



Munich Personal RePEc Archive

**Does Foreign Direct Investment Promote  
Growth? Panel Data and Time Series  
Evidence from Less Developed Countries,  
1970-2002**

Sarkar, Prabirjit

Jadavpur University

October 2007

Online at <https://mpra.ub.uni-muenchen.de/5176/>

MPRA Paper No. 5176, posted 06 Oct 2007 UTC

## **Does Foreign Direct Investment Promote Growth?**

### **Panel Data and Time Series Evidence from Less Developed Countries, 1970-2002**

**Prabirjit Sarkar\***

Economics Department, Jadavpur University

Kolkata (Calcutta) 700032, India

Email: [prabirjitsarkar@gmail.com](mailto:prabirjitsarkar@gmail.com)

### **Abstract**

The present study casts some doubt on the growth-promoting effect of foreign direct investment (FDI), which is widely supported by the proponents of financial globalization. The panel data analysis of 51 less developed countries shows a rising relationship between growth and FDI (relative to gross capital formation) only for the group of 11 relatively rich and open-economy countries. The time-series analysis observes meaningful positive relationships between FDI and growth only for 3 countries belonging to this group and some other countries. But by and large no long-term positive relationship exists between the two irrespective of income levels, openness and FDI-dependence.

Key words: Foreign Direct Investment, Financial Globalization, Liberalization.

\* I am grateful to Professor A I Campbell for valuable suggestions. But the usual disclaimer applies.

## **Introduction**

Freer flow of goods and services and freer mobility of capital are the order of the present era of globalization. Most of the mainstream economists are supporting free trade but they are divided on the issue of full-fledged financial globalization, which implies free movements of short-term and long-term capital. Bhagwati (1998), for instance, supported free trade but could not support full-fledged financial globalization because of its inherent crisis-prone nature. He argued that the 'Asian crisis cannot be separated from the excessive borrowings of short-term capital'. Before Bhagwati (1998), Stiglitz (1994) also criticized financial globalization on the grounds that financial markets are prone to market failures. Stiglitz (2000) argued that far more relevant (than other types of financial flows) for the long-term success of the economy is foreign direct investment (FDI).

There is some qualified empirical support for growth-promoting effect of FDI. Balasubramanyam *et al* (1996) used cross-section data relating to a sample of 46 countries and supported the hypothesis of Bhagwati: the growth-enhancing effect of FDI is stronger in those countries which pursue an outward-oriented trade policy than it is in those countries following an inward-oriented policy.

Borensztein *et al* (1998) studied the effect of FDI on economic growth in a cross-country regression framework; they utilized data on FDI flows from developed countries (DCs) to 69 less developed countries (LDCs) for the two decades, the 1970s and 1980s. Their findings suggest that 'FDI is an important vehicle for the transfer of technology, contributing relatively more to growth than domestic investment'. They also observed that FDI has the effect of increasing domestic investment suggesting a complementary relationship. There is a caveat: 'the higher productivity of FDI holds only when the host country has a minimum threshold stock of human capital'.

Time series and panel data analysis of De Mello (1999) for a sample of OECD and non-OECD countries in the period 1970-1990 arrived at the same conclusion as in Borensztein *et al* (1998). He also has the caveat: 'the extent to which FDI is growth- enhancing depends on the degree of complementarity and substitution between FDI and domestic investment'.

The panel data analysis of Bengoa *et al* (2003) for a sample of 18 Latin American countries for 1970-1999 shows that FDI is positively correlated with economic growth in the host countries. 'The host country requires, however, adequate human capital, economic stability and liberalized markets to benefit from long-term capital flows' (Bengoa *et al* 2003, p.529). Recently Li and Liu (2005) made a panel data analysis for 84 countries over the period 1970-99 and observed that the interaction of FDI with human capital exerted a strong positive effect on economic growth while that of FDI with the technological gap had a significant negative impact (see also Bende-Nabende *et al*, 2003).

Lipsev (2000), however, had a different view. He discounted the importance of FDI in capital formation of the LDCs: 'financing capital formation is not a primary role of FDI'. FDI can be viewed as 'freeing capital that had been frozen in industries that the owners would prefer to leave'.

Nunnenkamp (2004) commented that 'the currently prevailing euphoria about FDI rests on weak empirical foundations' and showed that it is much more difficult for poor LDCs to derive macroeconomic benefits from FDI than to attract FDI. Durham (2004) analyzed data for 80 countries from 1979 to 1998 and observed that foreign portfolio investment as well as foreign direct investment does not have direct positive effects on growth; effects are contingent on the 'absorptive capacity' of host countries.

Some studies question the direction of causation from FDI to growth and argue that economic growth robustly causes growth in domestic investment and/or FDI (Choe, 2003, Chakraborty, 2004 and Gao, 2005; see also Blomstrom *et al*, 1996). There is one study of 73 DCs and LDCs over the period 1995-1999; it points out that corruption is a stimulus for FDI as corruption can be beneficial in circumventing regulatory and administrative restrictions (Egger *et al*, 2005).

