EC331

Research in Applied Economics

The Relationship between FDI Flows and Growth in Africa

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1: Introduction

This project aims to examine the relationship between Foreign Direct Investment (henceforth FDI) flows and growth in Africa while also attempting to determine whether there is a difference in the effects on growth between 'Western' FDI flows and Chinese FDI flows.

Foreign Direct Investment is defined as a long-term investment by an investor resident in one country in an enterprise located in another country with the aim of significantly influencing the management of the foreign enterprise.

With millions of people relatively destitute poverty has remained a global concern for the past 60 years. Despite the recent rapid growth of many previously poor nations (particularly in South-East Asia, the so called "Asian Tigers") one large section of the globe remains destitute. Sub-Saharan Africa (with the exception of South Africa) remains the world's most impoverished region not only in terms of GDP per capita but also in terms of general wellbeing (as measured by the Human Development Index). Recent growth in Sub-Saharan African incomes is encouraging (average gross national income per capita has doubled in the last 10 years) but still leaves African incomes lagging far behind the world average. If FDI is responsible for some part of this recent growth then attempting to understand the ways in which FDI can effect growth and then devising appropriate policies to encourage it is clearly an important avenue of exploration.

According to the Ministry of Commerce of the People's Republic of China (MOFCOM 2009) recent years have seen China's FDI outflows to Africa have increased dramatically (from $75 million in 2003 to $1.6 billion in 2007). However, this is still a relatively small percentage of total African inward FDI. Most African FDI comes from Europe, the USA and South Africa; which together account for more than half of Africa's FDI inflows (UNCTAD 2007).

The difference between Chinese investment and the investment of the West in Africa is a prevalent media topic. Chinese investment is often portrayed as being an irresponsible 'bad influence' on African Development, mainly as a result of its refusal to make investment (or aid) determinant on good governance criteria. This is usually sharply contrasted with supposedly good governance promoting (through their insistence upon transparency measures outlined by the Extractive Industries Transparency Initiative) Western investments. The Economist (2004), quoting a trade expert at the South African institute of International Affairs, described China as having an "ethical advantage" over rival investors. Additionally, Chinese investments are often characterised as being overly focused on the extraction of natural resources (such as oil), although Cheung and Qian (2009) contest this.

While there has been a lot of work done in researching the effect of FDI on growth in developing economies, a large portion of this work appears to focus on Latin America and South East Asia with the aim of finding a causal link between FDI and growth; relatively little work has been done on the potentially differing effects of Chinese and Western FDI on growth in Africa. The objective of this project is to investigate whether there is a significant difference between the effects of Chinese and Western FDI upon growth in Africa, what the reasons for this difference may be and its implications for economic policy in Africa.

If a difference between the effects of Western and Chinese FDI flows is discovered then this would suggest that African policymakers should focus on attracting the most effective type of FDI and that policymakers in either China or the West should reassess the constraints (or lack thereof) that they place upon investment in Africa.

In the next section I review the relevant literature on the subject of FDI flows and their effect on developing nations. In section three I examine the models I plan to use and their theoretical backing. Section four contains a summary of the data and I present my results in section five. Section six contains my conclusions and an evaluation of my work with a view to any extensions that may be required.

2: Literature Review

Although literature on the relationship between FDI and growth is fairly plentiful most of this work focuses on the absolute level of FDI (rather than differentiating between different sources of FDI). Relatively little work has been done on the effect of FDI flows on growth in Africa and analysis of the differences between Western FDI and Chinese FDI is scarce and descriptive. The majority of empirical papers investigate the determinants of the Africa's recent influx of Chinese FDI.

Delechat et al (2009) investigate the determinants of aggregate private capital inflows in Sub-Saharan Africa and the relationship between these capital flows and growth in the period 2000-2007. They find that aggregate private capital flows are positively related to growth but were unable to determine causality.

Choong et al (2010) find that for developing nations foreign direct investment has a limited positive effect on growth whereas portfolio investment and foreign debt have negative effects on growth unless a significant stock-market development 'threshold' has been reached, at which point they have positive effects on growth (additionally the positive coefficient on FDI increases proportionally with stock market development). This corresponds with Durham's (2004) findings that the effect of foreign investment upon growth largely depends on the "absorptive capacity" of the country.

De Mello (1997) finds that the effect of FDI on growth is highly sensitive to country specific institutional and natural resource endowment factors. Additionally De Mello argues that creating a better environment for domestic investment to take place would be more effective in attracting FDI than policies specifically aimed at attracting investors from abroad.

