

FDI and Economic Growth Redux: A comparison of the effect of trade openness and human capital between BRIMCs and SSA countries

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Abstract

Current literature emphasises that foreign direct investment (FDI) benefits the host country by bringing the latest technology and managerial know how from developed countries. This paper shows that the benefits of FDI vary with respect to the level of openness and quality of human capital in developing countries. We visit the theoretical arguments and conduct an empirical analysis on the relationship between FDI and economic growth in Brazil, Russia, India, Mexico and China (BRIMCs) and select SSA countries for the period 1985-2006. In particular, we employ the panel data random effect (RE) technique to test whether trade openness and human capital has helped in the attraction of FDI, and also whether the extent to which FDI affects growth depends on trade openness and the quality of human capital. The results indicate that FDI is mainly determined by trade, literacy and infrastructural development. Economic growth also contributes to FDI inflow in our sample. In addition, we notice that trade openness interacts positively with human capital insofar as the attraction of FDI is concerned. One interesting result is that inflation has a positive but insignificant relationship with FDI in the SSA sample countries. Although FDI has a positive impact on economic growth, its impact is more pronounced with its interaction with trade in the BRIMC countries. In the SSA countries however, FDI interacts positively with human capital to promote economic growth. To test the sensitivity of our results, we employ the dynamic panel data method based on Generalised Method of Moments (GMM) to verify our findings. The results indicate that FDI has a positive relationship with economic growth.

Keywords: Foreign direct investment, economic growth, human capital, economic openness, BRIMCs, sub Saharan Africa

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1 Introduction:

Foreign direct investment (hereafter, FDI) has been recognised as an important factor for economic development. Many authors argue that the inflow of FDI could fill the technological gap between developed and developing countries (for example, Mankiw et al., 1992; Feenstra and Hanson, 1997; Zhang, 2001a and b). Additionally, it may improve management and labour skills and increase employment in host countries (Campos and Kinoshita, 2002). Hymer (1960 and 1976) in his influential seminal paper defines FDI as ‘a means of transferring tangible and intangible assets to organise international production’. According to the literature, the lack of major determinants of FDI such as human capital and openness to trade are potential reasons behind the slow growth in many developing countries. This is because as multinational companies (MNCs) transfer production abroad, they look for destinations where the costs of training workers to use new technologies are minimised (Dutta and Osei-Yeboah, 2008). According to Zhang and Markusen (1999), skilled labour is positively related to the inflow of FDI. This is further supported in several empirical literatures (Dunning, 1988; Eicher and Kalaitzidakis, 1997; Noorbakhsh et al. 2001 and Zhuang, 2008). Asiedu (2005) also find that having an educated population helps attract FDI inflows to African countries. Apart from recognising the effect of human capital in attracting FDI, several authors have stressed the importance of other policy variables such as trade liberalisation as a determinant of FDI inflow (Dunning, 1988; Kandiero and Chitiga, 2006; Asiedu, 2006). Neumayer and de Soysa, (2005) found that countries that are more open to trade have higher inflow of FDI.

In its survey of FDI, the World Investment Report (2006) by UNCTAD confirms that total FDI inflow into developing countries jumped by 22 per cent to \$334 billion in 2005. However, there are still regional disparities in the direction of its flow. For example, the share of FDI inflow to African countries and in particular sub Saharan African (hereafter, SSA) countries is less when compared to other regions¹ due to the fact that they exhibit features that make them unattractive to foreign investors (Udo and Obiora, 2006). On the one hand, foreign investors regard Africa as a ‘high risk investment’ region because of overdependence of many countries on primary commodities, macroeconomic and political instability² and most importantly, lack of well functioning financial systems which is required to take advantage of the benefits of FDI and in turn promote economic growth (Dupasquier and Osakwe, 2005; Alfaro et al., 2003, 2006; Morrisey, 2003 and Udo and Obiora, 2006). According to Asiedu (2003 and 2006), SSA countries seem to be trapped in a ‘*regional effect*’. On the other hand, countries in Asia, Latin America and Eastern Europe and Central Asia, in particular, Brazil, Russia, India, Mexico and China (hereafter, BRIMCs) have seen an increase in FDI inflows in recent years reflecting their strong economic prospects, openness and high volume of human capital accumulation due to improvements in policies and regulatory environment that is attractive to foreign investors.

¹ As of 2007, total FDI inflow to developing economies reached \$499 billion of which the share to Asia and Latin America was \$361 and \$103 billion dollars respectively and SSA received about \$33 billion. See United Nations Conference on Trade and Development <www.unctad.org/fdistatistics> for more information.

² According to Rodrik, (1998), this discouraged FDI flow and hence, led to the slow growth and poor standard of living observed in the region.

The inability of African countries to attract foreign investment in order to promote economic growth have led to new policies been drawn in order to reach the Millennium Development Goals (MDG).³ This has also prompted an extensive study on the determinants of FDI and growth effect of FDI in developing countries on a firm, national or regional level. The research in this area has been intensified in the last decade due to the increased perceived role of FDI in total capital flows, (Hussein, 2009).

