FDI-Growth Nexus in Ethiopia: Is there any Causality*†*

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Abstract:

The objective of this paper was to investigate the causal link between FDI and economic growth in Ethiopia. Using annual data ranging from 1974-2010 and employing the Toda-Yamamoto (1995) bivariate causality test, we could not find any causality running from FDI to growth or vice versa. However, there was an evidence of cointegration between FDI and growth. The implications of the results are: first, the flow of the aggregate level of FDI is too small to translate in to growth. Second, perhaps FDI flow has gone in to sectors that could not create linkages and fuel economic growth. Thus, developing countries like Ethiopia should formulate policies attracting FDI in to economic sectors that could harness the benefits of the FDI outweighing the costs of hosting FDI (like profit repatriation to FDI sending economy). Seabra and Flach (2005) document adverse impact of profit repatriation due to FDI. With further availability of data, future research should examine the causal link in a multivariate framework while addressing the issue of structural break.

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1. INTRODUCTION

The effect of foreign direct investment (FDI) on economic growth has been subject of long debate in development literature. Existing theories can be categorized in to two broad opposing views: One, those that claim negative or neutral effect of FDI on economic growth. For instance, predictions based on neoclassical growth models only affect the level of income without changing the long run growth (de Mello, 1997). Similarly, it is argued that FDI may not be beneficial due to possibility of profit repatriation from FDI recipient country to sending country (Seabra and Flach, 2005). Two, those that claim positive effect of FDI on economic growth mainly rooted in endogenous growth theories. They predict positive effect of FDI on growth as far as FDI generates increasing returns to production via externalities (de Mello, 1997, 1999).

It is argued that FDI enhances economic growth by increasing capital stock (composition effect) or facilitating the international technology transfer (knowledge effect). The technology transfer is possibly channelled through imitation, competition, linkage or training (Kinoshita, 2000; Sjolhom, 1999). That is domestic firms may imitate the technology used by multinational companies (MNCs) that operate in the domestic country; they may also be encouraged to use modern technology in order to survive the intense competition in the market due to entrance of MNCs in the domestic economy. Besides, MNCs may transact with domestic firms subcontracting some of their activities or requiring for intermediate inputs from domestic firms creating linkage that lead to different forms of assistance like changing their production process or training the domestic firms' human capital to use the new production process or technology.

Both theoretical views can not be ruled out with out empirical verifications. In line with this, there are several empirical studies examining the relationship between FDI and growth employing variants of econometric methods. However, the evidence is mixed. For instance, Liu et al (2002) reported positive effect of FDI on economic growth in China. Zhang (2001) examines the causality between FDI and growth for eleven countries on country-by-country basis and found mixed evidence. Carkovic and Levine (2002) reported no long run effect running from FDI to economic growth. Recently, Chowdhury and Mavratos (2006) found no causality link between FDI and growth in Chile, while present in Thailand and Malysia. Similarly, Hansen and Rand (2006) found no long run relationship between FDI and economic growth. However, they found causality running from FDI to gross capital formation (GCF) ratio to GDP. They used the latter indicator of FDI to separately test whether the knowledge or composition effect operates. Detailed survey of the relationship between FDI and economic growth is beyond the scope of this paper (see de Mello (1997, 1999); Ozturk, 2007).

Methodologically, much of the FDI-Growth literature is dominated by panel data based growth regression in view of capturing both cross-country and time dimensions (de Mello, 1997; Ozturk, 2007). The results from such regression indicate heterogeneous country impacts that imply for investigation at country level (Chowdhury and Mavrotas, 2006). Besides, such regressions have disadvantage of being subjected by too much averaging. Thus, FDI-growth nexus would be better investigated for a specific country using time-series approaches.

