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Has Foreign Direct Investment Led to Higher Productivity in sub-Saharan Africa?

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Abstract

In this paper, I will examine the linkage between foreign direct investment (FDI) and productivity in fourteen sub-Saharan economies – Benin, Botswana, Congo, Cote d'Ivoire, Gambia, Ghana, Malawi, Mauritius, Nigeria, Senegal, Seychelles, Togo, Tanzania and Zambia. I will use the Granger causality test and the Toda-Yamamoto version of the Granger causality test to test if FDI inflows result in higher productivity growth. I find limited evidence that FDI inflows contribute to higher total factor productivity growth. There was no evidence that FDI inflows lead to higher technical change but there was some evidence that FDI inflows lead to higher efficiency in three countries.

Keywords: Total factor productivity, Foreign direct investment, Sub-Saharan Africa, Granger causality

Foreign Direct Investment and Productivity in Sub-Saharan Africa

In this paper, I attempt to examine the impact of foreign direct investment (FDI) on productivity. This is because the spillover effects from FDI have been hypothesized to be technological and organizational in nature. Therefore we would expect the impact of FDI to manifest itself in higher productivity growth. As a result, it would seem natural to examine the relationship between FDI and productivity directly.

Past research has concentrated on examining the link between FDI and economic growth. The research has attempted to quantify the effect that FDI has on economic growth above its direct impact on increasing investment. In a sense, these studies attempted to measure the spillover effects of FDI on the economy albeit indirectly. Currently, research that examines directly the linkage between FDI and productivity is limited. This is especially true for developing countries. Part of the reason is the lack of data on productivity at the country level for many developing countries.

Recently, UNIDO has embarked on a project to create a database on productivity for a large number of countries, including many developing countries. I will use the results from the UNIDO productivity database to examine the relationship between FDI and productivity. The productivity estimates from the UNIDO database are obtained from Data Envelopment Analysis (DEA). These estimates also decomposed the change in productivity into technological change and technical efficiency change. Therefore in addition, to examining if FDI has contributed to productivity overall, I will also be able to examine how FDI influence these two components of productivity. Do FDI contribute to higher productivity by bringing in newer technology or do FDI contribute to higher productivity by introducing more efficient management process? These are interesting questions for both academics and policymakers. There are many incentives to encourage FDI because it is expected that they bring advanced technology to the country. It would be interesting to test directly if this is the case.

Introduction

The stock of FDI in sub-Saharan Africa has grown tremendously over the past decade or so. Data from UNCTAD (2006) revealed that the stock of FDI in sub-Saharan Africa has grown from US$35 billion in 1990 to US$187 billion in 2005. Most of the stock of FDI in sub-Saharan Africa is in South Africa. However, even excluding South Africa, the FDI stock in sub-Saharan Africa has increased from US$26 billion to US$118 billion over the same period. The flows of FDI to sub-Saharan Africa have similarly increased from US$1.7 billion to more than US$20 billion between 1990 and 2005. As a result of the impressive increase in FDI flows, sub-Saharan Africa share of FDI inflows into developing economies has climbed from 4.7% in 1990 to 6.3% in 2005.

However, FDI is not valued for its own sake. The value of FDI lies in its ability to promote the development in the recipient country. FDI has been seen as having an important role to play in the development process of many countries. In the standard neoclassical model for economic growth, increases in the capital stock and labour force will contribute to higher economic growth. Therefore the flow of FDI by increasing the domestic capital stock will contribute to increasing the growth of the economy. More importantly, it has often been argued that FDI contributes to growth beyond the direct effect of increasing the capital stock. FDI is seen to bring to the host country additional benefits such as new technology, access to foreign markets and managerial know-how.

Expectations of these extra benefits are part of the reasons that governments in developing countries provide special incentives to attract FDI into the countries.
These incentives can take the shape of setting up foreign investment promotion agencies or even to offer tax and fiscal incentives to foreign firms that invest in the country. These benefits can be quite costly in terms of tax revenues foregone. Therefore, it is important that the benefits of FDI can be clearly identified in order to justify the costs of the FDI promotion activities.

