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Foreign Direct Investment and Economic Growth in Papua New Guinea

Boniface Aipi and James Lloyd

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Boniface Aipi *
and
James Lloyd **

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* Boniface Aipi is a Senior Research Analyst with the Research Department at the Bank of Papua New Guinea.
** James Llyod was the Overseas Development Institute Fellow at the Bank of Papua New Guinea at the time research was undertaken for the paper.

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Abstract

This paper uses cointegration techniques to establish whether there is any long run relationship between foreign direct investment inflows and gross domestic product in Papua New Guinea. The paper also tests for Granger Causality between the two variables. The results show that there is a long run relationship and evidence of bi-causality between foreign direct investment inflows and gross domestic product growth. In the medium term, growth in foreign direct investment 'Granger causes' growth in gross domestic product. Between four and five years after the FDI inflow there is strong evidence of reverse causality.

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Foreign Direct Investment and Economic Growth in Papua New Guinea

1. Introduction

An important feature of globalisation in recent years has been the rise of foreign direct investment (FDI) to dominance as a source of external financing for developing countries. The linkages between FDI and economic growth in developing countries have been the subject of considerable debate and empirical investigation. The links have been studied by (i) looking at the determinants of growth, (ii) exploring the determinants of FDI, (iii) examining the role of multinational firms in host countries and (iv) examining the direction of causality between the rate of FDI inflows and the rate of Gross Domestic Product (GDP) growth.

This paper uses cointegration techniques to establish whether there is any long run relationship between foreign direct investment inflows and gross domestic product and also tests for Granger Causality between the two variables in Papua New Guinea between 1978 and 2004. It is found that there is a bi-causal relationship between the growth in FDI inflows and the growth in GDP in PNG. In the short run, there exists no evidence of any causation between the two variables. In the medium term there is evidence of one way causality from FDI to GDP growth, that is, growth in FDI 'Granger causes' growth in GDP. Between four and five years after the initial FDI inflow, there is strong evidence of reverse causality. That is, growth in GDP also 'Granger causes' growth in FDI inflows.

The paper provides the first empirical evidence of the relationship between FDI and GDP in PNG and aims to stimulate further research in this area. The rest of the paper is structured as follows. Section two briefly discusses the theoretical relationships between FDI and GDP, the third section briefly describes trends in FDI and GDP in PNG. The fourth section outlines the research methodology and presents the findings of the empirical investigation and the final section concludes.

2. The Relationship Between FDI and GDP

While a positive link between FDI inflows and growth has been established in the empirical literature, if tenuously, the direction of causality has been proved to vary across countries and can be bi-causal or mono-causal in either direction.[1] Economic theory supports causal or mono-causal in either direction. Economic theory supports the existence of both mono-causal and bi-causal relationships between the variables depending on the nature of FDI and the nature of the recipient country.

The issue is further complicated by a host of economic, political and social factors that can determine the direction of causality. We will briefly discuss the main economic determinants of the direction of causality in this section.

The view that FDI causes growth has been reinforced by developments in endogenous growth theory, which highlights the role of endogenous factors such as improvements in technology, efficiency and productivity in stimulating growth (Li and Liu 2004). The theory asserts that FDI's contribution to growth originates from its role in the generation of capital destined for production. Further, as FDI is a composite bundle of know-how, technology and knowledge, it can supplement the existing level of productivity in the recipient economy through spillovers. Spillovers to the recipient economy can occur through both labour training and skill acquisition and the introduction of alternative management and organisational structures. Foreign investors may, therefore, increase the productive capacity of the recipient country and act as a catalyst for domestic investment and technological progress which all lead to growth in GDP.

[1] See de Mello (1997) for a survey of the nexus between FDI and growth and further evidence of the FDI growth relationship and Niar-Reichert and Weinhold (2001) for a critical assessment of the literature. Carkovic and Levine (2003) provide an interesting overview of the film level literature on the FDI growth nexus. See Chowdhury and Mavrotas (2006) for evidence from Chile, Malaysia and Thailand on mono-casual and bi-casual relationships between FDI and economic growth.

Alternatively, causality may run in the opposite direction. Rapid economic growth, accompanied by higher per capita income, can encourage market-seeking FDI into the industrial, consumer durable goods and infrastructure sectors in the host country. Rapid GDP growth can also create a high level of capital requirements in the host country. The host country may choose, therefore, to attract more FDI by offering concessional terms to relieve capital constraints. Furthermore, rapid economic growth can build confidence with overseas investors investing in recipient countries and increases FDI inflows, as has been the case in China. Recent history indicates that the developing countries that have recently received significant proportions of FDI inflows to developing countries, such as South Korea, had previously attained strong and stable GDP growth rates by increasing domestic investment and the capacity of domestic industries.