Following this argument, we examine the causal link between FDI and economic growth in Ethiopia. Moreover, Ethiopia is an interesting case due to recent huge inflow of FDI (FDI rose from almost nil to nearly 5.5% of the Gross domestic Product [GDP] over last two decade), the recent policy attentions towards attracting FDI and the good growth record over the last 7 years. Besides, to the best of our knowledge, there is no previous empirical study that examines the causality between FDI and growth in Ethiopia. In terms of contribution, the paper add to the empirical literature on FDI-growth nexus drawing evidence from SSA country, Ethiopia, and employing the more robust Toda-Yamamoto (1995) causality test following (Chowdhury and Mavrotas, 2006) .

2. METHODOLOGY

2.1 The Data

According to UNCTADSTAT (2011), foreign direct investment (FDI) is defined as "an investment involving a long-term relationship and reflecting a lasting interest in and control by a resident entity in one economy (foreign direct investor or parent enterprise) of an enterprise resident in a different economy (FDI enterprise or affiliate enterprise or foreign affiliate). Such investment involves both the initial transaction between the two entities and all subsequent transactions between them and among foreign affiliates".

We used annual data on FDI and Growth for the period 1974-2010. FDI is measured as foreign direct investment as percentage of GDP. While growth is measured as Real GDP, real GDP per capita or the rate of growth in real GDP per capita. The main source of data is UNCTADSTAT (2011). Summary statistics of the variables used in the analysis of this study are provided in table 2.1 below.

Table 2.1: Data Description of the Main Variables

Variables	Description	Mean	Standard Deviation
RGDP	Real Gross Domestic Product	8645.16	3733.48
RGDPPC	Real Gross Domestic Product per capita	154.45	27.58
FDI	Foreign Domestic Investment to GDP ratio	1.05	1.62

Source: UNCTADSTAT (2011)

2.2 Econometric Approach

2.2.1 Stationarity Test

An issue in the estimation of time series data is to determine whether the variables are stationary or not, hence one required to test whether the two variables are non-stationary or not, i.e., a unit root test. This is due to the fact that simple regression of two independent nonstationary series often

result in a significant *t* statistics that indicates a statistically acceptable relationship while there is no sense in which the two variables to be related, spurious regression case (Granger and Newbold, 1974). We used the Augmented Dickey Fuller (ADF) test to check whether the two variables are nonstationary or not as formulated in (1) below:

$$\Delta y_t = \gamma_0 + \gamma y_{t-1} + \sum_{i=1}^{k} \gamma_i \Delta y_{t-i} + v_t \qquad (1)$$

Where: $y_t = (gdp_t, fdi_t)$ the variables to be tested for nonstationrity. The null hypothesis is the variables GDP and FDI contain Unit root and the alternative is each are stationary [i.e., integrated of order 0, I(0)]. If γ is statistically significant y_t is I(0). Here the ADF test requires use of the Dickey Fuller critical value.

If the series of the variables contain Unit root, one may suspect spurious regression problem between GDP and FDI. However, the time series literature have shown that regressing an I(1) dependent variable on an I(1) independent variable can be informative if these variables are related in some particular sense, that is, if they are cointegrated.

Asking whether two economic time series variables are cointegrated is like asking whether any long run relationship exists between the trends in the two variables. Given an I(1) gdp_t and I(1) is fdi_t, we test for cointegration using Johansen Maximum Likelihood (ML) procedure.

2.2.2 Johansen ML Cointegration Test

We used the Johansen cointegration procedure for conducting cointegration regression analysis since it provides a unified method for estimating and testing cointegrating relations in the framework of vector error correction (VEC) models (for details, see Johansen 1988; Johansen and Juselius 1990; Enders 1995, Harris and Sollis, 2003).