Balasubramanyam et al (1999) find that FDI has a positive impact on growth but that this impact is significantly greater in export promoting, rather than import substituting, economies. They found that in these export promoting countries foreign direct investment was more effective in promoting growth than domestic investment. They also found that, above a certain threshold level, there is a positive relationship between FDI and human capital (suggesting a positive spill-over effect from FDI on the productivity of labour).

Similarly to De Mello (1997) Nair-Reinheart and Weinhold (2001) find that the effect of FDI on growth across countries is fairly heterogeneous. However they do find evidence to support a positive causal link from FDI to growth and that this effect is, as Balasubramanyam et al (1999) suggest, greater for more open economies.

Chowdhury and Mavrotas (2006) investigate the direction of causality between growth and FDI for three developing economies (Chile, Malaysia and Thailand) and find that while it appears that growth causes FDI in Chile, both Malaysia and Thailand show evidence of bi-directional causality.

Borenzstein et al (1998) test the effect of FDI on growth in 69 developing countries over the last 20 years. They find that FDI contributes more to growth than domestic investment, but only once a certain threshold level of human capital has been achieved. If this threshold is not met, FDI does not contribute to growth. This further supports Durham (2004) and agrees with the majority of the literature.

Kyaw and Macdonald (2009) use a dynamic panel data model to estimate the connection between FDI and growth in 126 developing countries. They find that while FDI has a positive growth impact in lower and upper middle income countries (mostly Latin American, Northern African, Eastern European and South East Asian countries) in low income countries (mostly Sub-Saharan Africa) there is no positive relationship between FDI and growth. The authors suggest that this is due to a lack of absorptive capacity within these low income countries.

Cheung and Qian (2009) investigate the empirical determinants of Chinese FDI, finding that while it exhibits resource seeking behaviour in developing nations the recent 'going global' policy is not biased in favour of resource extraction. They find limited evidence that the procurement of natural resources (such as oil) is a major determinant of Chinese FDI in

Africa. Additionally the authors also find that Chinese investments are risk-insensitive, which could explain its large investments in high risk countries such as Sudan and Angola.

Downs (2007) argues that Chinese investments in Sudan and Angola have undermined international efforts to end the 'Darfur crisis' and to increase oil revenue transparency in these countries respectively. However, the author goes on to argue that the funds are being used for vital infrastructure projects and therefore the overall effect on growth may be ambiguous.

Buckley et al (2007) investigate the determinants of Chinese FDI in the period 1984-2001 in 22 OECD and 27 Non-OECD countries. They find that Chinese FDI, in contrast to Western FDI, is attracted by political risk in the host country. They put forward low capital costs (as a result of Chinese capital market imperfections) as an explanation. If increasing political risk does attract Chinese FDI then this could provide a disincentive to adopt stabilising reforms. The abandonment of such reforms would have a negative impact on growth. The authors also find that Chinese FDI exhibits significant natural-resource seeking behaviour.

The 'demonization' of Chinese involvement in Africa by various Western media sources is summarised by Sautman and Hairong (2009) who suggest that many of the negative portrayals of Chinese activity in Africa are specific examples without explanatory context.

Kaplisnky and Morris (2009) argue that both Chinese and Western FDI in Sub-Saharan Africa is natural resource seeking and that while Western FDI tends to be short term (and more profit oriented) Chinese FDI tends to be long term (which would be better for growth). They also state that, unlike Western FDI, Chinese FDI has a tendency to be bundled with aid packages and loans from the Chinese government (using the example of the Democratic Republic of Congo, which struck several advantageous aid and infrastructure agreements with China in exchange for rights to $14 billion of copper and cobalt reserves).

3: Theory and Methodology

In classical models capital is scarce in developing nations and plentiful in developed nations. The marginal product of capital is therefore higher in developing nations. Capital flows from developed nations (in the form of FDI) can therefore allow the developing nation to realise growth that would not otherwise have been achievable.

Romer (1990), in a more recent theory, postulates a model where growth is determined primarily by technological change (similar to the Solow model with technological change). However, in this model technological change is determined endogenously; the aggregate stock of designs is a function of the existing stock of designs and the amount of human capital engaged in research. In models such as this FDI can contribute to technological change by transferring knowledge from more advanced countries to developing countries,

and one would expect foreign direct investment from countries with the largest technological gap to be the most effective (i.e. investment from the west will contain a greater amount of 'knowledge' than investment from China).

