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FOREIGN DIRECT INVESTMENT INFLOWS AND ECONOMIC GROWTH: PANEL COINTEGRATION TESTS AND PANEL FMOLS ESTIMATORS*

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ABSTRACT

This paper examines the relationship between foreign direct investment (FDI) and economic growth using a panel data set for 10 African countries over the period, 1980-2004. We need recently developed techniques for testing panel cointegration which include Fully Modified Least Squares (FMOLS) to test and estimate the long run cointegration coefficients. We find a long term, cointegrating relationship, between FDI and economic growth. This holds for both measures of FDI (net FDI inflows and inward stock) and two measures of economic growth (growth rate of real GDP and growth rate of per capita real GDP). The cointegrating coefficients for most of the individuals and group means are significantly different from zero when economic growth is measured by the growth rate of real GDP but the results are weaker when economic growth is measured by the growth rate of real GDP per capita.

I. INTRODUCTION

The relation between foreign direct investment (FDI) and economic growth is a hotly debated topic in the literature of economic development. The general consensus, however, is that the role of FDI on the economies of the developing countries is becoming increasingly important. It is believed that FDI can help national development efforts of the developing countries by bringing in essential ingredients that are necessary for growth. Chief among theses are capital, technology, and entrepreneurial skills that the developing economies desperately need. In addition to these direct effects, FDI can have indirect effects by stimulating economic activity of local entrepreneurs who act as suppliers and distributors for foreign corporations. There can also be diffusion of the efficient product technique and managerial styles to local businesses.

FDI is becoming very important for African countries because it provides much needed capital to accelerate growth and reduce poverty. FDI has also certain features that affect the

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quality of growth with significant implication for poverty reduction. Because of its nature of tangible and long term investment, FDI is not subject to abrupt reversal as is portfolio investment. FDI may also reduce adverse supply shocks to the less developed economies stemming from financial instabilities. Further, FDI generates revenues that may support the development of safety net for the poor.

Although there is a strong theoretical basis evidence for the FDI-growth nexus, FDI can also have several potential negative effects (Saltz, 1992; Lall, 2000; and Agasin and Myers, 2000). FDI can crowd out domestic investment through unfair competition. Because multinational corporations (MNCs) often have skills, technology, and capital that local firms cannot match, FDI can create damaging competition for local firms. Foreign firms, being more efficient than smaller domestic firms and with more resources, can attract workers and finances away from local firms. While this poses a significant risk for local firms, it can also be argued that competition from more efficient foreign-owned firms can enhance local firms' efficiency and increase productivity for the economy as a whole. It is also argued that FDI may create price distortion through protectionism and monopolization. Foreign investment may also bring in capital-intensive production techniques into labor-intensive environment and thus can displace labor and lead to job losses.

Despite the possible negative effects of FDI, a consensus has emerged both among developed and developing countries about the potential net benefits of FDI to economic growth. Recognizing these benefits, developing countries not only have eased restrictions on foreign capital inflows but also have began to offer special incentives to foreign enterprises including lower income tax, import duty exemptions, and subsidies. As a result, the average annual FDI inflows to developing countries increased from an annual average of 19.1 billion dollars in 1980-1984 to 205.2 billion dollars in 2000-2004 (www.unctad.org.) The experience of some Latin American and Asian countries that have successfully attracted FDI suggests that the benefits are likely to be large for developing countries. It was only in 1990s that many African countries actively began to attract FDI. Despite offering a number of incentives, the level of FDI inflows to Africa increased only moderately. Moreover, where FDI has flowed to Africa, it has been concentrated in a limited number of countries and then only for large scale industries such as oil and mining.

This paper develops an empirical model and tests the long run relationship between FDI and economic growth in the presence of several control variables, such as trade openness, domestic investment spending, productivity of domestic labor, and inflation rate. The analysis uses panel data from some selected Sub-Saharan African countries for the period 1980-2004. Recently developed techniques for testing panel cointegration hypotheses are applied to test the null of or no cointegration, and panel Fully Modified Ordinary Least Squares (FMOLS) estimation method is used to estimate and test the long run cointegrating coefficients. Section II presents a brief review of the literature, section III presents trends of FDI inflows. Section IV specifies the model and conducts panel cointegration tests. Section V presents FMOLS results, and Section VI provides a summary and conclusions.

