Technological Capabilities and FDI-related Spillover: Evidence from Manufacturing Industries in Nigeria

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Abstract

Many studies provide evidences of the existence of FDI-related technology spillover effects, suggesting that FDI can act as a vehicle through which technologies and new ideas can be transferred to domestic firms in developing countries. However, some case studies and empirical researches find little evidence of a spillover effect arising from FDI inflow. These mixed empirical evidences imply that research needs to identify conditions under which spillovers actually occur. Accordingly, this study was conducted to explore the role of both subsidiary and indigenous firms' intensity of investments in technological activities and capabilities on their ability to attract and generate, capture and absorb FDI-related technology spillover. In doing so the Nigeria's manufacturing sector was targeted from which a sample was drawn. Data were collected through reliable-tested structured questionnaires and were analysed principally by using multiple correlation to establish association and regression to establish causality. By employing combined analytical approach, the research found positive and robust relationships between intensity of investments in technological capabilities vis-à-vis FDI-related technology spillover. The results also show that investments in R&D and acquisition of licensed technologies are the main drivers of spillover with subsidiaries contributing more to the process than indigenous firms.

Keywords: Technology Investments, FDI-related spillover in Nigeria

1. Introduction

Nigeria's quest for technological know-how through FDI has gathered impetus in recent years as the country is spending large sums of money to attract foreign companies (Yauri, 2006). This effort is manifested in signing six (6) Bilateral Investment Treaties (BITs) and eleven (11) Double Taxation Treaties (DTTs) aimed at encouraging the inflow of FDI. On similar development, (ODI,1997) reports Nigeria as the second largest recipient of FDI among low-income countries like India, Bangladesh, Vietnam, and other countries of African region.

Literature has documented sufficient explanations for justifying these efforts, for instance (Oman, 2000) and (Marin, 2008) explain that Multinational Companies (MNCs) bring in economic benefits such as employment, capital, new skills and technological knowledge to domestic economy. Such benefits are supposed to leak out from MNC subsidiaries to indigenous firms thus generating spillover effects. This belief has made the government of Nigeria to set up policies for attracting FDI-related spillover with particular emphasis on the manufacturing sector (UNCTAD, 2009).

Regrettably, despite increase in FDI inflows to the country, the performance of the sector is still at dismal level featured by low output, low capacity utilization and low sectoral contribution to GDP (CBN, 2010). This raises questions on the effectiveness of the expensive policies that are justified largely in terms of the spillovers to be achieved, regardless of the activities that are likely to be undertaken by the MNC subsidiaries and indigenous firms once they are established (Marin and Bell, 2006). It also generates new views among researchers on the roles of subsidiaries and local firms in the FDI-related technology spillover process.

These new views no longer see technology as a public good which can normally be transferred to the host economy by simply attracting FDI; it positions not only investments in technological activities made by subsidiaries to attract and generate spillover, as a decisive determinant of effective spillover, but also investments in technological capabilities made by indigenous firms to allow them capture and absorb it.

As such firms are now included into research models as active players in the process of attracting and generating spillover (Cantwell, 1995; Birkinshaw, Hood, and Jonsson, 1998; Rugman and Verbeke, 2001; Hale and Long 2006; Piscitello and Rabbiosi, 2006; Liu and Buck, 2007; Marin, 2008).

It is along this line of views that this research was conducted with the main objective of assessing the effects of firms' intensity of investments in technological activities and absorptive capabilities on FDI-related technology spillover among manufacturing firms in Nigeria. Even though the study is similar to recent studies on other countries, it is, however, unique in the case of Nigeria in the sense that it employs not only the technological investments of subsidiaries but also that of indigenous firms in a combined manner as indicators of subsidiaries' initiative for attracting and generating spillover as well as indigenous firms effort for capturing and absorbing the generated spillover (Dutse, Okwoli and Kurfi, 2011).

In doing so, the article summarizes related research evidences that provide basis for and support the need for the adopted research approach and went on to describe the methodology used in data collection and analyses. The last part of the article discusses the research outcome and its policy implication. It concludes by offering recommendations that can be adopted by Nigeria's economic planners for achieving meaningful and effective technology spillover in the economy.

