Effect of corporate tax on sector specific foreign direct investment in Ghana

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Abstract
There has been intense competition among developed and developing countries to attract foreign direct investment (FDI) in recent years. This competition for FDI is due to the fact that foreign capital creates employment and economic growth, augments the productive capital of a country, promotes transfer of technology and skills to the host country, and hence helps alleviate poverty, among other benefits. The competition, among other things, has taken the form of reduction in the corporate tax rate. Over the past two decades there has been a downward trend in corporate tax rate and an upward trend in FDI inflow in Ghana. Empirical evidence point to the fact FDI inflow to Ghana is not influenced by lower corporate tax rates. What is more, no study has explored quantitatively the effect of corporate tax on the inflow of FDI to the various sectors of the economy of Ghana. This study, therefore, examined the effect of corporate tax reduction on sector-specific FDI inflow in Ghana. Specifically, the study investigated the effect of corporate tax on FDI inflow into the mining sector, manufacturing sector, and service sector of the economy. Using the Johansen cointegration technique, the study found that corporate tax influences FDI inflow in the all the sectors. The study recommends that government should maintain a low corporate tax rate to attract more FDI.

Key Words: Corporate tax, Foreign Direct Investment, Cointegration, Ghana

JEL classification: F21, F23, H25, H32, 052

Introduction

Governments of developing countries have adopted many strategies to deal with the persistent poverty that has plagued them for decades. One such strategy has been engendering growth and job creation. In pursuing this objective, governments have tried to increase the level of investment in their respective countries. Unfortunately, most of these governments have realized that they cannot rely solely on domestic capital. Their strategies, therefore, have been to attract foreign capital that has become scarce and highly mobile in these days of globalization. Scarcity of these foreign resources has led to intense crumble among governments to influence their location to their favour.

The strive among governments to attract FDI is due to the fact that foreign capital augments the productive capacity of a country, promotes transfer of technology and skills to the host country, provides employment, tax revenues and hence helps alleviate poverty, among other benefits (Wang, Gu, Tse & Yim, 2013; Stowhase, 2002). Governments have therefore, used, extensively, tax and non-tax incentives to woo foreign investors to locate in their countries. The non-tax incentives are grants, loans, investment subsidies, and rebates to enhance the competitiveness of businesses. The tax incentives take the form of tax holiday, reduction in corporate income tax, removal of import tax and provision of low tax rates in export processing zones. The idea is that foreign firms are profit seeking and therefore, will locate where their profits could be maximized.

The reasoning above is aptly in line with Dunning's eclectic theory (Dunning, 1997; 1981), which is the basis of this study. The theory contends that in addition to having ownership and internationalization advantages, a firm must have locational advantages in the host economy before it decides to locate. The locational advantages are in the form of availability of natural resources, infrastructure, cheap labour, low taxes, etc. These locational factors enable the firm reduce costs of production, increase its efficiency and hence augment income. Thus, FDI will locate in countries that have lower tax rates, for example. This study focuses on one such locational factor, that is, corporate income tax.

Corporate income tax affects the profitability of investment. High corporate income tax reduces the profitability of investment and scares away private investors. Low corporate income tax, on the other hand, raises the returns on investments and so attracts FDI. Corporate income tax rates have been falling the world-over in recent years. Undoubtedly, the overarching reason for the corporate tax reduction has been to attract domestic and mobile foreign capital. This has made reduction in corporate tax rate to attract FDI one of the contentious issues in development economics. While some economists contend that reduced corporate tax rate attracts FDI, others hold the view that it does not.

Empirically, some studies have discovered a negative relationship between corporate tax rate and FDI inflow (Celine Azemar, Undated; de Mooij & Ederveen, 2001; Bénassy-Quéré et al., 2004; Gropp & Kostial 2001; Bertrand, Mucchielli, & Zitouna, 2007; Swenson, 2001 as cited in Stowhase, 2006; Papke, 1991, cited in Stowhase, 2006; Stowhase, 2002; Stowhase, 2006).

Other studies indicate no relationship between corporate tax rate and flows of FDI (Jensen, 2012; Onyeiwu & Shrestha, 2005; Hartman, 1984). Tsikata, et al (2000) found out that corporate tax does not significantly determine FDI in Ghana. However, their survey results indicated that the corporate tax rate significantly influences the location of FDI in the various sectors of the economy of Ghana. Other studies have however, found corporate income tax not to influence the location of FDI (Onyeiwu & Shrestha, 2005)

Yet other studies concentrated on the provision of public factors and corporate tax rate on FDI location and concluded that a policy of high corporate taxation combined with provision of public goods is better than another that combines low corporate taxation with the provision of low public inputs. Here, mention can be made of Gabe and Bell (2004). Some other empirical studies point to the fact that corporate tax reduction affects negatively other sectors of the economy. One such study is by Gomes and Pouget (2008) who found that corporate tax rate reduction affects negatively public investment, Ngowi (2000) found out that tax incentives to FDIs are a drain on government revenues and so for it to be effective it must be designed to target only those investments that would not locate in a host country in the absence of tax incentives. Other studies indicate that reduction in the corporate tax rate is to compensate for the lack of infrastructural facilities of those countries. Yet other strands of studies have concentrated on the effect of macroeconomic stability, level of development, or institutional quality, clustering effects, effective exchange rate, flexible labor markets and deeper financial markets, infrastructure and a more independent judiciary, educational attainment proxied by enrollment figures, large local market, natural resource endowments, low inflation, an efficient legal system and a good investment framework, corruption, and political instability (Walsh & Yu , 2010; Asiedu, 2006 & 2002; Kyereboah-Coleman & Agyire-Tettey, 2008).

Ghana has since 1983 carried out sweeping economic reforms to speed up the rate of growth of the economy. As part of the reforms, the tax system was overhauled. A number of fiscal incentives were introduced to attract both domestic and foreign investments. These incentives include lower export taxes for non-traditional exporters, 10 years exemption from the payment of corporate income tax for firms located in the export processing zones (EPZ), regional and sectoral tax incentives and reduced corporate tax rate. The most popular of the tax reform programme has been a constant downward revision of the statutory corporate tax rate as shown in Figure 1.