II. REVIEW OF LITERATURE

Empirical evidence on the link between FDI and economic growth is mixed. But some evidence from cross-section data at macro level suggests that FDI has a positive effect on

growth. It is, however, argued that growth enhancing effect of FDI depends on the host country's capacity to take advantage of externalities that might be limited by local socioeconomic conditions. Balasubramanyan *et al.* (1996), Zhang (2001) and UNCTAD (1998) find that the positive impact of FDI depends on the country's openness to trade. FDI can broaden access to export market as transnational corporations often serve as channels for the distribution of goods from the host country to other markets. Others, for example, Blomostrom *et al.* (1994), and DeMello (1997) find that FDI has significant positive effects on economic growth but the influence seems to be confined to higher income developing countries. The implied suggestion of this argument is that a high level of development acts as a catalyst for accelerated diffusion of technology and knowledge into the host country. This means that the host country must be capable of absorbing the new technology manifested in FDI in order to benefit from FDI. There is not much empirical evidence to date that supports this argument but Kumar (2002) reports that FDI is less productive in Africa, where technological progress is low, compared to other developing countries. Alfaro *et al. (2004)* emphasize the role of financial sector development on the link between FDI and Economic growth. Their study indicates that FDI promotes growth through financial markets. In a different study, Alfaro (2003) argues that the impact of FDI on economic growth is sector specific. FDI inflows into primary sector have negative effects on growth whereas inflows into the manufacturing sector have positive effect.

Borensztein *et al.* (1998), and Makki & Somwaru (2004) find that a significant relation between FDI and economic growth depends on the level of human capital in the host country. Host countries with better endowment of human capital are believed to benefit more from FDI-induced technology because an educated and well-trained labor force makes it easier for foreign technology to be transferred to local enterprises. In contrast Carkovick and Levine (2002), provide evidence that FDI inflows do not exert independent influence on growth. They argue the lack of impact of FDI on economic growth does not depend on human capital, level of economic development or the degree of openness.

The inclusion of FDI in the neoclassical growth model as is the case in most studies reviewed above, poses a problem of causality. GDP growth by itself or factors that affect GDP may influence FDI as well. If causality runs from GDP to FDI, the use of OLS may yield a biased result. Based on this possibility, several studies examined the causality between FDI and economic growth. Blomstrom *et al.* (1994) find strong evidence that FDI Granger causes economic growth whereas Kumar and Pradhan (2002) and Chaudry and Mavrotas (2006) find evidence of bidirectional causality.

The effect of FDI at the microeconomic level is also shrouded with controversy. Theory suggests that foreign investment generates externalities to domestic firms through the introduction of new products and product processes by foreign firms. As a rule, this would benefit domestic firms through the diffusion of new technology. The degree to which domestic firms benefit from such spillover of technology, however, depends on the absorption capacity of domestic firms. But empirical evidence on the benefit of firms from technology spillover is again mixed. Moran (1998) attributes the success of electronic exporting firms in Malaysia and auto parts exporting firms in Mexico to spillover of technology from foreign investment. Atkins and Harrison (1999) and Konings (1999), however, find that FDI has no spillover effect and hence does not increases the productivity of domestic firms. Summers (2000) suggests

that FDI leads to "enormous social benefits" resulting from gains in efficiency from reallocation of capital from capital-rich, industrialized nations to capital-poor LDCs.