Delechat et al (2009) include variables for institutional factors (such as the rule of law index published by the World Bank) within their model. I include a measure of perceived corruption (the Corruption Perceptions Index) in the following models as countries with higher perceived corruption may be likely to attract less foreign direct investment (as the cost of doing business is presumably far higher in corrupt states) and reap fewer rewards - in terms of growth - from this investment (as highly corrupt states may appropriate a large portion of any gains).

In a similar way to Nair-Reinheart and Weinhold (2001) I first use a fixed effects panel regression (which I will test, using the Hausman test, against the random effects estimation method) of the following form to examine the relationship between FDI and growth:

(1) $$growth_{it} = \beta_0 + \beta_1 ggdi_{it} + \beta_2 inf_{it} + \beta_3 gexp_{it} + \beta_4 fdiin_{it} + \varepsilon_{it}$$

I then extend the model to include various interaction terms between $fdiin$ and measures of openness, human capital and perceived corruption in order to investigate whether the relationship between FDI and growth varies with the level of openness of, the level of human capital available in or the perceived corruption in the economy. These three regressions are described respectively as follows:

(2) $$growth_{it} = \beta_0 + \beta_1 ggdi_{it} + \beta_2 inf_{it} + \beta_3 gexp_{it} + \beta_4 fdiin_{it} + \beta_5 fdiop_{it} + a_i + \varepsilon_{it}$$

(3) $$growth_{it} = \beta_0 + \beta_1 ggdi_{it} + \beta_2 inf_{it} + \beta_3 gexp_{it} + \beta_4 fdiin_{it} + \beta_5 fdises_{it} + a_i + \varepsilon_{it}$$

(4) $$growth_{it} = \beta_0 + \beta_1 ggdi_{it} + \beta_2 inf_{it} + \beta_3 gexp_{it} + \beta_4 fdiin_{it} + \beta_5 fdicpia_{it} + a_i + \varepsilon_{it}$$

I then perform a similar regression (detailed below), using measures of Chinese and Western FDI growth ($cfdig$ and $wfdig$ respectively), to investigate the claims that there is any difference between the effects of Chinese FDI and Western FDI.

(5) $$growth_{it} = \beta_0 + \beta_1 ggdi_{it} + \beta_2 inf_{it} + \beta_3 gexp_{it} + \beta_4 wfdig_{it} + \beta_5 cfdig_{it} + a_i + \varepsilon_{it}$$

Once again I also investigate the effects of various interaction terms between $cfdig$ and $wfdig$ and measures of human capital, trade openness and corruption.

$$growth_{it} = \beta_0 + \beta_1 ggdi_{it} + \beta_2 inf_{it} + \beta_3 gexp_{it} + \beta_4 wfdig_{it} + \beta_5 cfdig_{it} + \beta_6 cfdigop_{it} + \beta_7 wfdigop_{it} + a_i + \varepsilon_{it} \quad (6)$$

$$growth_{it} = \beta_0 + \beta_1 ggdi_{it} + \beta_2 inf_{it} + \beta_3 gexp_{it} + \beta_4 wfdig_{it} + \beta_5 cfdig_{it} + \beta_6 cfdigses_{it} + \beta_7 wfdigses_{it} + a_i + \varepsilon_{it} \quad (7)$$

$$growth_{it} = \beta_0 + \beta_1 ggdi_{it} + \beta_2 inf_{it} + \beta_3 gexp_{it} + \beta_4 wfdig_{it} + \beta_5 cfdig_{it} + \beta_6 cfdigcpia_{it} + \beta_7 wfdigcpia_{it} + a_i + \varepsilon_{it} \quad (8)$$

These models should show the contemporaneous effects of FDI on growth but the causal relationship between the two variables will still be indeterminate, it could simply be that changes in growth cause changes in FDI (or vice versa).

I also attempt to incorporate simple dynamics into the model by including a single lag of the dependent variable. This can be seen in the following regression:

$$lngdp_{it} = \beta_0 + \theta lngdp_{it-1} + \beta_1 ggdi_{it} + \beta_2 inf_{it} + \beta_3 fdiin_{it} + \beta_4 gexp_{it} + \beta_5 fdiop_{it} + a_i + \varepsilon_{it} \quad (9)$$