Recent research turns to emerging economies in Asia and Latin America and in particular, Brazil, Russia, India and China (BRICs). The BRICs is an acronym which was coined by Goldman Sachs in 2003 to represent the fastest growing emerging market economies (EMEs)⁴. A study by Goldman Sachs projected a combined GDP growth rate of about 13.4 per cent by 2050.⁵ Although, according to the report, the economists did not argue that these countries will organise themselves into an economic bloc or trade union but more recently, indication from the BRICs summit held in 2008 in Russia suggests that these countries might form a sort of economic bloc in the near future by taking advantage of their growing economic power. Consequently, as predicted by Wilson and Purushothaman (2003), if this should happen, these countries could become larger than the G6 economies as they presently contribute about 13 per cent to the world GDP.

According to the literature, BRIC countries play an important role in the world economy as producers of goods and services. According to the literature, the significance of the BRICs cannot be ignored as the persistent growth in the global economy is strengthened by the growth realised in China and India. These growths can be traced to the attraction of FDI through the liberalisation of the economy, improvement in the level of human development and international technology (IT) which is an essential strategy to attracting foreign investments and stimulating economic growth and development. According to Vijayakumar and Sridharan, (2010) the BRIC countries attract larger capital because of their larger potential consumer market having the common characteristics of a large population.

Recently, there has been a debate as to whether to include Mexico and South Africa to the BRICs. According to Goldman Sachs, (2005), Mexico has the potential to rival the BRICs; however it is considered a developed market as opposed emerging markets. In addition, the vice president and senior global economists, Sarah Lawson further emphasised that the term 'BRICs' was coined to refer to the fastest growing emerging market economies (EMEs) when we consider their economic size and potential. Nevertheless, in a report by Kowitt (2009), Jim O'Neill, the man responsible for the term 'BRICs' noted that "Mexico and Indonesia could possibly grow to the size of Russia in the future". The argument here is there is a possibility that Mexico's economic growth could be the size of Russia in the future. Thus, when we consider the annual growth rate of GDP to proxy economic potential, we observe that in 2006,

³ The MDG refers to a set of goals set to reduce poverty by half by the year 2015. See United Nations <<http://www.un.org/millenniumgoals/bkgd.shtml>> for more details.

⁴ See Wilson D and R. Purushothaman (2003), "Dreaming with the BRICs: The path to 2050", Goldman Sachs *Global Economics paper* (99), [online] available from <<http://www2.goldmansachs.com/ideas/brics/book/99-dreaming.pdf>> accessed on 08/07/08.

⁵ Wilson and Purushothaman, (2003) provides full details and conditions set for the projections.

Mexico had a growth rate of 4.81 per cent, while Brazil, Russia, India and China similarly had a GDP growth rate of 3.72, 7.40, 9.69 and 11.6 per cent respectively. We observed that Mexico's GDP grew about 1 percent more than that of Brazil in the same year. Therefore, we cannot ignore Mexico's role in global economic development. Consequently, this study includes Mexico and coins a new term BRIMC (Brazil, Russia, India, Mexico and China) and represents countries from Asian, Eastern Europe and Central Asia and Latin American region, which is of economic significance to the process of globalisation.

The BRIMC following the East Asian countries developed strategies to attract FDI to meet their growing potential. As a result, policies which allow these countries to open up their economies to FDI from MNCs lead to the development of these economies. In the existing literature, we note that the type of FDI a host country receives depends on the type of policies in place, thus FDI inflow varies from country to country. Specifically, FDI inflows to Brazil, Russia and Mexico are mostly concentrated in the productive sectors while China and India tend to receive more in the manufacturing sectors due to MNCs seeking to capitalise on its large domestic market and low labour costs (Eichengreen and Tong, 2005). It is worth mentioning that China has become a favourite destination for FDI in developing countries considering their huge domestic markets and low cost of labour. Although, FDI inflow to SSA countries is low, the literature points out that FDI is mostly concentrated in natural resources.

As a result of the success of the BRIMC countries, the present study intends to examine the strategies which the BRIMC countries adopted to attract FDI and what is lacking in the SSA region in order to learn from them. Specifically, the study focuses on two policy variables (human capital and trade openness) and its interactions insofar as attracting FDI is concerned. We further examine the impact of FDI on economic growth and the extent to which the interaction of FDI with trade and human capital affect economic growth in the BRIMC and SSA countries. We address these issues using a panel of eighteen developing countries over the period 1985 to 2006. Our choice of SSA countries is based on the magnitude of FDI inflows as of 2006.

The paper proceeds as follows. The following section provides a review of pertinent literature. Section 3 discusses the model, empirical analysis and the data. In section 4, the results are discussed and the study concludes in section 5.

2 Literature review:

In an attempt to explain why MNCs locate abroad, Ohlin (1933) used international trade theory and argued that international trade is motivated by the possibility of high profitability in growing markets along with the possibility of servicing these investments at a low cost in the host countries. For example, many MNCs moved their operations to China to take advantage of its low labour cost and huge domestic markets. In addition, Hymer (1976) notes that MNCs locate outside their home country by taking advantage of the monopolistic nature of local firms and are able to compete with those firms who have the knowledge of the domestic markets. These advantages include access to proprietary knowledge,

management skills and economies of scale. This theory suggests that the imperfection in the market makes it possible for MNCs to locate abroad. Consequently, by transferring these advantages; the MNCs gain comparative advantage over the local firms, (Morgan et al., 2003: 178).