III. TRENDS IN FDI INFLOWS

In the past two and half decades, global FDI flows increased tremendously following the integration of markets and production, economic liberalization, technological progress, and opening up of developing countries for foreign investment. As a result, global FDI increased from an annual average of $57 billion in 1980-84 to $840 billion in 2000-2004 (Table 1). At the same time, FDI has been more dispersed among home and host countries. In terms of regional distribution, the bulk of global FDI remain predominantly directed to developed economies. In 1980-84, inflows to the developed economies represented more than 67 per cent of the global FDI. By 2000-2004 the share of developed economies jumped to 73.5 per cent. The share of developing countries in global FDI in 1980-84 was 32.6 per cent and in 2000-2004, their share dropped to 24.3 per cent. Among the developing economies, inflows of FDI into Asia have been impressive. Total inflows into Asia increased from an annual average of $10.6 billion in 1980-84 to $119 billion in 200-2004. The share of Asian countries in the total FDI inflows to developing countries also increased from 55 per cent in 1980-84 to 58 per cent in 2000-2004.

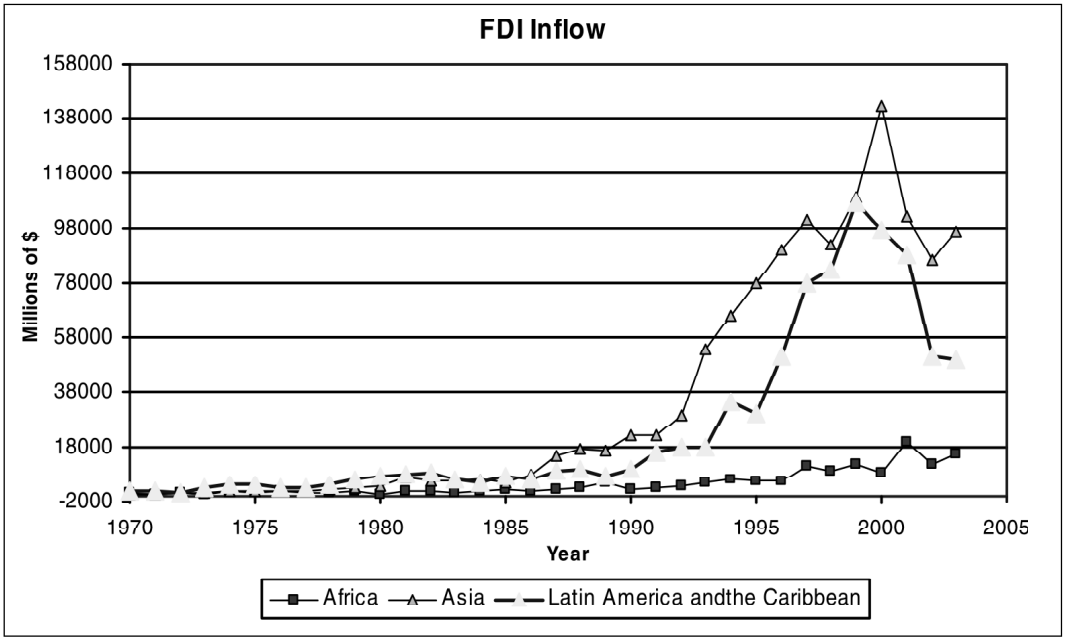
Table 1
Trends in Foreign Direct Investment (In Million $)

	1980-84	*1985-89*	*1990-94*	*1995-99*	*2000-04*
World	58724.5	128540	205098	603012	843867
Developed	39571	105019	139502	418104	620110
% of world	0.673841	0.817014	0.680172	0.693359	0.734843
Developing	19144	23515	64024	176037	205223
% of world	0.325997	0.182939	0.312163	0.29193	0.243194
Asia	10576.6	12566.8	41036	97347	119027
% of world	0.180105	0.097766	0.20008	0.161435	0.141049
% developing	0.552476	0.534416	0.640947	0.552992	0.579989
America	6948.5	7934.2	18272.8	69570.3	70315.9
% of world	0.118324	0.061726	0.089093	0.115371	0.083326
% developing	0.36296	0.33741	0.285405	0.395203	0.342632
Africa	1470	2854.2	4322.2	8632	15748.4
% world	0.025032	0.022205	0.021074	0.014315	0.018662
% developing	0.076786	0.121378	0.067509	0.049035	0.076738