However, including a lagged dependent variable causes the error term to become correlated with the lagged dependent variable. This can be easiest seen when first differencing (9) in order to remove the country specific effects:

$$\Delta lngdp_{it} = \theta \Delta lngdp_{it-1} + \beta_1 \Delta ggdi_{it} + \beta_2 \Delta inf_{it} + \beta_3 \Delta fdiin_{it} + \beta_4 \Delta gexp_{it} + \beta_5 \Delta fdiop_{it} + \Delta\varepsilon_{it} \quad (10)$$

Now in (10) $\Delta growth_{it-1} = lngdp_{it-1} - lngdp_{it-2}$ and $\Delta\varepsilon_{it} = \varepsilon_{it} - \varepsilon_{it-1}$, which, by construction, is correlated with $\Delta lngdp_{it-1}$. In order to deal with this I adopt a system GMM estimator (the Arellano-Bover/Blundell-Bond estimator), which uses as instruments lagged levels of $lngdp$ (i.e. $lngdp_{i1}$ is a valid instrument for $\Delta lngdp_{i3}$)as well as all the strictly exogenous regressors ($ggdi$, inf, $gexp$). I will also divide these results into income bands in order to examine whether the effects of FDI on growth are different for different income categories. The reason for the switch to $lngdp$ as the dependent variable is for ease of interpretation

$$\Delta lngdp_{it} = \theta \Delta \mathrm{lngdp}_{it-1} + \beta_1 \Delta ggdi_{it} + \beta_2 \Delta inf_{it} + \beta_3 \Delta fdiin_{it} + \beta_4 \Delta gexp_{it} + \beta_5 \Delta fdioil_{it} + \Delta\varepsilon_{it} \quad (11)$$

Regression (11) is a repeat of regression (10) substituting an interactive term between $fdiin$ and the dummy variable oil (which is equal to 1 if the economy earns oil rents and 0

otherwise) for the interactive term $fdiop$. This will allow the effect of FDI on growth to vary depending on whether or not the country is oil producing (i.e. has a large endowment of valuable natural resources).

One of the problems it is possible to face with a panel data set is unit roots. However, testing $growth$ for the presence of unit using the Harris-Tsavalls test (which is designed for cases where N is relatively large) it becomes clear that the presence of a unit root is strongly rejected (Appendix G). $lngdp$ cannot be tested for a unit root using the Harris-Tsavalls test because it is unbalanced.

4: Data Description and Analysis

This study uses a panel of 45 African Nations over the period 2003-2008. These countries, and the time period, were chosen based upon the availability data for disaggregated Chinese outward foreign direct investment flows. The majority of the Data has been taken from the World Bank's "World Development Indicators" database; destination specific breakdowns of FDI outflows are taken from the OECD database and the Chinese Ministry of Commerce (MOFCOM). However, since the Ministry of Commerce has only existed since 2003 disaggregated Chinese FDI data consistent with IMF-OECD standards is only available for six years (2003-2008 inclusive).

The dependent variable in this study is the annual growth rate of GDP per capita in each country. The main explanatory variables of interest are the foreign direct investment flows received by the country in aggregate, from 'western' investors and from China. These flows are all measured as a percentage of host country GDP.

Also included are other variables intended to capture common growth determinants. These include a measure of human capital, namely the percentage of the school-age population enrolled in secondary education and a measure of the growth rate of domestic investment. Inflation is included as a measure of the government's commitment to the macroeconomic performance of the country. The $gexp$ variable (the growth rate of exports in the economy) is used as a control for the trade openness of the economy. I have also created the dummy variable oil, mentioned in the previous section as being equal to 1 if the economy earns oil rents and 0 otherwise. This dummy variable is introduced in order to examine whether the effect of FDI on growth is altered in the presence of abundant valuable natural resources.

The countries in the sample have been divided into to three broad income categories according to the World Bank's Purchasing Power Parity measure of GDP in 2008. Low income countries are those with a per capita GDP of less than $1407, "Lower Middle Income" countries have a per capita GDP greater than $1407 and less than $4592 and "Upper Middle Income" countries are the countries with per capita GDP greater than $4592. A List of the countries belonging to each income group can be found in appendix A.