In a multivariate framework, following Harris and Sollis (2003), if one defines a vector $Z_t = (z_{1t}, z_{2t}, ..., z_{mt})'$ and allow each variable to be potentially endogenous in the system. Then one can write a VAR model with *k* lag length as in (2) below. In this study,

$$Z_t = \begin{bmatrix} \ln GDP_t \\ FDI_t \end{bmatrix}$$

$$Z_t = v + A_1 Z_{t-1} + ... + A_k Z_{t-k} + U_t \qquad\qquad U_t \sim IN(0, \Sigma) \qquad (2)$$

Equation (2) can be reformulated in to a vector error correction form as in (3) below:

$$\Delta Z_t = v + \sum_{i=1}^{k-1} \Gamma_i \Delta Z_{t-i} + \Pi Z_{t-1} + U_t \qquad (3)$$

Where $\Pi = \sum_{j=1}^{j=k} A_j - I$, $\Gamma_i = -\sum_{j=i+1}^{j=k} A_j$, v and U_t are vector of parameters and vector of *i.i.d* normal disturbance terms. Engle and Granger (1987) show that if the variables Z_t are I(1) the matrix Π in (3) has rank $0 \leq r < m$, where r is the number of linearly independent cointegrating vectors and m is the number of endogenous variables in the system. Hence, one can express Π as $\Pi = \alpha\beta'$, where α and β are both *m X r* matrices of rank *r*.

Specifying the system as in (3) contains information on both the short run and long run adjustment to changes in Z_t via the estimates of Γ_i and Π ($\hat{\Gamma}_i$ and $\hat{\Pi}$). Allowing for linear trend, a constant and assuming that there are *r* cointegrating relationships; one can rewrite (3) as follows:

$$\Delta Z_t = \alpha(\beta Z_{t-1} + \mu + \rho t) + \sum_{i=1}^{k-1} \Gamma_i \Delta Z_{t-i} + \gamma + \delta t + U_t \qquad (4)$$

By putting restrictions on the trend terms in (4), one can have 5 different vector error correction models. Identifying the proper specification among these 5 different specifications is an important issue in the Johansen procedure; since improper specification of the deterministic component (trend and constant terms) results in inference problem (Hendry and Juselius, 2000). Johansen (1992) suggests the need to test the joint hypothesis of both the rank order and the deterministic components, based on the so-called *Pantula principle*. That is to move through from the most restrictive alternative to the least restrictive model and at each stage to compare the trace test statistic to its critical value and only stop the first time the null hypothesis is not rejected. We followed the same to identify the proper specification and test for existence of cointegration.

The existence of cointegration implies that there is a long run, causal relationship between the variables of interest, at least in one direction. The Granger causality tests can, then, be performed within the VEC framework to determine the direction of the causality. However, due to sensitivity of the stationarity and cointegration test in finite sample rendering incorrect inferences (Toda and Yamamoto, 1995), we used the Toda-Yamamoto causality test to check for causal link between FDI and growth following Chowdhury and Mavartos (2006). This approach address the problem by specifying standard VAR in levels of the variables instead of difference; hence, minimizes the risk associated with testing for order of integration and the distortion of the tests' size as a result of pretesting (Mavartos and Kelly, 2001).

2.2.3 Toda-Yamamoto Causality Test

In this test, one need to estimate an augmented VAR($k+dmax$) model, where k is the optimal lag length in the original VAR system, and *dmax* is the maximal order of integration of the variables in the VAR system. The Granger no-causality test is based on a modified Wald (*MWald*) test for zero restrictions on the parameters of the original VAR(k) model. The remaining *dmax* autoregressive parameters are regarded as zeros and ignored in the VAR(k)model. This test has an asymptotic chi-square VAR ($k + dmax$) distribution when the augmented VAR is estimated. Rambaldi and Doran (1996) have shown that the *MWald* tests for testing Granger no-causality experience efficiency improvement when Seemingly Unrelated Regression (SUR) models are used in the estimation. We followed the same.

3. FDI AND ECONOMIC GROWTH IN ETHIOPIA: A DESCRIPTION

For long FDI flow to Ethiopia was very minimal. Perhaps this was due to instability in the country, the closed economic system preferred by the communist party that led the country during 1974-1991. In this section, we describe the trends for two periods 1974-1991 and 1991-2010 periods. The period selection is mainly dictated by the availability of data and the different economic system path the country followed over this two periods.