Prior to the 1980s, many African political leaders exercised hostile policies regarding private sector and FDI in particular. Foreign investment was not promoted and foreign ownership was limited up to a certain percentage and some sectors were completely closed to foreign business. As a result of this, FDI inflows to Africa till early 1980s were small relative to inflows into other developing economies. Since the mid-1980s, many African countries have initiated economic reform aimed at increasing the role of the private sector. They have taken steps to restore macroeconomic stability through devaluation where currency was overvalued, reduction of inflation rate and budget deficits. As part of those reforms, African countries have also improved regulatory framework for FDI making them more open, permitting profit repatriation

and providing tax and other incentives to attract foreign investment. Following these reforms, total FDI inflows to Africa increased gradually and stabilized at a higher level since late 1990s as shown in Figure 1.

Figure 1: Trends in FDI Inflow into Developing Regions

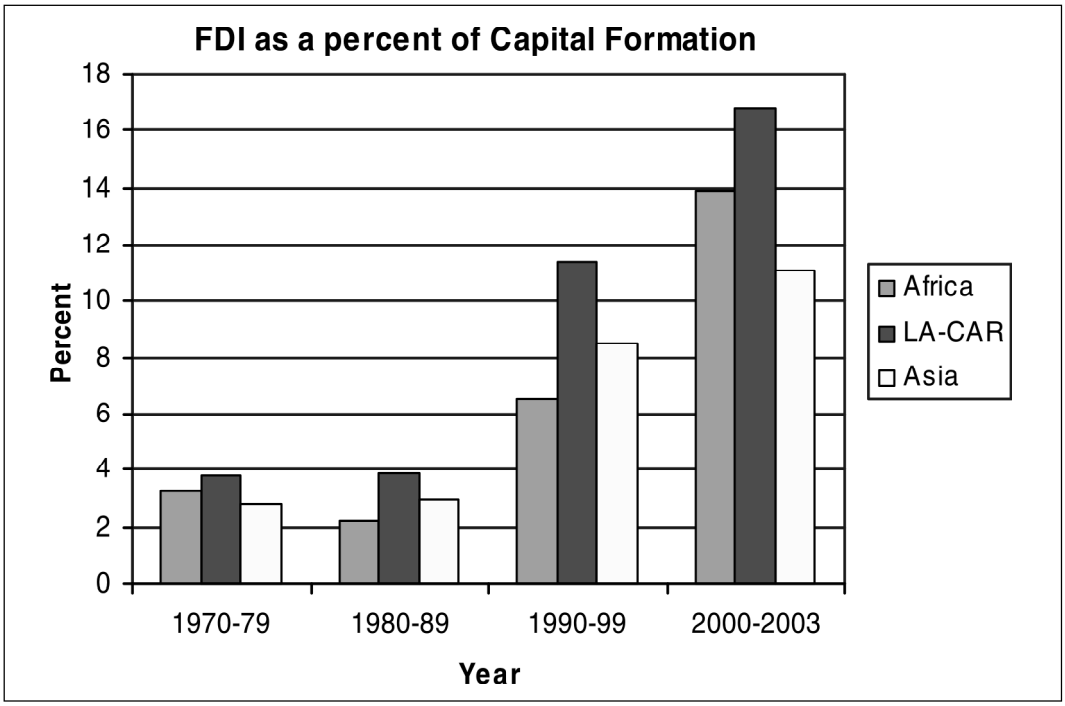


Although FDI inflows to Africa increased in absolute terms, it continued to lag behind FDI inflows into other developing regions. Most African countries received a very modest amount of FDI, despite economic reforms and the fact that the rates of return on FDI have generally been much higher in Africa than in other developing countries (Bhattachrya *et al*, 1997). Inflows into Africa averaged $15,748 million in 2000- 2004 accounting for only 1.8 percent of the global inflows and 7.7 percent of the inflows to developing countries. FDI inflows to Africa are small in absolute terms but they seem to have a greater impact on the African economies than what the absolute figures suggest. The average share of FDI inflows in gross domestic capital formation during 2000-2004 averaged 28.7 percent for Africa compared with 25.3 percent and 33.7 percent for Asia and Latin America respectively (UNCTAD, Foreign Direct Investment Data Base). Moreover, FDI inward stock as percent of GDP is relatively higher for Africa compared with other developing countries as a whole (see Figure 2).