Figure 1: A plot of Growth against FDI

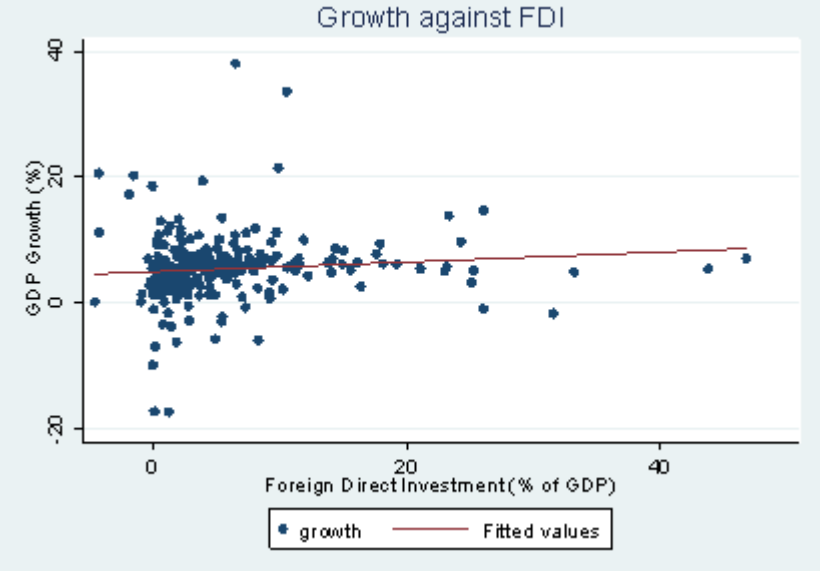

Figure one shows a plot of growth against FDI which seems to indicate a positive overall relationship between the two, high growth rates are associated with high rates of foreign direct investment. However, the causal relationship between the two remains unclear.

For a full list of all variables and their associated definitions see Appendix C.

5: Results and Analysis

Table 1 summarises the results of regressions (1)-(4)

Table 1: 'Fixed Effects' Regressions (1)-(4).

Dependant Variable = $growth$. *//*** denotes significance at the 10%/5%/1% level. T-Statistics in parenthesis**

Variable	Regressions			
	(1)	(2)	(3)	(4)
$ggdi$	0.0550545(4.34)***	0.0632565(4.91)***	0.0678356(4.98)***	0.0323457(1.05)
inf	-0.0642173(1.57)	-0.1033595(-2.40)**	-0.0872577(-1.71)	-0.0662717(-1.12)
$gexp$	0.0762091(5.58)***	0.073179(5.43)***	0.0268797(1.09)	-0.0272349(1.00)
$fdiin$	-0.0119837(-0.22)	-0.2110361(-2.20)**	-0.1639493(-1.80)*	0.3105763(1.10)
$fdiop$		0.0044981(2.48)**		
$fdises$			0.0054944(2.68)***	
$fdicpia$				-0.1254588(-1.03)

Testing regression (1) against the random effects model using the Hausman test (appendix H) causes a rejection of the null hypothesis that the difference in coefficients is not systematic (i.e. the fixed effects estimation method should be used).

In regression (1), $fdiin$ is not statistically significant. This is not completely unexpected however; Kyaw and Macdonald (2009) find no correlation between FDI and growth in low income countries (which is most of Sub-Saharan Africa). Borenzstein et al (1998) find that a certain 'threshold' level of human capital is required before FDI begins to contribute towards growth and Durham (2004) finds that the effect of FDI depends largely upon the 'absorptive capacity' of the host country.

In regression (2) the inclusion of an interaction term ($fdiop$) between FDI and a measure of openness (exports of goods and services as a percentage of GDP) raises the statistical significance of $fdiin$. This regression suggests that the effect of FDI on growth is negative for closed economies, slowly becoming positive as the economy becomes more open. More specifically, an increase in FDI of one percentage point of GDP is associated with a decrease in growth of 0.207 percentage points holding all else constant. This supports Balasubramanyam et al (1999), who found that the positive effect of FDI on growth is larger in more open economies. These first two regressions are also largely in agreement with the findings of Nair-Reinheart & Weinhold (2001), who estimate similar regressions for 24 developing countries from 1971-1995.

Regression (3) replaces the interaction term between FDI and openness with an interaction term ($fdises$) between FDI and a measure of Human capital (net enrolment in secondary education as a percentage of the school age population). $fdiin$ in this regression is only significant at the 10% level but it is important to note that once again the sign of $fdiin$ is negative and the sign of the interaction term $fdises$ is positive (and significant). This suggests that FDI is initially detrimental to growth but becomes more beneficial as human capital increases, again supporting Borenzstein et al (1998).

None of the coefficients are significant in the fourth regression, where an interaction term between $fdiin$ and a measure of perceived corruption (the corruption perceptions index) is used to investigate the possible effects that corruption has on the FDI-growth relationship. This may be because $cpia$ varies very little over time.