2. Literature Review

FDI-related technology spillovers in the host economies of developing countries are important areas of research in the international economics and management literature. The consensus of opinion among researchers (Ikiara, 2003; Marin and Bell, 2006; Dutse, 2008 and UNCTAD 2009) is that MNC subsidiaries bring in new technologies, skills, marketing expertise and novel management techniques from their parents into host countries, these knowledge resources may 'leak' to indigenous companies through various channels.

Principally, this could be achieved through the integration of the local market with the international operators, labour mobility between subsidiaries and indigenous firms resulting in knowledge spillover, learning from the demonstration of new technologies represented in foreign subsidiaries and when indigenous firms receive technical assistance. UNCTAD (2005) emphasize that FDI-led Technology spillovers can play a significant role in the productivity growth of indigenous enterprises in a host economy. Lichtenberg & De la Potterie (1996), Xu (2000), Pradhan (2006), Sun (2010) agree.

Recently, however, a growing number of empirical studies have emerged in literature discuss with somewhat contradictory conclusions. For instance as (Ghali and Rezgui 2008) explain, that the outcome of the studies are significant in some cases and insignificant in some for instance, the earlier studies of (Blomström & Persson, 1983) and (Blomström 1986) covering developing and low income economies, have confirmed the presence of positive spillover using cross sectional data.

However, as can be deduced from the summaries of (Görg and Greenaway, 2001) and (Ozturk,2007), the work of (Haddad & Harrison, 1993) on Morocco using panel datasets, shows weak and insignificant slipover effects while (Saltz, 1992; Kokko, Tansini and Zejan, 1996; Aitken & Harrison, 1999; and Kathuria, 2000 on India) found significantly negative effects. Recently the works of (Marin and Bell, 2006; Pradhan, 2006; Sasidharan, 2006; Marin, 2008), have presented conclusions of several in-depth studies that attempt to provide some level of explanations for the contradictory findings on spillover effects.

In a logical manner (Marin, 2008) added to the debate by offering a novel pattern of opinion suggesting that experts should be questioning the main assumptions underlying the models used by the researchers. She explains that "*what matters much more is what subsidiaries actually do once they have been established or acquired – namely whether they are entrepreneurial and innovative enough to contribute to the host economy in a constructive way*" . . Marin, 2008*: 25)*. The same pattern of view can be extended to indigenous firms' initiatives also. Accordingly this provides the underpinning of key issues in research and policy priority decisions on how government of Nigeria can facilitate the promotion and accumulation of technological assets and capacities by MNC' subsidiaries and also strengthen the absorptive capabilities of indigenous firms to serve as the main drivers of FDI-related spillover effects particularly within manufacturing sector of the economy.

3. Methodology

The process of gathering empirical data was similar to the one used in the works of (Ferson, Kreinovich, Hajagos, Oberkampf, and Ginzburg, 2007). A survey was carried out to gather data on the firm-level investment and engagement of resources in technological activities of both foreign subsidiaries and indigenous manufacturing firms operating in Nigeria for the period between 2006 – 2012. As designed contacts with the target manufacturing firms were initially made through letters of introduction and explanation from the researcher so as to avoid low response rate as observed by (Fowler, 1993; Bednar and Westphal, 2006).

Accordingly, follow-ups were made through making appointments by telephone for meetings to discuss and fill out the questionnaires. The questionnaire responses were provided by senior line managers (such as Plant Manager, Marketing Manager or Financial Controller) or higher officers representing the company because top executives and line managers are often the individuals with the necessary knowledge to answer questions concerning organizational-level phenomena (Zajac, 1990).

Using sample size approximation procedure provided in (Israel, 1992) a sample size of 318 was drawn from an alphabetical listing of 1558 members of Manufacturers' Association of Nigeria which serves as the population. Consequently, a multi-stage sampling technique known as Probability Proportional to Size (PPS) Cluster Sampling was used as the sampling procedure for clustering the firms in to six geo-political zones of the country and apportioning equal number of states to serve as survey clusters; then stratifying the sample based on company type i.e. indigenous/MNC subsidiary and finally, simply randomly selecting respondent firms as influenced by their concentration in a cluster as shown in table 1.