IV. REVIEW OF PANEL UNIT ROOT AND COINTEGRATION TESTS

In recent years, a plethora of literature has emerged on testing for non-stationarity in the panel data comprising both cross-section and panel data. Testing for non-statonarity is complicated because the researcher has to make alternative assumptions about the heterogeneity

Figure 2: FDI as a Per cent of Gross Fixed Capital Formation



of intercepts, time trends and autoregressive coefficients across members of the panel. Levin and Lin (1993) use ADF test in individual series as starting points of their testing procedure for the presence of unit root. These tests incorporate heterogeneity across panel members by allowing for fixed effects and unit specific time trends in addition to common time trends.

Im *et al.* (1997) modify Levine and Lin's framework by allowing for heterogeneity of the coefficient on the lagged dependent variable. The authors propose the use of a group-mean LM test to test the hypothesis that coefficient of the lagged variable is zero across all members of panel. Standard ADF regressions and LM statistic are then computed. In simplistic terms, one calculates *a* statistic *t*, which is the average of ADF t stats for individual countries. Authors show that *t* converges a normal distribution.

There are two trends in the literature on cointegration analysis involving panel data. First approach is a residual-based two-step procedure, which is a panel version of Engle-Granger approach to time series data. This approach assumes homogeneous long run coefficients and adjustment parameters, and allows for heterogeneity in the coefficient of lagged dependent variable. The opposite trend is the assumption of heterogeneity in model parameters. Panel cointegration tests are based on cross-sectional averages of individual parameters. This approach does not use panel-based information and is valid only if model parameters across the panel are determined independently of each other (Green and Kleibeges, 1999). As Green and Kleibeges notes, panel dimension, by allowing the interdependence among panel members, increases the power of conitegration test.

V. THE MODEL AND PANEL COINTEGRATION TESTS

As discussed above, economic growth is believed to be influenced by FDI and several internal factors. The basic growth model can be specified in a general form as:

$$GGDP = f(FDI, INV, OPN, GRLF, INF) \quad (1)$$

Where,

GGDP = a measure of economic growth

INV = gross domestic investment spending

OPN = trade openness

GRLF = growth of labor force

INF = domestic inflation rate

The basic model is specified in a cointegrated framework as:

$$Y_{it} = \alpha_i + \beta X_{it} + \mu it \quad (2)$$

$$X_{it} = X_{it\text{-}1} + \varepsilon it'$$

Where, Y_{it} is a measure of economic growth, X_{it} is a vector of regressors, β is the cointegrating vector, α_i indicates that the cointegrating relationship includes member specific fixed effects, $i = 1, 2, .., 10$, and $t = 1, 2, 3, \ldots, 25$. As Pedroni (2000) states the vector error process, which is defined as $(\mu it, \varepsilon it)' = \zeta_{it}$, is assumed to be stationary with asymptotic covariance Ω_i, and $\zeta_{it} = (\mu it, \varepsilon it)' \sim I(0)$. In the vector error process, $(\mu it, \varepsilon it)' = \zeta_{it}$, the first element is a scalar series and the second element is a five dimensional vector of the differences in the regressors such that $\varepsilon it = X_{it} - X_{it-1} = \Delta X_{it}$. This vector gives the scalar long run variance of μit and the long run covariance between μit and each of εit.

Economic growth is measured both by the growth rate in GDP (GRGDP) and the growth rate in GDP per capita (GDPPC). The vector of regressors includes FDI and four control variables. FDI is also measured by net inflows of foreign capital as a percent of GDP (FDII) . Inward stock of FDI as a per cent of GDP (FDIS) is also used as an alternative measure of FDI. The control variables are gross domestic investment spending (INV), trade openness (OPN), growth rate in labor force (GRLF), and domestic inflation rate (INF). Increases in FDI inflows (or inward stock of FDI), gross domestic investment, trade openness, and the growth rate in labor force are expected to have positive impacts on economic growth while an increase in domestic inflation rate is expected to have a negative effect on economic growth.