Table 2: Fixed Effect Regressions (5)-(8)

Dependant Variable = $growth$. *//*** denotes significance at the 10%/5%/1% level. T-Statistics in parenthesis**

Variable	Regressions			
	(5)	**(6)**	**(7)**	**(8)**
$ggdi$	0.0387597(1.70)*	0.0414346(1.79)*	0.0450267(0.67)	0.061141(1.18)
inf	-0.1499143(-2.87)***	-0.143147(-2.76)***	-0.1900299(-1.29)	-0.0772575(-0.69)
$gexp$	-0.0318947(-0.72)	-0.0151281(-0.34)	-0.1155537(-1.16)	-0.0451846(-0.61)
$cfdig$	0.0088273(0.31)	0.2201985(1.79)*	-0.0055971(-0.03)	1.166874(0.72)
$wfdig$	-0.0339517(-0.73)	-0.0284505(-0.18)	-0.4080817(-0.76)	-0.5541895(-1.33)
$cfdigop$		-0.0068132(-1.76)*		
$wfdigop$		-0.0004778(-0.12)		
$cfdigses$			0.0005429(0.13)	
$wfdigses$			0.0035785(0.36)	
$cfdigcpia$				-0.3664146(-0.68)
$wfdigcpia$				0.2465878(1.29)

Once again regression (5) shows no significant link between FDI (whether from China or from the West) and growth. Regression (6) however, appears to show a link, significant at

the 10% level, between Chinese FDI and growth. However, a joint F-test testing $cfdig$ and $cfdigop$ fails to reject the null hypothesis that both coefficients are equal to zero (see Appendix B). There are no significant variables in regressions (7) and (8).

Table 3: Dynamic Regressions by Income Category (Regression 10)

Dependant Variable = $\Delta lngdp$. *//*** denotes significance at the 10%/5%/1% level. T-Statistics in parenthesis. L1 denotes a 1-period lagged variable.**

Variable	Low Income	Lower Middle Income	Upper Middle Income
$lngdp.L1$	1.647791 (21.15)***	0.9800343 (7.25)***	0.7643797 (5.22)***
$lngdp.L2$	-0.7266208 (-9.14)***	-0.010333 (-0.07)	0.2598627 (1.83)*
$ggdi$	0.0007647 (2.34)**	0.0003588 (1.24)	0.0002853 (1.97)**
inf	-0.0001625 (-0.35)	-0.0021294 (-2.49)**	-0.0018285 (-2.34)**
$gexp$	0.0000212 (0.10)	0.0015173 (3.32) ***	0.0018258 (3.18)***
$fdiin$	-0.0076893 (-2.23)**	0.0050533 (1.96) **	0.0077964 (2.87)***
$fdiop$	0.0002476 (2.55)**	-0.0001254 (-1.66)*	-0.0000815 (-2.82)***

Regression (10) is a dynamic reimagining of regression (2) (dynamic versions of regressions (3)-(8) were also tried but proved to be statistically insignificant in all variables) that produces some interesting results, one of which is that growth displays much more inertia in the Low Income countries than in the Lower Middle Income or Upper Middle Income countries.

Also interesting is the finding that $fdiin$ is a statistically significant determinant of growth at all income levels. The coefficient of $fdiin$ is negative for the low income group while the coefficient of the interaction term $fdiop$ is positive, suggesting that FDI is actually harmful for growth unless the economy is relatively open. This again supports the previous literature, Kyaw and MacDonald (2009) find a negative relationship between FDI and growth in the lowest income band (although they do not include an interactive measure of openness such as $fdiop$).

Strangely, the sign of $fdiop$ in the Upper Middle Income countries is slightly negative, perhaps suggesting that very open countries (e.g. those for whom exports comprise a large percentage of GDP) are too attractive to investors from abroad (who may be more comfortable investing in countries and firms whose goods they regularly see on world markets rather than in the most profitable locations). These foreign investors may displace more profitable domestic investments due to their preference for familiarity. For the middle income group the effects of FDI are unambiguously positive and $fdiop$, while negative, is only significant at the ten percent level.

For the Upper Middle Income and Lower Middle Income countries $gexp$ is positive and significant, suggesting that increases in the growth rate of exports are associated with increases in growth. More specifically, a one percentage point increase in the growth rate of the exports of a Lower Middle Income (Upper Middle Income) country implies an increase in the growth rate of 0.0015173 (0.0018258) percentage points.

The results of the Sargan test of over-identifying restrictions (Appendix E) do not reject the null hypothesis that the over-identifying restrictions are valid suggesting that there is no need to alter the specification of the model.