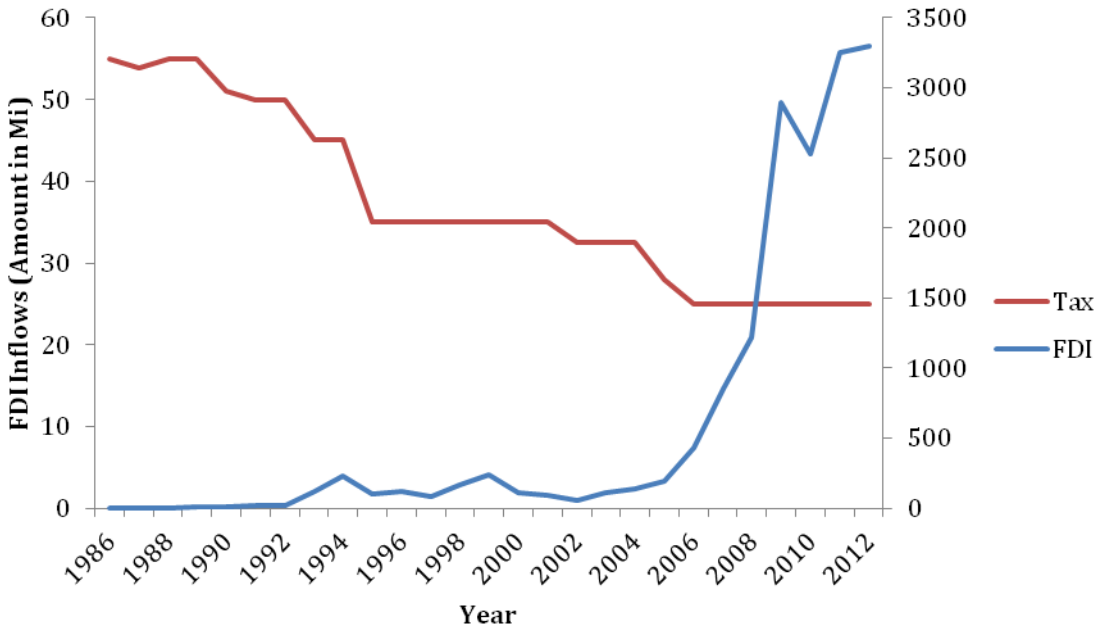

Figure1: Trends in FDI and corporate tax rate
Source: Author's own computation with data from WDI (for FDI) and Michigan World Tax data base (for corporate tax rates)

For instance, on average the statutory corporate tax rate has decreased from 55 per cent in 1986 to 25 percent in 2012. It is worth noting that in 2006, besides reducing the corporate tax rate to 25 per cent, the government introduced specific tax incentives to firms in specific sectors of the economy. For instance, manufacturing companies located in Accra and Tema attract 25 per cent corporate tax and any company located in all other regional capitals attracted 18.75 per cent. Firms established outside regional capitals attract 12.50 per cent. In addition, agro processing companies located in Accra and Tema attracted 20 per cent and those located in other regional capitals except Temale, Bolgatanga and Wa attract 10 per cent. Those located in Northern, Upper East and Upper West regions attracted 0 per cent and those outside regional capitals also attracted 0 per cent. These reductions in the corporate tax rate were meant to reduce the tax burden on the private sector, spur investors to expand their activities and invest in locations outside Accra and Tema, strengthen the private sector's role in economic development and provide a sustainable base for reducing poverty and enhance the position of Ghana as a strong destination for FDI (Ministry of Finance & Economic Planning, 2006).

Also shown in Figure 1 is the fact that FDI inflow has increased since 1986. In fact, FDI has increased from 4.3 million US Dollars in 1986 to 3294.52 million US Dollars in 2012. Again, the mining, manufacturing and service sectors of the economy of Ghana have seen substantial increases in FDI inflows in recent times as shown in Figure 2.

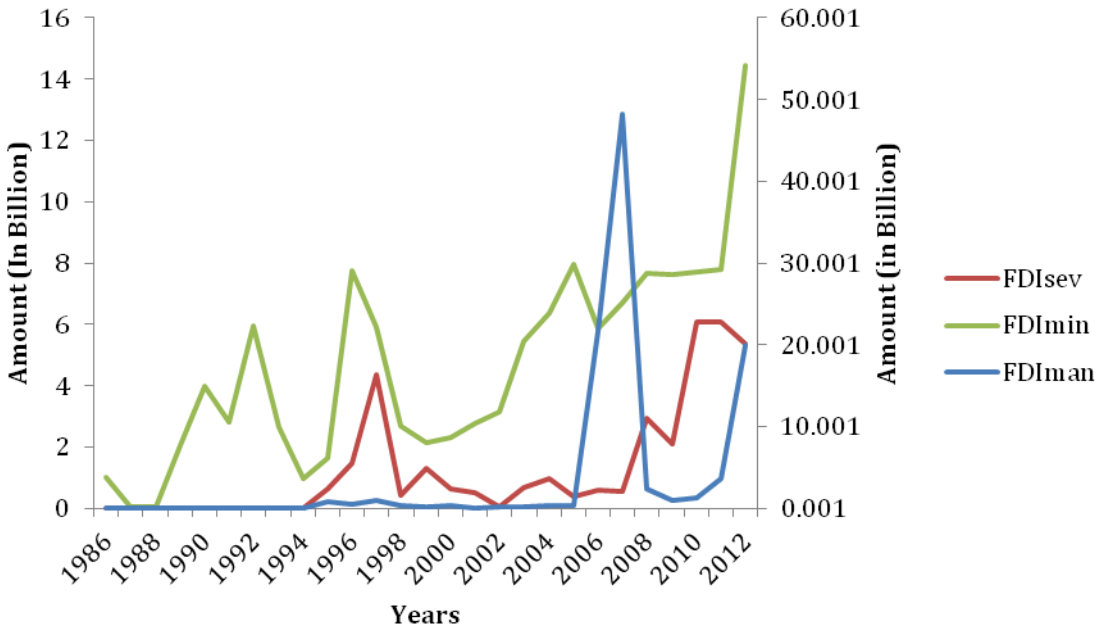

Figure 2. Trends in sectoral FDI
Source: Author's own computation using data from GIPC, 2013.

In terms of ranking, during the period of study, 1986 to 2012, the mining subsector received the highest amount of FDIs, followed by the service subsector and then the manufacturing sector (Abdulai, 2005).