This was possible because elements within a cluster were ideally heterogeneous as possible, and there was homogeneity between cluster means. Each was a small scale representation of the total population. The clusters were mutually exclusive and collectively exhaustive.

Table 1 Distribution of Clustered Sample Firms by Region and Type

Region (No of states)	No of selected states (Clusters)	Firm Type		All Firms
		Subsidiaries Firms	Indigenous Firms	
North-Central (7)	6	6 (25%)	16 (75%)	22 (6%)
North-Eastern (6)	6	6 (25%)	16 (75%)	22 (6%)
North-Western (7)	6	6 (25%)	16 (75%)	22 (6%)
South-Eastern (5)	5	6 (25%)	16 (75%)	22 (6%)
South-South (6)	6	6 (25%)	16 (75%)	22 (6%)
South-Western (6)	6	64 (25%)	192 (75%)	256 (70%)
All Regions (**37**)	**36**	**92 (25%)**	**274 (75%)**	**366 (100%)**

In this process, equal proportions of elements were used for each cluster except the south-west cluster which was apportioned a disproportionate number of respondent based on the strength of concentration of firms in that unit. This rule-of-thump was adopted in view of the fact that over 55% of the population-firms is located within Lagos state which is considered as the hub of manufacturing in Nigeria (MAN, 1994 and MAN, 2003). Indeed, evidences exist where studies on manufacturing in Nigeria selected only firms located in Lagos as the representative sample (Kuye and Oghojafor, 2011; and Kuye and Sulaimon, 2011). However, to ensure accuracy, a 15% non-response rate was assumed and so equivalent of as many companies (48 companies) as the required sample were identified to ensure that a sample as close as possible to the desired sample (or at least adequate enough to satisfy the required size for designed statistical analyses) was obtained, hence, consistent to the process of multistage clustering, a total of 366 questionnaires were distributed.

In line with the above, as shown in table 1 the data collection process involved a proportionate distribution of a total of 92(25%) of the MNC subsidiary firms and 274 (75%) indigenous firms; making a total of 366 firms evident in the following subdivisions: - North-central 22 (6%), North-east (22 (6%), North-west 22 (6%), south-east 22 (6%), south-south 22 (6%), and South-west 256 (70%).

As can also be seen in table 2, out of the 366 questionnaires distributed 269 (73%) were retrieved and 158 (43%) were found to valid for use; this also reflected 50% of the 318 desired sample size. A total of 111 were found to be invalid, while 97 questionnaires were not returned at all.

Table 2 Distribution of Retrieved Questionnaires

SN	Description	Response Rate	
1	Total Number of Questionnaires Distributed	366	100%
2	Desired Sample size (respondent firms)	318	86%
3	Total Number of Questionnaires Returned	269	73%
4	Total Number of Questionnaires not Returned	97	27%
5	Total Number of Questionnaires that are invalid	111	30%
6	Total Number of Questionnaires that are Valid	158	43%

While the valid questionnaires size of 158 was less than the desired size (318) by almost 50%, it however, satisfied the standard size needed for analysis of continuous data. Hence (Hair, Anderson, Tatham, & Black, 1995) declare that to use correlation and multiple regression analysis, the ratio of observations to independent variables should not fall below five (5) and (Bartlett, Kotrlik, & Higgins, 2001) agree. Bartlett, et. al, (2001) further argue that if this minimum is not followed, the risk of over-fitting of results to specific sample exists, and would therefore be deficient in generalization. By implication a minimum of 25 (5 independent variables x 5) respondents were required for this study.

The questionnaire used was designed to give the firms an opportunity to provide responses on an investment-intensity-estimation scale built on the five-point measurement scale with values ranging from a minimum of 1 and a maximum of 5 indicating approximation of investment activities from 0% to 90% and above. In the design of the questionnaire, the guiding principles of questionnaire design as explicated in (Taylor-Powell, 1998; Bednar and Westphal, 2006) were followed as much as possible. Some of the questionnaire items were developed from existing surveys (Marin and Bell, 2006; UNIDO 2002, 2003, and 2005) as they have been shown to be reliable.

