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RESEARCH ARTICLE

FOREIGN DIRECT INVESTMENT AND ECONOMIC GROWTH IN TIME-VARYING CAUSALITY: EMPIRICAL EVIDENCE FROM NIGERIA

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Abstract

This study looked at the empirical association between foreign direct investment (FDI) and economic growth (RGDP) in Nigeria using the flexible properties of the wavelet approach. This novel technique allows the decomposition of time series across time scales. This study used continuous wavelet transform, wavelet covariance, wavelet correlation, and wavelet coherence ratios to investigate the relationship between FDI and RGDP using monthly data from 1980M1 to 2019M12. For almost the entire studied period on a long scale, the study evidences the strong coherence between the series. It is noteworthy that there is the existence of bidirectional causality in the long timescale. Meanwhile, the wavelet-based Granger casualty results indicate a bidirectional causal interplay between FDI and RGDP in the short, medium, long, and very long run. Thus, it can be recommended that the government needs to attract more FDI inflows into the

country and further provide and nurture the expansion of FDI inflows in the country, ultimately benefiting economic growth.

Keywords: Economic growth, FDI, Nigeria, wavelet coherence, wavelet-based Granger causality.

JEL CLASSIFICATION: B22, C18, F21, F31, G15

1. Introduction

The need for financial inflows by developing countries to supplement domestic savings for investment and economic growth have existed for decades; thanks to the domestic investments-savings gap that necessitated the need for other finance sources off-shore in the domestic country to sustain the performance of the macroeconomic variables. The 2008 global financial crisis has made the benefits of financial inflows to developing countries re-assessed (Brambila-Macias & Massa, 2010) as the crisis's effects intensified in developing countries through financial integration and volatile financial inflows. Several studies have been conducted pre-and post-global financial crises, with findings documented on the impact of the various broad categories of financial inflows.

In theoretical literature and traditional framework, foreign direct investment (FDI), a primary known form of financial inflows, has been argued to directly affect economic growth since it is assumed to complement domestic investments and is considered to be an essential supplement for capital and investment shortages (Silajdzic, & Mehic, 2015). However, along the lines of more recent endogenous growth models, Romer (1986 &1990), Grossmann and Helpman (1991) posited that FDI may also be assumed to indirectly contribute to economic growth by increasing the stock of knowledge and fostering technological growth of a technologically inferior recipient economy, hence stimulating domestic investments.
Furthermore, human capital resources, economic and political stabilities, as well as market openness are the necessities for the host countries to benefit from FDI inflows (Abramovitz, 1986), while Borensztein, De Gregorio and Lee (1998) and Markusen and Maskus (2002) believed that FDI could exert higher producing efficiency only when the developing host countries reached the lowest level of human capital accumulation. The long-term critical elements for FDI operations, such as absolute/comparative national factor endowment, market scale/distance, and trading and investing costs in the target host countries, were underlined from the developed countries' perspective (Fadhil & Almsafir, 2015). Meanwhile, Bengoa and Sanchez-Robles (2003) argued that recipient economies require human capital, economic stability, and liberalised markets to benefit from long term FDI inflows.
These made many developing countries in the global context liberalise their external accounts to facilitate FDI inflows, acknowledging the need to draw financial inflows. As a result, sub-Saharan Africa (SSA) countries of Botswana, Burundi, Cape Verde, Ghana, Mauritania, Nigeria, Sao Tome and Principe, Senegal, Seychelles, Swaziland, and Uganda liberalized their capital accounts between 1995 to 2010 to encourage this financial inflows into their economies for stimulating and encouraging the adequate performance of the economy (International Monetary Fund [IMF], 2012).
In contrast, FDI was viewed with distrust by most developing countries in the 1950s and 1960s. It was seen as a threat to national sovereignty, and multinational corporations were accused of undermining social welfare by manipulating transfer prices and forming enclaves (Abbes, Mostéfa, Seghir, & Zakarya, 2015). Developing countries' attitudes have shifted dramatically with the current globalization of markets, globalization and internalization of production, and monetary policies as they are now compelled to explore non-traditional and

non-generating debt investment sources, hence FDI necessity. FDI are more stable and less vulnerable to financial catastrophes because they can generate extra funding opportunities without increasing a country's external debt (Rufai, Aworinde & Ajibola, 2022). Indeed, FDI is increasingly sought by both rich and developing countries, and it is no longer seen as a source of dominance but rather as a vital channel for technology transfer and innovation.
Several studies have explored the effects of FDI on economic growth (Fadhil & Almsafir, 2015; Lee, 2013; Mugableh, 2015; Silajdzic & Mehic, 2015). It was then argued that human capital resources, political and economic stabilities, and market openness are necessary for a country to benefit from FDI inflows (Albulescu, 2015; Combes, Kinda, Ouedraogo, & Plane, 2019; Fadhil & Almsafir, 2015). Busse and Hefeker (2007) argued that FDI could give the optimum efficiency when the host country reaches a minor level of human capital accumulation.