Bi-causal relationships, whereby FDI causes GDP growth which in turn causes FDI inflows and visa versa, can be activated through the strength of the changes in the domestic economy brought on by increased FDI inflows or GDP growth rates. The international economic and business environment can also contribute to bi-causal relationships. For example, more skilled labour and increased growth, arising from new FDI projects training the domestic labour force, could encourage efficiency and market seeking FDI inflows to exploit skilled labour and the growing market in the host economy. Alternatively, increased growth, due to increased domestic investment, can attract FDI to service the growing market, which in turn increases investment and increases GDP growth.

On the other hand, FDI inflows can introduce features to the host economy that can adversely effect GDP growth. FDI inflows may, for example, inhibit competition from domestic firms and thus hamper growth. This is especially relevant if the host country government affords extra protection to foreign investors as a means of attracting foreign capital.

High levels of FDI into the mineral sector can also create the Dutch disease effect of exchange rate appreciation, which may constrain the growth of manufactured exports. Furthermore, FDI could lead to a higher output of minerals in countries with reserves of extractive resources which would increase the size of economic rents available to elites. This may increase corruption and lower economic growth rates.

There are no hard and fast rules that determine the direction of mono-causality or bi-causality between FDI and GDP across countries. For example, the nature of the FDI and the policy environment and level of existing factor endowments in the recipient country determine the attractiveness of a country to foreign investment and the foreign investor's willingness and ability to transfer new technologies, management processes and organisational structures which all determine the direction of causality between the two variables.

3. FDI and Economic Growth in PNG

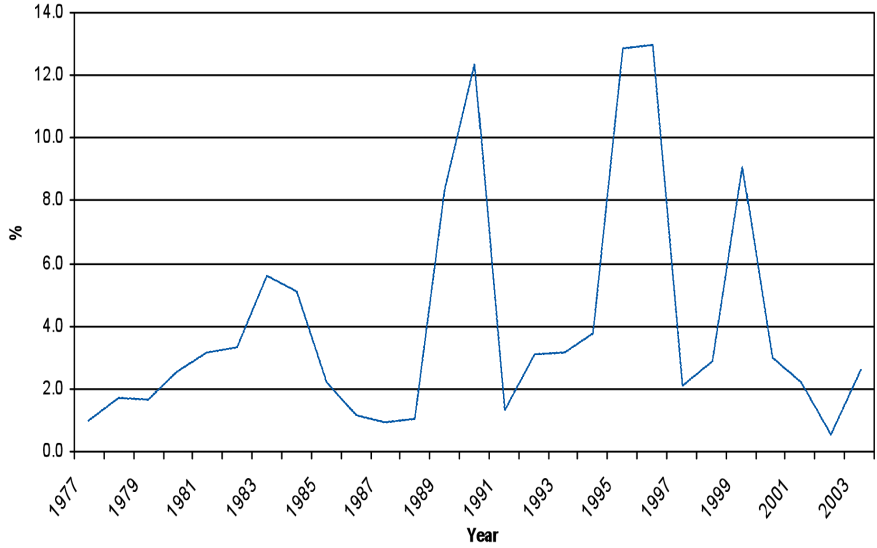
Historically, developing countries have received only a small portion of total FDI inflows. In 2004, the most recent year under study in this paper, PNG received a total of US$25.4 million in FDI compared to the US$74.5 billion of total FDI flows to the Asia Pacific region (Asian Development Bank 2006). FDI flows into PNG, as a percentage of GDP, since 1977 have fluctuated widely due to the highly intermittent nature of FDI flows that are destined for large scale mineral and petroleum projects.[2]

There were significant FDI inflows to PNG from 1981 and 1984, due to the construction of the Ok Tedi copper and gold mine in the Western province of PNG, while the surge in FDI inflows between the years 1989 and 1990 was for the construction of the Porgera gold mine and the Kutubu petroleum projects. Another surge in FDI inflows occured between the years 1995 and 1997, this was the result of the construction of the Lihir and Tolukuma gold and silver mines and the Gobe, South East Gobe and Moran crude oil projects. Futhermore, in 1997, the construction of the RD tuna canning plant in Madang commenced.

[2] Mineral and petroleum projects are capital intensive and the initial investment in the project requires high capital inflows, which wither during the years of production.

For the period under study, average annual FDI inflows were K202.6 million which is 4.1 percent as a percentage of total GDP over the period. The peak was reached in 1997 at 13.0 percent of GDP and the low was in 2003, at 0.6 percent of GDP. The rate of FDI inflows are depicted in (figure 1).