Nevertheless, additional questions were also developed suitable to the context of the study. All questions were shown in closed form, because closed questions provide guidance that may encourage the respondents to have more interest in answering the questionnaire. In development process of the questionnaire, the first draft was reviewed by the some professors who suggested improvements in wordings and layout. Similarly, it was sent out to a number of firms and was later returned with observations on the nature and extent of data required. Thereafter, all observations were then noted and corrections effected.

The questionnaire contains various indicators on the wide range of technological activities at the firms' level separated in to six segments representing the constructs measuring technological activities on the part of both foreign and domestic firms in generating and attracting FDI-related technology spillover. Accordingly, the constructs have characterized in the following ways:-

i. FDI-related technology spillover is the most important and It occurs when the technological investments lead to improvements in the technology or productivity of firms such that they can capture and absorb spillover enabled by their own technological capabilities (Marin and Bell, 2006). Technology spillover can be manifested in form of increase in productive output, workers efficiency (Chuang and Lin, 1999), knowledge and skills capability (UNCTAD, 1999; Gorg and Greenaway 2001; Pradhan 2006), costs reduction (Pradhan, 2002), product quality (Hale and Long, 2006; Sasidharan, 2006), product and process innovativeness (Kinoshita, 2000; Marin and Bell 2006; 2008).

ii. Technological Activities & Capabilities (TAC) are reflected in the recapitulation of diverse technological investments and activities undertaken by firms that were identified in various studies (Cohen and Levinthal, 1990; Chuang, and Lin, 1999; Nooteboom, 1999; Todo, and Miyamoto, 2002; UNCTAD, 2005; Marin and Bell, 2006, Marin, 2008; Chudnovsky, Lopez and Rosi, 2008; Zhu, 2010) as factors that may be responsible for effective FDI-related spillover. Accordingly, *Intensity of Investments in Research and Development activities (IIRDA), Intensity of Investments in Innovation Activities (IIIA), Intensity of Investments & activities in Acquisition of licensed Technologies (IIALT), Intensity of Investments in Staff Training and Development Activities (IISTDA), Intensity of Investments in Skills Employment Activities (IISEA)* have been operationalised as construct measures in this research.

4. Constructs Reliability and validity Diagnoses

This test was conducted to estimate the reliability of the above six constructs used in data collection based on the criteria provided in (Sekaran, 2003). The results of reliability test exhibits Cronbach's Alpha value based on *Standardized Items* of 0.567 for the constructs with 8 items measuring investments in R&D; 0.814 for construct with 9 items measuring investments dedicated exclusively to innovation activities; 0.501 for the construct with 8 items measuring investments in acquisition of licensed technologies; 0.750 for construct with 8 items measuring investments in staff training and development activities; 0.508 for construct with 8 items measuring investments in skills employment activities; 0.762 for construct with 8 items measuring the overall FDI-related technology spillover; while the for the construct measuring firms' innovativeness reflected an impressive apha of 0.813. Only the construct measuring intensity of investments in skills employment activities required deletion of an item. However, all the other 5 constructs were reliable as observed by (Hinton, Brownlow, McMurray, and Cozens, 2004) having values indicating high and moderate reliability.

As for validity, the use of panel of experts to review the test specifications and the selection of items confirms the content validity of a test constructs, while positive and strong correlations between the dependent and independent variables is indicative of convergent and nomological validity as the results support the various theories built for such relationships.

5. Data Normality Diagnoses

This was done to ensure that the data meets normality assumptions so that inferences on results can be valid and reliable. Consequently, the data was subjected to both of the two popular forms of normality tests graphical and numerical. By physically visualizing the graphical distributions of random variables' differences between empirical distribution and a theoretical distribution which appears to be fairly normal as shown in figure 1. Similarly figure 2 indicates absence of outliers from the data.