According to Dunning's eclectic paradigm theory (1980, 1988, 1993 and 1998), FDI is determined by three sets of advantages: Ownership, Location and Internalisation, (OLI). The theory suggests that when firms possess greater ownership and internalisation advantage and the location advantage favours the host country, (i.e., creating and exploiting these advantages in a location outside the home country) the more the FDI that will be undertaken. Following this, Dunning (1993) outlines four reasons why foreign investors locate abroad. According to him, foreign firms invest outside their home countries for several reasons which include; *factor/resource/labour-seeking*, *efficiency-seeking*, *market-seeking* and *strategic asset motivation*.⁶

A number of studies have been carried out to empirically study the relationship between FDI, trade, human capital and its impact on economic growth in developing countries (Ayanwale, 2007; Ang, 2008; Zhuang, 2008; Wang and Wong, 2009). According to Dunning (1993), market seeking FDI involves MNCs exporting or opening a new market in host countries in order to boost their sales, therefore, trade openness is important in order to attract FDI, Makki et al, (2004). Using panel data technique, Campos and Kinoshita (2004) examined the determinants of FDI in 25 transition economies from the Central and Eastern Eurobarometer countries (CEEB) and Commonwealth of Independent States (CIS) between 1990 and 1998. They found that the determinants of FDI vary across the choice of sample. They also found that FDI in these countries are a mixture of *resource*, *efficiency* and *market seeking*. Whilst they found the abundance of natural resources and low level of human capital as the main determinants of FDI in the CEEBs, external liberalisation is important for attracting FDI in CIS. Asiedu (2002) studying the determinants of FDI in 24 countries in sub Saharan Africa over the period 1984-2000, concluded that large markets, natural resources and good infrastructure are significant in promoting FDI in SSA. The author also found that regional economic cooperation may promote FDI in SSA.

Ng'ang'a (2005) considered the interaction of infrastructural development and degree of openness on FDI inflow in 95 developing countries over the period 1980 to 2002. Both fixed effects estimator (FEE) and pooled ordinary least squares (POLS) was employed. The results show that FDI is greatly influenced by the quality of infrastructure and openness of the economy to trade. However, these two determinants vary across the sample countries studied. Ang (2008) found a positive relationship between FDI and trade in Malaysia. Apart from recognising the effect of trade openness in attracting FDI, several authors have stressed the importance of other policy variables such as human capital, macroeconomic stability and infrastructural development as a determinant of FDI inflow (e.g. Makki and Somwaru, 2004).

⁶ See Dunning (1993) and DeMello (1997) for extensive details on the determinant and motivation of FDI.

As MNCs transfer their production abroad, they are motivated by a reduction in transaction cost; as such they look for destinations where the costs of training workers to use new technologies are minimised (Dutta and Osei-Yeboah, 2008). This implies that cheap human capital favour the location of MNCs. Although Lucas (1990) pointed out that the lack of human capital discouraged FDI inflow to developing countries as the existence of human capital, and in particular cheap labour, is an important determinant of FDI. Xing (2006) emphasised the role of cheap labour in China as one of the main advantages of attracting FDI inflow. Using different measures of human capital to explore the relationship between FDI and human capital, Checchi et al. (2007) found that inward FDI lead to increased enrolment in higher education as it creates job opportunities for skilled workers. Zhuang (2008) cites that FDI has different effects on different levels of education in China. Whilst Tanna and Topaiboul (2005) found that skilled labour has a complementary relation with FDI in Thailand, Dutta and Osei-Yeboah, (2008) emphasised that the nature of the relationship between FDI and skilled labour can be substitutes or complements. From the foregoing, FDI is mainly determined as a result of market size, openness, human capital development, infrastructure and natural resources.

In studying the determinant of growth, the new growth theory suggests that FDI may affect economic growth directly because it contributes to capital accumulation and transfer of technology to the host country. In addition, it may contribute to economic growth indirectly where the direct transfer of technology augments the stock of knowledge through labour training and skill acquisition. Furthermore, Becker (1993) emphasised that the productivity of the people in an economy is changed by investments in education, skills and technology.

The development in the endogenous growth theory has encouraged researchers to examine the channels through which FDI promotes economic growth in the long run (Grossman and Helpman, 1991). Balasubramanyam et al., (1996) argue that the factors described in the new growth theory as growth enhancing can be obtained through FDI if the investment climate and trade policies found in the host country support the creation of human capital, therefore increasing returns to scale and spillover effects, which are crucial in promoting economic growth. In their paper, they found FDI plays an important role in promoting economic growth through learning by doing and knowledge spillovers.

According to Gerschenkron (1962), the presence of MNCs in host countries can lead to technological transfer through the transmission of ideas (that enters the country through FDI or trade) in intermediate and capital goods that embody technology. According to these explanations, both trade and FDI can be included in the production function besides labour and domestic capital. In an empirical study, Borensztein et al., (1998) examined the impact of technological diffusion from FDI on economic growth in 69 developing countries. They found that FDI can only lead to higher productivity in output growth when there is a minimum threshold stock of human capital. The point here is that the positive effect of FDI on economic growth depends on whether the educated workforce in the country can take advantage of the technological spillovers associated with FDI. The authors concluded that a host country has to

have sufficient absorptive capability in order for FDI to promote economic growth. Their results also suggest that FDI is an important channel for the transfer of technology and contributes more to growth than domestic investment.

