

# The Role of Technology License Agreements in the Transfer and Domestication of Foreign Technologies in Nigeria

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## Abstract

This paper is a comparative analysis between the capital importation coming into the country through Foreign Direct Investments (FDIs) and the remittances made by local companies abroad, for the payment of technology license fees under technology transfer agreements. The study uses data obtained from the central bank of Nigeria's annual bulletin and the data of technology remittances from the quarterly releases of the National Office for Technology Acquisition and Promotion (NOTAP) for the years 1999-2014. The major aim of the analysis is to determine the benefit of FDIs to the Nigerian economy in comparison with the remittances made by the local companies. The study also conducted a technology transfer analysis using the technology transfer agreements to determine the possibility of technology transfer process. The findings of the investigations show that when compared with technology remittances FDIs have a win-win benefit to the Nigeria economy. However, on the issue of technology transfer, the investigation reveals that technology transfer agreements are not playing the major role in the transfer and absorption of technological knowledge to the recipient local companies.

**Keywords:** Technology transfer, FDIs, remittances, technology license agreements

## Introduction

Broadly speaking, the word "Technology Transfer" can be regarded as the flow of applicable knowledge, skill, capability, expertise, equipment or facility for the manufacture, construction, management, processing or production of a device, product, system or service from one location or use to another within a specific time frame (Okongwu, (2008)).

Technology transfer is a concept that is not well understood by the less developed countries, where technology is perceived as an exclusive assets belonging only to the industrialised nations, who have the monopoly to determine whom they can transfer the knowledge to. Technology transfer is rather, a process that is cumbersome to acquire and only sustained effort and commitment of a state or corporate entities can lead to its attainment and utilisation for economic advantage.

In order to eliminate the misleading misconception in the use of the word, the word technology acquisition, which is more often preferred by the public, as it conveys the attainment of technological capability, has been used interchangeably with the word technology transfer.

Many ways by which technology can be acquired have been recognised. In the first instance, technology itself requires to be searched and identified. The scope of the search for availability of technology can be extended to cover various information sources directly or indirectly. Directly, technology can be sourced through various channels such as vertically linked firms (suppliers and customers) and knowledge pools (e.g. patents, trade fairs, technology fairs and road shows, exhibitions, and trade associations, universities, government and private research institutes).

Technology information can also be acquired through the internet, networking with research and academic institutions, business information centres, and other business firms that have the financial capability to access foreign or local technologies (Corazon T. A., et al.).

Indirectly, foreign technologies can be acquired through the facilitation of technology brokers or intermediaries.

In developing countries like Nigeria, one of the ways by which technology information can be acquired is from government institutions such as the National Office of Technology Acquisition and Promotion (NOTAP). One of the major function of this Office is the registration of technology transfer agreements entered between local companies and foreign technology suppliers. The law in Nigeria requires technology transfer agreements to be registered with the agency, an office under the umbrella of the Federal Ministry of Science and Technology. Over the years since 1979 (when the agency was established) the agency has registered and documented various types of technology transfer agreements ranging from technical knowhow, technical and management services, software license, franchise agreements, etc.

The information so documented provides information about the type of technology, the technology suppliers, end-users, the cost of technology and so on. Apart from sourcing for technologies directly from the agency, the information can also be sourced from periodic seminars, conferences, technovations and workshops organised by the agency from time to time.

Technology information emanating from these sources are purposely documented for the benefit of local

inventors, innovators, research institutes, academic institutions and other private research outfits in order stimulate research and innovation activities that are in tandem with the needs of the local industries.

Available records have shown that NOTAP has, to date, documented more than 1000 different types of technology information and ancillary services from technology transfer agreements since 1979. The number of registered agreements will continue to rise continuously as more and more agreements are entered between foreign and local partners.

Technology transfer agreements are supposed to provide the best contractual opportunity for domestic companies in the host nation to acquire and domesticate foreign technologies. However, to date, despite the implementation of numerous technology license agreements and availability of technology information in databases and other sources aforementioned. There is little or no evidence to suggest that technology transfer agreements have facilitated the process of technology transfer in the country.