The relevant questions to ask at this juncture are: First, what effect has reduction in corporate tax rate had on the upward surge in FDI flow into Ghana since 1986? Second, have the sectoral distribution of FDI been affected by reduction in corporate tax rate? This study, therefore, examined the effect of corporate tax reduction on FDI flow into Ghana. Specifically, the study estimated the effect of corporate tax reduction on sector specific FDI inflow into Ghana.

Studies on FDI in Ghana have used aggregate data and most of them have found no relationship between FDI and corporate tax. For instance, Tsikata, Asante and Gyasi, (2000) used mixed methods to investigate the determinants of FDI in Ghana. In their econometric analysis, they used aggregate FDI as the dependent variable and found taxation not to be a significant determinant of FDI. But their survey and interview components indicated that corporate tax was essential in influencing the location decision of FDI, especially at the sectoral level in Ghana. The study by Tsikata, et al (2005) is very informative but the use of aggregate FDI data is problematic as it masks sectoral differences. Besides, the policy relevance of such a study is limited because FDIs have been found to be heterogeneous in their behaviour and so may not respond equally to tax reductions (Stowhase, 2006). Therefore, knowledge of the responsiveness of the sector-specific FDI to corporate tax rate changes will help policy makers to formulate and implement appropriate tax policies to attract FDI in Ghana. These differences can only be detected when disaggregate data are used. This study, therefore, explored the effect of corporate tax on FDI flow into the various sectors of the economy. The contribution of this paper

lies in the fact that it uses disaggregated FDI data to investigate the effect of corporate tax on FDI flow into the various sectors of the economy of Ghana. In addition, it adds the case of a lower middle-income country, Ghana, to the vast literature on fiscal incentives and FDI, which exists mostly for advanced economies.

The results of the study indicate that reduction in the corporate tax rate influences FDI inflow to the mining sector, manufacturing and service sectors of the economy of Ghana. The rest of the paper is structured as follows: the next section deals with the methodology made up of the model and a discussion of the data used for the study. Section three presents the results and discussion of the findings, and finally, section four considers the conclusions and policy recommendation(s) of the study.

Methodology

This section presents the methodology of the study. The study employed the Vector Error correction model proposed by Johansen (1988). To be able to apply this approach, variables under consideration had to be stationary. In pursuant of this estimation technique, the stationarity properties of the variables of interest were examined to ensure that they were stationary. The next step was to test for cointegration of the variables. The long run equation was then derived from the unnormalized cointegration vectors. Finally, the short run dynamic model was derived by specifying an over-parameterized equation that was eventually reduced to a parsimonious equation.

Model Specification

The models for estimating the factors that affect FDI inflows to specific sectors of the Ghanaian economy are presented below. Following theoretical and empirical literature, the flow of FDI into the service sector, manufacturing sector and mining sector are modeled and numbered as equations 1, 2 and 3, respectively.

$$LFDI_{sev} = {}_0 + {}_1 LREER_t + {}_2 VAD_{sev} + {}_3 TAX_t + {}_4 LCPI_t + {}_5 EXP_{sevt} + {}_6 LIFE_t + {}_7 INT + {}_8 TEL + {}_t \quad (1)$$

$$LFDI_{MAN} = {}_0 + {}_1 LREER_t + {}_2 VAD_{MAN} + {}_3 TAX_t + {}_4 LCPI_t + {}_5 EXP_{MANt} + {}_6 LIFE_t + {}_7 INT + {}_t \quad (2)$$

$$LFDI_{MIN} = {}_0 + {}_1 LREER_t + {}_2 VAD_{MIN} + {}_3 TAX_t + {}_4 LCPI_t + {}_5 EXP_{MINt} + {}_6 LIFE_t + {}_7 INT + {}_8 TEL + {}_t \quad (3)$$

Where LREER is log of real effective exchange rate, TAX is corporate tax, LCPI is the log of Consumer price index, EXP is the percentage of merchandise exports of the sectors, LFDI is the log of FDI into the various sectors indicated by the subscripts (The subscript MIN indicates mining sector, SEV for service and MAN for manufacturing sector), INT represents interest rate, LIFE is life expectancy, used as a proxy for human capital. TEL is telephone access per 1000 of the population, a proxy for infrastructure. VAD is valued-added for each of the sectors. It should be noted that t is time, β_i, γ_i and α_i are parameters to be estimated. Finally, ε_t is the error term that is normally distributed and white noise.

Variable description

Based on theoretical and empirical literature, the flow of FDI into a sector in a year was used as the dependent variable. The explanatory variable of interest is the corporate tax rate.

Since the corporate tax increases the tax burden of the firm, it was expected that the inflow of FDI to a sector would reduce when corporate tax rate increases (Bertrand, Mucchielli, & Zitouna, 2007; Stowhase 2006).

Other explanatory variables are the size of the host market. The literature on FDI location studies shows that firms locate in foreign locations where they have the potential to sell their products. Therefore, a country that has a big potential or real market receives more FDI while a country with a small potential market receives few FDIs (Resmini, 2000; Asiedu, 2006 & 2002). The size of the domestic market was proxied by the value added of each of the sectors.

Market-seeking FDIs also consider the degree of easiness of exporting their products before locating in a country. Countries that facilitate the export of goods attract more FDIs and those that restrict exports attract fewer FDIs. The easy of exports was proxied by the percentage of the sector's export of total merchandise exports and it was expected to have a positive effect on the FDIs to a sector (Resmini, 2000; Singh & Jun, 1995; Asiedu, 2006).

Another factor taken into consideration by foreign investors in deciding on where to locate is the availability and quality of social and economic infrastructure. Since the provision of these facilities raise the operational costs of firms and hence reduce their profitability, their availability will reduce such costs. Therefore, countries that have more and good quality infrastructure attract more FDI projects while those with few and poor quality infrastructure attracts few FDIs (Walsh and Yu, 2010; Asiedu , 2006). In this study the availability and quality of infrastructure was proxied with the number of telephone lines per 1000 people and it was expected to affect positively FDI attracted into the country.

The health of the labour force was represented by life expectancy. Where people are healthy, they can have longer life expectancy and, all other things being equal, longer working lives. On the other hand, where people are not healthy, their life expectancy is low and hence they have a shorter working life. It was expected that life expectancy would have a positive effect on the expected number of FDI projects registered in a sector.