In this paper, I will examine if FDI contribute to higher productivity in the recipient country. In particular, I will focus on examining the linkage between FDI and productivity in fourteen sub-Saharan African countries – Benin, Botswana, Congo, Cote d'Ivoire, Gambia, Ghana, Malawi, Mauritius, Nigeria, Senegal, Seychelles, Togo, Tanzania and Zambia. The sample is selected based on the availability of reliable data on productivity. They are a relatively diverse group of countries ranging from large economies such as Nigeria to small economies such as Seychelles.

I will use the Granger causality test and the Toda-Yamamoto version of the Granger causality test to examine the relationship between the inflows of FDI and various measures of productivity that has been compiled by UNIDO. Although there have been suggestions that FDI inflows can help increase productivity in developing countries, there has been little research that examines directly the linkage between FDI and productivity at the macro level. This paper here attempts to fill that gap. The results show that there is limited evidence that FDI inflows contribute to higher total factor productivity (TFP) growth in our sample of countries. Only Botswana and Congo shows some weak evidence that FDI causes higher TFP growth in these two countries. There was no evidence that FDI inflows lead to higher technical change but there was some evidence that FDI inflows lead to higher efficiency in three countries – Cote d'Ivoire, Ghana and Malawi.

Literature Review

There is a large body of literature on the impact of FDI. In this literature review, I will focus on reviewing some of the studies on the impact of FDI on technology, economic growth and productivity. Unfortunately, the literature on the impact of FDI in African countries is still relatively limited. Hence the review of the literature here will present the results for developing countries in general rather than just focusing on Africa.

Most studies of FDI in Africa so far have focused on examining the determinants of FDI flows into Africa. For example, Basu and Srinivasan (2002) analyzed FDI in African countries and argued that the main determinants of FDI flows in Africa can be divided into four categories – natural resource, specific locational advantage, policies towards FDI and economic reforms. They also argued that a "critical mass of

mutually reinforcing policies" is needed for Africa to continue attracting FDI. In particular, they emphasised the importance of political and macroeconomic stability. Meanwhile, Asiedu (2005) uses panel data for 22 African countries to show that the presence of natural resources and large domestic market tend to promote FDI inflows into the country. However, she also finds that by improving their macroeconomic environment and policy stance, countries that are no well endowed with natural resources or with small domestic market can also increase their FDI inflows. Therefore, this suggests that the appropriate policies can play a very important role in attracting FDI.

FDI is seen as an important channel for the transmission of technology for many developing countries. Findlay (1978) suggests that FDI can increase the productivity of the host country as the more advanced management techniques and technologies of the foreign firms spread to local firms. Multinational companies are usually at the technological frontier and have access to latest and most advanced technologies. It is expected that as they invest in plants in developing countries they will at the same time transfer these high level technologies. It is hoped that the technology that is embedded in the multinational companies' plant will spread to other plants in the countries.

There has also been extensive evidence in the literature that analyzes the contributions of FDI to economic growth. Overall, the evidence has been mixed. More recent studies tend to find that for FDI to contribute to higher growth, other factor such as highly-skilled workforce and better institutions need to be present. De Gregorio (1992) by examining the experiences of 12 Latin American countries over the period 1950-85 found that FDI provides three times the boost to economic growth as compared with aggregate investment. Blomstrom *et al* (1992) arrived at a similar conclusion using a larger sample of developing countries. They also find that FDI has a strong impact of the economic growth of developing countries. However, they also find that this effect is limited to higher-income developing countries. For lower income developing countries, other factors such as secondary education were more important. Ram and Zhang (2002) using data from the 1990s from a large cross-section of countries also find that FDI has a positive impact on economic growth.