Figure 1: FDI Inflows as percentage of GDP (1977 – 2004)



Source: UNCTAD 2006

The majority of FDI into PNG has been channelled into the mining and petroleum sectors. Of the total volume of FDI stock received by PNG between the years 1988 and 2004, 77.4 percent was destined for the mineral sector; while the manufacturing and agriculture sectors received smaller volumes of FDI inflows (see Table 1).

Table 1: Distribution of FDI in Papua New Guinea by Sector (1988 – 2004)

Sector	Percentage Composition
Mineral	**77.4**
Agriculture	**5.5**
Forestry	**4.1**
Manufacturing	**3.3**
Banking, Institutions and Finance	**3.2**
Other	**3.0**
Retail	**1.3**
Fishing	**0.8**
Power	**0.6**
Hotel/Restaurants	**0.3**
Transport	**0.2**
Drilling	**0.1**

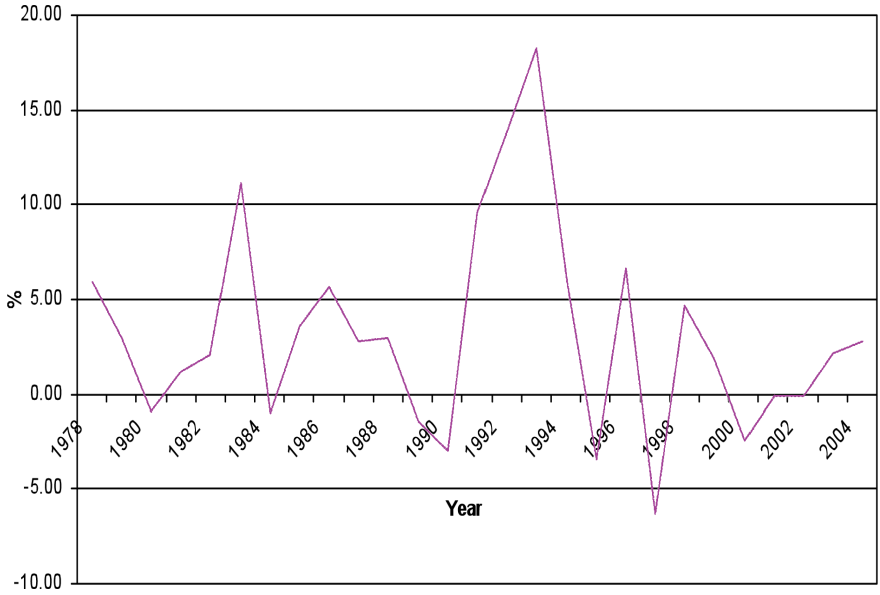
Source: CSDRMS[3] – Bank of Papua New Guinea

[3] Commonwealth Secretariat Debt Recording and Management System (CSDRMS). The CSDRMS first recorded data in 1988. This is why data for the years prior to this unavailable.

Economic growth rates have fluctuated widely since independence in PNG. Moderate growth rates were experienced shortly after independence as can be seen in graph 2. However growth rates plummeted to negative between 1980 and 1982 as a result of the world recession which was precipitated by increases in crude oil price. The economy recovered between 1982 and 1984 due to the construction and commencement of production at the OK Tedi mine. Between the years 1985 and 1988, the economy experienced economic growth due to the construction and commencement of production at the Misima and Porgera mines. However, the closure of the Panguna copper mine on the island of Bougainville in 1989 ushered in another period of economic contraction from 1989-1990. Between the years 1991 to 1995 PNG experienced GDP growth due to the construction and commencement of production at the Kutubu crude oil project and the Tolokuma and Lihir gold mines. In 1997, the El-Nino induced drought reduced the volume of PNG's agricultural export commodities. This, combined with the effects of the Asian Financial Crisis, lead to negative growth in 1997. From 2002 to 2004, the economy experienced consistent positive growth which was driven by high commodity prices.

The average annual growth rate for the period under study was 3.1 percent. The peak was reached in 1993 at 18.2 percent, while the trough was in 1997, with a negative growth rate of 6.3 percent.