Exchange rate variability is also another variable foreign firms consider in deciding where to locate. In a floating exchange rate regime, depreciation of the local currency reduces the costs of location and therefore attracts more FDIs (Froot and Stein, 1991; Blonigen (1997). Appreciation of the local currency, on the other hand, increases the costs of locating foreign firms and so such a country attract fewer FDIs. In addition to the level exchange rate, FDIs are concerned about the variability of the exchange. Where the exchange rate is more volatile, FDIs are not able to plan. However, where the exchange rate is less volatile it aids planning and therefore such locations attract more FDI. Both phenomena were captured with the real effective exchange rate and they were expected to have a negative effect on the flow of FDI to the various sectors (Kyereboah-Coleman & Agyire-Tettey, 2008).

Inflation is expected to increase the operational costs of firms and so countries with high inflation attract few FDIs while countries with stable inflation attract more FDI (Walsh and Yu, 2010; Asiedu, 2006). Based on this theoretical foundation, we expected inflation to have a negative effect on FDI attracted into the various sectors of the economy.

The final variable of significance considered in this study is interest rate. Most foreign investors borrow from the domestic money market to finance their investments. Since interest

rate is a cost, countries with prohibitive interest discourage FDI while those with low interest rate encourage FDI. The bank rate was used as a proxy for interest rate. The interest rate was expected to have a negative effect on FDI flow to the various sectors of the economy.

Data Sources

The data used for the study was obtained from various sources. In particular, the FDI data was obtained from the Ghana Investment Promotion Centre (GIPC) while the rest of the dataset were obtained from the Bank of Ghana website. The study used quarterly data from 1986 to 2012. To obtain quarterly data for GDP, REER, TEL, LIFE, and Tax, the study used the Gondolfo et al (1981) algorithms to interpolate the annual data into quarterly data. The basis for the quarterly interpolation of the data was met since inflation variables were already in quarters. It has been argued that interpolated data transforms the distribution of the data. However, the use of the interpolated data did not affect the validity of the results presented in this paper.

Results and Discussion

Unit root test for variable stationarity

The stationarity status of the variables was examined since the Johansen cointegration approach requires that the variables must be stationary. The results from the Philip- Perron test are presented in Table 1 while that of the ADF test results are in Table 2.

Table 1: Philip-Perron unit root test results

Variable	Tau	Critical value	I(q)
$LFDI_{MAN}$	-5.8278	-3.4956***	1
$LFDI_{MIN}$	-3.4551	-0.011*	1
FDI_{SEV}	-7.9407	-3.4950***	1
LIFE	-2.4383	-1.9439**	1
LGDP	-4.0977	-4.062***	1
TEL	-3.6487	-3.495**	1
LREER	-3.7015	-3.4950***	1
EXP_{MAN}	-3.8079	-3.4950***	1
EXP_{MIN}	-3.5428	-3.9502***	1
TAX	-3.766	-3.4950***	1
EXP_{SEV}	-2.905	-2.889*	1
VAD_{MAN}	-3.861	-3.4950**	1
VAD_{SEV}	-2.870	-2.581*	1
INTER	-3.728	-3.4950***	1
LCPI	-4.145	-3.950***	1

***, **, * rep 1%, 5% & 10% significant levels, respectively.
Source: Generated using E-Views 7

From the results, it is clear that all the variables used in the estimation were integrated of order one. This gives an impetus for cointegration analysis based on Johansen's full information maximum likelihood approach. The results indicate $LFDI_{MIN}$ EXP_{SEV} and VAD_{SEV} are stationary at first difference at the 90% confidence level. VAD_{MAN}, LIFE, TEL are stationary at 95%

confidence level. Finally, all the remaining variables are stationary at first difference at 99% confidence level. These results are confirmed by the ADF test in Table 2.

Table 2: Unit root test using ADF test

Variable	Tau	Critical value	I(q)
FDIMAN	-5.828	-3.495***	1
FDIMIN	-4.852	-3.497***	1
FDISEV	-4.486	-3.498***	1
LIFE	-3.284	-2.892**	1
LGDP	-4.265	-3.498***	1
TEL	-4.266	-2.589***	1
LREER	-3.302	-2.892**	1
EXP_{MAN}	-4.868	-3.501***	1
EXP_{MIN}	-3.901	-3.501***	1
TAX	-3.543	-3.501***	1
EXP_{SEV}	-4.473	-3.497***	1
VAD_{MAN}	-3.765	-3.501**	1
VAD_{SEV}	-2.578	-1.944**	1
INTER	-3.603	-3.501***	1
LCPI	-4.568	-2.589***	1

***, **, * rep 1%, 5% & 10% significant levels, respectively.
Source: Generated using E-Views 7

Results of Cointegration test

Based on the unit root test, the study tested for cointegration among the variables. The results indicate that the number of cointegration equations in the FDI to the manufacturing sector equation is 1. Thus there exist cointegration relationship between the FDI_{MAN} and the remaining explanatory variables. This is an indication of a long-run relationship between FDI_{MAN} and the explanatory variables. Even though the trace statistics picked two suggesting that there are two cointegration equations among the variables, this study put preference on the Maximum eigenvalues and used the single equation suggested by the maximum-Eigenvalues statistics (refer to Table 3 and Table 4).

Table 3: Unrestricted Cointegration Rank Test (Trace) for Manufacturing

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.766000	379.2676	143.6691	0.0000
At most 1 *	0.630658	229.6669	111.7805	0.0000
At most 2 *	0.447486	127.0754	83.93712	0.0000
At most 3 *	0.335445	65.96797	60.06141	0.0146
At most 4	0.131557	23.87830	40.17493	0.7130
At most 5	0.059612	9.349806	24.27596	0.8917
At most 6	0.028738	3.019141	12.32090	0.8453
At most 7	0.000153	0.015776	4.129906	0.9183

Source: Generated using E-Views 7

Table 4: Unrestricted Cointegration Rank Test (Maximum Eigenvalue) for Manufacturing

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.582711	89.14548	48.87720	0.0000
At most 1	0.319765	39.30233	42.77219	0.7543
At most 2	0.447486	61.10744	36.63019	0.0000
At most 3	0.335445	21.08967	30.43961	0.4312
At most 4	0.131557	14.52850	24.15921	0.5518
At most 5	0.059612	6.330665	17.79730	0.8712
At most 6	0.028738	3.003365	11.22480	0.7872
At most 7	0.000153	0.015776	4.129906	0.9183

Source: Generated using E-Views 7

The results from the cointegration test further suggest that there exist long run relationship between FDI_{SEV} and the explanatory variables. The number of cointegration equations suggested by the maximum-eigenvalues was three (3). This means that there are three long-run relationships that exist in the VAR model for the service sector FDI inflow. However, this study only estimates the equation of interest, which is the FDI to the service sector equation (See Table 5 and Table 6).