The panel cointegration method developed by Pedroni (1999) is used to test cointegration of Y_{it} with FDI and each of the other variables in the vector X_{it}. As described above, this procedure utilizes the residuals from the cointegrating regression and allows heterogeneity in the panel and thus does not impose homogeneity of the cointegrating vectors. Fixed effects and individual specific deterministic trends are also allowed. Pedroni (1999) derives and discusses the mathematical expressions and properties of seven different panel cointegration statistics, and explores their small sample performances. These cointegration statistics are divided into two categories. The first category consists of four statistics that are based on pooling of residuals across different members of the panel and is referred to as within-dimension, and the second category consists of the remaining three that are based on averaging of individually estimated

coefficients and is referred to as between-dimension. The within-dimension based statistics are commonly known as panel cointegration statistics and the between-dimension based statistics are commonly known as group mean panel cointegration statistics. These statistics, shown in Tables 2 and 7, were computed using the RATS codes for this study.

Table 2
Panel Cointegration Test Statistics
Dependent Variable: GRGDP

Statistics	*No Time Trend*	*With Time trend*
Panel v-stat	5.5852	4.5748
Panel rho-stat	-15.6659	-14.9376
Panel pp-stat	-10.4578	-10.9096
Panel adf-stat	-4.5469	- 4.5560
Group rho-stat	-16.8985	-15.3267
Group pp-stat	-12.2945	-12.0574
Group adf-stat	-5.1851	- 4.8829

Time periods = 25, N = 10, Number of regressors = 5, Default maximum lag = 3.
All reported statistics are distributed with N(0,1) under null of unit root or no cointegration. Large negative panel and group statistics lead to rejection of the null hypothesis of no cointegration**.** Panel stats are weighted by long run variances.

Table 3
Individual FMOLS Results
Dependent Variable : GRGDP
Regressor: FDIS

Country	*FMOLS*	*t-stat.*
Botswana	0.12	3.09*
Cameroon	-0.73	-0.93
Cote'Ivoire	-0.07	-0.49
Kenya	-1.04	-2.68**
Madagascar	1.07	2.16**
Mauritius	-0.17	-1.63
Niger	0.24	0.85
Nigeria	0.17	2.63*
Senegal	0.31	2.75*
Zimbabwe	0.09	3.02*
Panel Group	-0.001	-2.78*

* Significant at 1% level, ** significant at 5% level.

Table 4
Panel Group FMOLS Results
(Without Time Dummies)
Dependent Variable: GRGDP

Regressors	*FMOLS*	*t-stat.*
FDIS	-0.17	-2.49**
INV	0.18	2.85**
OPN	0.08	3.79*
GRLF	-4.23	-10.17*
INF	-0.03	-1.89***

* significant at 1%, ** significant at 5%, *** significant at 10%.

Table 5
Individual FMOLS Results
Dependent Variable: GRGDP
Regressor: FDII

Country	*FMOLS*	*t-stat.*
Botswana	0.50	1.48
Cameroon	3.74	2.24*
Cote'Ivoire	1.00	1.29
Kenya	-1.18	-0.57
Madagascar	3.75	1.45
Mauritius	-0.33	-0.77
Niger	-3.20	-1.94**
Nigeria	2.13	3.05***
Senegal	0.63	1.01
Zimbabwe	0.15	0.30
Panel Group	0.72	2.39*

* Significant at 1% level, ** significant at 5% level.

Table 6
Panel Group FMOLS Results
(Without Time Dummies)
Dependent Variable: GRGDP

Regressors	*FMOLS*	*t-stat.*
FDII	-0.49	-1.95**
INV	0.17	2.67**
OPN	0.03	2.11**
GRLF	-4.33	-9.16*
INF	-0.02	-0.86

* significant at 1%, ** significant at 5%.