Figure 2: GDP Growth Rate (1978 – 2004)

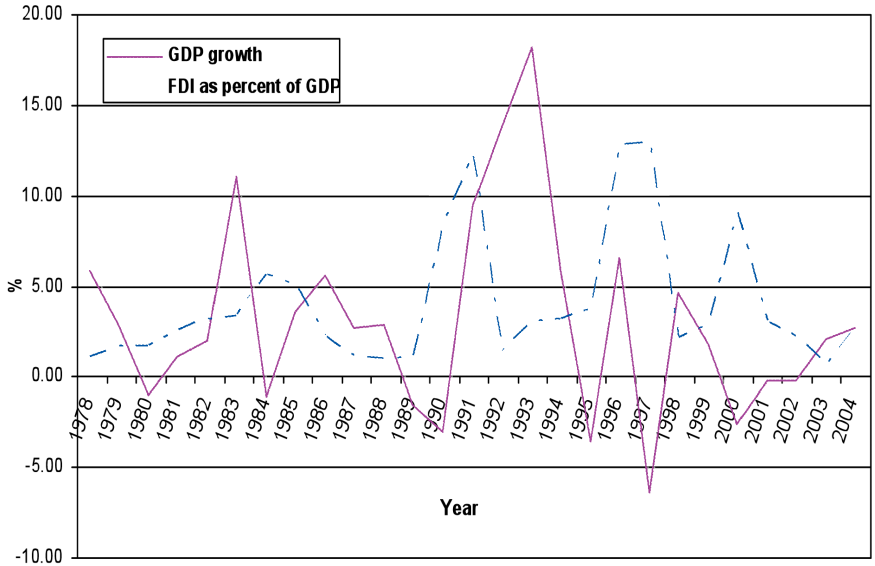


Source: National Statistical Office and Bank of Papua New Guinea 2008

The distribution of PNG's GDP by industry is uneven. Agriculture, the main stay of the economy since independence, has seen its dominance wane. Agriculture's share of GDP was 33.6 percent of GDP between the years 1988 and 2004 whilst the mining and petroleum sectors contribution to GDP during the same period remains high at 18.0 percent. Mining and petroleum sectors contribution to GDP has become more prevalent in recent years, while the more labour intensive sectors, such as manufacturing, remain small.

Table 2: Composition of Papua New Guinea's Total Real GDP between 1988-2004		
Sector	**Value (million kina)**	Percentage of total
Agriculture	37,440.2	**33.6**
Mining and Petroleum	20,049.9	**18.0**
Community Services	14,832.7	**13.3**
Manufacturing	9,319.7	**8.4**
Wholesale and Retail	7,844.4	**7.0**
Construction	6,872.0	**6.2**
Transport storage and communication	4,453.6	**4.0**
Finance		**3.7**
Electricity		**1.7**
Note: Total real GDP is the sum of industries less imputed bank charges, plus import duties, less subsidies.		
Source: Bank of Papua New Guinea (2007) & Department of Treasury in 2007.		

Figure 3: FDI as percentage of GDP and GDP growth rates (1978 – 2004)



Source: National Statistical Office, Bank of PNG and UNCTAD

Graph 3, which combines graphs 1 and 2, appears to show the variables moving together which would imply that they are cointegrated. This will be tested empirically in this paper.

We anticipate a bi-causal relationship between FDI inflows and GDP growth in PNG. Initially, large FDI inflows are expected to increase aggregate investment and productivity and therefore growth. The growth in domestic skills, technologies and the domestic market bought on by FDI are expected to further increase the attractiveness of PNG to foreign investors.

When testing for Granger Causality, there is a possibility that the associations and conditional associations estimated are due to unrecorded variables. In respect of this, Granger Causality would only exist if the variables have strict exogeneity. PNG's case provides a very interesting case of when the variables do not have strict exogeneity. For example, exogenously determined commodity price booms cause higher FDI inflows and productive capacity as it is more worthwhile to invest because of increased growth due to higher government expenditure. Granger Causality between FDI and GDP growth rates could therefore be influenced by exogenous changes in commodity prices in both directions. This suggests that the results of this paper should be used for positive prediction and not normative policy making.

4. Methodology

The data used in the study are the annual growth rate in FDI inflows, sourced from the World Investment Report (UNCTAD 2007), and PNG's annual real GDP growth rate, sourced from various editions of the Bank of Papua New Guinea's Quarterly Economic Bulletin (BPNG 2007). The period under study is from 1978 to 2004. FDI was deflated using the GDP (1988) deflator and growth rates were calculated.

In order to establish the short and long term effects of the growth rates of FDI inflows and the growth rates of GDP, quarterly time series were generated from the annual data set using low to high frequency quadratic match sum method. This was done to address the low number of observations in the annual series and increase the degrees of freedom of the time series. Comparative growth paths for each time series were generated to test for bias in the results and are included in Appendix 2. There does not seem to be any biases in the results as both the annual and quarterly growth paths show similar trends.

A three-stage procedure, identical to that used by Narayan and Smyth (2004), was used to establish the causal relationship between FDI growth rates and GDP growth rates in PNG.