As can be seen from figure 3.1 (right panel), the period 1974-1991 witnessed deterioration in economic performance. This was a period of control regime, pro-closed market movement and protracted civil war. During this period, the country embarked on nationalization of productive assets, business environment became hostile to investors and markets highly regulated. To once dismay, the country faced 1984/85 famine. All this contributed to the dismal economic performance.

In view of foreign direct investment, the period recorded an average of 0.097% of the GDP that fell down from nearly 1% of the GDP. The political turmoil, the overvalued exchange rate and discriminatory economic policies that penalized private sector clearly sent a message of bad FDI destination.

The period 1991-2010 was a period of recovery and recently witnessing sustained growth over the last seven years. With the down fall of the pro-socialist regime and formation of federal states, the incumbent adopted structural adjustment policies with Ethiopian context of liberalization (Geda and Befekadu, 2005). The military expenditure declined sharply. Black market premium fell from 358% in 1992 to 15.5% in 1997 (Geda and Befekadu, 2005). Overall, the policy reforms and political stability contributed towards better economic performance. Notwithstanding the down turns during 1994 drought, 1998 Ethio-Eritrean border conflict and other political instabilities.

Looking in to FDI, the period attracted huge flow of FDI that once reached to nearly 5.5% of the GDP. This was possible due to the liberalization of different markets that attracted foreign investors, devaluation of Birr (Ethiopian currency) and different investment proclamations with preferential treatments (like tax holidays) to attract investment. Despite the average rise in foreign investment, the FDI flow was highly volatile as can be seen in figure 3.1 below. Partly, this was due to frequent revisions of investment proclamation and instability due to border conflict with Eritrea that perhaps reduced investment confidence.

Looking in to the trend of FDI and growth pre 1991(figure 3.1), it seems that one can not establish a link between FDI and growth. However, visualizing the relationship post 1991a positive link could be shown on average though a negative relationship emerge in the last couple of years.
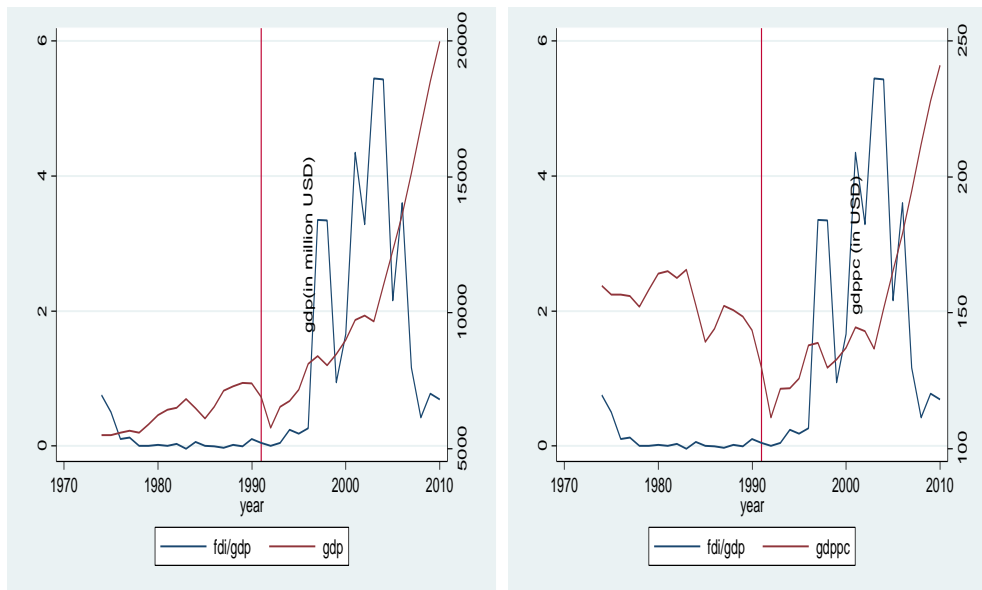