Table 5: Unrestricted Cointegration Rank Test (Trace) for service

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.728841	319.4137	125.6154	0.0000
At most 1 *	0.570729	184.9937	95.75366	0.0000
At most 2 *	0.333868	97.88998	69.81889	0.0001
At most 3	0.268256	48.04450	47.85613	0.0571
At most 4	0.121869	23.87506	29.79707	0.2058
At most 5	0.090656	10.48924	15.49471	0.2450
At most 6	0.006782	0.700949	3.841466	0.4025

Source: Generated using E-Views 7

Table 6: Unrestricted Cointegration Rank Test (Maximum Eigenvalue) for service

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.728841	134.4200	46.23142	0.0000
At most 1 *	0.570729	87.10371	40.07757	0.0000
At most 2 *	0.333868	41.84547	33.87687	0.0046
At most 3	0.268256	32.16945	27.58434	0.0820
At most 4	0.121869	13.38581	21.13162	0.4174
At most 5	0.090656	9.788295	14.26460	0.2262
At most 6	0.006782	0.700949	3.841466	0.4025

Source: Generated using E-Views 7

The last equation that was examined was the model explaining the FDI flow to the mining sector. The null hypothesis of no cointegration equation was rejected based on both the maximum-eigenvalues statistic and the trace statistics. The results show that there is long run relationship among the variable used in the estimation. The number of cointegration equation established from the model was three (Refer to Table 7 and Table 8). However, only the equation of relevance was estimated in this study.

Table 7: Unrestricted Cointegration Rank Test (Trace) for Mining

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.513158	220.9543	125.6154	0.0000
At most 1 *	0.409920	148.9727	95.75366	0.0000
At most 2 *	0.334441	96.22299	69.81889	0.0001
At most 3	0.261823	45.51013	47.85613	0.1081
At most 4	0.144520	25.15291	29.79707	0.1560
At most 5	0.060020	9.543706	15.49471	0.3175
At most 6	0.032984	3.354002	3.841466	0.0670

Source: Generated using E-Views 7

Table 8: Unrestricted Cointegration Rank Test (Maximum Eigenvalue) for mining

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.513158	71.98160	46.23142	0.0000
At most 1 *	0.409920	52.74967	40.07757	0.0011
At most 2 *	0.334441	40.71285	33.87687	0.0066
At most 3	0.161823	20.35722	27.58434	0.2215
At most 4	0.144520	15.60921	21.13162	0.2485
At most 5	0.060020	6.189705	14.26460	0.5890
At most 6	0.032984	3.354002	3.841466	0.0670

Source: Generated using E-Views 7

Long-Run results

The long run equations were derived from the unnormalized cointegration vectors that were got from the cointegration test conducted earlier. The results are presented in Table 9. The effect of corporate tax on FDI inflows has been investigated extensively in the literature, but the results have been conflicting. The argument for the reduction in corporate tax is based on the fact that higher corporate tax reduces the profitability of investment in the host country and so results in low FDI inflow. Devereux, Lockwood and Redoano (2002) emphasize that countries do compete over corporate tax rate and multinational companies choose their destination based on the corporate rate existing in the destination country, holding all other factors constant. The study examined whether the effect of corporate tax on FDI inflows to Ghana has a negative effect as predicted by theory and most empirical studies. The results indicate that corporate tax influences the inflow of FDI negatively for all the sectors under consideration in the long run. Corporate tax had a negative and significant effect on FDI flow into the service sector, manufacturing sector and the mining sector of the economy. The coefficient of corporate tax was statistically significant at 1 percent for the manufacturing and the service sector as well as the mining sector. The impact of corporate tax on FDI is stronger for the service sector compared to the manufacturing and the mining sectors of the Ghanaian economy. This difference could result from the existence of fiscal incentives, including tax holidays for the manufacturing sector and the mining sectors of the economy. To be more specific, a 1% increase in corporate tax would result in the decline in FDI inflows by 0.19, 0.27 and 0.89 in the manufacturing, mining and the service sectors respectively. The result is in line with those of Azemar and Delios (2005), DeMooij and Ederveen (2003 & 2005), Tsikata et al (2000). Jun (1989, 1994) explains the reason why tax has a negative influence on FDI as tax being a profit reducer. The implication is that high rocketing domestic corporate tax will push FDI projects to a country with moderate taxes for foreign investors. Agarwal (1980) argued that the impact of tax on FDI is very limted in its effect. The results suggest a similar pattern. Even though the effect of tax on FDI is significant, the coeffcient seems to be very minimal for the manufacturing sector. It must be said

that, mining investment in Ghana is more export oriented. It follows that the effect of tax on the mining sector is intitutively right. The findings for the service and the manufacturing sectors are not different from the findings of Benassy-Quere et al (2005) and Azemar & Delios (2008).

The results further show a positive effect of real effective exchange rate on the inflow of FDI to the manufacturing and mining sectors in the long run. This result is supportive of the idea that exchange rate depreciation favours FDIs that locate in sectors where commodities are produced for export. A weaker real exchange rate might be expected to increase vertical FDI as firms take advantage of relatively low prices in host markets to purchase facilities or, if output is re-exported, to increase home-country profits on goods sent to a third market. Froot and Stein (1991) find evidence of this relationship in which a weaker host country's currency tends to increase inward FDI within an imperfect capital market model as depreciation makes the host country's assets less expensive relative to assets in the home country. Blonigen (1997) makes a "firm specific asset" argument to show that exchange rate depreciation in host countries tend to increase FDI inflows. Looking at the Ghanaian manufacturing and the mining industry, most of their production is export-oriented. Hence depreciation of the local currency against those of the rest of the world would favour FDI inflow to these sectors of the economy. However, for the service sector, exchange rate depreciation has a negative effect on service FDI inflows in Ghana. The reason could be that, the Ghanaian service sector requires mostly imported inputs which real depreciation of the currency make expensive to purchase therefore making the service sector unattractive to FDI under extreme exchange rate depreciation. The estimated coefficients are statistically significant at 1% across sectors. This indicates that real effective exchange rate is important in explaining the inflow of FDI to the various sectors of the Ghanaian economy under study.