In this perspective the present study examines the relationship between FDI and growth in the less developed countries for which the relevant data are readily available. Our findings are presented in the next section (Section II). In the last section concluding observations are made (Section III).

## II

### **Growth of FDI and its long-term relation with economic growth**

Foreign Direct Investment (FDI) registered a rapid growth as shown in the data presented in Table I. From 13 billion US dollar in 1970, total FDI flows rose to 55 billion and further to 209 billion in 1990, 336 in 1995 and 1388 in 2000. During 2001-2003, it showed a tendency to decline. The share of DCs rose from 69 per cent in 1970 to 84 percent in 1980; thereafter it showed a tendency to decline reaching 61 per cent in 1995 implying a rise in the share of LDCs in the rapidly rising FDI flows. The lion's share of the FDI flows to LDC went to Asia and the Pacific (23 per cent of the world total). Due to the Asian financial crisis, the share fell in 2000 (to 11 per cent) and the share of DCs rose.

### **Panel Data Findings, 1981-2002**

The question is: does a country with a higher FDI relative to its gross domestic capital formation (GKF), FDIGKF, grow at a faster rate? We seek an answer to this question on the basis of World Bank data on World Development Indicators (WDI). On the basis of the availability of data we have chosen a sample of 51 countries- all these are non-OECD countries excepting Mexico and Korea (who are included in the OECD group in the 1990s). For our panel data analysis the period of our study is chosen to be 1981-2002 in order to get data for all the relevant variables for all these countries.

The sample of 51 countries is divided into different groups on the basis of the two rules of thumb. One is the average share of trade (export plus import) in GDP, TRDGDP and the other is average per capita GDP

(in purchasing power parity constant dollar), PCGDPP (over the period 1981-2002). On the basis of TRDGDP 34 countries are categorized as highly trade-dependent Open Economy (with average TRDGDP more than 50 per cent) and the remaining 17 countries as Closed Economy (with average TRDGDP less than or equal to 50 per cent). On the basis of PCGDPP the countries are further classified as Rich (PCGDPP > \$5000) and Poor (all others). Altogether 16 countries (5 from Closed Economy and 11 from Open Economy) belong to this Rich category. The list of the countries and the relevant data (averages over the period 1981-2002) are presented in Table II.

With the aid of STATA programme we have considered two alternative types of panel regression analysis between the rate of growth of per capita GDP (PCGDPG) and the share of FDI in gross fixed capital formation (FDIGKF): the country-fixed effect model (FE) and the random-effect model (RE). The FE is designed to control for omitted variables that differ across countries but are constant over time. This is equivalent to generating dummy variables for each country-cases and including them in a standard linear regression to control for these fixed country-effects. The RE is used if there is reason to believe that some omitted variables may be constant over time but vary between cases, and others may be fixed between cases but vary over time. The Breusch-Pagan Lagrange multiplier test has been conducted to choose the appropriate model. It strongly supports the RE model. Estimates are reported in Table III.

It is observed that the higher the FDIGKF the higher is the growth rate, PCGDPG. The result does not change if we introduce the initial condition – the log values of initial (1981) level of GDP per capita (LPCY81) in the tradition of so-called ‘Barro Regression’ of the ‘Convergence Hypothesis’ literature (see Sarkar, 2000). The coefficient of LPCY81 is insignificant implying no ‘absolute convergence’ among the LDCs.

The observation, however, changes if we put two separate sets of dummies (each set separately or jointly) for 16 ‘rich’ LDCs and 34 highly trade dependent ‘open’ LDCs. It is observed that ‘open’ group tends to experience higher growth rates without having any relationship with FDIGKF and ‘rich’ group tends to

experience a higher growth rate if FDIGKF is higher (intercept dummy for ‘open’ group, Dt and slope dummy for ‘rich’, SDr are significant and other dummies are insignificant).

### **Individual Country Cases: Time Series Study, 1970-2002**

In this section we have undertaken aggregative and disaggregative time series analysis to supplement our panel data analysis. Our objective is to examine whether at country or region or different group levels there exists a meaningful relationship between growth and FDIGKF over a long period, 1970-2002 (in some cases shorter periods are considered due to non-availability of data).

We shall use Autoregressive Distributive Lag (ARDL) approach to cointegration developed by Pesaran and Shin (1999) to ascertain the existence of a long run relationship between FDIGKF and growth. This approach does not require any pre-testing of the variables to determine the order of their integration (how many times the data are to be differenced to achieve the stationarity property of the data).<sup>1</sup>

The following ARDL equation is fitted to the time series data on growth (PCGDPG) and FDIGKF for each of the 51 LDCs:

$$(1) \quad Y_t = a + b.t + \sum_{i=1}^p b_i Y_{t-i} + \sum_{j=0}^q c_j X_{t-j}$$