Table 4: Dynamic Regressions by Income Category (Regression 11)

Dependant Variable = $\Delta lngdp$. *//*** denotes significance at the 10%/5%/1% level. T-Statistics in parenthesis. L1 denotes a 1-period lagged variable**

Variable	Low Income	Lower Middle Income	Upper Middle Income
$lngdp.L1$	1.70919 (26.11)***	1.011404 (7.40)***	0.6982192 (4.10)***
$lngdp.L2$	-0.7307167 (-11.72)***	-0.0284786 (-0.20)	0.2836918 (1.75)*
$ggdi$	0.0004355 (1.59)	0.000854 (2.67)***	0.0005336 (3.15)***
inf	0.0002474 (0.58)	-0.0020142 (-2.29)**	-0.0026614 (-3.80)***
$gexp$	0.0000204 (0.10)	0.0014551 (2.63)***	0.001238 (2.05) **
$fdiin$	0.0006319 (1.00)	0.0007049 (1.13)	0.0013686 (0.86)
$fdioil$	0.0205706 (5.04)***	0.0063919 (2.89)***	-0.003608 (-0.14)

Regression (11) is similar to regression (10), all that has been changed is the replacement of $fdiop$ with $fdioil$, which is $fdiin$ multiplied by the dummy variable oil which is equal to 1 in oil producing countries. $fdioil$ therefore represents the additional effect of FDI on growth faced by oil producing nations. $fdioil$ is highly significant and positive in both Low Income and Lower Middle Income countries, suggesting that poorer oil producing nations actually benefit greatly from increases in foreign direct investment. For example, an oil producing Lower Middle Income nation benefits 0.63919 percentage points of growth more than a non-oil producing Lower Middle Income nation from a percentage point increase in net FDI inflows as a percentage of GDP.

Once again, the results of the Sargan test of over-identifying restrictions (Appendix F) do not reject the null hypothesis that the over-identifying restrictions are valid so there is no need to alter the model.

6: Conclusion, Limitations and Extensions

The main conclusion that can be drawn from this paper is that foreign direct investment is an important positive determinant of growth in developing African nations but it must be combined, particularly in low income countries, with increases in trade openness and increases in human capital. The main implication for policy therefore is that simply attracting foreign direct investment is not enough to secure growth, efforts must be made to both increase the stock of human capital (by educating more people in developing nations) and to increase the openness of the economy to trade. This study contributes to the literature by examining the effects of FDI on growth in Africa in a dynamic model in detail and, in finding results very similar to those found in previous papers, this study adds to the weight of literature supporting the connection between the effects of FDI on growth and the economy's level of trade openness.

One of the main limitations of this study is the availability of the data. Since the Chinese Ministry of Commerce (MOFCOM) has only published disaggregated FDI statistics that conform to IMF-OECD standards since 2003 the time dimension of the panel is limited to six years (2003-2008 inclusive). Additionally, the lack of data for secondary school enrolment (ses) has limited my ability to account for human capital in any of the models.

It is a cause for concern that I have been unable to empirically determine the effects of China's move into Africa. However, if Chinese investments were indeed detrimental to economic growth in developing nations then we would expect this to appear clearly in the data. Since I have uncovered no evidence to suggest that Chinese investments are harmful for development in Africa it would make sense to give China the benefit of the doubt until such a link can be empirically shown. Therefore, it would probably be more useful if popular media focused on raising awareness of the more mundane issues of development such as increasing education levels (thereby increasing the stock of human capital) in, and the trade openness of, developing nations in Africa, rather than on the (still relatively small) investments by China.

Possible extensions of this study include increasing the number of countries in the panel (i.e. including developing countries outside of Africa) in order to examine a wider range of FDI behaviour. Further work, and more sophisticated empirics, could also focus on trying to understand the empirical effects of China's foreign direct investment on growth in developed nations and attempting empirically refute, or prove, the popular viewpoint that China is investing 'irresponsibly'.