Some studies note that the benefit of FDI is strongly dependent on how open a country is to globalisation. Further, Grossman and Helpman (1991) notes that trade openness could be considered as another channel through which output growth can be promoted as it will increase market size and allow a country to have access to advanced technologies and investment which will enhance productivity of the country's resources. In addition, Driffield and Love, (2007) argue that by improving access to foreign technological advances (i.e. FDI and trade) this can enhance the efficiency of these countries beyond the effect of increased investment which is a key requirement for sustained economic growth. The argument here is that, trade openness enhances a country's access to free flow of goods and services as a result a country could have access to technological and knowledge spillovers. Hence, we can also examine the impact of technological diffusion and knowledge spillover from trade on economic growth.

3 Empirical framework:

The empirical framework draws on existing literature on the determinant of FDI such as Asiedu (2002, 2006) where FDI is regressed on economic growth and a conditioning information set. In line with this literature, we will estimate the following model:

$$FDI_{it} = \alpha_{it} + \beta_1 TO_{it} + \beta_2 HC_{it} + \beta_3 (TO * HC)_{it} + \beta_4 gPCAP_{it} + \beta_5 INF_{it} + \beta_6 INFRA_{it} + \beta_7 GC_{it} + \varepsilon_{it} \quad (1)$$

where, FDI_{it} ⁷ denotes the net inflow of FDI of country i in year t ; TO_{it} denotes trade openness; HC_{it} denotes human capital; $(TO * HC)_{it}$ is the variable of interest and refers to the interaction between trade openness and human capital; $gPCAP_{it}$ denotes annual growth rate of GDP per capita; INF_{it} denotes inflation; $INFRA_{it}$ is the total number of mobile and fixed lines denoting for infrastructure and GC_{it} is the government consumption. The variables, FDI, TO and GC are measured as a proportion to GDP. I refers to the individual countries ($i= 1, 2 \dots, N$) and t refers to the sample years ($t= 1985, 1986 \dots, T$) and ε_{it} is the error term.

To assess the impact of FDI on economic growth, we follow Mankiw et al., (1992), Balasubramanyam et al., (1996), Borensztein et al., (1998) and Makki and Somwaru (2004) type model⁸ which is based on endogenous growth framework. In this framework FDI contributes to economic growth directly through technological knowledge spillovers and other factors of production, and indirectly through development in human capital and infrastructure. To empirically assess the impact of FDI on growth and the

⁷ According to Borensztein et al., (1998), the choice of FDI variable depends on the type of FDI effect a researcher is trying to uncover. Thus, when trying to analyse the impact of technology transfer and knowledge spillover, it is assumed that the use of FDI net inflow will provide a more detailed analysis as opposed FDI net outflow. For this reason, FDI net inflow has been used in the regression.

⁸ For the theoretical derivation of this model, see Borensztein et al., (1995 and 1998).

interrelationship between FDI, trade openness, human capital and growth, we estimate the following model:

$$gPCAP_{it} = \alpha_{it} + \beta_1 FDI_{it} + \beta_2 TO_{it} + \beta_3 HC_{it} + \beta_4 (FDI * TO)_{it} + \beta_5 (FDI * HC)_{it} + \beta_6 (TO * HC)_{it} + \beta_7 INF_{it} + \beta_8 INFRA_{it} + \beta_9 GC_{it} + \varepsilon_{it} \quad (2)$$

where, $(FDI * TO)_{it}$ is the interaction between FDI and trade openness; $(FDI * HC)_{it}$ is the interaction between FDI and human capital. Equation (2) extends the Makki and Somawaru (2004) model to include the interaction between trade openness and human capital.⁹

This analysis is based on an unbalanced panel data set of 18 developing countries¹⁰ over the period 1985-2006. Equations (1)¹¹ and (2)¹² are estimated using the appropriate panel regression technique (either fixed or random effect model).

3.1 The Data:

This study analyses the impact of FDI, human capital and trade openness on economic growth in 18 developing countries. The data is taken from various sources. The measure of FDI used in this study is FDI net inflow as a per cent of GDP: this is taken from United Nations Conference on Trade and Development, (UNCTAD) ESDS international, University of Manchester, MIMAS (2009). Total trade, adult literacy rate and annual growth rate of GDP per capita is used to proxy trade openness, human capital and economic potential respectively. This is obtained from World Development Indicators, ESDS international, University of Manchester, MIMAS (2009) and UNESCO UIS, ESDS international, University of Manchester, MIMAS (2009). We expect a positive relationship between trade, literacy rate, economic potential and FDI inflows.

Other control variables include: inflation rate, natural logarithm of mobiles and fixed lines and government consumption. This is used to control for macroeconomic stability, infrastructural development and the size of government. The data is obtained from International Financial Statistics - IMF, (2009) and World Development Indicators, ESDS international, University of Manchester, MIMAS (2009) respectively. We expect a direct relationship between FDI and infrastructure and an indirect relationship between inflation, government size and FDI.