---

<sup>1</sup> With the advent of modern ‘unit-root’ econometrics and cointegration studies, the examination of the relationships between two variables requires the pre-testing of the stationarity property or the order of integration of the variables. It is often difficult to ascertain the order of integration. Without a proper knowledge of the order of integration, the cointegration analysis cannot be conducted to examine the meaningfulness of the relationship between two variables. This pre-testing based cointegration analysis is some kind of ‘data mining’ to get a particular result. The ARDL approach to cointegration is free from this pre-testing.

where  $Y$  is the growth rate of real GDP per capita (PCGDPG),  $X$  is FDIGKF,  $t$ ,  $t-i$  and  $t-j$  denote time periods and  $p$ ,  $q$  are unknown lags to be determined by various criteria. We have used four alternative criteria for choosing the values of the lags ( $p$  and  $q$ ) of the ARDL ( $p$ ,  $q$ ) model: R Bar Square Criterion (RBSQ), Akaike Information Criterion (AIC), Schwarz Bayesian criterion (SBC) and Hannan-Quinn (H-Q) criterion. The estimates of the long-term coefficient of FDIGKF are reported in Table IV.

At aggregative level, experiences of different World Bank categories such as 'High Income', 'Low Income' and 'Middle Income' countries are studied over the period 1975-2002. In no case do we get a meaningful relationship between growth and FDI (as a percentage of gross capital formation). Similar is the story for different geographical regions (we have reported only the cases of East Asia and Latin America).

For our disaggregative country case studies we find that different criteria choose different lag structures (ARDL models) and conclusion often varies from model to model. If we use the SBC criterion recommended by Pesaran and Shin (1999), we find that for 11 countries (Algeria, Republic of Congo, Gambia, Haiti, Indonesia, Malaysia, Mauritius, Paraguay, Peru, Senegal and Trinidad), the share of FDI in gross capital formation (FDIGKF) has positively significant long-term relationships with the growth rate. For all these countries excepting Algeria we find these positive relationships in ARDL models selected with the other three criteria. If we count the countries showing a positive relationship in at least one ARDL model we get four other country cases (Burkina Faso, Fiji, Madagascar and Philippines).

A clear (implying all the ARDL models telling the same story) negative (!) relationship can be found for four cases – Egypt, Gabon, Kenya and Sri Lanka; all of them belong to the 'open' group. Three other country cases both belonging to the 'open' group (Argentina, Chile and Ghana) can be added to the list if we count the countries showing a negative relationship in at least one ARDL model. Thus out of 51 country case we get altogether 29 (deducting 15 positive and 7 negative cases) clear cases of no relationship of statistical significance.



The countries experiencing positive long-term relationship between growth and FDIGKF are by and large 'open' countries. But we find no such relationship for many 'open' countries including Korea, Thailand and Singapore. Rather for some 'open' countries (six out of seven cases noted before) we observe negative relationships. For Korea and Thailand we have re-examined the relationship after taking into account the 1997 crisis. Intercept and slope dummies for 1997-2002 and 1998-2002 are added to the ARDL equation (1) separately but there is no change in the conclusion (details are skipped). It is no wonder that Crotty (2006) found that the eight-year experiment with radical neoliberal restructuring (with much emphasis on FDI) has been a failure for the majority of Korea's people.

Out of the 11 countries belonging to the category 'open' and 'rich' only four (Algeria, Malaysia, Mauritius and Trinidad) experienced the positive relationship while all others experienced no relationship.

Another interesting matter is to note that only five FDI-dependent countries (with 1981-2002 average FDIGKF = 10 per cent or more) such as Congo (14%), Fiji (16%), Gambia (18%), Malaysia (13%) and Trinidad (26%) experienced positive relationships between FDIGKF and growth (average FDIGKF in parentheses). Many other FDI-dependent LDCs such as Argentina (10%), Bolivia (23%), Costa Rica (12%), Chile (17%), Nigeria (16%) and Singapore (33%) etc experienced no such positive relationships (average FDIGKF in parentheses).

### III

#### **Concluding Observation**

Last decade (the 1990s) witnessed rapid growth of FDI flows as a part of financial globalization (it declined during 2000-2003 but it is too early to call it a trend-reversal). This development has a wider support among the economists who are otherwise critical of other aspects of financial globalization such as rising

short-term capital flows because of its vulnerability towards financial crisis. Rising flow of FDI is expected to promote growth.

To examine the relationship between growth and FDI (relative to gross capital formation) the present study analyzed panel (1981-2002) and time-series (1970-2002) data for 51 LDCs. The panel data analysis observed a rising relationship between growth and FDI (relative to GKF) only for the group of 16 countries having high GDP per capita and high trade-dependence. Time-series analysis of individual country cases concludes that only for ten countries it can be clearly said that the share of FDI in their gross capital formation has a long-term positive relationship with the growth of per capita income. There are also four clear cases of negative relationship. In the majority of country cases we observe no long-term relationship between FDI share and growth irrespective of whether these countries are closed or open (as measured by the share of trade in their GDP) and poor or rich (as measured by their GDP per capita) compared to the countries experiencing a positive long-term relationship. Nor they can be called FDI-shy (implying lower FDIGKF).