Carkovic and Levine (2002) is one of the papers using macro level data to find little support for the importance of FDI in stimulating growth. They argue that previous studies showing the benefit of FDI on economic growth has not fully taken into account the endogeneity problem. Countries with good economic performance will tend to attract more foreign direct investment. Therefore, if the endogeneity problem is not taken into account, it is unclear that foreign direct investment is what drives economic growth rather than the other way round. Once they have taken care of the endogeneity problem, they found that growth drives FDI rather than the other way round.

This result has been supported by other studies as well. Li and Liu (2005) using a large sample of developed and developing countries find that beginning in the mid-1980s, the relationship between FDI and economic growth have become increasingly endogenous. Both Zhang (2002) and Zhang (1999) find evidence of two-way Granger causality in the relationship between FDI and China's economic growth. Similarly, Choe (2003) in a large sample of 80 countries finds evidence of two-way causality between FDI and economic growth. In addition, he also finds that the effects are more apparent from economic growth to FDI.

The evidence that only higher-income developing countries benefit from FDI suggests that there may be other factors that determine how much a country benefit from FDI. Later research attempts to identify these factors. For example, Borensztein *et al* (1998) shows that the country needs a certain level of human capital in order for the country to benefit fully from FDI. They performed cross-country regressions on a sample of 69 developing countries and found that FDI contributes more to growth than domestic investment. Further, they also found that FDI is complementary with human capital i.e. human capital needs to be above a certain threshold for FDI to be more productive than domestic investment. It would seem that although FDI may bring with it advanced technology and techniques, the country also need to have sufficient absorptive capacity in terms of qualified people in order to benefit fully from it. Without sufficient level of human capital, the country does not have the absorptive capacity to take full advantage of FDI. Therefore, FDI is not seen as a cure-all. The country needs to have the right level of human capital for FDI to be fully effective.

However, the belief that FDI provides extra benefit to the economy is not universally shared. Nunnenkamp and Spatz (2003) found using data of US FDI stock abroad that the link between FDI and economic growth is quite weak. On a slightly bright note, they do find that the link tend to be stronger in countries with more favourable characteristics such as better institutions, more educated workforce and openness to trade. In general, however, they are quite skeptical about the benefits from FDI. They argue that it is easier to attract FDI than to derive benefit from it.

The other strand of literature has used firm-level data to examine the benefits of FDI. The evidence from firm-level research has been mixed but is probably less optimistic that the macro-level evidence on the benefits of FDI. Aitken and Harrison (1999) using data for over 4,000 Venezuelan firms found that there are very limited spillover effects from foreign firms to domestic firms. There are some benefits to small individual plants from foreign investment, but for large firms there is no evidence of benefits of foreign investment once the differences in plant characteristics are taken into account. More disappointingly, they also found evidence of negative spillover effects from foreign to domestic enterprises, i.e. productivity in domestic firms is lower when foreign investment increases. This is in contrast with most other studies that find positive spillovers. The reason is that these studies are often estimated at the industry level and do not take into account differences in productivity across industries. Therefore if foreign investors are attracted to more productive industries, these could lead to the (wrong) conclusion that foreign investment has positive spillover effects on the economy.

A similarly pessimistic result can be found in Sasidharan (2006) where he finds that FDI does not have significant vertical or horizontal spillovers in a sample of around 2,700 Indian manufacturing firms over the period of 1994-2002. This sample period encompasses the period where India witnessed a large inflow of FDI. So, it is rather disappointing to see that these flows seem to have brought little benefits to the domestic firms.

In order to better understand the impact of FDI in Africa, UNIDO (2006) has carried out a large-scale survey of foreign investors in sub-Saharan Africa. The survey covers

more than 1200 foreign-owned firms in the manufacturing and services sector in 15 sub-Saharan African countries. One of the aims of the survey is to measure the impact that FDI has on the companies. The survey uses training and research and development expenditure as proxies to measure the impact of FDI on technology and skill enhancements. It finds that only about a third of the firms reported investing in training. Interestingly, what is found is that African firms are the ones that invested most heavily in staff training. This could be a reflection of the longer-term perspective of the African investors. While less than 10% of the firms reported spending any money on research and development, it is interesting to note that the survey finds that firms from developing countries tend to spend more on research and development than firms from developed countries.