The presence of different levels of openness adds a new perspective to the relationship between human capital and FDI inflows. Therefore, to capture the simultaneous effect of trade openness and human capital, we include the interaction between trade and human capital, which we refer to as *interaction term*.

⁹ We include the interaction between trade openness and human capital to assess the impact of trade as another channel of technology diffusion and knowledge spillover.

¹⁰ See Table 1 in the appendix.

¹¹ Using a Hausman test, we compare the fixed versus random effects under the null hypothesis that the coefficient estimated by the efficient random effects estimators are the same as the ones estimated by the consistent fixed effects estimators. More clearly, H_0 : difference in coefficients not systematic. For equation (1), $\text{Chi2}(7) = (b-B)' [(V_b - V_B)^{-1}] (b-B) = 4.89$ and $\text{Prob} > \text{chi2} = 0.6733$. Thus, the non significant p-value suggests using random effect estimator in equation (1).

¹² The Hausman test gives a $\text{chi2}(9) = (b-B)' [(V_b - V_B)^{-1}] (b-B) = 10.99$ and $\text{Prob} > \text{chi2} = 0.2020$. Thus the insignificant p-value suggests using random effect estimator.

On one hand, a positive interaction term would suggest that for a given level of openness, as literacy rate rises, there is a greater FDI inflow to a nation. On the other hand, for a given level of openness, an increase in literacy rate will lead to a decrease in FDI inflow (see Table 2 appendix for summary statistics).

4 Discussion of Results:

Our results are grouped into two categories: the determinant of FDI and the impact of FDI on economic growth. We test this for a sample of 18 countries and in a subgroup of BRIMC and SSA countries. The results are discussed below:

4.1.1 The determinants of FDI:

For FDI to grow in a country, it first needs to be attracted into that country. Hence, it is important to understand the determinants of FDI in order to be able to formulate and implement policies that would lead to an increase in its attraction. Therefore, we begin the analysis by determining the variables that are important in explaining the variation in the flow of FDI to developing countries, and in particular into the BRIMCs and SSA. The overall performance of the various model specifications is satisfactory, with the coefficients correctly signed.

Model 1, table 3 is the benchmark of our model. According to table 3, trade is positively related to FDI inflow (Model 1-3). In Model 1, a one per cent increase in trade will increase FDI inflow by 0.10 per cent. The positive effect of trade with FDI agrees with Asiedu (2002), who worked on the determinant of FDI in SSA countries. However, this is contrary to Anyanwu, (1998) and Ayanwale (2007). In Models (1, 2 and 4), Human capital has a positive and the coefficient is statistically significant at the 1 per cent level. This is consistent with previous studies (Asiedu, 2005), suggesting that human capital will encourage FDI inflows. Turning to our variable of interest the interaction between trade and human capital, this enters with a negative sign however; the coefficient is significant at the 1 per cent level. The result suggests that for a given level of openness, an increase in human capital leads to a decrease in the inflow of FDI. In Models (4 and 5), when trade is not included in the regression, the interaction term is positive, with a significant coefficient. This suggests that FDI increases with a given level of openness and high human capital development.

Models (1-5) shows that annual growth rate of per capita GDP has a positive and statistically significant relationship with FDI. This suggests that, as the economy grows, the more FDI that is attracted. Infrastructural development enters with the correct sign; however the coefficient is only significant in Model 3. The positive impact of infrastructural development is consistent with the literature. The result suggests that for a significant contribution of infrastructural development on the inflow of FDI, there is a need for the government to invest in the available infrastructure so that this would facilitate the attraction of FDI.

Inflation and government consumption both have a negative relation with FDI in Models (1-5). This is consistent with our expectation. The results suggest that the policies put in place do not encourage the flow of FDI and the nature of government consumption does not favour FDI inflow. The negative relation of government consumption and FDI suggests that the nature of government consumption does not involve investment in assets that encourage FDI inflow.

Turning to the subgroup, our result indicates that the main determinant of FDI to the BRIMC countries is human capital, infrastructural development and trade openness. However, high inflation leads to a fall in FDI inflow. Similarly, FDI to the SSA countries in our sample are determined by economic potential, trade openness and human capital. Our findings are consistent with previous studies such as (Asiedu, 2002, 2005 and Ayanwale, 2007). In Model (7), we observe that inflation has a positive relationship with FDI. The positive but insignificant relationship is contrary to our expectation. Though a positive sign of inflation is quite surprising, the result provides support to theoretical vagueness regarding the impact of inflation on FDI. According to the literature, regions with low and stable rates of inflation are expected to attract more FDI compared to other regions with high inflation rate (such as the SSA countries in this sample). The non significance of the inflation variable indicates the need for constructive attention to be given to monetary and fiscal policies in order to control inflation so as to encourage FDI inflows. The result provides support to the findings of Asiedu (2005) who reports that low inflation helps attract FDI inflows in African countries.

The interaction term is negative in both the BRIMC and SSA countries; however, the coefficient is significant in the BRIMC countries. In Model (6), though trade openness and human capital are positive, the negative sign and significant coefficient of the interaction term suggests that both trade and human capital are substitutes instead of complementary in the BRIMC countries.