## 2.0 Literature review

### 2.1 Sources of Technology Transfer

According to literatures technology transfer is a vehicle through which technical knowledge for use in production is transferred from a technology supplier to a technology end-user. There are various channels through which technology can be transferred (Bernard, 2004; Jože 2003; Jared, 2011). Accordingly, one of the ways by which technology can be transferred is through international licensing agreements. Technology licensing may occur within firms, among joint ventures, or between unrelated firms. Which form is preferable to technology owners depends on many factors, including the strength of intellectual property protection (IPR). Patents, trade secrets, copyrights, and trademarks can all serve as direct facilitators of knowledge transfer. This channel, however, does not offer the latest and most valuable technologies as they are not available on license (World Investment Report, 2000).

Technology transfer can also take through foreign direct investments (FDIs). Recent studies have shown that FDI provides probably the most important and cheapest channel of direct technology transfer as well as indirect, intra-industry knowledge spillovers to developing countries (Blomström, 1997).

FDIs offer one of the greatest sources of productivity and growth especially among firms in transition economies due to the urgent need to restructure quickly. FDIs may be the cheapest means of technology transfer, as the recipient firm normally does not have to finance the acquisition of new technologies. Coupled with that, FDIs tend to transfer newer technologies more quickly than licensing agreements and international trade (Mansfield, 1980).

As a result, attracting foreign direct investments (FDIs) has become a significant policy priority in developing countries. This is so with a view to creating jobs and injecting capital into the domestic economy. Moreover, FDI often comes with new technologies and innovations and is potentially an important source of productivity and growth, which may help host country's domestic industries to catch up with the international technology frontier (Carol, 2015).

Previous studies (Aitken, 1999; Borensztein, 1998; Blomström, 1999) offer empirical evidences to suggest the FDIs flows is important for firm's productivity growth in developing countries.

Technology transfer can be acquired through international trade, particularly from the imports of intermediate products and capital equipment (Joze, 2003) as well as through learning by exporting into industrial countries (Clerides, 1997).

Imports of capital goods provide a source of acquiring the means of production without the transactional costs involved in FDI or technical licensing agreements (Yared, 2011). Capital goods imports are actually embodied technology flows entering a country. They introduce into the production processes new machinery, other capital equipment and components which incorporate technologies that do not necessarily incorporate high or frontier technologies, but are nevertheless new to the recipient firm. Imported capital goods can prove a cheap way to develop local technological capabilities if they can be used as models for reverse engineering to produce the machines locally.

International trade in goods and services bears some potential for transmitting technological information. Imported capital goods and technological inputs can directly improve productivity by being used in production processes.

Despite the numerous channels of technology transfer, intensive studies have indicated that there is no conclusive evidence to suggest that the positive aspect of technology and its spillover from the multinational companies to local indigenous firms is realistic.

Though, previous studies using empirical models, have pointed out that there is quite enormous evidence on positive direct technology transfer mainly from a multinational corporation (MNC) to its local affiliates. In most cases, this is for the purpose of achieving higher productivity levels and growth (Haddad, 1993).

Evidently, technology spillovers have been found to take place in some developing countries, such as the Czech Republic, but mostly limited to firms engaged in R&D or in the production of electrical equipment

(Kinoshita, 2000).

Technology spillovers can be facilitated by the privatisation methods adopted by local firms. In some instances, it has been found out that privatisation, that is open to foreign capital, gains significant direct technology transfer through FDI, while firms privatisation that is localised to local firms as well as to insiders (i.e. employees and managers) are constrained to access to international knowledge spillovers through international trade flows (Damijan, 2003).

Other factors such as relative simplicity of technology products (Haddad, 1993), export orientation (Blomstrom, 1999) and sufficient human capital (Blomatrom, 1994) are noted to be the major contributors to the attainment of technology spillovers in developing countries.

However, in spite of the theoretical justification of potential spillovers, the evidence on technology spillovers from a local affiliate to its horizontal competitors or to its vertically linked suppliers and customers is very weak or even negative.

## 2.2 Barriers to Technology Transfer

There are numerous of identified barriers that hinder the attainment of technology spillovers in developing countries, such as Nigeria.

In the first place, technology as we know it is an intangible firm's resource, which is sometimes expensive to acquire. A firm would not be willing to part with this valuable resource to another company that is not affiliated so easily without a price. The foreign firms would use whatever means to protect this resource and use it to have a competitive edge over their potential competitors.