Figure 3.1: Trend of FDI-to-GDP ratio (fdi/gdp) , Real GDP (gdp) and Real GDP percapita (gdppc) [1974-2010]

4. ECONOMETRIC RESULTS

The econometric results are given in the following four steps. First, we present the ADF unit root test. Second, we present the optimum lag structure selection for the VAR. Third, the Toda-Yamamoto causality test results are provided. Last, cointegration test result based on Johanson ML procedure also given.

Table 4.1 provides ADF test results. The results show that both real GDP and FDI are I(1) series at 5% level of significance. The test for two unit roots, I(2) is rejected at 10% level of significance, hence the two variables are integrated of order one. As can be seen from table 4.1, disaggregating the data in to two different regimes, the results hold true.

Table 4.1: ADF Test Results[♠]

Variables	Whole Period: 1974-2010		Period I: 1974-1991		Period II: 1991-2010	
	Ho: I(1)	*Ho: I(2)*	*Ho: I(1)*	*Ho: I(2)*	*Ho: I(1)*	*Ho: I(2)*
lnRGDP	-0.297	-4.338***	-3.315	-5.780***	-0.435	-3.149*
	(0.9896)	(0.0027)	(0.0639)	(0.0000)	(0.9858)	(0.0950)
FDI to GDP Ratio	-2.191	-5.763***	-10.967	-3.078	-1.389	-4.393***
	(0.4951)	(0.0000)	(0.0000)	(0.1115)	(0.8640)	(0.0022)

Values in parenthesis are MacKinnon approximate p-value
[♠]The lag lengeth for the ADF test was set at one lag length based on Schwarz Bayseian Information Criteria (SBIC)

The results for selecting the optimum lag structure of the VAR (k) are found based on the Akaike information criteria (AIC), Hannan-Quinn information criteria (HQIC) and SBIC. All consistently indicate the optimum lag length of 1. Hence, we selected one lag as the optimum lag length for the VAR model to be estimated.

Given the maximal order of integration ($d_{max}=1$) and the selected optimal VAR length ($k=1$), we estimated the following augmented VAR model using Seemingly Unrelated Regression (SUR) method.

$$Z_t = \nu + A_1 Z_{t-1} + A_2 Z_{t-2} + U_t \qquad\qquad U_t \sim IN(0, \Sigma) \qquad\qquad (5)$$

Where: $\quad Z_t = \begin{bmatrix} \ln GDP_t \\ FDI_t \end{bmatrix}$, $\quad Z_{t-1} = \begin{bmatrix} \ln GDP_{t-1} \\ FDI_{t-1} \end{bmatrix}$ and $\quad Z_{t-2} = \begin{bmatrix} \ln GDP_{t-2} \\ FDI_{t-2} \end{bmatrix}$.

$A_1 = \begin{bmatrix} \alpha_{11}^1 & \alpha_{12}^1 \\ \alpha_{21}^1 & \alpha_{11}^1 \end{bmatrix}$ and $A_2 = \begin{bmatrix} \alpha_{11}^2 & \alpha_{12}^2 \\ \alpha_{21}^2 & \alpha_{11}^2 \end{bmatrix}$.

Testing for causality based on Toda-Yamamoto (1995) is to check whether $\alpha_{12}^1 = 0$ in the case of FDI does not granger cause growth and $\alpha_{21}^1 = 0$ in the case of growth does not granger cause FDI. Table 4.2 below presents the result.

