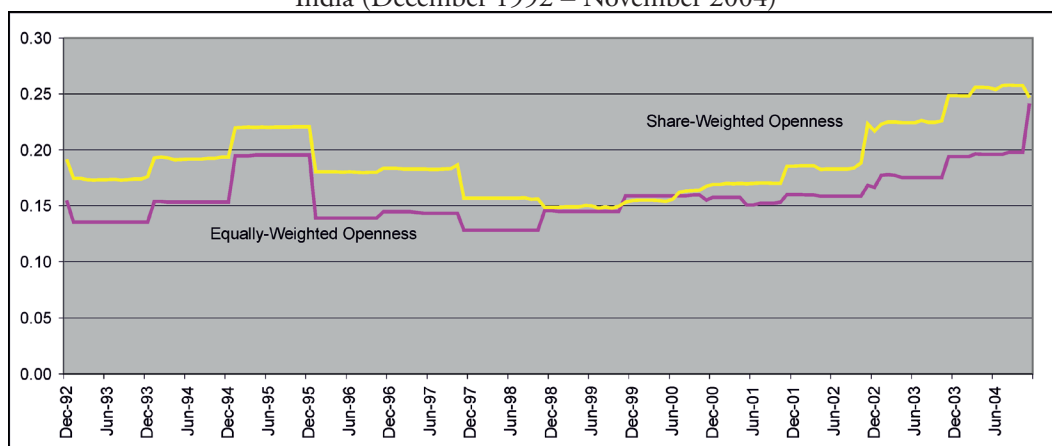

Figure 2: Aggregate stock market openness (December 1992 – November 2004)
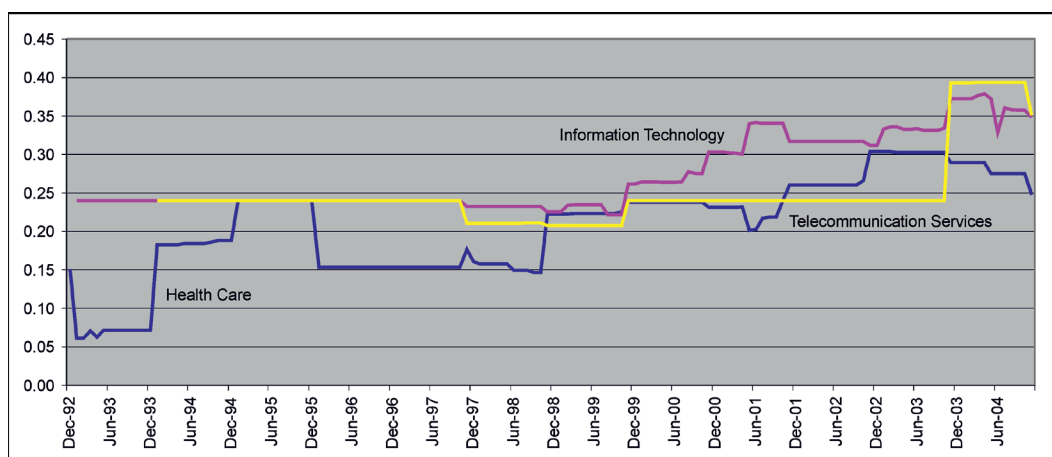

Figure 3: Share-weighted sector openness (December 1992 – November 2004)

Table 6: Regression estimation results

	Share-weighted	Share-weighted	Consumer Discretionary	Consumer Staples	Energy	Financials	Health Care	Industrials	Information Technology	Materials	Telecommunication Services	Utilities
Openness index	0.184 (0.111)	0.139 (0.109)	0.030 (0.063)	-0.010 (0.029)	0.005 (0.042)	0.320 (0.228)	0.076 (0.043)	0.011 (0.033)	0.019 (0.059)	0.165 (0.114)	-0.006 (0.012)	0.130 (0.066)
Stock returns		0.160 (0.065)	0.165 (0.068)	0.169 (0.066)	0.168 (0.066)	0.118 (0.059)	0.144 (0.063)	0.168 (0.066)	0.157 (0.063)	0.161 (0.064)	0.070 (0.053)	0.149 (0.062)
Interest rate differential		0.010 (0.006)	0.010 (0.006)	0.010 (0.006)	0.010 (0.006)	0.010 (0.005)	0.010 (0.006)	0.010 (0.006)	0.011 (0.006)	0.010 (0.006)	0.008 (0.006)	0.012 (0.006)
Trend	-0.126 (0.040)	-0.109 (0.030)	-0.107 (0.030)	-0.107 (0.029)	-0.108 (0.029)	-0.108 (0.029)	-0.103 (0.029)	-0.108 (0.030)	-0.110 (0.030)	-0.107 (0.029)	-0.084 (0.036)	-0.111 (0.030)
R-squared	0.1348	0.1888	0.1870	0.1868	0.1867	0.2243	0.2000	0.1868	0.2021	0.1913	0.1388	0.2049
Obs	143	143	143	143	143	142	143	143	142	143	130	142

Note: White heteroskedasticity-consistent robust standard errors are given in parentheses.

the marginal increase in these flows have been decreasing or, alternatively, the pace at which the portfolio flows are coming into India have slowed down.