Granstrand, 1998, linked technology to artefacts and science, with a high degree of codifiability, used for practical applications and is capable of being protected by patent rights. For firms that operate in the same sector the foreign-invested firms compete with domestic firms and so have every incentive to prevent their embodied knowledge and technologies from leaking to their domestic competitors (Javorcik, 2004).

Technology diffusion is prevalent where there is interaction between foreign domesticated firms and local firms. However, in developing countries the level of interaction between the foreign-owned multinationals (MNC) and the domestic firms are very low, or nonexistent, which makes technology spillover very difficult.

The policy system of a state has been noted elsewhere to play a decisive role in the effectiveness of technology transfer. It is difficult for technology transfer to succeed in a country or region, where there are frequent government interventions and many restrictions on foreign-funded enterprises. Policies of technology-importing countries or regions will have a direct impact on technology transfer in scientific and technical content and quality (Yared, 2011).

The absorptive capacity of the recipient domestic firm can play a profound effect in promoting the process of technology spillovers from multinational companies to domestic firms. This tends to occur more frequently when the social capabilities of the host country and the absorptive capacity of the firms in the economy are high.

Observations gathered in the course of writing this paper has shown that technology spillovers and the lack of it in Nigeria could be traced back to the local companies themselves. Majority of the companies who are engaged with technology transfer agreements of one kind or the other are affiliates of the parent foreign companies supplying the technologies. In most cases the real intention of the parent companies in signing technology transfer agreement with an affiliate company may not be for the purpose of transferring the knowledge, but, rather, it is intended to serve as a conduit for repatriating the huge profits the multinational company is making in the host country.

In developing countries there is none or very weak linkage between local companies and foreign based technology suppliers. Linkage is sometimes necessary so that the productive capabilities of the local firm in certain goods or services where it lacks the required skills to manufacture can be enhanced. By establishing linkage the local company stands a better chance to acquire new and better technologies from the foreign supplier.

Productivity gains from foreign owned firms operating in a host country can only be realised where there is a direct linkage between the domestic firm and the foreign owned firm (Carol, 2015).

Unfortunately, foreign investors operating in developing countries are always reluctant to establish any form of local linkages with the indigenous firms and or the research and innovation institutions of the host countries (Rasiah, 2005), unless there is a legal requirement (Gallagher, 2006).

Another barrier to technology transfer can be traced to the unwillingness of foreign based companies to embark on backward integration for the supply of inputs in the host country. It is uneconomical or inefficient to be self sufficient in every area due to the limitation in the distribution of resources worldwide. Companies, consequently, seek to engage other local companies to produce some of their goods in areas where they feel the local company has comparative advantage (Nawaz Sharif, 2009).

Competition between companies operating in the same locality plays a big role in enhancing the process of technology spillovers. Through competition, companies are compelled to source for better technical knowhow and equipments that will give them competitive edge over their counterparts. Lack of competition therefore retards

the process of technology spillover among the firms.

In addition to the lack of competition, even where it exists between two counterparts within the same sector, the foreign counterpart has every incentive to prevent their embodied knowledge and technologies from leaking to their domestic competitors (Newman, 2015).

Effective technology spillover is tied to the educational capabilities of the employees in the local firms. Low educational capacity of employees affects their ability to comprehend technology knowledge very well. In most cases, the majority of local personnel working in most firms are low educated workers and do not possess the required qualifications needed to absorb foreign technologies (Okejiri, 2000). Higher positions are always occupied by the expatriate managers that possess higher qualifications, but with reluctance to implement the strategy of technology absorption. As a result, the overall technology spillover and its attendant horizontal or vertical transfer process is lost.

Previous empirical studies have pointed out that for FDI to contribute to over-all domestic productivity growth through technology spillover the technology gap between domestic and foreign firms should as much as possible be maintained at a very low level and sufficient absorptive capacity should be available in the domestic firms (Kokko, 1994, Borensztein, 1998 and Kinoshita, 2000).

The absence of a robust IPR culture in developing countries is another impediment to the attainment of technology transfer. The lack or absence of a sound IPR system has led to many inventions/innovations and research efforts to be wasted half way through to its development. As a result, all the technological knowledge that may have been acquired in order to adapt the technology is eventually abandoned.