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Appendix:

A) Countries in the Sample

Low Income	**Lower Middle Income**	**Upper Middle Income**
Chad	Benin	Algeria
Democratic Republic of Congo	Cameroon	Angola
Eritrea	Cape Verde	Botswana
Ethiopia	Republic of Congo	Egypt
Gambia	Cote d'Ivoire	Equatorial Guinea
Guinea	Djibouti	Gabon
Liberia	Ghana	Libya
Madagascar	Kenya	Mauritius
Malawi	Lesotho	Namibia
Mali	Mauritania	Seychelles
Mozambique	Morocco	South Africa
Niger	Nigeria	Tunisia
Rwanda	Senegal	Zimbabwe
Sierra Leone	Sudan	
Tanzania		
Togo		
Uganda		
Zambia		

B) F-test of $cfdig$ and $cfdigop$ in regression (6)

```
. test cfdig cfdigop

 ( 1)  cfdig = 0
 ( 2)  cfdigop = 0

       F(  2,    45) =    1.60
            Prob > F =    0.2133
```

C) Variable Definitions

Variable	**Definition**
$growth$	Growth rate of GDP at market prices (Constant 2000 US)
$ggdi$	Growth of Gross Domestic Investment (% of GDP)
inf	Inflation Rate (%)
$fdiin$	Net Inflows of Foreign Direct Investment (% of GDP
$cfdig$	Growth rate of FDI inflows from China
$wfdig$	Growth rate of FDI inflows from the four main Western investors (France, The Netherlands, The UK and the USA)
ses	Net enrolment in secondary education as a percentage of school age population

$gexp$	Growth rate of exports of goods and services (% of GDP)
$exportsper$	Exports of goods and services (% of GDP)
$cpia$	Transparency, accountability and corruption in the public sector rating (1=low – 6=high)
$fdiop$	$fdiin*exportsper$
$fdises$	$fdiin*ses$
$fdicpia$	$fdiin*cpia$
$cfdigop$	$cfdig*exportsper$
$wfdigop$	$wfdig*exportsper$
$cfdigses$	$cfdig*ses$
$wfdigses$	$wfdig*ses$
$cfdigcpia$	$cfdig*cpia$
$wfdigcpia$	$wfdig*cpia$
oil	Dummy variable = 1 if Oil rents as a % of GDP is greater than 0, 0 otherwise
$fdioil$	$fdiin*oil$
$lngdp$	ln(GDP Per Capita PPP)

D) Stata Commands for all Regressions

Regression Number	Stata Command
(1)	xtreg growth ggdi inf gexp fdiin, fe
(2)	xtreg growth ggdi inf gexp fdiin fdiop, fe
(3)	xtreg growth ggdi inf gexp fdiin fdises, fe
(4)	xtreg growth ggdi inf gexp fdiin fdicpia, fe
(5)	xtreg growth ggdi inf gexp cfdig wfdig, fe
(6)	xtreg growth ggdi inf gexp cfdig wfdig cfdigop wfdigop, fe
(7)	xtreg growth ggdi inf gexp cfdig wfdig cfdigses wfdigses, fe
(8)	xtreg growth ggdi inf gexp cfdig wfdig cfdigcpia wfdigcpia, fe
(10)	by income, sort: xtdpdsys lngdp ggdi gexp inf, endog(fdiin fdiop) lags(2)
(11)	by income, sort: xtdpdsys lngdp ggdi gexp inf, endog(fdiin fdioil) lags(2)

E) Sargan Test of Regression (10)

```
. estat sargan
Sargan test of overidentifying restrictions
        H0: overidentifying restrictions are valid

        chi2(32)     =  28.50292
        Prob > chi2  =    0.6443
```

F) Sargan Test of Regression (11)

```
. estat sargan
Sargan test of overidentifying restrictions
        H0: overidentifying restrictions are valid

        chi2(32)     =  29.58489
        Prob > chi2  =    0.5893
```

G) Unit root test

```
. xtunitroot ht growth

Harris-Tzavalis unit-root test for growth
------------------------------------------

Ho: Panels contain unit roots                Number of panels  =     45
Ha: Panels are stationary                    Number of periods =      6

AR parameter: Common                         Asymptotics: N -> Infinity
Panel means:  Included                                    T Fixed
Time trend:   Not included
```

	Statistic	z	p-value
rho	0.0379	-8.4816	0.0000

H) Results of Hausman test of Regression (1)

	Coefficients (b) h	Coefficients (B) r	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
ggdi	.0550545	.0427939	.0122606	.0019998
inf	-.0642173	-.034403	-.0298143	.020308
gexp	.0762091	.1061991	-.02999	.0049175
fdiin	-.0119837	-.0241834	.0121998	.0300184

```
                b = consistent under Ho and Ha; obtained from xtreg
     B = inconsistent under Ha, efficient under Ho; obtained from xtreg

  Test:  Ho:  difference in coefficients not systematic

              chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                      =       53.70
            Prob>chi2 =      0.0000
```