The limitation of the present study is a lack of fully specified model, which incorporates all the major determinants of growth, and examine the impact of FDI on growth. It however accommodates income and trade openness (which are likely to have an endogenous relationship with FDI) by way of classification of countries on the basis of these factors and through the use of dummies for the different classes. In the ARDL approach other variables affecting growth are sought to be captured by incorporating time (t) in the ARDL equation<sup>2</sup>. It keeps the ARDL equation as simple as possible and provides us the scope of choosing the optimum lag structure out of very high lag-length compared to the period of analysis. Thus due care is given to the lagged adjustment of growth through a change in FDI. Pending further investigation of individual country cases, our study at a minimum empirically suggests that there exists no meaningful positive relationship between FDI and growth for the LDCs unless they are both open and relatively rich, and even presents evidence for questioning such a relationship in that one limited case. Thus the present

---

<sup>2</sup> For cases where time trend is insignificant we have omitted time variable, t and verified the results. The basic conclusion remains unaffected.

study casts some doubt on the growth-promoting effect of FDI the importance of which is rising as a part of the recent drive towards financial globalization.

**Reference:**

Bende-Nabende, A., J.L. Ford, B. Santos and S. Sen. 2003. The Interaction between FDI, Output and the Spill over Variables: Co-integration and VAR analyses for APEC, 1969-1999. *Applied Economic Letters* 10: 165-172.

Bengoa, Marta and Blanca Sanchez-Robles. 2003. Foreign Direct Investment, Economic Freedom and Growth: New evidence from Latin America. *European Journal of Political Economy* 19: 529-545.

Bhagwati, Jagdish.1998. The Capital Myth: The Difference between Trade in Widgets and Trade in Dollars. *Foreign Affairs* 77 (May/June): 7-12.

Blomstrom, Magnus, Robert Lipsey and Mario Zejan. Is Fixed Investment the Key to Economic Growth? *Quarterly Journal of Economics* 111(1): 269-276.

Borensztein, E., J. De Gregorio, J.W. Lee. 1998. How Does Foreign Direct Investment Affect Economic Growth? *Journal of International Economics* 45:115-135.

Buffie, Edward F. 1993. Direct Foreign Investment, Crowding Out, and Underemployment in the Dualistic Economy. *Oxford Economic Papers* 45: 639-667.

Chakraborty, Chandana and Parantap Basu. 2002. Foreign Direct Investment and Growth in India: A Cointegration Approach. *Applied Economics* 34:1061-1073.

Choe, Jong II. 2003. Do Foreign Direct Investment and Gross Domestic Investment Promote Economic Growth? *Review of Development Economics* 7(1): 44-57.

Crotty, James.2006. The Effects of Neoliberal "Reforms" on the Postcrisis Korean Economy. *Review of Radical Political Economics*. 38 (3): 381-387.

Durham, J. Benson. 2004. Absorptive Capacity and the effects of Foreign Direct Investment and Equity Foreign Portfolio Investment on Economic Growth. *European Economic Review* 48: 285-306.

Egger, Peter and Hannes Winner. 2005. Evidence on Corruption as an Incentive for Foreign Direct Investment. *European Journal of Political Economy* 21(4): 932-952.

Gao, Ting. 2005. Foreign Direct Investment and Growth under Economic Integration. *Journal of International Economics* 67(1): 157-174.

- Li, Xiaoying and Xiaming Liu. 2005. Foreign Direct Investment and Economic Growth: An Increasingly Endogenously Relationship. *World Development* 33 (3): 393-407.
- Lipsey, Robert E. 2000. Interpreting Developed Countries' Foreign Direct Investment. *NBER Working Paper No.7810*.
- Nunnenkamp, Peter. 2004. To What Extent Can Foreign Direct Investment Help Achieve International Development Goals? *World Economy* 27(5): 657-678.
- Patrick, H. 1966. Financial Development and Economic Growth in Underdeveloped Countries. *Economic Development and Cultural Change* 14: 174-189.
- Pesaran, M.H. and Y. Shin. 1999. An autoregressive distributed lag-modelling approach to co integration analysis. In. *Econometrics and Economic Theory in the 20<sup>th</sup> Century: The Ragnar Frisch Centennial Symposium*. Strom, S. (ed.). Cambridge: Cambridge University Press.
- Sarkar, Prabirjit. 2000. North-South Uneven Development. What the Data Show. *Review* 23(4): 439-457.
- Stiglitz, Joseph. 2000. Capital Market Liberalization, Economic Growth, and Instability. *World Development* 28(6): 1075-1086.