The nature of investment made through FDIs affects the attainment of technology transfer. Observation has shown that most foreign based investments in Nigeria are product based rather than being partly science and technology based. Any developing nation that can move from product based FDIs to science based foreign investments is likely to enhance and fast-track the process of technology transfer (Amojala, 2014).

The lack of political will by the government to promulgate comprehensive and coherent policies on technology transfer also decelerates the process of absorption and domestication of foreign technology into the country.

The absence of collaboration between academic research institutions in the public and private institutions and the companies operating in the country also affects the process of technology transfer. Research and development activities are not paid special attention and even where an invention is developed it normally ends at the prototype level as no venture capitalist is willing to invest in it. This has seriously impacted negatively on the process of technology transfer in the country.

### **3.0 Aims and Objective of this Study**

The major focus of this study is to analyse the trend in capital importation under FDIs in Nigeria and to compare the result with foreign remittances made by local companies for the payment of intangible technology license fees abroad.

The investigation was carried out comparatively using available figures of the amount invested through FDIs, from the Central Bank of Nigeria (CBN) and the technology remittances made abroad by local companies operating in Nigeria.

The comparison will enable us to establish the economic viability of FDIs with respect to the technology spending for the payment of technology fees to foreign suppliers.

Furthermore, the study also analyses the trend in the registration of technology transfer agreements with NOTAP in order to establish the possibility for the existence of technology transfer under the technology transfer agreements.

A statistical measurement indicator that is based on counting the number of the agreements registered within a certain time interval of 10 years was used to predict the prospect of technology transfer under the agreements. In order to forecast the possibility of technology transfer the following assumptions were adopted:

- Almost all of the agreements registered from the beginning of data collection were retained throughout the investigation (1983-2014) without being terminated
- Under IPR system new inventions have a license period of 20 years before it becomes available for exploitation free of charge,
- The decrease in the number of agreements over a certain period indicates that transfer of technology has taken place and conversely non-decrease of registered agreements over a certain period means there is no technology transfer
- Companies are free to renew the license agreements indefinitely as long as there is sufficient evidence to show that the technology is an updated technology.

By monitoring the Geometric Progression (G.P.) of the agreements over certain period of time we can predict whether technology transfer has taken place or not.

Under the agreements the technologies are expected to be absorbed and domesticated by the local companies

over a certain period of time. To this end, the numbers of agreements that are registered are expected to be reducing with time to indicates that there is technology spillover taking place.

### 3.1 Source of Data

The data for this study were obtained from two sources. Data for the remittances made by the companies and the number of technology agreements registered were both collected from the quarterly technology analysis periodically carried out by NOTAP. Data for the amount of investment made under foreign direct investments (FDIs) was obtained from the publications of the Central Bank of Nigeria's (CBN) statistical annual bulletins.

**Table 1: Foreign Remittances made by Companies (1999-2014)**

YEAR	REMITTANCES (\$billions)
1999	0.14
2000	0.17
2001	0.38
2002	0.29
2003	0.26
2004	0.17
2005	0.87
2006	0.45
2007	1.41
2008	0.79
2009	6.64
2010	0.45
2011	3.11
2012	0.32
2013	0.37
2014	2.86

Table 1 above is the data of foreign remittances made by companies for the period 1999 to 2014.

**Table 2: Foreign Direct Investments made by companies (1999-2014)**

YEAR	FDI (\$billions)
1999	4.04
2000	16.45
2001	4.94
2002	8.99
2003	13.53
2004	20.06
2005	26.08
2006	41.73
2007	4.32
2008	4.66
2009	3.81
2010	3.81
2011	5.30
2012	3.20
2013	6.74
2014	2.28

Table 2 above is the figures of foreign direct investments (FDIs) coming into the country from 1999 to 2014.