Table 7
Panel Cointegration Test Statistics
Dependent Variable: GDPPC

Statistics	*No Time Trend*	*With Time Trend*
Panel v-stat	9.1734	6.2760
Panel rho-stat	-33.9838	-29.8442
Panel pp-stat	-10.3929	-11.7697
Panel adf-stat	-4.1545	- 4.3411
Group rho-stat	-31.1764	-25.8589
Group pp-stat	-11.9676	-12.4567
Group adf-stat	-4.5624	- 4.3920

Time periods = 25, N = 10, Number of regressors = 5, Default maximum lag = 3.
All reported statistics are distributed with N(0,1) under null of unit root or no cointegration. Large negative panel and group statistics lead to rejection of the null hypothesis of no cointegration**.** Panel stats are weighted by long run variances.

The statistics in Table 2 were obtained with and without deterministic trends with five regressors and the growth rate in GDP as the dependent variable, and a maximum default lag of 3. The statistics in Table 7 were obtained under the same specifications and with the same number of regressors using the growth rate in GDP per capita as the dependent variable. In both tables, the first of the four panel cointegration statistics is the variance ratio. The second and third are analogous to the Phillips-Perron rho-statistic and Phillips-Perron t-statistic, respectively. The fourth panel statistic is analogous to the augmented Dickey-Fuller t-statistic. The remaining three statistics are group mean panel cointegration statistics and are analogous to the Phillips-Perron rho-statistic, Phillips-Perron t-statistic, and augmented Dickey-Fuller t-statistic, respectively. The panel variance statistic is always positive and the remaining six are always negative. As stated below each table, the computer program is set up so that each of the statistics is distributed with N(0, 1) under null of unit root or no cointegration. Parametric and non-parametric versions of these statistics also have the same asymptotic distributions according to the model specification. Thus, the standardized statistics of both the pooled panel cointegration statistics and the group mean panel cointegration statistics converge to normal distribution for both parametric and non-parametric versions. This, therefore, allows one to use the critical values from the standard normal table for one-sided test to reject the null. The null hypothesis is thus rejected if the panel variance-statistic is large and positive, and the panel and group statistics are large and negative. So for the panel and group statistics the left tail is used to reject the null hypothesis. Since the critical value at 5 per cent level under normal distribution is ±1.645, the null of unit root or no cointegration is overwhelmingly rejected by all statistics at 1 per cent significance level. The rejection of the null of no cointegration means that each of the regressors is cointegrated with the with both the growth rate in GDP and the growth rate in GDP per capita in the long run. The next step is to estimate the cointegrating slope coefficients and test their statistical significance.

IV. FMOLS RESULTS

The cointegrating slope coefficients were estimated by a method known as panel Fully Modified Ordinary Least Squares (FMOLS). These cointegrating coefficients are also referred to as between-dimension panel group mean FMOLS estimators. This estimation technique, which is based on the mathematical specifications developed by Pedroni (2000), pools only the long run relationship while allowing the short-run dynamics to be heterogeneous. The estimation technique also allows common time dummies to be included. This model was, however, estimated without common time dummies under the assumption that the panel members do not have common economic policies or common external disturbances that are shared across individual members. Furthermore, as Pedroni (2001) reports, the cointegrating coefficients and the t-statistics of FMOLS results without common time dummies are not different from the FMOLS results with common time dummies.