Figure 1 Histogram - Normality Checking

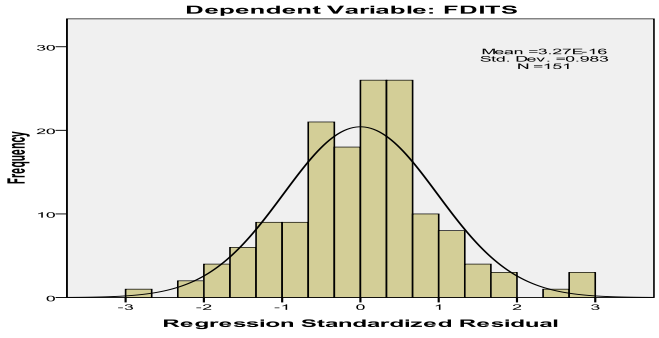
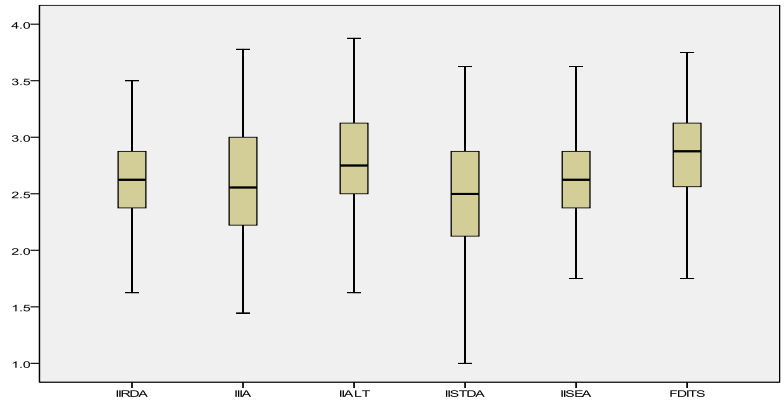


Figure 2 Box Plot - Normality Checking



Secondly, the numerical method first employs the use of skewness and kurtosis for determining and observing the data statistics to see the levels of symmetry of the distributions and clustering of scores toward the center of the distributions of variables. Hence a close examination of the results of the six constructs using the first method depicted in table 3 reveals no significant deviation from the standard and the acceptable level of skewness and kurtosis as both are near zero and three as recommended by (Pack, 2008) that: - "*a normally distributed random variable should have skewness and kurtosis near zero and three,*" (p. 8) i.e. ±3.

Table 3 Skewness & Kurtosis

	N	Skewness		Kurtosis	
	Statistic	Statistic	Std. Error	Statistic	Std. Error
IIRDA	151	-.069	.197	-.547	.392
IIIA	151	.307	.197	-.510	.392
IIALT	151	.120	.197	-.003	.392
IISTDA	151	.014	.197	-.438	.392
IISEA	151	.230	.197	-.205	.392
FDI-TS	151	-.160	.197	-.473	.392

Another numerical method of normality test was conducted using the Kolmogorov-Smirnov Z test and it confirms the earlier results and all the six constructs have an Asymp. Sig. (2-tailed) value greater than 0.001 i.e IIRDA = 0.094; IIIA = 0.051; IIALT = 0.088; IISTDA = 0.113; IISEA = 0.211; and FDI-TS 0.350. This conforms to the position of (Park, 2008) that a construct with S-K Z alpha level of less ($p < .001$) indicates a possible normality violation.

6. Method of Data Analysis and Hypothesis Testing

Usually multiple correlation and regression analyses are conducted to determine the influence of multiple predictors on a single criterion variable. In this case Pearson correlation analysis was first conducted to determine the existence and level of association between the variables, and then followed by multiple regression analysis to establish causality in FDI-related technology spillover (FDI-TS) process due to intensity of investments in technological activities and capabilities (IITAC).