In the first stage, stationarity properties of the variables under investigation were tested using the Augmented Dicker-Fuller (ADF) test on the levels and the first differences of the log-series on the basis of equation 1. It is a necessary condition to establish the stationarity of the variables at levels or in difference form to investigate the long run relationship between the two variables.

$$\Delta Y = a_0 + b_1 Y_{t-1} + \sum_{j=1}^{n} c_j \Delta Y_{t-j} + \epsilon_t \qquad \textbf{(1)}$$

Where:

Y is the dependent variable under consideration;

a_0 is the constant term in the equation.

b_1 is the coefficient of the lagged dependent variable.

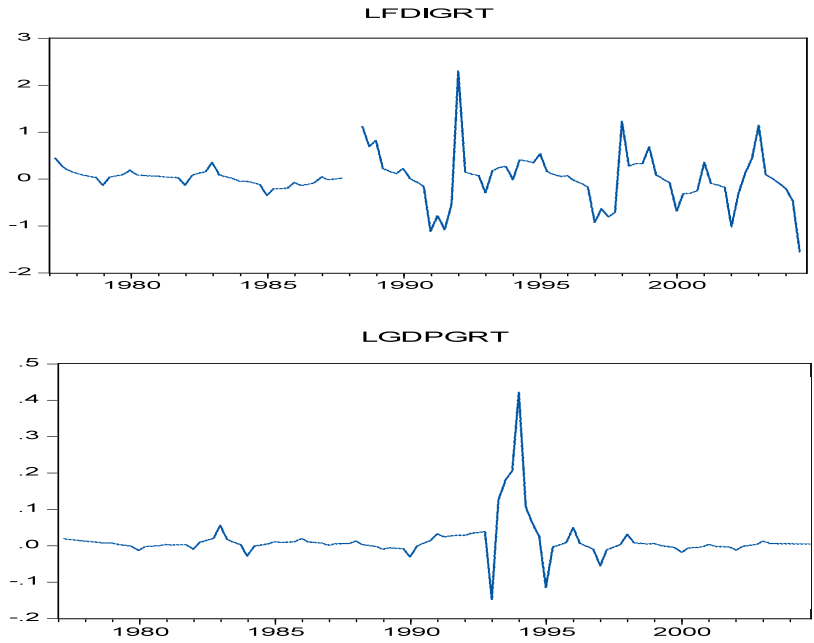
n is the number of lags in the dependent variables set to a maximum lag of order of $\sqrt{N}$ so as to induce a white noise term.

c_j is the vector of coefficients of the differenced and lagged dependent variable.

ϵ is the stochastic error term.

The value of 'n' was dependent upon the lowest number of lags that resulted in no autocorrelation in the disturbances. Both the Akaike's information criterion (AIC) and Schwartz information criterion (SIC) were used to determine the value of 'n'. In order to reject the null hypothesis of a unit root, the Mackinnon (1991) critical values have to be greater than the calculated ADF test values. Results of the ADF test on levels and differences are presented in table 3.

Figure 4: LOGFDIGRT and LOGGDPGRT at Levels



Source: Author's calculations

According to results from table 3, both variables are stationary at levels. The null hypothesis of a unit root is rejected for GDP and FDI growth rates at all levels, since the calculated ADF test results of -5.84 and -6.54 for GDP and FDI growth rates, respectively, are less than the Mackinnon critical values.

Table 3: ADF unit root test	
Variable	Levels
Log Real GDP growth rate	**-5.84 (2)**
Log real FDI growth rate	**-6.54 (2)**
Mackinnon Critical Values **1% -3.49** **5% -2.89** **10% -2.58**	
Note: Figures in parentheses are the value of n in Equation 1. Source: Author's calculations	

Results from the ADF tests and even the oscillating nature of the graphs in figure 4 delineate stationarity of both series in their levels. This means that the series are integrated to the order zero, I(0).

The second stage in the process involved investigating the long run cointegrating relationship between the two variables using two different approaches, that is, the augmented Engle-Granger (AEG) approach and the Durbin-Watson approach. Both approaches use the following equations specification to establish the long run equilibrium relationship between the two variables.

$$lnGDP_t = \alpha_0 + \alpha_1 lnFDI_t + \mu_t \quad \textbf{(2)}$$

$$lnFDI_t = \beta_0 + \beta_1 lnGDP_t + \mu_t \quad \textbf{(3)}$$

Where:

$lnGDP_t$ is the log form of GDP growth rates;
$lnFDI_t$ is the log form of FDI growth rates;
β_0 is the constant term for equation 3;
α_1 is the coefficient of equation 2;
α_0 is the constant term for equation 2;
β_1 is the coefficient of equation 3;
μ_t is the stochastic error or disturbance term