FMOLS estimators and the t-statistics for individual countries are reported in Tables 3, 5, 8, and 10. Group mean FMOLS estimators and the t-statistics for the panel are reported in Tables 4, 6, 9, and 11. Tables 2 and 3 show the effects of FDI inward stock on GRGDP and Tables 5 and 6 show the effects of net FDI inflows on GRGDP. Similarly, Tables 8 and 9 are the results obtained by regressing GDPPC on FDI inward stock for individual country and the

Table 8
Individual FMOLS Results
Dependent Variable : GDPPC
Regressor: FDIS

Country	*FMOLS*	*t-stat.*
Botswana	0.07	1.82***
Cameroon	-0.64	-0.80
Cote'Ivoire	0.16	1.10
Kenya	-0.40	-1.21
Madagascar	0.52	1.91***
Mauritius	-0.10	-1.01
Niger	0.22	0.90
Nigeria	0.12	2.24**
Senegal	0.22	2.24**
Zimbabwe	-0.14	-2.52**
Panel Group	-0.001	-1.53

* *Significant at 5% level, *** significant at 10% level.

Table 9
Panel Group FMOLS Results
(Without Time Dummies)
Dependent Variable: GDPPC

Regressors	*FMOLS*	*t-stat.*
FDIS	0.02	-0.93
INV	0.17	2.92**
OPN	0.04	2.42**
GRLF	-5.39	-16.83*
INF	-0.02	-1.42

* significant at 1%, ** significant at 5%.

Table 10
Individual FMOLS Results
Dependent Variable: GDPPC
Regressor: FDII

Country	*FMOLS*	*t-stat.*
Botswana	0.51	2.02**
Cameroon	3.46	2.00**
Cote'Ivoire	1.63	2.56**
Kenya	0.78	0.55
Madagascar	3.43	2.66**
Mauritius	-0.13	-0.32
Niger	-3.17	-2.24**
Nigeria	1.72	2.98**
Senegal	0.62	1.25
Zimbabwe	-0.37	-0.45
Panel Group	0.85	3.48*

* *Significant at 5% level, * significant at 1% level.

Table 11
Panel Group FMOLS Results
(Without Time Dummies)
Dependent Variable: GDPPC

Regressors	*FMOLS*	*t-stat.*
FDII	-0.15	-0.77
INV	0.14	2.38*
OPN	0.02	1.05
GRLF	5.14	-14.58*
INF	-0.01	-0.74

* significant at 1%, ** significant at 5%.

panel respectively. Tables 10 and 11 are the results of the regression of GDPPC on FDI net inflows.

The group mean FMOLS estimators reported in Tables 3, 5, 8 and 10 are interpreted as the mean values for the cointegrating vectors. The group mean test statistics are invariant to whether the model is estimated with heterogeneous intercepts or without intercepts, or whether X_{it} is univariate or multi-dimensional vector according to Pedroni (2000). The null hypothesis is that each of the coefficients is zero and the alternative hypothesis is not all the coefficients are zero. More formally, H_o: $\beta_m = 0$ and H_a: $\beta_m \neq 0$ for all m, where m is the number of the group mean coefficients. As shown in Tables 4, 6, 9, and 11, the group mean t-statistics for the mean slope coefficients between economic growth and most of the regressors is significant. Therefore, the null hypothesis that the individual coefficients are all zero is rejected at least at 5 per cent significance level. The results thus provide some evidence that the slope coefficients between economic growth and FDI are significantly different from zero.

V. SUMMARY AND CONCLUSIONS

The paper has examined the long run relationship between economic growth, alternatively measured by growth rate in GDP and growth rate in GDP per capita, and inward FDI measured by net FDI inflows and FDI inward stock. The study uses panel data from 10 Sub-Saharan African countries for the period 1980-2004. The panel cointegration test statistics overwhelmingly reject the null hypothesis of unit root or no cointegration between economic growth and FDI, suggesting that both measures of economic growth are cointegrated with net FDI inflows and FDI inward stock. The evidence thus indicates the existence of long run relationship between economic growth and FDI for the sample of countries. This means that economic growth and FDI inflows to these countries do not seem to drift away from the long run equilibrium.

The cointegrating coefficients are estimated using the panel Fully Modified OLS technique. The individual and group mean statistics suggest that most of the individual and average slope coefficients are significantly different from zero when economic growth is measured by the growth rate in GDP. The null hypothesis that the individual coefficients are all zero is rejected at least at 10 per cent significance level. But the results are weaker when economic growth is measured by the growth rate in GDP per capita.

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