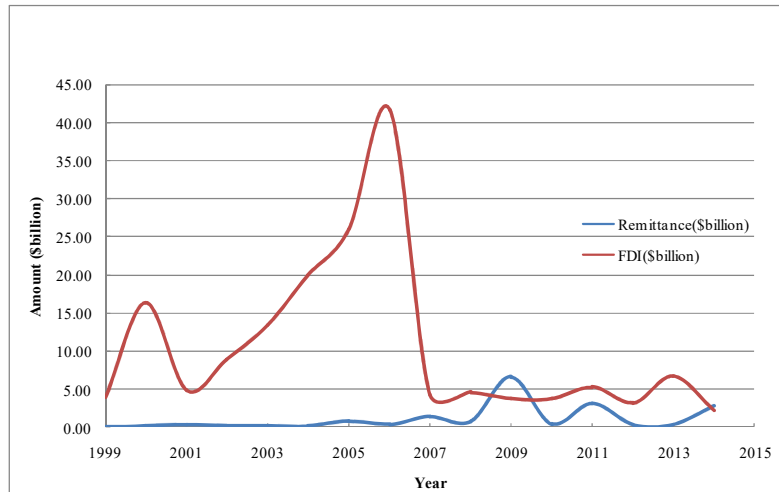
### 4.0 Results and Analysis

In this section graphical analysis of the annual remittances and foreign direct investments (FDIs) made by firms between 1999-2014 is presented.

Figure 1 is the graphical representation of the annual remittances and the annual investments made by the companies. From the curves it can be seen that at the early years of this data the volume of foreign direct investments (FDIs) coming into the country is by far greater than the volume of remittances made by the local companies. It shows that FDIs entering the country hugely outweighs the remittances going out of the country. From 1999-2004 FDIs continues to dominate foreign remittances. However, by 2004 the amount of foreign remittances begins to show its presence over FDIs which continue to move up. This could be attributed to the establishment of new industries and offer of more technology services by foreign companies.

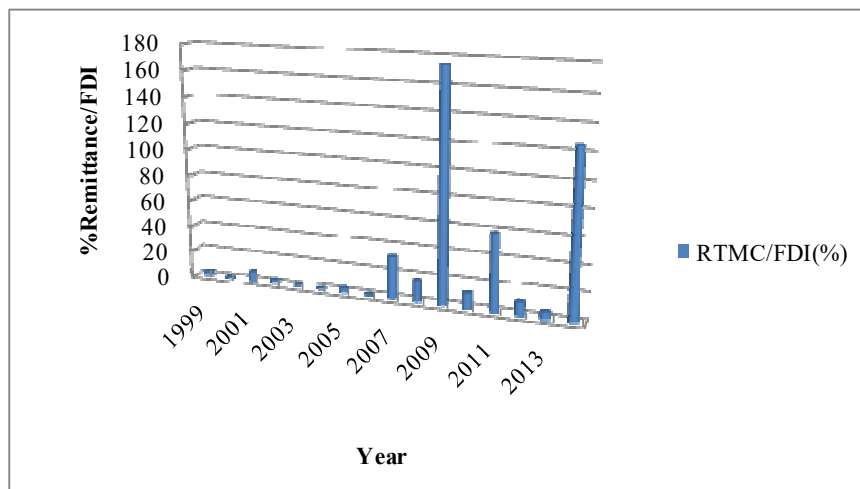
From 1999 there is an up and down trajectory in the volume of FDIs coming into the country due to the favourable investment climate provided by the government. The trend continues until 2006 when it reaches its peak and thereafter, begins to drop sharply to reach its lowest level in 2007.

Consequently, at the point where FDIs drops to the lowest level the remittances start to appreciate and can be seen from the curve (Figure 1). At this point, the gap between remittances and foreign direct investments (FDIs) narrows. From 2007-2014 the two transactions continue to move at equal edge with each other, indicating that FDIs are reducing and becoming equating with remittances.



**Figure 1: Curves of Annual Remittances and FDIs**

Figure 2 below is the graphical representation of the percentage variation of remittances against foreign direct investments. As is shown, from 1999 to 2006 the percentage of remittances in terms of FDIs is very low. However, from 2007 to 2014 there is an appreciation in the variation of remittances against FDIs and in some instances (2009) with remittances shooting beyond FDIs.