According to AEG approach, residual series (μ_t) of both equations 2 and 3 have to be stationary to qualify cointegration of the two variables. Applying ADF test on the residuals series, that is to run OLS on the following equation specification,

$$\mu_t = \delta\mu_{t-1} + \sum_{j=1}^{n} \delta_j \Delta\mu_{t-1} + \epsilon_t \qquad \textbf{(4)}$$

and test the following hypothesis;

H_o: $\delta = 0$, for non-stationarity of μ_t i.e. for non-cointergation, $t_\delta > \tau$

H_1: $\delta < 0$, for stationarity of μ_t i.e. for cointergation, $t_\delta < \tau$

Table 4: Cointegration test

Equation	**Slope**	**CRDW**	ADF
2	0.01	0.99	**-5.83**
3	0.88	1.16	**-6.66**
Critical Values			
1%		**-2.59**	
5%		**-1.94**	
10%		**-1.61**	
Source: Author's Calculations			

From the results in table 4, the calculated ADF values (t_δ) of -5.83 and -6.66 are both less than the Mackinnon critical values (τ) hence we reject null hypothesis and accept alternative hypothesis at all significance levels, implying cointegration.

This means that the two variables, real GDP and FDI growth rates, demonstrate long run equilibrium association in PNG.

To verify the cointegration established by the AEG approach, Durbin-Watson, approach of testing cointegration was used. Durbin-Watson approach of testing cointegration tests the following hypothesis.

H_o: non-stationarity of μ_t i.e. for non-cointergation, if CRDW<d

H_1: stationarity of μ_t i.e. for cointergation,, if CRDW>d

The critical 'd' values, with the null hypothesis being d=0, have been computed by Sargan and Bhargava (1983) and by Engle and Granger (1987). These critical values are 0.511, 0.386 and 0.322 for significance levels 0.001, 0.005 and 0.10 respectively. Results in table 4 shows that, for both equations 2 and 3, CRDW>d, hence we reject null hypothesis and accept alternative hypothesis for all significance levels, hence confirm cointegration of the two variables.

The third and the final stage in the analysis of the two variables involved establishing the direction of causality between the two variables. Causation does not, in the common sense of the word, refer to cause and effect relationships, but, establishes a long run predictability of the dependent variable by the independent variable. In this case, the predictability of GDP growth rates by FDI growth rates, or vice versa.

We used tests of Granger-Causality (Granger, 1969), to determine the causal relationship between the two series. To test for causality and the direction of causation, the following two equations were specified.

$$GDP_t = \alpha_0 + \sum_{j=1}^{n} \alpha_{t-j} GDP_{t-j} + \sum_{j=1}^{n} \alpha_{t-j} FDI_{t-j} \quad \textbf{(5)}$$

$$FDI_t = \alpha_0 + \sum_{j=1}^{n} \alpha_{t-j} FDI_{t-j} + \sum_{j=1}^{n} \alpha_{t-j} GDP_{t-j} \quad \textbf{(6)}$$

where:

n is the number of lags on the variables.

α_0 is the constant term in the equations.

α_{t-j} is the vector of coefficients of the lagged dependent variable.

Depending on the F-values of equations 5 and 6, the null hypothesis that GDP does not Granger cause FDI and FDI does not Granger cause GDP would be either rejected or accepted. Table 5 summarizes all the results of Granger-Causality test.

Table 5: Granger Causality Test

n	F-stats (5)	Prob (5)	F-stats (6)	Prob (6)
1	0.01366	0.90719	1.02222	0.31436
2	0.06562	0.93653	0.70616	0.49601
3	0.05093	0.98473	0.64900	0.58550
4	1.77189	0.14131	0.80499	0.52513
5	10.3193	0.00000*	0.78927	0.56022
6	8.47929	0.00000*	0.91105	0.49121
7	8.23363	0.00000*	1.03104	0.41635
8	7.26803	0.00000*	1.14723	0.34250
9	6.61347	0.00000*	1.15989	0.33390

10	5.76601	0.00000*	1.15408	0.33715
11	4.91981	0.00002*	1.11058	0.36827
12	4.17008	0.00010*	1.44342	0.17261
13	3.81567	0.00023*	1.36384	0.20685
14	3.41542	0.00064*	1.46943	0.15704
15	2.94474	0.00238*	1.06977	0.40796
16	2.85602	0.00314*	1.16256	0.33438
17	2.82067	0.00372*	1.47757	0.15465
18	2.49275	0.01011*	1.70793	0.08588***
19	2.50789	0.01113*	1.84295	0.06339***
20	0.30003	0.99634	2.76331	0.00732*
21	0.36696	0.98790	2.68445	0.01172*
22	0.63339	0.84866	5.65265	0.00017*
23	0.77494	0.71678	7.02946	0.00016*
24	2.32833	0.07268***	6.68482	0.00112*
25	3.22811	0.05729***	13.1020	0.00090*
26	1.49189	0.42204	12.6226	0.02930**