**Table I. Foreign Direct Investment (FDI) Inflows, 1970-2003(Selected Years)**

(Billion US \$)\*

<b>Regions or Countries</b>	<b>1970</b>	<b>1980</b>	<b>1990</b>	<b>1995</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>
<b>World</b>	13 (100)	55 (100)	209 (100)	336 (100)	1388 (100)	818 (100)	679 (100)	560 (100)
<b>Developed Countries</b>	9 (69)	46 (84)	171 (82)	204 (61)	1108 (80)	571 (70)	490 (72)	367 (66)
<b>European Union</b>	5 (38)	21 (38)	97 (46)	115 (34)	671 (48)	357 (44)	374 (55)	295 (43)
<b>USA</b>	1 (8)	17 (31)	48 (23)	59 (18)	314 (23)	159 (19)	63 (9)	30 (4)
<b>Canada</b>	2 (15)	6 (11)	8 (4)	9 (3)	67 (5)	27 (3)	21 (3)	7 (1)
<b>Australia</b>	1 (8)	2 (4)	8 (4)	12 (4)	13 (1)	4 (0)	14 (2)	8 (1)
<b>Developing Countries</b>	4 (31)	8 (14)	37 (18)	116 (34)	252 (18)	220 (27)	158 (23)	172 (25)
<b>Africa</b>	1 (8)	0 (0)	2 (1)	5 (1)	9 (0)	20 (2)	12 (2)	15 (2)
<b>Asia &amp; the Pacific</b>	1 (8)	0 (0)	25 (12)	80 (23)	146 (11)	112 (14)	94 (14)	107 (16)
<b>Latin America and Caribbean</b>	2 (15)	7 (13)	10 (5)	30 (9)	98 (7)	88 (11)	51 (8)	50 (7)

\* Figures in billion are rounded from figures in millions. Figures in parentheses are percentages of the world total.

Source: UNCTAD web site-<http://www.unctad.org>

**Table II. Income, Growth, Trade Openness and Share of FDI in Capital****Formation of Selected LDCs, 1981-2002**

(Annual Averages)

<b>Country</b>	<b>PCGDPP<sup>1</sup></b>	<b>PCGDPG<sup>2</sup></b> (%)	<b>TRDGDP<sup>3</sup></b> (%)	<b>FDIGKF<sup>4</sup></b> (%)
<b>CLOSED ECONOMY<sup>5</sup></b>				
Argentina*	10941	-0.38	19	10
Bangladesh	1266	2.15	24	0.5
Bolivia	2242	-0.22	48	23
Brazil*	6794	0.47	19	8
Burkina Faso	925	1.4	36	1
Cameroon	2091	0.01	49	3
Guatemala	3647	-0.1	40	8
Haiti	2243	-2.71	41	1
India	1807	3.55	19	1
Madagascar	884	-2.01	43	4
Mexico*	7934	0.63	43	9
Pakistan	1599	2.25	35	3
Peru	4700	-0.14	32	8
Rwanda	1162	0.1	31	3
Sierra Leon	808	-3.13	43	-4
Uruguay*	7695	0.16	41	4
Venezuela*	5955	-1.23	48	9
<b>OPEN ECONOMY<sup>5</sup></b>				
Algeria*	5532	-0.01	51	1
Botswana*	5557	4.69	104	8

Chile*	6757	3.41	57	17
Congo	968	0.13	113	14
Costa Rica*	7120	1.16	79	12
Cote d'Ivoire	1763	-1.76	70	8
Dominican Republic	4683	2.28	71	10
Ecuador	3385	0.00	55	10
Egypt	2974	2.49	51	7
El Salvador	4016	0.59	54	6
Fiji	4637	0.77	110	16
Gabon*	6258	-0.72	92	-1
Gambia	1699	-0.28	113	18
Ghana	1703	0.57	54	6
Honduras	2518	-0.12	75	6
Indonesia	2445	3.55	55	-0.2
Jamaica	3583	0.7	99	9
Jordan	4196	-0.21	120	6
Kenya	1051	-0.19	60	2
Korea*	10282	6.19	65	2
Malawi	550	0.03	60	9
Malaysia*	6430	3.52	157	13
Mauritius*	7017	4.59	120	3
Nigeria	829	-0.83	64	16
Panama*	5327	1.25	156	4
Paraguay	4727	-0.41	62	4
Philippines	3845	0.21	72	6
Senegal	1405	0.58	66	5
Singapore*	16206	4.29	290	33



Sri Lanka	2578	3.15	73	4
Thailand	4805	4.7	79	7
Trinidad & Tobago*	7832	-0.05	83	26
Tunisia	4998	2.1	86	7
Zimbabwe	2639	-0.58	57	4

\* 'Rich' countries with 1981-2002 average per capita GDP > \$5000 (internationally comparable purchasing power parity dollar).

1 PCGDPP = Per capita GDP in purchasing power parity constant (2000) US \$;

2 PCGDPG = Growth in real GDP per capita;

3 TRDGDP = Trade (exports plus imports) as percentage of GDP, Trade openness index;

4 FDIGKF = Foreign direct investment as percentage of gross domestic capital formation;

5 Countries are categorized as 'Closed Economy' if their Trade (Exports + Imports) as a percentage of GDP, TRDGDP (1981-2002 average) < 50 per cent. All others are considered as Open Economy countries.