4.1.2 The impact of FDI on economic growth:

We present the result of the impact of FDI, trade, human capital and their interactions on economic growth in Table 4 using random effects estimation method. According to Models (1-4), FDI has a positive and statistically significant relation with economic growth. The positive relationship is consistent with the literature (see De Gregorio, 1992; Borensztein et al., 1995 and 1998). Trade enters with a mixed sign (Models 1-4) with a statistically significant coefficient in Models (1-2). This is consistent with previous literatures such as Li and Liu (2004) who report a positive relation between trade and economic growth and Choudhri and Hakura, (2000) who concluded that openness to trade may have either a positive or negative impact on growth depending on the growth potential of the sector. We also find that human capital enters with a mixed sign (Models 1-4). The coefficient is significant in Models (1-2). The negative impact of human capital on economic growth is similar to the results reported by Ayanwale, (2007) who used the share of secondary school and university enrolment to proxy human capital.

The results suggest that the interaction between trade and human capital does not promote economic growth, although the coefficient is significant (Models 1-2). According to Model 3, FDI promotes economic growth by itself and through its interaction with human capital. This is consistent with other results such as (Borensztein et al., 1995 and 1998; Balasubramanyam et al., 1996; Makki and Somwaru, 2004). Further, our result shows that the interaction between FDI and Trade is mixed. When the result is positive, the coefficient is insignificant.

The coefficients of inflation and infrastructure are correctly signed and statistically significant (Models 1-4). We also observe that government consumption is negative and insignificant in the regression analysis. The negative impact of inflation on economic growth suggests that high inflation does not promote economic growth. The positive influence of infrastructure also suggests that the investment in infrastructure such as roads, telecommunication and electricity will enhance economic growth in the sample of countries.

According to Model 5, table 4, FDI has a positive impact on growth in the BRIMC countries, however its impact is pronounced through its interaction with trade. Infrastructural development also promotes economic growth in the BRIMCs. In the SSA countries (Model 6), we notice that FDI promotes economic growth by itself and through its interaction with human capital. We observe that the interaction between FDI and trade and human capital does not promote economic growth.

4.1.3 Robustness of result

To check for the robustness of our results, we conduct a number of changes to the model specification and employed other estimators. Firstly, we change FDI inflow to FDI stock inflow and the result of the estimation is presented in Table 5. The result shows that both trade and human capital have a positive relationship with FDI inflows and their coefficients are statistically significant. This is supportive of our earlier findings. Therefore, irrespective of the dependent variable used, trade and human capital exerted a positive effect on FDI.

A similar process is repeated for the economic growth equation. Here we change annual growth rate of GDP to growth rate of GDP and the results are presented in Table 6. The result is supportive of our earlier findings that FDI is positively related to economic growth. In Model (3 and 4), when we exclude the interaction between trade and human capital, we notice that FDI promotes economic growth in the BRIMC and SSA countries. In particular, a one per cent increase in FDI lead to a 6.28 per cent increase in economic growth in the BRIMCs. Similarly, a one per cent increase in FDI in SSA countries leads to 0.32 per cent increase in growth.

To deal with the potential endogeneity of FDI, we employ the dynamic panel estimator (DPD) based on Generalised Method of Moment (GMM) methodology proposed by Arellano and Bond, (1991). This estimation technique allows the economic growth indicator to partially adjust to their long run equilibrium value with a year, (Baltagi et al, 2008). All explanatory variables are lagged by one period to

ensure that the lagged dependent variable EG_{it-1} can be treated as predetermined and therefore not correlated with the error term. The result of our GMM estimation indicates that FDI is positively related to economic growth; however, the coefficient is insignificant.

5 Conclusion:

This paper examines the interaction between trade openness and human capital insofar as attracting FDI in the BRIMCs and SSA countries is concerned. The results indicate that trade openness, human capital and economic growth encourages the inflow of FDI in the sample of countries and that there is a strong, positive interaction between trade openness and human capital (proxied by adult literacy rate). According to the result, FDI promotes economic growth in the sample of countries and in the BRIMC and SSA countries. The effect of FDI is enhanced by its interactions with trade to promote economic growth in the BRIMC countries and in the SSA countries, the interaction between FDI and human capital promotes economic growth.

By introducing trade openness as a channel for technology transfer and interacting this with human capital, our result yields a negative and statistically significant coefficient across the whole sample. This implies that the interaction of trade openness with human capital inhibit economic growth in the countries studied. This is also negative and significant in the sample of SSA countries.

Based on the empirical findings, it is suggested that developing countries in SSA should not only develop policies that would encourage economic openness and human capital development, particularly investing in education, but they should also ensure that these policies are implemented in order to attract foreign investments for sustainable economic growth.