Hale and Long (2006) provide a more positive view of spillovers from FDI. They use the survey of 1500 firms in China to examine if there are technological spillovers from foreign firms to domestic firms in the same city and industry. They find there are indeed positive spillover effects from foreign firms operating in China. However, the spillover benefits are not evenly spread. Domestic firms that have relatively higher productivity obtained positive spillovers from the foreign firms while domestic firms with lower productivity derived negative spillovers. The paper then proceeds to examine how the positive spillovers from foreign firms are channelled to the domestic firms. What the authors find is that the movement of high-skilled workers from the foreign firms to the domestic firms is one of the channels. They also find that domestic firms that have more highly skilled workforce tend to have higher productivity in the presence of more FDI. Evidence of positive spillover from technologically advanced firms working mainly through the movement of high-skilled workers from the foreign firms to domestic firms and through the network externalities effect. Therefore, we again see the need for complementary factors such as a well-functioning labour market to ensure that the benefits of FDI are fully realized. This could be one reason that most studies have found little evidence of positive spillovers of FDI in developing countries where the labour institutions are not so well-developed while there are more evidence for positive spillovers in developed countries. However, they do not assume that the spillovers can be spread to firms outside the industry. This could be the case if there are spillovers in terms of managerial and organizations ability.

The main drawback of these micro-level studies is that they only take into account the effect of spillovers within the sector that is surveyed. Most of the surveys are carried out on manufacturing firms. Hence if there are spillover effects from the manufacturing sector into the services sector, these effects will not be fully captured in these studies. By using macro-level data in this paper to examine the spillover effects, I hope to be able to more fully capture the spillover effects from FDI.

Data

The data for foreign direct investment are from the UNCTAD Foreign Direct Investment database on the Internet[1]. There are several measures of foreign direct investment that have been used in the literature. In this paper, I will use foreign direct investment inflows as a share of GDP as my measure of FDI. I believe this measure best represents the impact of foreign direct investment on the overall economy.

I will use the total factor productivity (TFP) estimates from the UNIDO productivity database as my indicators of productivity at the country level. The full details about the methods used to obtain the TFP estimates can be found in Isaksson (2006). The first step in estimating productivity is the assumption of the existence of an aggregate production function for each of the countries. Without assuming the existence of an aggregate production function, we will be unable to measure TFP. Traditionally, TFP has been estimated using the growth accounting method. However, for this paper I will use the TFP estimates that are obtained from data envelopment analysis (DEA). The main advantage that DEA has over growth accounting is that it does not require as many assumptions. For example, DEA does not assume that the countries are technically efficient or that the countries are perfectly competitive. On the downside, DEA is more sensitive to outliers and mismeasurement. Another advantage of DEA is that we are able to decompose the change in TFP into a change in technical efficiency and technological change. This has important implications as it can help us identify whether FDI contribute to higher productivity by inducing greater efficiency or through technology transfer that increases technological change.

[1] http://www.unctad.org/Templates/Page.asp?intItemID=1923&lang=1

We follow Färe *et al* (1994) approach in adopting the DEA method for calculating productivity at the country level. Each country's output and inputs at a point of time is treated as a production point in our sample. The production function has GDP as output, and labour and capital as inputs. Technically, DEA involves the use of linear programming methods to construct a non-parametric piece-wise frontier. This frontier can be thought as a world technology frontier. Movements of the world technology frontier can be thought of as technical change and movements towards the world technology can be seen as a change in technical efficiency. The Malmquist index can then be used to obtain the measure of TFP growth.

The data for each country's GDP, labour and capital used in the DEA are obtained from the Penn World Tables 6.1. The estimate for capital is obtained from investment data and following Crego *et al* (1998) assuming that the capital stock lasts for 20 years with a decay parameter of 0.70.