Various empirical studies have attributed FDI flow to the degree or the level of openness of a particular economy. Studies that examine the effect of openness include, but not exhaustive, Asiedu (2002), Seim (2009), Walsh and Yu (2010) and Anyanwu (2011). These studies found openness to be related to FDI inflows to a particular country. Wash and Yu (2010) also suggest that export-oriented firms would be more attracted to sectors that are more opened. Resmini (2000) makes similar assertion. This was examined in the case of Ghana. The result indicates that openness is positively related to all the sectors' FDI inflows. The results from the long run estimation suggest that openness of the particular sector is one of the important factors that explain FDI inflow to that sector. More specifically, the effect of openness on the manufacturing FDI inflow is about 0.40 while that of the service and the mining sectors are very marginal. However they all have a positive effect. The result supports the argument that FDI would flow into sectors that are more open and thus confirms Resmini (2000), who studying manufacturing investment argued that increasing openness lead to increase FDI into a particular sector. Singh and Jun (1995) also find that export orientation is very important in attracting FDI, and links this to the rising complementarity of trade and FDI flows.

Tiebout (1965) argues that FDI location is influenced by the availability of infrastructure. This implies that telephone must be positively related to FDI inflow to the country. The results show that telephone has a positive effect on FDI inflow to the mining and service sectors. The finding supports the results of Mollick, Ramos-Duran and Silva-Ochoa (2006) and Gastanaga, Nugent and Pashamova (1998). For the two sectors, the coeffiecient in the models are statistically significant at less than 1 percent. The study also found a positive effect of life expectancy on FDI flow. The positive relationship found in this study is therefore a confirmation

of existing theoretical postulates and empirical findings such as Alsan, Bloom and Canning (2006) and Globerman and Shapiro (2002).

The effect of sectoral GDP contributions on FDI inflow was also examined. The results indicate that the manufacturing sector value added was significant at 1 percent. While that of the service sector was also positive and significant. GDP was used as the proxy for valued added for the mining sector and it was also found to be significant. The value added was used to capture each sector's size in the economy.

Finally, and as shown in Table 9, CPI has negative effect on the inflow of FDI into the manufacturing and mining sectors. The results show that a rise in consumer prices will lead to a fall in FDI inflow into the two sectors. Also, interest rate has a negative effect on inflow of FDI to the mining sector.

Table 9: Long-run estimation of FDI to various sectors

	Manufacturing	Mining	Service
LREER	6.514451	16.99549	-11.53839
	(1.18407)	(3.07948)	(3.45218)
	[5.50174]	[5.51895]	[-3.34235]
VAD	1.734168		4.361504
	(0.32843)		(0.50606)
	[5.28010]		[8.61847]
TAX	-0.193329	-0.279734	-.892159
	(0.03979)	(0.03933)	(0.41665)
	[-4.85844]	[-7.11257]	[-4.54132]
CPI	-0.298110	-0.184789	
	(0.02547)	(0.07619)	
	[-11.7037]	[-2.42552]	
EXP	0.402442	7.73E-09	6.13E-08
	(0.04733)	(1.4E-09)	(8.4E-09)
	[8.50318]	[5.33721]	[7.32355]
LIFE	2.520814		1.965427
	(0.29591)		(0.57610)
	[8.51888]		[3.41160]
TEL		16.36176	2.051193
		(0.89483)	(0.18567)
		[18.2848]	[0.41312]
INT		-0.451308	
		(0.02623)	
		[-17.2044]	
GDP ($VAD_{MIN)}$		0.025051	
		(0.02367)	

		[1.05828]	
C	139.2562	97.83195	-40.17414
	(50.675)	(34.643)	(21.321)
	[2.74803]	[2.74803]	[-2.74803]

Source: Author's estimation

The Short run dynamic results

To move from the long run estimations to short run estimations, error terms were obtained from the long run estimated equations and introduced into an over-parameterized model. The short run dynamic models were estimated to see how the models adjust when there is shock. The results are presented in Tables 10, 11, and 12.

Table 10: Short run dynamic of Manufacturing sector and FDI

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ECT(-1)	-0.433605	0.103584	-4.186041	0.0001
D(LFDIMAN(-4))	0.830976	0.203335	4.086745	0.0002
D(LFDIMAN(-5))	0.663510	0.164111	4.043049	0.0002
D(LFDIMAN(-6))	0.526129	0.155750	3.378039	0.0015
D(LREER(-5))	-45.08558	19.53141	-2.308363	0.0255
D(LREER(-8))	-32.71382	10.10379	-3.237777	0.0022
$D(VAD_{MAN}(-1))$	-7.549958	1.823605	-4.140129	0.0001
$D(VAD_{MAN}(-7))$	9.978193	3.784768	2.636408	0.0114
$D(VAD_{MAN}(-8))$	-8.226488	2.128337	-3.865219	0.0003
D(TAX(-1))	0.309504	0.604820	0.511729	0.6113
D(TAX(-2))	-2.020192	1.076719	-1.876249	0.1670
D(TAX(-3))	1.691350	1.140577	1.482889	0.1449
D(TAX(-4))	0.731757	1.026463	0.712892	0.4795
D(TAX(-5))	-1.309108	0.564906	-2.317389	0.0250
D(LCPI(-1))	0.401817	0.130297	3.083853	0.0035
$D(EXP_{MAN}(-4))$	0.786418	0.394545	-1.993231	0.0522
$D(EXP_{MAN}(-8))$	0.852868	0.311182	2.740733	0.0087
D(LIFE(-1))	7.670677	2.510771	-3.055108	0.0037
D(LIFE(-2))	6.536837	3.883401	1.683276	0.0991
C	0.362421	0.151433	2.393279	0.0208
R-squared	0.833735	Mean dependent var		0.075675
Adjusted R-squared	0.656627	S.D. dependent var		0.674379
S.E. of regression	0.395173	Akaike info criterion		1.286972
Sum squared resid	7.183423	Schwarz criterion		2.622570
Log likelihood	-11.77464	F-statistic		4.707498
Durbin-Watson stat	2.227694	Prob(F-statistic)		0.000000