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Appendix

Table 1: Countries in the Sample

BRIMC	SSA	
Brazil	Benin	Senegal
Russia	Botswana	South Africa
India	Cameroon	Swaziland
Mexico	Ghana	Tanzania
China	Kenya	Zambia
	Malawi	Zimbabwe
	Namibia	

Table 2: Summary of dataset used (Annual data 1985-2006)

Variable	Definition	Sources	Mean	Std. Dev.	Min	Max
GPCAP	Annual growth rate of GDP per capita	WDI, ESDS, (2009)	1.42	4.35	-14.57	15.86
FDI	The ratio of Foreign direct investment (inflow) as a per cent of GDP	UNCTAD, ESDS, (2009)	1.94	2.35	-7.64	12
TO	Trade : The ratio of (Exports plus Imports) as a per cent of GDP	WDI, ESDS, (2009)	63.67	35.80	12.36	190.75
HC	Human Capital, Adult literacy rate: per cent of adult age 15 years and over (literacy). Calculated using (100 - illiteracy rate).	UNESCO UIS database, (2009)	70.58	18.01	22	99.71
TOHC	Trade*Human capital	Authors calculation	4585.78	2986.75	568.56	15431.68
FDIHC	FDI*Human capital	Authors calculation	158.14	196.06	534.04	1014
FDITO	FDI*Trade	Authors calculation	163.65	287.09	685.69	1869.46
LNTELS	Natural logarithm of mobile and telephone subscribers	WDI, ESDS, (2009)	13.25	2.72	9.02	20.54
INF	Inflation, Consumer Price Index	International Financial Statistics, IMF, Dr Matthew Shane, (2009)	50.24	235.64	-7.87	2920.39
GC	Government Consumption	WDI, ESDS, (2009)	14.82	5.24	4.49	32.19

Table 3: Determinants of FDI

Regression Results: 1985-2006

Dependent variable: FDI inflow as a per cent of GDP

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
	Full Sample				BRIMC		
TRADE	0.1025 (3.70)***	0.0913 (3.35)***	0.0507 (2.48)***			0.2050 (2.48)***	0.0790 (2.29)**
LITERACY	0.0685 (2.73)***	0.0864 (3.68)***		0.0219 (1.60)	0.0051 (0.28)	0.1100 (4.33)***	0.0588 (1.97)**
TRADE*LIT	-0.0010 (-2.82)***	-0.0009 (-2.50)**	-0.0003 (-1.19)	0.0003 (3.78)***	0.0003 (3.92)***	-0.0023 (-2.76)***	-0.0007 (-1.56)
GPCAP	0.0633 (2.42)**	0.0718 (2.78)***	0.0719 (2.75)***	0.0840 (3.24)***	0.0797 (3.05)***	0.0483 (1.20)	0.1077 (3.20)***
LNTELS	0.1865 (1.60)		0.2724 (3.19)***		0.1197 (1.34)	0.4788 (3.35)***	-0.0016 (-0.01)
INF	-0.0007 (-2.05)**	-0.0008 (-1.69)*	-0.0007 (-1.58)	-0.0008 (-1.86)*	-0.0008 (-1.78)*	-0.0008 (-2.09)**	0.0060 (1.02)
GC	-0.0403 (-1.56)	-0.0498 (-1.96)**	-0.0340 (-1.31)	-0.0499 (-1.94)**	-0.0434 (-1.66)*	-0.0697 (-0.76)	-0.0631 (-2.20)**
Constant	-6.6920 (-3.51)***	-5.2312 (-2.95)***	-3.1034 (-2.22)**	-0.2275 (-0.23)	-0.7694 (-0.73)	-13.9792 (-5.75)***	-3.4576 (-1.38)
Obs	384	384	384	384	384	103	281
R²	0.1450	0.1396	0.1310	0.1121	0.1147	0.2900	0.1256

Note: Absolute t-statistics are reported in parentheses. The symbols, ***, ** and * indicate that the coefficient is significant at 1, 5 and 10% levels respectively. Model 1 is the benchmark of the analysis.

Table 4: The impact of FDI on economic growth

Regression Results: 1985-2006

Dependent variable: Annual growth rate of GDP per capita

Variable	Benchmark					
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	Full Sample				BRIMC	SSA
FDI	0.1819 (1.66)*	0.2614 (2.61)***	0.2457 (2.28)**	0.2682 (2.59)***	4.9930 (1.26)	0.2633 (2.45)**
TRADE	0.1493 (2.67)***	0.1430 (2.65)***	-0.0123 (-1.19)	-0.0149 (-1.40)	0.0040 (0.01)	0.2274 (3.55)***
LITERACY	0.0827 (1.77)*	0.0840 (1.86)*	-0.0257 (-0.93)	-0.0216 (-0.77)	0.0983 (1.45)	0.1545 (2.65)***
TRADE*LITERACY	-0.0021 (-2.98)***	-0.0020 (-2.92)***			-0.0014 (-0.48)	-0.0031 (-3.77)***
FDI*LITERACY	0.0032 (1.13)		0.0021 (1.63)		-0.0755 (-1.51)	0.0110 (3.22)***
FDI*TRADE	-0.0008 (-0.44)			0.0013 (1.48)	0.0430 (2.68)***	-0.0060 (-2.68)***
INF	-0.0023 (-2.62)***	-0.0026 (-2.93)***	-0.0026 (-2.93)***	-0.0027 (-3.08)***	-0.0030 (-3.04)***	-0.0124 (-1.18)***
LNTELS	0.4652 (2.77)***	0.5070 (3.21)***	0.4115 (2.67)***	0.4390 (2.81)***	1.0608 (2.88)***	0.2350 (0.99)
GC	-0.0296 (-0.59)	-0.0180 (-0.36)	-0.0190 (-0.38)	-0.0163 (-0.33)	-0.3895 (-1.64)*	0.0320 (0.61)
Constant	-10.5285 (-2.88)***	-11.1392 (-3.10)***	-1.8475 (-0.93)	-2.2823 (-1.16)	-12.8324 (-1.87)*	-14.4769 (-3.21)***
Obs	384	384	384	384	103	281
R²	0.1044	0.0986	0.0800	0.0803	0.2163	0.1367

Note: Absolute t-statistics are reported in parentheses.