In this paper, I will focus on examining the linkage between FDI and productivity in fourteen sub-Saharan countries – Benin, Botswana, Congo, Cote d'Ivoire, Gambia, Ghana, Malawi, Mauritius, Nigeria, Senegal, Seychelles, Togo, Tanzania and Zambia. This group of countries were chosen based on the availability of reliable productivity and FDI data. The data for these economies cover the period 1970-2000 except for Botswana where it covers from 1974-2000 as foreign direct investment data was not available for Botswana for the period 1970-1973.

Table 1 presents an overview of productivity and the various measures of foreign direct investment in our sample of sub-Saharan countries. In general, the table shows that the TFP performance of the countries in our sample has been quite disappointing. More than half of the countries exhibited negative TFP growth. Among the countries in our sample, Gambia and Togo were the best performers with average TFP growth of 2.46% p.a. and 2.03% p.a. respectively over the period. We can further decompose the TFP growth into its two components – technical change and efficiency change. What we find is that for most of the countries, the underperformance in TFP growth can be traced to negative efficiency change. The FDI performance of the

countries is relatively good. Seychelles has by far the highest share of FDI (7.51%) relative to GDP followed by Congo (4.22%).

Empirical Analysis

In order to determine whether there is a causal relationship between FDI and productivity, we will perform Granger causality tests on FDI and productivity. This test was introduced in Granger (1969) and has widely utilised to examine the direction of causality between two time-series variables. However, before we can proceed with using the Granger causality test we need to check the time series properties of the variables. In the case where the variables are not stationary, the usual asymptotic distribution of the test statistic in the Granger test may not be valid. Therefore it is important to ensure that the variables are stationary before proceeding.

In order to check if the variables are stationary, I will use the Phillips-Perron (1988) unit root test. The advantage of the Phillips-Perron test over the Dickey-Fuller unit root test is that the test statistics from the Phillips-Perron test has been made adjusted to take into account of serial correlation by using the Newey-West (1997) covariance matrix. The null hypothesis of the Phillips-Perron unit root test is that the variable has a unit root. The Phillips-Perron test statistics for each of the variables and economies in the sample are shown in Table 2. Basically the results show that for the various indicators of productivity – TFP growth, technical change and efficiency change – the null hypothesis of a unit root can be rejected. For six of the countries, FDI/GDP is also stationary in level. However, for eight of the countries, Benin, Botswana, Cote d'Ivoire, Gambia, Ghana, Mauritius, Nigeria and Togo, FDI/GDP is not stationary in level but is stationary in first difference. Therefore, for these countries, I will be using the Todo-Yamamoto (1995) modified version of the Granger causality test, which is able to handle non-stationarity of the variables.

Now that, I have checked for the stationarity of the variables, I can proceed to carrying out the Granger causality test introduced by Granger (1969). The concept of the Granger causality test is based on the idea that events in the past cannot be influenced by events today or in the future. Therefore, if event A occurs before event B, then only event A can "cause" event B. What we are doing when we are carrying

out the Granger causality test is to test whether variations in one variable occurs before variations in another variable. Variable X is said to Granger cause variable Y if the past values variable X can improve the forecast Y. It is also possible that that the two variables X and Y, Granger causes each other. If this is the case, then we have bi-directional Granger causality.

In order to test for Granger causality, I will estimate a bivariate vector autoregression (VAR) model for each of the country in the sample. Formally, we can write the VAR to be estimated for each country as:

$$\begin{bmatrix} FDI_t \\ PROD_t \end{bmatrix} = \begin{bmatrix} \alpha_1 \\ \alpha_2 \end{bmatrix} + \sum_{i=1}^{p} \begin{bmatrix} \beta_{1i} & \varphi_{1i} \\ \beta_{2i} & \varphi_{2i} \end{bmatrix} \begin{bmatrix} FDI_{t-i} \\ PROD_{t-i} \end{bmatrix} + \begin{bmatrix} u_{1t} \\ u_{2t} \end{bmatrix}$$

where t is the time subscript, p is the number of lags for the VAR, FDI is the foreign direct investment share of GDP, and PROD represents the various measures of productivity growth. $\beta_{1i,}\, \beta_{2i,}\, \varphi_{1i}$ and φ_{2i} are the coefficients from the VAR; and u_{1t} and u_{2t} are the uncorrelated residuals from the VAR.