Source: Author's estimate

Table 11: Short-run dynamic for FDI into mining sector

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ECT(-1)	-0.004808	0.002762	-1.740855	0.0877
D(LFDIMIN(-1)	0.437801	0.042669	10.26030	0.0000
D(LFDIMIN(-2)	0.067845	0.025745	2.635296	0.0111
D(LREER(-8))	2.086886	0.951021	2.194364	0.0328
$D(EXP_{MIN}(-2))$	9.73E-10	4.96E-10	-1.961227	0.0553
$D(EXP_{MIN}(-6))$	2.52E-09	1.27E-09	-1.981293	0.0530
$D(EXP_{MIN}(-7))$	1.31E-09	6.52E-10	-2.010124	0.0497
$D(EXP_{MIN}(-8))$	3.84E-09	6.20E-10	6.189508	0.0000
D(TAX(-6))	-0.342672	0.179489	-1.909152	0.0619
D(TEL(-1))	0.348453	0.128193	2.718186	0.0089
D(LCPI(-1))	-0.017145	0.005777	-2.968123	0.0046
D(INTER(-3))	-0.089567	0.034177	-2.620663	0.0115
D(INTER(-4))	0.082846	0.044345	1.868228	0.0675
D(INTER(-8))	0.107220	0.030704	3.492008	0.0010
D(GDP(-4))	0.102159	0.026359	3.875653	0.0003
C	-0.053315	0.043235	-1.233152	0.2232
R-squared	0.953242	Mean dependent var		0.039265
Adjusted R-squared	0.913819	S.D. dependent var		0.198715
Sum squared resid	0.173558	Schwarz criterion		-1.358081
Log likelihood	164.6941	F-statistic		24.17965
Durbin-Watson stat	2.127691	Prob(F-statistic)		0.000000

Source: Author's estimate

Table 12: Short-run dynamic of FDI to service sector

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
ECT(-1)	0.317174	0.155988	2.033325	0.0456
D(LFDISEV(-2))	-0.355398	0.132861	-2.674964	0.0092
$D(VAD_{SER}(-1))$	-0.379218	0.207961	-1.823508	0.0723
$D(VAD_{SER}(-2))$	0.472364	0.268600	1.758612	0.0828
D(TAX(-2))	-1.053720	0.416733	-2.528525	0.0136
$D(EXP_{SEV}(-2))$	-9.97E-09	2.58E-09	-3.867929	0.0002
$D(EXP_{SEV}(-4))$	8.51E-09	2.52E-09	3.373040	0.0012
$D(EXP_{SEV}(-7))$	-8.14E-09	4.29E-09	-1.896761	0.0618
D(LREER(-7))	3.725387	1.991167	1.870956	0.0653

C	-0.116253	0.114249	-1.017535	0.3122
R-squared	0.566973	Mean dependent var		0.060587
Adjusted R-squared	0.523141	S.D. dependent var		0.550941
S.E. of regression	0.515905	Akaike info criterion		1.712263
Sum squared resid	19.69571	Schwarz criterion		2.299926
Log likelihood	-60.18863	F-statistic		1.635296
Durbin-Watson stat	2.056519	Prob(F-statistic)		0.063740

Source: Author's estimate

The results show that previous FDI flow results in further FDI inflows to the manufacturing sector. This is in line with the argument that successful FDIs influence the FDI inflow from other MNCs. The fourth, fifth and the sixth previous quarters are able to influence the flow of FDI to the manufacturing sector of the economy. The result is statistically significant at less than 5%. Similarly, the mining sector FDI inflows have an effect on the subsequent FDI inflows. This results shows that FDI into the mining sector of the economy is positively related to the past two periods FDI inflows. Such results in the mining are understandable. This is because FDI to the mining sector may come along with other complementary mining services. This would only depend on the success or failure of the initial FDI to the mining sector. However, in the service sector, previous FDI to the service sector has a negative effect on the subsequent FDI inflows to the service sector. This result for the service sector would be because of the size of the economy. Also, service sector FDI are basically market seeking hence the initial FDIs have the market advantage and may prevent other service FDI to enter the economy.

The effect of corporate tax as shown by the result does not immediately affect the level of FDI that flows into the manufacturing sector of the economy. The first to the fourth lag of corporate tax is not significant in influencing the levels of FDI inflow in the current period. However, the fifth lag of corporate tax affects the current FDI inflows to the manufacturing sector. The results simply imply that FDIs to the manufacturing sector experienced a delayed effect of corporate tax. The main reason why such result could be found is the numerous tax exemptions that are given to foreign firms in Ghana to attract foreign direct investments. The impact of the corporate tax on the mining sector FDI is negative and significant in the short-run. That is corporate tax matter for FDIs in the short run. However, it takes the sixth lag for the corporate tax to have effect on the current levels of mining FDI. This result indicates that, the mining FDI comes into the economy basically for resources. For the service sector, tax is negative and statistically significant and so reduces service FDI inflows. For the service sector, second lag corporate tax has a negative impact on FDI inflows. Comparing the short-run impact of tax on FDI inflows, based on the lag lengths, the service sector seems to have an early response of the level of tax compared to the mining and manufacturing FDI. Nevertheless, the negative impact of FDI seen in the short-run does not deviate from the general literature on corporate tax effect on FDI inflows. The results of this study, therefore, support the finding of earlier studies like Mooij and Ederveen (2003), Harding and Javorcik (2007) and Azemar and Delios (2008) and Xin-zhong (2005).

Life expectancy is statistically significant for the first two previous quarters for the manufacturing sector. Thus the FDI that comes into the manufacturing sector of the economy looks at the level of the quality of human capital in the sector. A higher life expectancy means

that the ability to have a healthy and productive labour exists. For the mining and service sector, life expectancy as a proxy for human capital was not significant hence it was deleted to achieve parsimonious equations.

The level of export has a significantly positive effect in the fourth and the eight previous quarters on the current levels of FDI inflows to the manufacturing sectors of the economy. The result indicates that export orientation of the sector is very important for attracting FDI flows into the sector in the short run. Similar story could be told about the mining sector. The 2^{nd} , 6^{th}, 7^{th} and 8^{th} quarters of mining sector export have positive effect on the level of FDI that flows into the mining sector. However, the sign of the openness alternate for the service industry. The effect of export on FDI inflows to the service sectors was negative in the second quarter while positive in the 4^{th} quarter. This effect of openness on the service sector in the short run was not expected. However, in general, in the short run openness measured by export from the various sector plays a significant role as had been indicated by many studies (Siem, 2009).