The symbols, ***, ** and * indicate that the coefficient is significant at 1, 5 and 10% levels respectively.

Table 5: Sensitivity Analysis Determinant of FDI

Dependent variable: FDI stock inflow

Variable	Model 1	Model 2	Model 3
	Full Sample	BRIMC	SSA
TRADE	0.8943 (3.78)***	-0.4027 (-1.65)*	0.9529 (3.35)***
LITERACY	0.5949 (2.53)**	0.5163 (7.44)***	0.8951 (2.88)***
TRADE*LITERACY	-0.0066 (-2.15)**	0.0023 (0.96)	-0.0071 (-1.87)*
GPCAP	-0.8478 (-0.42)	0.0844 (0.53)	-0.3667 (-1.59)
LNTELS	-0.5888 (-0.99)	2.1944 (4.93)***	-2.4091 (-1.98)**
INF	-0.0067 (-3.01)***	-0.0034 (-2.16)**	0.1516 (0.57)
GC	0.1726 (0.72)	-1.1355 (-3.00)***	-0.0546 (-1.36)
Constant	-37.0937 (-3.13)***	-42.1337 (-6.88)***	-39.0897 (-2.26)**
Obs	384	103	275
R²	0.2275	0.4491	0.25

Note: Absolute t-statistics are reported in parentheses. The t statistics are computed using heteroscedastic consistent standard errors.

The symbols, ***, ** and * indicate that the coefficient is significant at 1, 5 and 10% levels respectively.

Table 6: Sensitivity Analysis: Impact of FDI on economic growth

Dependent variable: Annual growth rate of GDP

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
	RE	RE	BRIMC	SSA	GMM	GMM	BRIMC	SSA
FDI	0.1840 (1.66)*	0.2600 (2.34)**	6.8105 (2.19)**	0.3253 (2.89)***	0.0431 (0.37)	0.0435 (0.37)	-8.3302 (-1.85)*	0.0941 (0.76)
TRADE	0.1867 (3.26)***	-0.0152 (-1.31)	-0.1565 (-3.39)***	-0.0089 (-0.58)	-0.0208 (-0.23)	-0.0199 (-0.98)	0.5582 (1.53)	0.0985 (0.97)
LITERACY	0.0879 (1.80)*	-0.0434 (-1.38)	0.0807 (1.76)*	-0.0248 (-0.69)	-0.1920 (-1.35)	-0.1889 (-1.36)	-0.2381 (-0.60)	0.2603 (1.35)
TRADE*LITERACY	-0.0026 (-3.62)***				0.00002 (0.01)		-0.0060 (-1.52)	-0.0014 (-1.05)
FDI*LITERACY	0.0025 (0.89)	0.0008 (0.28)	-0.0975 (-2.43)**	0.0061 (1.96)**	0.0034 (1.05)	0.0034 (1.06)	0.0985 (1.77)*	0.0085 (2.08)**
FDI*TRADE	-0.0006 (-0.30)	0.0008 (0.40)	0.0472 (3.55)***	-0.0027 (-1.14)	-0.0027 (-1.25)	-0.0027 (-1.27)	-0.0091 (-0.51)	-0.0052 (-1.95)**
INF	-0.0024 (-2.67)**	-0.0028 (-3.02)***	-0.0031 (-2.93)***	-0.0159 (-1.23)	-0.0019 (-1.66)*	-0.0019 (-1.67)*	-0.0009 (-0.98)	-0.0010 (-0.08)
LNTELS	0.2704 (1.52)	0.1941 (1.12)	0.9294 (2.74)***	-0.1315 (-0.68)	-0.3117 (-0.77)	-0.3097 (-0.76)	-0.9579 (-0.77)	0.2600 (0.63)
GC	-0.0667 (-1.30)	-0.0607 (-1.17)	-0.5007 (-2.37)**	-0.0162 (-0.24)	-0.1200 (-1.85)*	-0.1194 (-1.86)*	-0.6183 (-2.64)***	-0.0350 (-0.53)
lag GDP					0.2217 (4.12)***	0.2213 (4.13)***	0.2587 (2.58)***	0.1678 (2.51)***
Constant	-5.4507 (-1.44)	5.4593 (2.48)**	-4.8921 (-0.89)	6.8086 (2.56)***	0.2163 (1.47)	0.2142 (1.49)	0.4468 (2.01)**	-0.2890 (-1.37)
Obs	384	384	103	281	348	348	103	255
R²	0.1019	0.0807	0.1918	0.0681				
Sargan Test					[0.9046]	[0.9008]	[1.0000]	[0.9297]

Notes: Figures in parenthesis are t statistics and figures in brackets [] are p-values. The t statistics are computed using heteroscedastic consistent standard errors. ***, ** and * indicate that the coefficient is significant at 1, 5 and 10% levels respectively. The Sargan test shows that the instruments are valid.