Source: World Development Indicators published by World Bank.

**Table III. Importance of Foreign Direct Investment in Capital Accumulation and Growth: Panel Data Analysis<sup>1</sup> of Selected Less Developed Countries, 1981-2002**

a	FDI-GKF	Dt	SDt	Dr	SDr	LPC-Y81	R-Sq	LM <sup>2</sup>
0.66 *	0.03 *						0.01	223.16
-0.83	0.03 *					0.19	0.01	224.48
-0.08	0.02	0.01	1.08				0.03	184.09
-0.12	0.03 *	1.19 *					0.02	183.47
0.62 *	0.02		0.02				0.01	210.46
0.43	0.02			0.64	0.05 **		0.03	189.63
-0.36	0.02	1.26 *	-0.01	0.55	0.06 **		0.04	149.73
-0.15	0.01	1.18 *			0.06 **		0.04	158.76
0.69	0.01	1.19 *			0.06 **	-0.11	0.04	157.07

\* Significant at 5 per cent level.

\*\* Significant at 0.01 per cent level .

1 The following equation is fitted:

$$\begin{aligned} & \text{Growth of Per Capita GDP (PCGDPG)} \\ & = a + b. \text{FDIGKF} + cDt + d.SDt + e.Dr + f.SDr + g \text{LPCY81} \end{aligned}$$

where Dr = 1 for 16 'rich' countries with 1981-2002 average GDP per capita > \$ 5000 (purchasing power parity dollar) and = 0 otherwise, Dt = 1 for 34 highly trade-dependent 'open' countries with 1981-2002 average trade share (TRDGDP) > 50 per cent and = 0 otherwise, SDr = Dr.FDIGKF and SDt = Dt.FDIGKF, LPCY81 is the log of 1981- per capita GDP.

Setting one or more parameters (c to g) equal to zero, we have fitted alternative regression equations.

2 The Breusch-Pagan Lagrange multiplier test statistic.

**Table IV. Foreign direct investment and growth: estimates of long-term relationships through ARDL method<sup>1</sup>, 1970-2002**

Countries or Regions Criteria (Model)	FDIGKF	C	T
<b>Algeria<sup>R</sup></b>			
RBSQ (8,0)	0.22	-16.84	0.52
AIC/H-Q (4,2)	1.27**	5.95**	-0.22**
SBC (0,0)	0.76*	4.99	-0.18
<b>Argentina<sup>R, C</sup></b>			
RBSQ (1,4)	-1.69	-21.92	1.01
AIC (0,4)	-1.33*	-17.9	0.82
SBC/H-Q (0,0)	-0.04	-0.03	0.01
<b>Bangladesh<sup>C</sup></b>			
RBSQ (7,0)	0.36	-1.7*	0.11**
AIC/SBC/H-Q (6,0)	0.39	-1.47*	0.11**
<b>Bolivia<sup>C</sup></b>			
RBSQ/AIC (6,4)	-0.14	-11.44	0.42
SBC (1,0)	-0.09	-12.69**	0.46*
H-Q (5,4)	-0.09	-8.19*	0.29
<b>Botswana<sup>R</sup></b>			
RBSQ/AIC (5,8)	0.59	-14.81	0.42
SBC/H-Q (5,3)	0.5	-8.53	0.26
<b>Brazil<sup>R,C</sup></b>			
RBSQ (3,8)	-1.42	14.37	-0.26
AIC/ SBC/H-Q (0,0)	-0.04	0.36	0.03
<b>Burkina Faso<sup>C</sup></b>			
RBSQ/AIC (5,5)	0.67*	1.23	-0.02
SBC/H-Q (2,0)	-0.29	0.18	0.04
<b>Cameroon<sup>C</sup></b>			
RBSQ/ AIC/ SBC/H-Q (8,8)	5.65	-15.02	0.04
<b>Chile<sup>R</sup></b>			
RBSQ/AIC (6,6)	-0.6**	-15.25**	0.84**
SBC/H-Q (1,0)	-0.29	-2.17	0.33