It is interesting to note that real exchange rate is negative for the manufacturing sector. In fact, the 5^{th} and 8^{th} quarters are all negative and significant. In the mining sector, however, real exchange rate has a positive effect on FDI inflows into the sector. It is equally positive in the service sector. Again, inflation affects FDI inflow into the manufacturing sector positively. But in the mining sector, the effect is negative.

The error correction terms for all the sectors are statistically significant and have the correct signs. In Table 10, the error correction coefficient of -.433 indicates that it would take approximately three quarters for any shock in the manufacturing sector to be corrected. The coefficient for the error term for the mining sector is also negative, but very small. An error correction of -0.004 (See: Table 11) shows that, the speed of adjustment for the mining sector is very slow and it would take a very long time for shocks in the mining sector to be corrected. The error term for the service sector is significant but positive as shown in Table 12.

Post estimation tests

To check for the robustness of the results the serial correlation test, the Ramsay reset test and the stability test (using CUSUM and CUSUMSQ) were conducted. The results presented in Table 13 show that for all the models, the null hypothesis of no serial correlation was not rejected. That is, the estimated results for the three models did not suffer from the problem of serial correlation. The Ramsay Reset test for functional form was done. Using the null hypothesis of correct specification of the model, we failed to reject the null hypothesis for all the estimated models. Thus the models were correctly specified given the variables used and the time period for the model. The Cumulative Sum of Recursive Residuals (CUSUM) and Cumulative Sum of Squares (CUSUMSQ) were also examined. The test required that the graph of the residual falls within the 5% critical bounds. The graphs (refer figures 1, 2, and 3)indicate that the parameters of all the models were stable for the estimation period.

Table 13: Post estimation tests

Test	Sector	F-statistic	Probability
Ransey Reset test	Service	0.434271	0.512924
	Manufacturing	0.019622	0.888985

Serial Correlation	Mining	2.269468	0.321508
	Service	2.369413	0.102688
	Manufacturing	1.291821	0.126098
	Mining	0.871657	0.422624

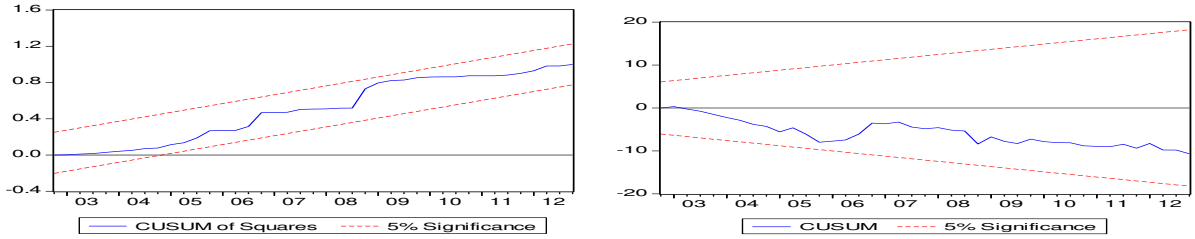

Figure 1: CUSUM and CUSUM Square for Manufacturing model

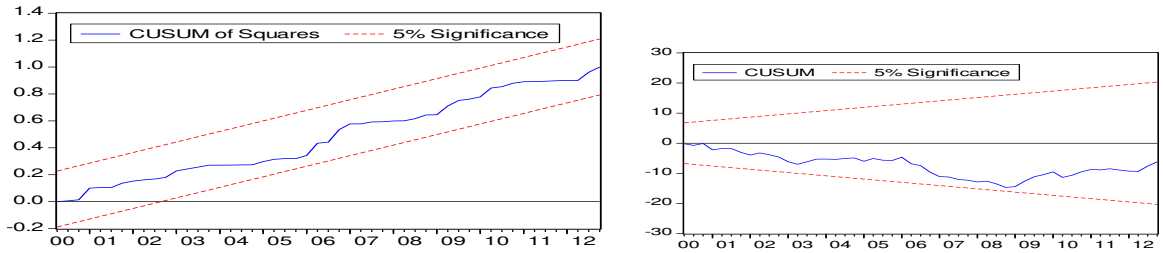

Figure 2: CUSUM and CUSUM for Mining model

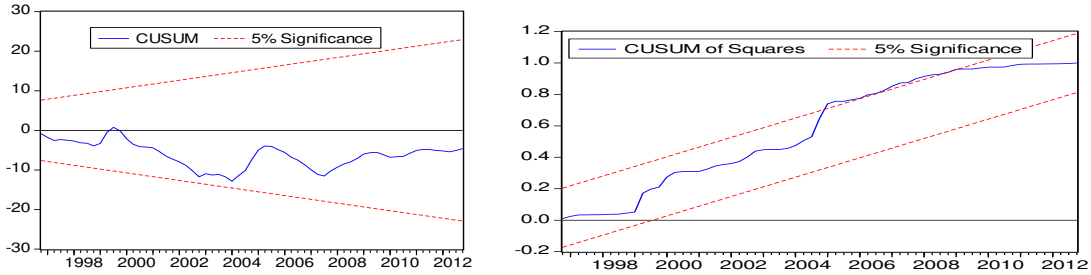

Figure 3: CUSUM and CUSUMSQ for Service sector

Conclusions and Policy Recommendations

There is the general realization in recent times that FDI are heterogeneous and therefore respond to incentives differently. Therefore, this study estimated the relationship between sector-specific FDI and corporate tax in Ghana, using the Johansen cointegration estimation technique. The results indicate that corporate tax influences the flow of FDI to the manufacturing sector, mining sector and service sector. The results further show that infrastructure, quality of life, human capital development and economic stability are equally important in explaining FDI inflow to the various sectors.

It is, therefore, recommended that government of Ghana should continue to reduce corporate tax rate. In so doing, more FDI will be attracted to the service sector, mining sector and the manufacturing sector. Beside the fact that reduction in the corporate tax rate will attract more FDI into the various sectors, it could also increase the tax payment compliance rate of FDI which in the long run argument government revenues. To be able to continually benefit from the flow of FDI, Ghana must ensure that the quality of human capital is improved. Again, continual growth in per capita is necessary to attract FDI into the economy. The Bank of Ghana should strive to achieve exchange rate stability since it is crucial for the long run inflow of FDI. The government also needs to improve upon existing infrastructural facilities and where possible build new ones so as to attract more FDI. Finally, government must ensure that all sectors of the economy are adequately opened up so as to attract FDI.

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