In testing for Granger causality, what we are doing is to check and see if the past values of a variable are useful in forecasting the present value of another variable. If we want to examine if FDI Granger causes productivity, this would mean testing to see if $\beta_{2i} = 0$ for all values of $i = 1, 2, \ldots p$. This can be implemented by means of a Wald test with the null hypothesis that the values of the estimated coefficients (β_{2i}) are jointly zero. Hence, if we reject the null hypothesis, then we can say that FDI Granger causes productivity. Similarly, we can also test to see if productivity Granger causes FDI. It is quite possible that higher productivity in a country attracts more foreign investors into the country. It is also possible to have the result of bi-directional Granger causality where FDI and productivity Granger causes one another. This would imply that there are feedback effects between FDI and productivity.

One of the shortcomings of the Granger causality test procedure is that we have to ensure that the variables used in the test is stationary. Since for eight of the countries in the sample the level of FDI inflows is not stationary, the result from the Granger

causality test will not be valid. Instead for these eight countries, I will use the Toda and Yamamoto (1995) modified version of the Granger causality test to examine the relationship between FDI and productivity. The main advantage of the Toda-Yamamoto test is that it allows for the variables in the VAR to be non-stationary or even cointegrated. Therefore, the Toda-Yamamoto test allows us to also test for causality the level of FDI inflows although it is known to be non-stationary. Implementing the Toda-Yamamoto test is relatively straightforward. It is shown that standard asymptotic theory holds for the results from the VAR if we add extra lags of the variables equal in number to the maximum order of integration. Since it has been determined that the maximum order of integration for FDI inflows is one, one extra lag will be added to the VAR to be estimated. The coefficient of the extra lag, however, will not be used in the computation of the Wald test for causality.

Before we can estimate our VAR, we need to decide on the lag length for each of the VAR. I set the maximum lag length for the VAR to be 3 years and use the Akaike Information Criterion to select the appropriate lag length. This is an important step before estimating the VAR as the choice of lag length has been shown to influence the results from the Granger causality test. The results of the lag length selection process for the VARs with TFP growth, technical change and efficiency change as the dependent variables are shown in Table 3. The results show that for most of the countries a parsimonious specification of the VAR is the appropriate choice.

Once the lag length for each of the VAR has been determined, I will test to see if FDI "causes" TFP growth and if TFP growth "causes" FDI. The results of the Todo-Yamomoto causality and Granger causality Wald test are shown in Table 4 and Table 5 respectively. What I have found is that there is little evidence of FDI causing higher TFP growth. In our sample, we can only find two countries where there is some weak evidence of FDI causing TFP growth – Congo and Botswana. In Seychelles we find that there is weak evidence of TFP causing FDI. Therefore, the empirical suggest that for our sample of countries there is not much evidence of the spillover effects of FDI onto the broader economy.

In addition, to examining the relationship between FDI and TFP growth, I will also analyse the relationship between FDI and one of the components of TFP growth – technical change. This component of TFP growth can be viewed as measuring the increase in technological capability of a country. Another way to see it is that technical change measures the shift of the technological frontier that a country faces. One of the oft-stated benefits of FDI is that it helps to transfer technology to developing economies. I will perform the Granger causality test for FDI and technical change to examine if FDI does lead to technical change. The results of the Toda-Yamamoto and Granger causality test are shown in Table 6 and Table 7 respectively. In this case, we find that none of the countries in our sample show evidence of one-way causality from FDI to technical change. However, in the case of Ghana, we have strong evidence of bidirectional causality suggesting that there are strong feedback effects between FDI and technical change there. Overall, this suggests that FDI in our sample of sub-Saharan Africa countries has contributed to greater technological improvement.