**Figure 2: Remittances as percentage (%) of FDIs.**

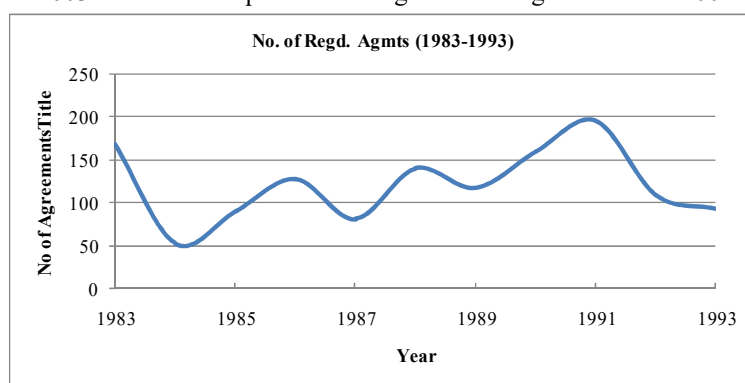
#### 4.1 Determinants of Technology Transfer

The study also examines the trend in the number of agreements registered (1983-2014) in order to establish the possibility of technology transfer. Table 3 below is the data collected on the number of technology license agreements registered by the companies with NOTAP from 1983-2014.

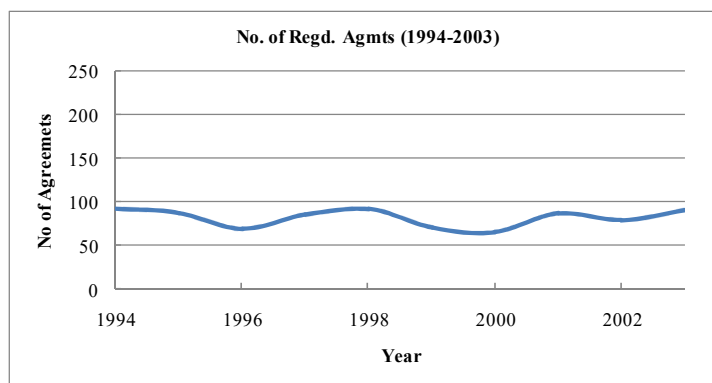
**Table 3: Total Number of Agreement Registered (1983-2014)**

YEAR	AGREEMENTS REGISTERED
1983	169
1984	52
1985	91
1986	127
1987	81
1988	140
1989	117
1990	160
1991	197
1992	109
1993	93
1994	92
1995	88
1996	69
1997	85
1998	92
1999	70
2000	65
2001	87
2002	79
2003	90
2004	83
2005	146
2006	149
2007	170
2008	139
2009	157
2010	144
2011	175
2012	128
2013	115
2014	159

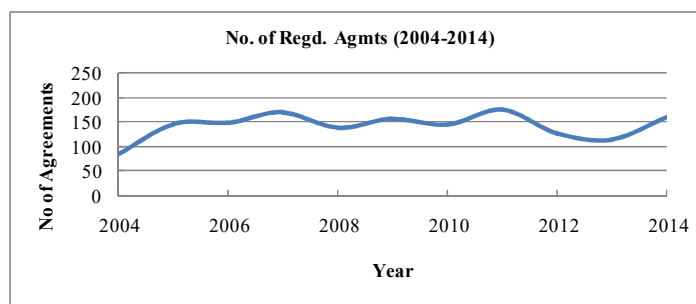
For the purpose of this analysis the entire data was divided into three quarters of ten year time interval of 10 years. The first quarter is for agreements registered from 1983 to 1993. The second quarter is for agreements registered from 1994 to 2003 and the third quarter is for agreements registered from 2004-2014.



**Figure 3: Distribution of Registered Agreements from 1983-1993**



**Figure 4: Distribution of Registered Agreements from 1994-2003**



**Figure 5: Distribution of Registered Agreements from 2004-2014**

Figures 3-5 are the distribution curves of the agreements registered from 1983 to 2014, with each plot covering an interval of 10 years. From the figure, it can be seen that the distribution curves of the agreements from the beginning (1983 to 1993) shows a general rise in the number of agreements registered during that period. The trend could be attributed to the period of massive rush to register technology agreements with NOTAP due to government injunction that compelled companies to register their agreements before they can be able to remit technology fees through central bank (CBN).

From 1994-2003 the volume of registered agreements starts to drop. Contrary to expectation, this decrease may not be attributed to technology transfer, as the time interval between the first quarter and the current quarter is only ten years to enable the companies absorb the technologies. Instead, the decrease in the number of registered agreements could be attributed to the fall in demand for Foreign Exchange (FOREX) from official market.

Observation has shown that from 1992 to 2003 the unofficial foreign exchange market (popularly called Bureau de Change) was thriving side by side with the government official FOREX market. Bureau de Change business was lucrative and booming business then and the rate of exchange existing in the two markets was at par with each other.