<b>Congo, Rep.</b>			
RBSQ/ H-Q (5,6)	0.42*	27.83**	-1.01**
AIC (8,8)	0.63*	28.2*	-1.09*
SBC (5,3)	0.33*	22.68**	-0.81**
<b>Costa Rica<sup>R</sup></b>			
RBSQ/ AIC /H-Q (5,8)	-0.22	5.99	-0.13
SBC (0,0)	0.15	-2.79	0.07
<b>Cote d'Ivoire</b>			
RBSQ (5,0)	0.09	-1.95	-0.01
AIC /H-Q / SBC (0,0)	0.08	-3.82	0.04
<b>Dominican Republic</b>			
RBSQ/ AIC/ SBC/H-Q (0,0)	0.11	-1.56	0.09
<b>Ecuador</b>			
RBSQ/ AIC/ SBC/H-Q (0,1)	0.11	2.63	-0.01
<b>Egypt</b>			
RBSQ/ AIC/ SBC/H-Q (1,8)	-0.31*	3.84	0.03
<b>El Salvador</b>			
RBSQ / SBC/H-Q (6,7)	0.8	-11.93**	0.32**
AIC (8,7)	0.71	-11.13**	0.3**
<b>Fiji<sup>2</sup></b>			
RBSQ (4,7)	0.47**	2.8	-0.29**
AIC/H-Q (7,8)	0.47**	4.01**	-0.33**
SBC (1,0)	0.004	-1.11	0.06
<b>Gabon<sup>R</sup></b>			
RBSQ/ AIC/ SBC/H-Q (6,1)	-0.1*	-1.47	0.01
<b>Gambia</b>			
RBSQ/SBC (7,5)	0.09**	6.08**	-0.23**
AIC/H-Q (8,8)	0.09**	6.02**	-0.21**
<b>Ghana</b>			
RBSQ/ AIC /H-Q (3,8)	-0.51*	-9.22**	0.39*
SBC (0,3)	-0.41	-9.8*	0.4*
<b>Guatemala<sup>C</sup></b>			
RBSQ (8,0)	-0.06	1.39	0.06
AIC (8,8)	-0.98	11.01	-0.08
SBC (1,0)	0.14	-7.07	0.18
H-Q (4,0)	-0.03	-2.34	0.09
<b>Haiti<sup>C</sup></b>			
RBSQ/ AIC/ SBC/H-Q (8,8)	1.51**	-9.75**	0.15**
<b>Honduras</b>			
RBSQ (0,8)	1.61	3.07	-0.33
AIC/ H-Q (0,1)	0.25	1.23	-0.08

SBC (0,0)	0.04	0.2	-0.01
<b>India<sup>C</sup></b>			
RBSQ/ AIC (4,4)	-0.45	-1.53	0.16*
SBC (0,0)	-0.35	-1.43	0.16
H-Q (4,0)	-0.25	-1.34	0.15*
<b>Indonesia</b>			
RBSQ/ AIC/ SBC/H-Q (1,2)	0.37**	6.35**	-0.08
<b>Jamaica</b>			
RBSQ (1,5)	-0.41	-6.54	0.28
AIC/ SBC/H-Q (1,0)	-0.03	-2.53	0.09
<b>Jordan<sup>3</sup></b>			
RBSQ (3,0)	0.08	-1.46	0.02
AIC/ SBC/H-Q (0,0)	0.04	-4.8	0.12
<b>Kenya</b>			
RBSQ/ AIC/ SBC/H-Q (6,8)	-0.59*	6.46**	-0.15**
<b>Korea<sup>3 R d</sup></b>			
RBSQ (6,5)	-3.78	12.8*	-0.06
AIC/ SBC/H-Q (7,7)	-1.34	14.39	-0.18
<b>Madagascar<sup>C</sup></b>			
RBSQ/ AIC/ H-Q (8,8)	0.36*	-2.25*	-0.02
SBC (0,0)	0.57	1.98	-0.18
<b>Malawi</b>			
RBSQ/ AIC (8,8)	-0.22	23.47	-0.79
SBC/H-Q (1,0)	-0.06	-2.37	0.09
<b>Malaysia<sup>R</sup></b>			
RBSQ (6,5)	0.69**	-2.47	-0.08*
AIC/ SBC/H-Q (0,0)	0.35**	2.31	-0.01
<b>Mauritius<sup>4 R</sup></b>			
RBSQ/ AIC/ SBC/H-Q (6,5)	0.18*	8.4**	-0.12**
<b>Mexico<sup>R,C</sup></b>			
RBSQ /AIC (1,2)	0.11	3.68	-0.07
SBC (0,0)	-0.45	0.14	0.15
H-Q (1,0)	-0.78	-1.81	0.3
<b>Nigeria</b>			
RBSQ/ AIC (4,2)	0.13	-4.94	0.08
SBC/H-Q (4,1)	0.2	-3.46	-0.003
<b>Pakistan<sup>C</sup></b>			
RBSQ/ AIC/ SBC/H-Q (8,8)	-0.3	8.73	-0.14
<b>Panama<sup>5 R</sup></b>			
RBSQ/ AIC/ SBC/H-Q (6,6)	-0.43	-65.99	1.89