Finally, I will analyse the relationship between FDI and efficiency change. The concept of efficiency change can be thought of as improvements in the productivity of the economy from non-technological improvements in the economy such as organizational or management change. It can also be viewed as a movement by a country towards the technological frontier. The results of the Toda-Yamamoto and Granger causality test between FDI and efficiency change are shown in Table 8 and Table 9 respectively. We have found that both Ghana and Malawi exhibited strong evidence that FDI leads to higher efficiency change. In addition, Cote d'Ivoire also shows weak evidence of FDI leading to higher efficiency change. Meanwhile, Seychelles shows strong evidence of bi-drectional causality between FDI and efficiency change. Therefore, our results here suggest that there is some evidence that FDI has contributed to greater efficiency change in some of the countries in our sample. This suggests that it may be easier in Africa for FDI to transmit managerial and organizational improvements rather than technical knowledge.

Concluding Remarks

I have used the Granger causality test and the Toda-Yamamoto version of the Granger causality test to examine the relationship between FDI and productivity in the economy at the aggregate level. Previously, most research on the relationship between FDI and productivity has relied on using firm-level data. The drawback of using firm-level data is that it may not be able to capture the spillover effects that happen outside the industry. By using productivity data for the whole economy, I am able to capture the spillover effects of FDI on the whole economy. Using a sample of fourteen sub-Saharan countries, I have found that there is only weak evidence in two countries (Botswana and Congo) of FDI causing higher TFP growth. We proceed to decompose TFP growth into its two components – technical change and efficiency change – to identify if FDI has any effect on these two components. The results show that FDI has not contributed to technical change in the countries in our sample. However, we find evidence that FDI has contributed to higher efficiency change in three countries. Therefore, it would seem that seem FDI has been more successful in transferring "soft" knowledge such as managerial or organizational skills that tend to lead to higher efficiency rather than "hard" knowledge that lead to higher technical change.

Although the results suggest that FDI has limited effect on TFP growth, the results do not imply that FDI is not beneficial. However, it does suggest that in order for countries to benefit fully from the spillover effects of FDI, there should be greater emphasis placed on the type and quality of FDI that is being attracted. Higher FDI flows per se do not necessarily lead to better productivity. It is also important to note that to benefit fully from FDI, the countries should also have the necessary skilled labour force that is able to assimilate and spread the benefits from FDI.

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Table 1: Productivity and Foreign Direct Investment, 1970-2000 (Annual Average*)

	TFP growth (% p.a.)	Technical Change (% p.a.)	Efficiency Change (% p.a.)	FDI/ GDP (%)
Benin	0.32	-0.17	0.04	1.05
Botswana	-0.79	0.61	-1.59	2.49
Congo	-3.62	0.27	-4.16	4.22
Cote d'Ivoire	-0.66	0.25	-1.09	1.20
Gambia	2.46	0.04	1.99	2.52
Ghana	-2.38	0.19	-3.18	0.88
Malawi	-1.91	0.28	-2.46	1.11
Mauritius	-1.48	-0.20	-1.47	0.80
Nigeria	1.58	-0.20	1.42	1.97
Senegal	-0.40	0.75	-1.57	0.81
Seychelles	0.49	-0.18	0.59	7.51
Togo	2.03	0.22	1.55	1.24
UR Tanzania	-0.21	0.68	-1.20	0.76
Zambia	-1.96	-0.44	-1.79	2.28

* Except FDI indicators for Botswana which is from 1974-2000.
** Gross Fixed Capital Formation.