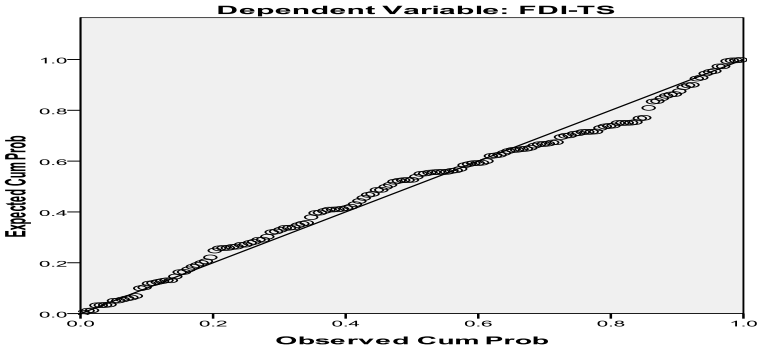
7. Sample Adequacy, Model Linearity, Homoscedasticity and Normality

Sample size of 151 after removal of outliers was considered to be within the threshold accepted by some researchers as valid for using multiple regression analysis, which requires that the ratio of observations to independent variables should not fall below five (Hair, et. al., 1995; Bartlett, et. al., 2001) while (Tabachnick and Fidell, 2001) recommend having a sample size >= 104 + m, where m = number of independent variables; i.e. in the first instance 5 x 5 variables = 25 or in the second instance 104 +5 = 109. Also (Comfrey and Lee, 1992) consider a sample size of not less than 100 as good and adequate for analysis. Therefore, the 158 valid questionnaires were adequate for the applicable analysis.

Similarly, the 50 percent response rate is also adequate and consistent with the views of (Ngesa, Onbati and Mutuku, 2003) that response rates between 50% and 92% for questionnaire surveys have been reported as valid especially in Nigeria's difficult environments where apathy for completing questionnaire is quite prominent.
As for linearity and normality, the model followed a straight line pattern in figure 3 signifying linearity between the criterion and the predictive factors. The normal probability plot of the residuals shows the points close to the line; therefore, the residuals appear to be approximately normally distributed (Howell, 2004) thus satisfying the Homoscedasticity and Normality assumptions.

Furthermore, evaluation of the standard residual statistics reveals a minimum of value of -2.749 and a maximum of 2.958 which are equally within the limit margin. So also the Cook's Distance maximum value of 0.11 is less than the bench mark of not greater than 1.00. Likewise, there was no collinearity problems as none of the constructs' correlation coefficient was greater 0.74, tolerance of 0.321 and variation inflation factor (VIF) of not more than 2.715, thus indicating normality and absence of collinearity.

Figure 3 Normal P-P Plot of Regression Standardized Residual



8. Research Findings

The results are presented in two phases; firstly, coefficients of Pearson correlation which is a relational statistical technique used to measure the strength of some relationships between the dependent and independent variables. Analysis of the correlation matrix in table 4 indicates that many of the observed relationships between FDI-TS and the five variables are all positive and strong so also in-between all the variables. For instance between FDI-TS and IIRDA r = 0.695 is the strongest (i.e. between dependent and independent) followed by IIALT r = 0.659; IIIA r = 0.580; IISEA r = 0.483; and lastly IISTDA r = 0.478 being the weakest relationship in the matrix. With regards to the inter-variables association, the strongest relationship in the matrix is between IISTDA and IISEA r = 0.741.

Table 4 Pearson Correlation Statistics

	FDI-TS	IIRDA	IIIA	IIALT	IISTDA	IISEA
FDI-TS	1.000	.695	.580	.659	.478	.483
IIRDA	.695	1.000	.649	.682	.561	.506
IIIA	.580	.649	1.000	.689	.718	.637
IIALT	.659	.682	.689	1.000	.692	.612
IISTDA	.478	.561	.718	.692	1.000	.741
IISEA	.483	.506	.637	.612	.741	1.000

By implication, it indicates that if MNC subsidiary companies invest intensively in technological activities they are more likely to attract and generate FDI-related technology spillover; while indigenous firms that equally invested intensively in technological capabilities are also likely to capture and absorb FDI-related technology spillover. Secondly, following the fact that the correlation coefficients suggest a strong positive linear correlation between the criterion variable and the predictors resulting in the data points being clustered closely about a positively sloping regression further multiple regression analysis is ensued to ascertain existence and level of prediction between IITAC and FDITS.