We now repeat the estimation for each of the ten different sectors. We find statistical evidence at least at the 10 percent significance level that two sectors – health care and utilities – have a notable impact of sector openness on U.S. portfolio inflows to India. Results are especially strong for the utilities sector. For example, a 1 percent increase in openness in the utilities sector is related with a 0.13 percent increase in inflows a result that is significant at the 5 percent level. None of the other sectors, however, impart a strong correlation between openness and inflows. Except for the telecommunication sector estimation, all others identify a significant positive impact of stock return behavior on portfolio inflows at the 1 or 5 percent significance levels. Although not as significant, we still identify a positive link between the interest rate differential and inflows for all sectors except the telecommunication sector.[8] The magnitude of the effect coming from stock return behavior is also greater than that coming from the interest rate differential.

Clearly, the key determinant of U.S. portfolio inflows to India is the stock return behavior followed by the interest rate differential. The openness of the aggregate market is not a strong determinant of these inflows especially once we add stock returns and interest rate differentials as additional explanatory variables to the model. However, it is noteworthy that the effect of openness in the utilities sector withstands the sound effect of stock return behavior. Finally, we consistently observe a significant negative trend in the change in inflows for all sector estimations. This result reiterates our earlier finding that the marginal increase in inflows shows a declining trend over time. An intuitive explanation is that other emerging markets in the Asian region or elsewhere attracted some of the U.S. portfolio inflows that previously went to India. More generally, as the Indian stock market became financially integrated with the world markets it has had to compete with other emerging markets for portfolio inflows from foreign investors.

We note that the R-squared values for all estimations are low implying a not so good fit for our models. Based on data availability for India, this is in fact the best model we can utilize to address our research question. Even with the inclusion of all explanatory variables listed in equation (4), the R-squared values remain low. While we acknowledge the problem of not being able to obtain a higher explanatory power for each of our estimations, we are still able to obtain useful results that shed light on the link between market openness and U.S. portfolio inflows to India.

6. Conclusion

In this paper, we examined the link between market openness and U.S. portfolio inflows in the emerging market economy of India. In particular, we asked the research question whether market openness both at the aggregate and sector levels has led to increased portfolio inflows to India. We used monthly data for companies listed on the Indian stock exchange from December 1992 to November 2004 for our analysis. We first constructed share-weighted market openness indices for the aggregate market and ten individual sectors using data at the individual stock level. We then conducted a regression analysis to formally test whether openness has been a significant determinant of inflows.

We found that market openness at the aggregate level is *not* a key determinant of U.S. portfolio inflows especially after controlling for a host of other explanatory variables. Instead, the key determinant is found to be stock return behavior. In other words, a well-performing aggregate stock market regardless of how open it is to foreign investors has been the primary reason for U.S. portfolio inflows to India. However, we did find evidence that the utility sector openness has significantly affected U.S. portfolio inflows even after controlling for stock return behavior and interest rate differentials.

A detailed study of the different sectors could help us understand why we have observed a close link between openness and inflows in only one out of so many sectors. If we had access to more recent data, we would be able to increase the explanatory power in our estimation models and analyze findings for the more recent years.

Notes

1. The IFC Indexes: Methodology, Definitions, and Practices (1999).

2. Given data availability, U.S. portfolio inflows are a good measure of foreign capital inflows to emerging markets.

3. Bae et al. (2004) use stock investibility as a measure of openness in their study of 33 emerging markets. These authors first obtain a frequency distribution of investible weights for groups of stocks categorized by country, region, industry, size, and year. They also examine the relationship between stock investibility and return volatility in a pooled time series and cross sectional regression and find that volatility is positively related to the degree of investibility of individual stocks even after controlling for a host of explanatory variables.

4.   The IFC's *Emerging Stock Markets Factbook* (various issues from 1986-1999) document qualitative features of stock markets for many emerging markets including India. For example, we find annual information for how transparent the Indian stock market has been from the year 1986 to 1994. This information is based on, for example, how often the securities exchange bulletin is published and whether there exist internationally accepted accounting standards and investor protection laws. We also find information for market exit restrictions on the repatriation of foreign income and capital from 1986 to 1999. However, this information is not sufficient for us to construct indices that would quantify the qualitative features of the Indian stock market for our time period of study.

5.   This data is available at the following web site: http://www.treas.gov/tic/ticsec.html.

6.   A plot of the share-weighted indices for all other sectors is available upon request.

7.   Endogeneity is an unlikely issue in our set up. This is because it is difficult to make the argument that the domestic stock market becomes more open to foreign investors as U.S. portfolio inflows to India increases. It is unlikely that a stock market, especially an emerging stock market, will be liberalized to foreign investors within a month of receiving news that there has been an increase in U.S. portfolio inflows. First of all, legal procedures involved in approving such policy reforms generally take a considerable amount of time. Also, to the extent that liberalization policies are recommended as part of policy reform packages by international organizations such as the IMF, market openness in emerging markets can reasonably be treated as exogenous to the model. Nevertheless, we estimated a two stage least squares (2SLS) model to account for possible endogeneity in the model. Our instruments are the growth in industrial production and the existing explanatory variables of the model. We find that the coefficient estimate on aggregate market openness remains insignificant at a conventional 5 percent significance level in the 2SLS estimation as well.

8.   A closer look at the telecommunication sector openness index shows that this sector has been about 24 percent open for most of the sample period except in the last twelve months from the end of 2003 to 2004 when the sector openness drastically increased to about 40 percent. It is difficult to detect any meaningful impact of openness for this sector given the relatively little or no variation in the index for the bigger part and the sudden increase in the latter part of the sample period.

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