Table 2: Phillips-Perron (Z_t) test statistic for unit root

	FDI/GDP	Δ(FDI/GDP)	TFP growth	Technical change	Efficiency change
Benin	-2.732	-6.111*	-4.331*	-3.369*	-4.540*
Botswana	-2.826	-7.007*	-6.732*	-4.155*	-6.246*
Congo	-3.656*		-5.447*	-3.731*	-4.621*
Cote d'Ivoire	-1.918	-7.045*	-4.059*	-3.518*	-5.570*
Gambia	-1.033	-7.213*	-3.563*	-3.156*	-4.331*
Ghana	-2.712	-6.962*	-4.687*	-3.354*	-3.328*
Malawi	-3.382*		-7.758*	-3.169*	-8.515*
Mauritius	-2.631	-6.197*	-5.969*	-6.515*	-5.507*
Nigeria	-2.664	-9.584*	-3.802*	-3.259*	-3.871*
Senegal	-4.876*		-6.139*	-3.300*	-4.569*
Seychelles	-4.925*		-5.244*	-5.395*	-4.837*
Togo	-1.611	-8.401*	-7.178*	-3.247*	-5.816*
UR Tanzania	-3.974*		-6.680*	-3.272*	-4.743*
Zambia	-3.827*		-5.119*	-3.314*	-3.760*

* reject the null hypothesis that the variable has a unit root at the 5% level.

Table 3: Optimal Lag Length for the VAR

Country	TFP Growth	Technical Change	Efficiency Change
Benin	1	1	1
Botswana	1	1	1
Congo	3	3	1
Cote d'Ivoire	1	1	1
Gambia	1	1	1
Ghana	1	3	2
Malawi	1	1	1
Mauritius	1	1	1
Nigeria	1	1	1
Senegal	2	1	1
Seychelles	3	2	3
Togo	2	1	2
UR Tanzania	3	1	1
Zambia	1	1	1

Table 4: Toda-Yamamoto Causality Test for FDI Growth and TFP Growth

	ΔFDI → TFP growth	TFP growth → ΔFDI
Benin	0.27	0.34
Botswana	3.46*	2.08
Cote d'Ivoire	0.79	0.65
Gambia	0.14	0.04
Ghana	1.28	0.39
Mauritius	0.00	0.66
Nigeria	2.05	0.04
Togo	0.71	3.20

* denotes significance at 10% level

Table 5: Granger Causality Test for FDI Growth and TFP Growth

	ΔFDI → TFP growth	TFP growth → ΔFDI
Congo	6.35*	0.64
Malawi	0.02	0.71
Senegal	0.01	1.71
Seychelles	3.79	7.26*
Tanzania	6.21	4.76
Zambia	0.98	1.22

* denotes significance at 10% level

Table 6: Toda-Yamamoto Causality Test for FDI Growth and Technical Change

	FDI → Technical Change	Technical Change → FDI
Benin	0.17	0.01
Botswana	0.84	3.42*
Cote d'Ivoire	2.16	9.37**
Gambia	1.12	0.02
Ghana	19.08**	21.65**
Mauritius	0.00	1.46
Nigeria	0.13	0.19
Togo	0.10	0.64

* denotes significance at 10% level, ** denotes significance at 5% level

Table 7: Granger Causality Test for FDI Growth and Technical Change

	FDI → Technical Change	Technical Change → FDI
Congo	2.92	4.28
Malawi	1.69	1.94
Senegal	0.09	2.37
Seychelles	0.31	0.73
Tanzania	1.35	0.01
Zambia	0.22	5.67**

* denotes significance at 10% level, ** denotes significance at 5% level

Table 8: Toda-Yamamoto Causality Test for FDI Growth and Efficiency Change

	FDI → Efficiency Change	Efficiency Change → FDI
Benin	0.02	1.32
Botswana	0.07	8.35**
Cote d'Ivoire	3.04*	2.61
Gambia	0.31	0.01
Ghana	20.36**	3.41
Mauritius	0.02	0.09
Nigeria	1.47	0.16
Togo	2.27	1.03

* denotes significance at 10% level, ** denotes significance at 5% level

Table 9: Granger Causality Test for FDI Growth and Efficiency Change

	FDI → Efficiency Change	Efficiency Change → FDI
Congo	0.13	0.15
Malawi	4.75**	0.09
Senegal	0.15	2.40
Seychelles	8.75**	10.68**
Tanzania	1.63	1.68
Zambia	0.30	1.06

* denotes significance at 10% level, ** denotes significance at 5% level

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