Note:

* represents significance at 1% level

** represents significance at 5% level

*** represents significance at 10% level

Numbers in brackets correspond to equations 5 and 6

Source: Author's calculations

The Granger Causality test results, as shown in table 5, displays bi-causality. The null hypothesis, that FDI does not Granger cause GDP is rejected at the 1 percent significance level from the 5th to the 19th quarter, while the null hypothesis, that GDP does not Granger cause FDI is rejected at the 1 percent significant level from the 20th to the 25th quarter. This implies that, in the medium term, higher FDI inflow growth rates increase GDP growth rates, while, between four and five years, higher GDP growth rates increase FDI inflow growth rates. Notably, 10 percent significance levels for GDP does not granger cause FDI at the 18th and 19th quarters is not significant to draw conclusions, consequently its ruled out, as is the case for 10 percent significance level at the 24th and 25th quarters for FDI does not granger cause GDP.

5. Conclusion

Using quarterly time series data for the period 1978 - 2004, we investigated the long run relationship between FDI and economic growth by applying a three stage process. We first employed unit root tests on the two series and established their stationarity at levels. We then proceeded with cointegration tests and established a long run association between the two variables. Finally, we tested for Granger Causality.

In the short term there is no evidence of causality. We established a positive medium term causal relationship from the rate of foreign direct investment inflows to the rate of economic growth. We also found that five years after the initial FDI inflow, the relationship between the rate of FDI inflows and GDP growth is bi-causal. That is, GDP growth 'Granger causes' FDI inflows between four and five years after the initial inflow of FDI. The results support the theoretical underpinnings of the relationship between the rate of FDI inflows into PNG and the rate of GDP growth in PNG and sets the stage for future research.

The government should, therefore, attract FDI as part of its strategy of increasing GDP and the productive capacity of the economy as well as increasing the size of the domestic consumer market in order to further attract FDI inflows. Given the strong possibility that Granger causality, in this case, could be influenced by exogenous commodity prices in both directions the policy recommendations should be considered cautiously.

In order for PNG to harness the positive effects of FDI projects, it is important that further research is undertaken. Future researchers can expand on the empirical analysis presented in this paper by addressing the lack of strict exogeneity between FDI and GDP in PNG through the use of a multivariate Vector Auto Regression analysis by including, for example, the terms of trade and the real effective exchange rate in the model. Future research should also attempt to decompose the relationship between FDI and GDP growth in the mineral and non-mineral sectors and investigate when and how spillovers occur to domestic firms.

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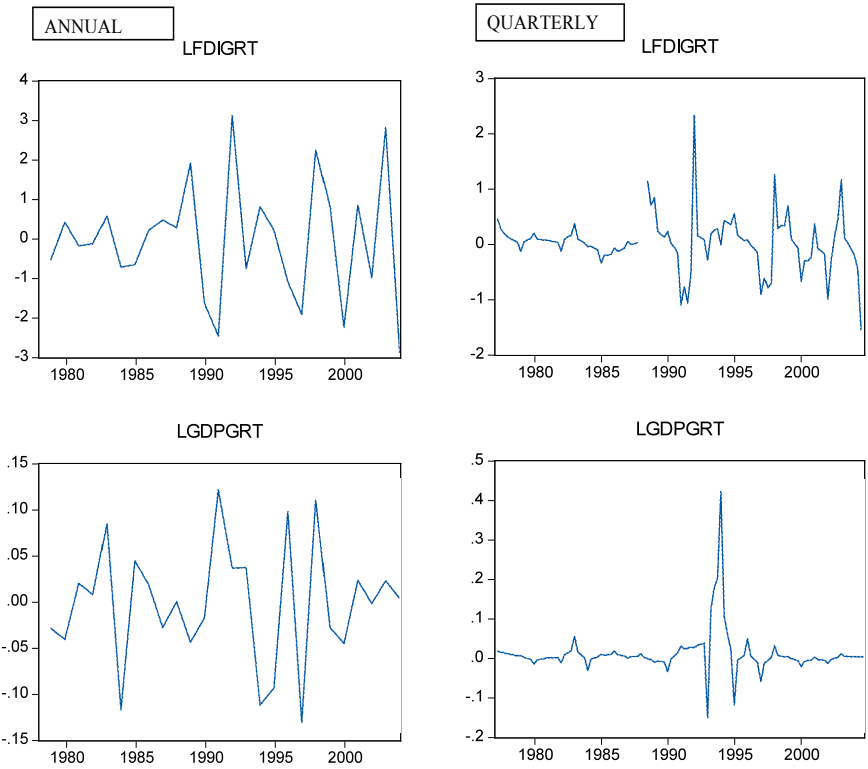
Appendix 1:
FDI and GDP data