As shown in table 5 the coefficient of determination i.e. the adjusted R^2 is 0.543; which indicates that about 54.3% of the variation in the data on FDI-related technology spillover is explained by variation in the data on intensity of investments in technological activities of manufacturing firms.

Table 5 Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.747[a]	.559	.543	.32748	1.514

a. Predictors: (Constant), IISEA, IIRDA, IIIA, IIALT, IISTDA
b. Dependent Variable: FDITS

This is further demonstrated by anova statistics in table 6 which shows the linear combination of the five independent factors being significantly related to changes in dependent factor, F (5, 145) = 36.688, P = 0.000 < 0.05 alpha.

Table 6 ANOVA[b] Statistics

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	19.673	5	3.935	36.688	.000[a]
	Residual	15.551	145	.107		
	Total	35.224	150			

a. Predictors: (Constant), IISEA, IIRDA, IIIA, IIALT, IISTDA
b. Dependent Variable: FDITS

The regression equation appears to be very useful for making predictions since the value of adjusted R^2 is closer to 1. Hence at 5% significance level, the data provide sufficient evidence to conclude that the slope of the population regression line is not 0 and, hence, IITAC is useful as a predictor of FDI-TS. Therefore, since *p*-value < 0.000 ≤ 0.05, the hypothesis that which state that:- *the ability of manufacturing firms in Nigeria to attract, generate, capture and absorb FDI-related technology spillover is dependent on the intensity of their investments in technological activities and capability* is accepted.

Table 7 Model Regression Coefficients[a]

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.199	.217		.914	.362
IIRDA	.498	.094	.426	5.308	.000
IIIA	.118	.088	.121	1.336	.184
IIALT	.375	.104	.326	3.598	.000
IISTDA	-.135	.088	-.148	-1.525	.130
IISEA	.123	.104	.101	1.183	.239

Assessment of individual contribution of the variables in explaining the variation in the model was done based on the standardized coefficient results which indicates two (2) of the independent variables made significant contribution as shown in table 7 i.e. IIRDA with Beta = 0.426, p= 0.00 at 0.05 α made statistically significant contribution to the prediction of change in FDI-related spillover; this is followed by IIALT with beta = 0.326, p= 0.000 at 0.05 α. The remaining variables IIIA with beta = 0.121, p= 0.184 at 0.05 α; and IISEA with beta = 0.101, p= 0.239 at 0.05 α made insignificant contributions to the model. However, IISTDA made negative and insignificant contribution with beta = -0.148, p= 0.130 at 0.05 α. By implication the main driver of spillover is intensity of investments in research and development activities followed by acquisition of licensed technologies by the firms.

To further determine if there is a variation between the means of the MNC subsidiaries and that of the indigenous firms' vis-à-vis the attraction, generation, capture and absorption of FDI-related technology spillover, an independent sample t-test was used to compare the means of interval dependent variable for the two independent groups i.e. based on the nature of the firms. Standard deviations for the two groups demonstrated similarity with values as 0.44893 and 0.47572, alongside a *P*-value of 0.815 for *Levene's test*. Consequently the "equal variances assumed" test was used based on the standing rule that, if the test statistic *F* is insignificant, Levene's test has found that the two variances did not differ significantly (Hinton, et. al., 2004).

Table 8 Group Statistics

	Type of Company	N	Mean	Std. Deviation	Std. Error Mean
FDI-TS	MNC Subsidiary	59	3.0360	.44893	.05845
	Indigenous Firms	92	2.7500	.47572	.04960

By implication, the significant results in table 8 indicate that there is a statistically significant difference between the mean score of FDI-TS for MNC subsidiaries and indigenous manufacturing firms in Nigeria as shown in the results of t = 3.684, p = .000. In other words, the subsidiaries have a statistically significantly higher mean score of 3.0360 on attracting and generating FDI-TS than the indigenous firms with lower mean score of 2.7500 in capturing and absorbing FDI-TS.