Table 4.2: Toda-Yamamoto Causality Test Result

Null Hypothesis	1974-2010	1974-1991	1991-2010
	MWald Test	MWald Test	MWald Test
FDI doesnot granger cause GDP	0.02 (0.8744)	0.81 (0.3676)	1.45 (0.2282)
GDPdoesnot granger cause FDI	0.21 (0.6446)	1.69 (0.1931)	0.05 (0.8217)

Values in parenthesis are *p*-value

The evidence clearly portray for not rejecting the null hypothesis of Granger non-causality from FDI to growth and vice versa. We could not find a causal link between FDI and Growth in Ethiopia. Finding the Granger non-causality between FDI and Growth and the I(1) series of the two variables, we further checked for any long run relationship between FDI and growth. The results for Johanson ML cointegration test is provided in table 4.3 below.

Table 4.3: Johanson ML Cointegration Test result for FDI and Growth [*Restricted constant Specification*]

Null Hypothesis	Maximum Eigen Value	5% critical value	Trace Statistics	5% critical value
1974-2010				
r=0	15.5140	15.67	20.5357	19.96
r≤1	5.0218	9.24	5.0218**	9.42
1974-1991				
r=0	23.9382	15.67	29.7860	19.96
r≤1	5.8479	9.24	5.8479**	9.42
1991-2010				
r=0	10.7433	15.67	15.1327**	19.96
r≤1	4.3893	9.24	4.3893	9.42

The cointegration test reveals that possibly there is one cointegration rank implying a long run relationship between FDI and growth in Ethiopia. Variant of specifications of vector error correction model with different indicators of growth variable tested and the cointegration rank is the same in almost all cases. This result may imply two phenomenons. One, it may be the case that the variable FDI is a very good proxy for a variable that affect growth. Two, it may be the case that the aggregate level of FDI is too small to translate in to growth in our sample period but a possible indication of the relationship over the long run.

Further in ensuring the robustness of the results presented hitherto. We used different indicators of the variables FDI (FDI to GCF ratio) and Growth (real GDPPC, RGDPPCgr). Though in the interest of brevity not presented here, the results are qualitatively the same and could be obtained from the author up on request.

Further, one would like to examine the growth performance in a multivariate framework incorporating other possible endogenous variables. The availability of data was constraining hence lest for small sample size that could render fragile statistical results in multivariate time series framework. Moreover, this study does not explicitly address issue of structural breaks

that may limit the results, hence a caution in drawing conclusions. With further availability of data, these can be possible future research area.

5. CONCLUSION

The objective of this paper was to investigate the causal link between FDI and economic growth in Ethiopia. Using annual data ranging from 1974-2010 and employing the Toda-Yamamoto (1995) bivariate causality test, we could not find any causality running from FDI to growth or vice versa. However, there was an evidence of cointegration between FDI and growth. That is, possible long run relationship between FDI and growth. The implications of the results are: first, the flow of the aggregate level of FDI is too small to translate in to growth. This may indicate that economic growth is a necessary but not sufficient condition for attracting FDI. Thus, efforts should be exerted on addressing the fundamentals (like infrastructure, human capital and institutions, etc) than specific policy for attracting FDI. Second, perhaps FDI flow has gone in to sectors that could not create linkages and fuel economic growth. This may indicate the impact of FDI on growth is conditional on the type of economic sector, where technology transfer, managerial skills, organizational process and skill acquisitions are more possible than otherwise. Thus, developing countries like Ethiopia should formulate policies attracting FDI in to economic sectors that could harness the benefits of the FDI outweighing the costs of hosting FDI (like profit repatriation to FDI sending economy). Seabra and Flach (2005) document adverse impact of profit repatriation due to FDI. As pointed out earlier, with further availability of data future research should examine the causal link in a multivariate framework while addressing the issue of structural break to uncover more robust evidence.

REFERENCES

Carkovic, M. and R. Levine (2002), 'Does Foreign Direct Investment Accelerate Economic Growth?', Working Paper Series. Accessed from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=314924 on 29/10/2011

Chowdhury, A. and G. Mavrotas (2006), 'FDI and Growth: What Causes what?', *The World Economy*, **29**, 1, 9-19.

de Mello, L. R. (1997), 'Foreign Direct Investment in Developing Countries and Growth: A Selective Survey', *Journal of Development Studies*, **34**, 1, 1–34.

de Mello, L. R. (1999), 'Foreign Direct Investment-led Growth: Evidence from Time Series and Panel Data', *Oxford Economic Papers*, **51**, 1, 133–51.