As such, companies started patronising the unofficial market instead, as the exchange rate can be negotiated to lower price at the bureau de change. Furthermore, it saves the valuable time that would otherwise be spent in processing FOREX from government channels.

From 2004-2014 the number of agreements registered again starts to rise. The increases may be attributed to the new government directives which require companies to register their agreements with NOTAP's or lose further fiscal incentives available to foreign investors.

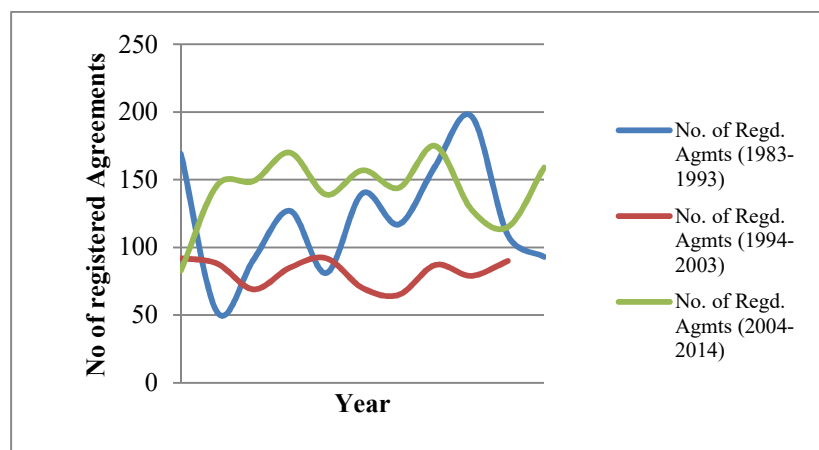
However, generally, it can be observed from the curves that there are consistencies in the number of agreements registered for the three periods. The trend shows that there is a constant of proportionality in the number of agreements recorded annually.

In order to show the annual variation in the number of agreements for the three periods the average values of the number of agreements were computed statistically. The results obtained are depicted in Table 4 below.



**Table 4: Number of Agreements Registered**

	1983-1993	1994-2003	2004-2014
	169	92	83
	52	88	146
	91	69	149
	127	85	170
	81	92	139
	140	70	157
	117	65	144
	160	87	175
	197	79	128
	109	90	115
	93	92	159
<b>Average Values</b>	121	82	142



**Figure 6: Curves Fitting for Entire 3 Periods of the Registered Agreements**

Figure 6 is the curve fitting of the number of agreements registered for the three periods. Observation shows that there is a good correlation between the curves for the period 1983-1993 and 2004-2014. The small variation in the fits could be attributed to the entry of new agreements from new companies who have joined the registration process. However, when the curve for the 1994-2003 quarter was fitted to the other two curves the result shows there is a drop in the number of agreements registered for this period than in the other two periods after some years later.

Based on this indicator and by neglecting the contribution of the number of agreements registered from 1994-2003 due to the factors stated earlier, we can deduce that the number of registered agreements for the whole 30 year duration is almost constant.

**5.0 Conclusion**

From the results of these investigations, we can make the assertion that there is a win-win situation between the remittances being made by local companies in Nigeria, for payment of technology fees and the investments coming into the country through foreign direct investments..

With regard to the promise of technology transfer contained under the obligations of the agreements the studies found that there is no evidence to suggest that technology spillover is taking place from the agreements. Furthermore, indicators are that the agreements are continues to be implemented even after 20 years of coming into force showing issues bordering the enforcement of IPR are lightly regarded in the implementation of technological transactions in the country.

Therefore, we can conclusively affirm that foreign technology transfer agreements do not play a mayor significant role in the transfer of technology to local industries in Nigeria since 1983 when the issue of technology transfer became an institutional matter in the affairs of the governance.

On the contrary companies, which are mostly the off-shoot of the multinational corporations, are simply using the

agreements to repatriate the huge profits they are making to their parent companies abroad. The companies are reluctant and are not committed to absorb and domesticate foreign technologies locally.

To this end, if host nations are to safeguard the benefits of foreign direct investments they must exert a concerted strategy that can encourage foreign and local companies to implement the obligations of technology transfer under the technology transfer agreements.

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