<b>Paraguay</b>			
RBSQ/ AIC/ SBC/H-Q (7,8)	0.32*	11.94**	-0.38**
<b>Peru<sup>C</sup></b>			
RBSQ (8,1)	0.57*	6.99	-0.36
AIC/ H-Q (7,1)	0.64*	7.49	-0.39
SBC (0,0)	0.36*	3.36	-0.19
<b>Philippines</b>			
RBSQ (4,6)	1.23**	11.57**	-0.54**
AIC (8,6)	1.43**	12.56**	-0.59**
SBC/H-Q (2,1)	0.59	4.41	-0.23
<b>Rwanda<sup>C</sup></b>			
RBSQ/ AIC (2,5)	-0.75	11.23	-0.2
SBC/H-Q (0,0)	1.2	-17.24	0.43
<b>Senegal</b>			
RBSQ/ AIC/ SBC/H-Q (2,8)	0.41**	-8.4*	0.22**
<b>Sierra Leon<sup>5C</sup></b>			
RBSQ (1,0)	0.01	-1.69	-0.06
AIC/ SBC/H-Q (7,8)	0.01	-2.37	-0.04
<b>Singapore<sup>6R</sup></b>			
RBSQ (4,1)	-0.02	8.3**	-0.08
AIC (4,0)	0.02	9.26**	-0.17
SBC/H-Q (0,0)	0.03	9.96*	-0.19
<b>Sri Lanka</b>			
RBSQ/ AIC/ SBC/H-Q (0,8)	-1.53*	-0.17	0.24
<b>Thailand<sup>d</sup></b>			
RBSQ/ AIC/ SBC/H-Q (8,8)	-1.05	3.52	0.16
<b>Trinidad &amp; Tobago<sup>R</sup></b>			
RBSQ/H-Q (6,6)	0.26**	5.28	-0.31*
AIC (7,6)	0.23**	4.82	-0.27*
SBC (1,1)	0.32*	5.36	-0.39
<b>Tunisia</b>			
RBSQ/ AIC (0,6)	-0.18	0.43	0.09
SBC/H-Q (0,0)	-0.09	0.8	0.07
<b>Uruguay<sup>R, C</sup></b>			
RBSQ/ AIC (5,5)	-2.98	24.18	-0.04
SBC/H-Q (1,2)	-1.28	17.64	-0.39
<b>Venezuela<sup>R, C</sup></b>			
RBSQ (0,5)	-0.5	-15.57	0.53
AIC/H-Q (0,2)	-0.09	-6.94	0.19
SBC (0,0)	0.25	1.99	-0.18

<b>Zimbabwe</b>			
RBSQ/ H-Q (7,5)	0.16	-2.61	0.09
AIC (8,5)	0.16	-2.22	0.08
SBC (0,0)	0.11	7.8	-0.27
<b>Low Income<sup>7</sup></b>			
RBSQ/ AIC/SBC/H-Q (0,0)	0.04	-0.49	0.07
<b>Middle Income<sup>7</sup></b>			
RBSQ/ AIC/ H-Q (5,1)	0.06	-0.26	0.06
SBC(0,1)	0.12	1.37	0.00
<b>High Income<sup>7</sup></b>			
RBSQ (4,1)	0.01	3.05**	-0.03
AIC/ H-Q (2,1)	0.005	3.01**	-0.03
SBC(2,0)	0.05	3.34**	-0.05
<b>East Asia<sup>7d</sup></b>			
RBSQ/ AIC/H-Q (3,5)	-0.34	1.76	0.17*
SBC (1,0)	-0.01	5.35	0.03
<b>Latin America<sup>7</sup></b>			
RBSQ (2,2)	-0.04	1.91	-0.04
AIC/H-Q (1,0)	-0.03	1.26	-0.01
SBC (0,0)	0.02	1.86	-0.04

\*\* Significant at 1 per cent level (based on asymptotic standard errors).

\* Significant at 5 per cent level (based on asymptotic standard errors).

1 The fitted ARDL (p, q) model is:

$$G_t = a + b.t + \sum_{i=1}^p b_i G_{t-i} + \sum_{j=0}^q d_j F_{t-j}$$

where G is the growth rate of real GDP per capita (PCGDPG), F is Foreign Direct Investment as a percentage of gross domestic capital formation (FDIGKF) and the subscripts t, t-i, t-j indicate different time periods and p and q are unknown lags to be determined by various criteria.

We have used four alternative criteria: R Bar Square Criterion (RBSQ), Akaike Information Criterion (AIC), Schwarz Bayesian criterion (SBC) and Hannan-Quinn (H-Q) criterion. The estimates of the long-term coefficients are obtained with the aid of Microfit program and reported here with the chosen ARDL model (p, q) in parentheses.

2 Period of analysis is 1970-2001.

3        Period of analysis is 1976-2002.

4        Period of analysis is 1981-2002.

5        Period of analysis is 1980-2002.

6        Period of analysis is 1972-2002.

7        Period of analysis is 1975-2002.

C        ‘Closed Economy’ countries with their Trade (Exports + Imports) as a percentage of GDP, TRDGDP (1981-2002 average) < 50 per cent. All others are considered as Open Economy countries.

R        ‘Rich’: Countries with 1981-2002 average per capita GDP > \$5000 (internationally comparable purchasing power parity 2000 dollar). All others are ‘Poor’.

d        For Korea, Thailand and East Asia intercept and slope dummies (alternatively for both 1997-2002 and 1998-2002) are added to the ARDL equation and the long-term coefficients of FDIGKF are re-estimated. These are found to be insignificant (details are skipped). In view of insignificant time trend, we re-estimated the coefficients of FDIGKF without time variable and slope dummy. **But the conclusion does not change.**