Year	Real GDP	GDP (current)	FDI in current prices US Dollars millions	Exchange Rate	FDI in Kina millions	GDP Deflator	Deflate FDI	GDP Grt	FDI Grt	GDP GRT	FDI GRT
1977	1732.3	1410.3	19.80	1.3200	15.00	81.41	18.42				
1978	1834.7	1535	38.91	1.4530	26.78	83.66	32.01	5.91	73.72	105.91	173.72
1979	1888.9	1773.1	44.20	1.4488	30.51	93.87	32.50	2.95	1.54	102.95	101.54
1980	1870.7	1855.2	75.52	1.5531	48.63	99.17	49.03	-0.96	50.86	99.04	150.86
1981	1892.2	1826	86.18	1.4695	58.65	96.50	60.77	1.15	23.94	101.15	123.94
1982	1930.4	1899.8	85.89	1.3371	64.24	98.41	65.27	2.02	7.40	102.02	107.40
1983	2145.5	2145.4	138.87	1.1422	121.58	100.00	121.59	11.14	86.28	111.14	186.28
1984	2124.3	2124.3	115.69	1.0623	108.91	100.00	108.90	-0.99	-10.43	99.01	89.57
1985	2200.7	2200.3	49.18	0.9877	49.80	99.98	49.81	3.60	-54.27	103.60	45.73
1986	2324.5	2324.7	28.82	1.0404	27.70	100.01	27.70	5.63	-44.38	105.63	55.62
1987	2388.9	2388.9	27.54	1.1384	24.19	100.00	24.19	2.77	-12.68	102.77	87.32
1988	2458.4	3169.9	42.67	1.2100	35.27	128.94	27.35	2.9	13.08	102.90	113.08
1989	2423.4	3045.7	295.76	1.1633	0.05	125.68	0.04	-1.4		98.58	100.00
1990	2350.8	3076.1	397.91	1.0493	0.01	130.85	0.01	-3.0	-72.04	97.00	27.96
1991	2575.4	3605.5	51.49	1.0498	0.05	140.00	0.03	9.6	202.07	109.55	302.07
1992	2931.5	4223	133.73	1.0127	0.01	144.06	0.01	13.8	-80.30	113.83	19.70
1993	3465.1	4867.1	158.46	1.0190	0.02	140.46	0.01	18.2	100.40	118.20	200.40
1994	7733.4	5530.3	178.97	0.8485	0.02	71.51	0.03	5.9	160.54	105.90	260.54
1995	7466.8	6194.7	595.39	0.7490	0.01	82.96	0.01	-3.4	-68.20	96.55	31.80
1996	7959.5	6794.7	654.25	0.7425	0.15	85.37	0.18	6.6	1528.86	106.60	1628.86
1997	7454.5	7079.6	87.62	0.5710	0.01	94.97	0.01	-6.3	-94.05	93.66	5.95
1998	7803.6	7803.6	109.63	0.4770	0.05	100.00	0.05	4.7	398.85	104.68	498.85
1999	7948.3	8828.3	296.49	0.3710	0.06	111.07	0.05	1.9	-1.44	101.85	98.56
2000	7750.2	9735.8	95.93	0.3255	0.06	125.62	0.05	-2.5	-11.74	97.51	88.26
2001	7740.7	10396.3	62.54	0.2658	0.01	134.31	0.00	-0.1	-89.19	99.88	10.81
2002	7660.9	11656.7	18.23	0.2488	0.02	152.16	0.01	-0.2	102.53	99.84	202.53
2003	7895.7	12567.3	101.00	0.3000	0.04	159.17	0.03	2.2	177.32	102.16	277.32
2004	8110.5	12652.1	25.80	0.3200	0.12	156.00	0.07	2.7	168.45	102.72	268.45

Appendix 2:
Annual and Quarterly GDP and FDI growth paths



High frequency data is known to produce bias results due to clustering and outlier problems. Many filtering methodologies have been used to filter clustered and outlier data to study the relationships between variables. In this case, when we used E-views low to high frequency quadratic match sum method to generate quarterly (high frequency) series from an annual (low frequency) series, clusters and outlying data were filtered automatically by the process. Consequently, representative data series were generated as can be seen in appendix 2, where the annual and quarterly growth paths of both FDI and GDP show similar trends.

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