Enders, W. (1995), *Applied Econometric Time Series,* New York, NY: John Wiley and Sons.

Engle, R. F. and C. W. J. Granger (1987), 'Cointegration and Error Correction: Representation, Estimation, and Testing', *Econometrica,* vol. **55**, 2, 251-76.

Geda, Alemayehu and B. Degefe (2003), 'Explaining African Economic Growth: The Case of Ethiopia', Final Report to AERC. Accessed from http://alemayehu.com/AA%20Recent%20Publication/Growth_FinalFR_August_2005.pdf on October 25, 2011.

Granger, C. W. J., and P. Newbold (1974), 'Spurious Regressions in Econometrics', *Journal of Econometrics,* **2**, 111–120.

Hansen, H. and J. Rand (2006), 'FDI and Growth: What Causes what?', *The World Economy*, **29**, 1, 21-41.

Harris, R. and R. Sollis (2003), *Applied Time Series Modelling and Forecasting*, Chichester, John Wiley and Sons.

Hendry, D. and Juselius, K. (2000), 'Explaining Cointegration Analysis: Part II.' Discussion Papers 00-20, Department of Economics, University of Copenhagen, Denmark.

Johansen, S. (1992), 'Determination of cointegration rank in the presence of a linear trend', *Oxford Bulletin of Economics and Statistics,* **54**, 383-397.

Johansen, S. (1988), 'Statistical analysis of Cointegrating Vectors', *Journal of Economic Dynamics and Control,* **12**, 231-254.

Johansen, S. and K. Juselius (1990), 'Maximum Likelihood Estimation and Inference on Cointegration-with Applications to Demand for Money', *Oxford Bulletin of Economics and Statistics,* **52**, 2, 169-210.

Kinoshita, Y. (2000), 'R&D and technology spillovers via FDI: Innovation and absorptive capacity', Accessed from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=258194 on 29/10/2011

Liu, X., Burridge, P. and Sinclair, P.J.N., (2002), 'Relationships between economic growth, foreign direct investment and trade: Evidence from China', *Applied Economics* **34**, 1433-1440.

Mavrotas, G. and R. Kelly (2001), 'Old Wine in New Bottles: Testing Causality Between Savings and Growth', *The Manchester School*, **69**, 97–105.

Ozturk, Ilhan (2007), 'Foreign Direct Investment – Growth Nexus: A Review of the Recent Literature', *International Journal of Applied Econometrics and Quantitative Studies* ,**4**, 2, 79-98. Accessed from http://www.usc.es/~economet/reviews/ijaeqs424.pdf on 29/10/2011

Rambaldi, A.N., and Doran, H.E. (1996), 'Testing for Granger non-causality in cointegrated systems made easy', Working Papers in Econometrics and Applied Statistics 88, Department of Econometrics, The University of New England.

Seabra, F and L. Flach (2005), 'Foreign Direct investment and Profit Outflows: A Causality Analysis for the Brazilian Economy', *Economics Bulletin,* **6**, 1, 1-15.

Sjoholm, F., (1999), 'Technology gap, competition, and spillovers from FDI: evidence from establishment data', *Journal of Development Studies*, **36,** 1, 53–73.

Toda, H. Y. and T. Yamamoto (1995), 'Statistical Inference in Vector Autoregressions with Possible Integrated Processes', *Journal of Econometrics*, **66**, 1–2, 225–50.

Zhang, K. H. (2001), 'Does Foreign Direct Investment Promote Economic Growth? Evidence from East Asia and Latin America', *Contemporary Economic Policy*, **19**, 2, 175–85.