9. Discussion and Conclusions

In this study, the use of three empirical methodologies was adopted not only to test the strength of association between variables and robustness of FDI-related spillover but also the degree of occurrence particular to subsidiaries and to indigenous firms. From the results it is clear that the intensity of investments in technological activities and capabilities by firms matter, though perhaps not quite in the manner as evidenced in some studies on other countries. For instance, intensity of investments in research & development activities and acquisition of licensed technologies appear to promote the attraction and generation of technology spillover, which in turn are strongly associated with the existence of firms' initiative; while all other variables appear to have little or no significant effect.

Even though the outcome of this relationship supports the views of earlier studies and the findings of (Marin and Bell, 2006) on Argentina, (Marin and Sasidharan, 2007) on Argentina and India and (Ghali and Rezgui, 2008) on Tunisia, however, the level of the relationship appears to be not as robust as those found in some of these studies. This has been attributed to low intensity of investments in R&D by large foreign firms in Nigeria that are often reluctant to conduct R&D outside their home base, especially in the developing countries, most big industrial establishments undertake their R&D activities abroad, to the detriment of the Nigerian economy (Adenikinju, 2005).

Similar explanations may be found in a number of problems identified by (UNCTAD, 2009; UNIDO,2002 ; Ray and Rahman, 2006) which are somewhat related to the operating environment of the firms in the local economy, i.e. poor physical infrastructure, inadequate supportive institutional infrastructure to provide support in terms of finance, information, skill development, and technology brokering, inadequate mechanisms for intellectual property protection, lack of local suppliers who can deliver quality supplies and lack of policies to develop such suppliers. Alongside these are bureaucratic delays at various levels of host government in obtaining approvals and clearances for finalizing technology transfer agreements, ineffective and sometimes excessive government intervention and regulation.

These problems have been explained to act as impediments to firms initiatives in the economy and might as well be the explanation for the weakness in the outcome of the relationship between the variables. In addition to these is the unavailability of competent local skills as (Ray and Rahman, 2006) further explain that at technology transfer stage "*very often, firms in developing nations are confronted with finding suitable people at this stage and close cooperation with the transferor may be needed to locate required skills*.

This may also be connected to the brain drain crisis being experienced in the country. As a result most MNCs are forced to source skills and talents outside Nigeria, especially at the initial stage of their entry, which also increases their cost of operations. Strikingly, staff training & development made negative and insignificant contribution to the relationship. According to (Barro, 1999), this kind of negative change does not mean that the sector is witnessing spillover regression; instead the result should be interpreted as the consequence of an inefficient market functioning. In this particular case, staff training and development strategy may be a source of relative technology spillover regression in the local country. In an attempt to overcome this, sometimes, many of the subsidiaries (and indigenous firms alike) schedule and conduct training programs either in-house or at subsidiary's approved locations probably outside Nigeria, thus increasing costs of operations.

In summary, the implication of this can be explained in a number of ways. Firstly, subsidiaries do attract and generate technology spillover in the host economy; however, the absorptive capabilities of the indigenous firms seem to be weak due to structural problems associated with the local environment. Hence, although FDI may bring with it advanced technology and techniques, Nigerian firms must have sufficient absorptive capacity, in terms of R & D, innovations, acquired licensed technologies, trained and qualified people, to benefit fully from it. Without a sufficient level of absorptive capability, the country will not be able to take full advantage of FDI. Therefore, attracting FDI alone cannot be viewed as a perfect cure-all strategy (Borensztein, De Gregorio, and Lee, 1998).

It is therefore recommended that there is the need for Nigerian government to develop a policy approach that is designed not only to attract better technological resources through FDI, but also to promote innovativeness through R&D and entrepreneurial drive among the technologically active firms in the manufacturing sector. This can be done by creating favourable conditions for knowledge exchange, promoting selected technologies & products, supporting technological capabilities of active indigenous firms, and improvement of technical education of potential workforce. This would encourage MNCs to transfer more valuable technologies to foreign subsidiaries in Nigeria and also increase domestic firms' ability to absorb superior technology from them.

10. References

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