Market size, expansion rate, trade liberalization, exchange rate, firm clustering effects, political stability, good governance, tax incentives, labour availability and cost, labour productivity, and infrastructure are the most frequent determinants of FDI inflows in the literature that is currently available. The market size was additionally recognized by Janicki and Wunnava (2004) as the primary factor influencing FDI inflow. Like Sahoo (2006), Khachoo and Khan (2012) found evidence that market size was the primary driver of FDI inflow out of several conventional predictors of FDI flows. According to the extant literature, the most frequent and well-liked factor influencing FDI inflows is market size as measured by GDP.

In the Nigerian context, FDI inflows have been quite evident in most sectors of the Nigerian economy, while a handful of studies analysed some aspects of FDI in the country (Edozien, 1968; Hakam, 1966; May, 1965 (as cited in Obadan, 1982); Rufai, Aworinde & Ajibola, 2022). Since gaining its independence, Nigeria has been a significant exporter of agricultural goods, accounting for 16 and 43% of the world's cocoa and palm oil production, respectively (United Nations Conference on Trade and Development [UNCTAD], 2013). A Lloyds Bank analysis claims that the Nigerian government has successfully lured FDI into the country, as FDI now plays a significant role in Nigeria's economic growth. In line with this, Nigeria drew USD 2.4 billion in FDI inbound in 2020, a 3.5 per cent rise from the USD 2.3 billion realized in 2019, while FDI total stock was USD 102 billion, according to UNCTAD (2021) in their World Investment Report. The government of Nigeria has made it a priority to mobilize inward further FDI, making Nigeria the third host economy for FDI in Africa, behind Egypt and Ethiopia.

Economic growth determines a country's prevailing standard of living and is usually captured by the percentage change in the real gross domestic product (GDP). Meanwhile, 10 years of decelerated annual growth of 2.5 per cent was recorded in the global real GDP in 2019, with a substantial drop to -4.3 per cent in 2020 due to the COVID-19 pandemic (UNCTAD, 2020). Furthermore, the real GDP in Africa grew by 2.9 per cent. In comparison, developing Latin America experienced a slight negative growth of -0.4 per cent, with the growth rate of the transition and developed economies depreciating to 1.8 and 2.2 per cent retrospectively, like that of the Less Developed Countries (LDCs), which grew at 4.7 per cent as against the Less-Less developing countries (LLDCs) with 4.5 per cent. (UNCTAD, 2020). Accordingly, the Nigeria Bureau of Statistics (NBS) reported that despite the country's ongoing recovery from the Covid-19 pandemic, which wreaked havoc on the country's oil sector, Nigeria's GDP increased by 3.98% year over year in the fourth quarter of 2021, making it the country's sixth consecutive quarter of growth. Agriculture (3.58%), trade (5.34%), information and

communication (5.03%), and financial services are all key contributors to the non-oil sector's (4.73%) continued expansion (24.14 per cent).

Analysis of aggregate output (GDP) fluctuations and FDI inflows using a transformation that may capture events locally in time and frequency may be intriguing, given the probable time-varying nature of those variables. A function $f(x)$, such as a signal, a surface, a series, etc., is broken down into more basic functions, which include information about $f(x)$, using wavelets, a specific sort of function that is localised in the time and frequency domain $f(x)$. Gençay, Selçuk, and Whitcher (2001b, 2001a) and Ramsey and Lampart (1998) made the earliest wavelet analysis applications in economics and finance. Aguiar-Conraria, Azevedo, & Soares (2008), Mayes and Crowley (2009), and Gallegati and Gallegati (2007) used maximum overlap discrete wavelet transform (MODWT), and continuous wavelet transform (CWT), respectively to show the value of cross-wavelet analysis in revealing time-frequency interactions between two economic time-series.

Thus, this study applied the wavelet methodology to analyze Nigeria's FDI inflows on economic growth. **The remaining components of this study, excluding the introduction, are as follows: The literature review is in section 2, and the discussion of the paper's methods is in section 3. Section 4 discusses the analysis and findings, while Section 5 concentrates on the conclusion and policy recommendations.**

2. Literature Review

Researchers have studied the nexus between FDI and economic growth in host countries for years. The causal relationship between FDI and economic growth can go in either direction. First, the FDI-led growth theory claims that FDI boosts economic growth in host nations by expanding capital stock, creating new job possibilities, and facilitating knowledge transfer (De Gregorio, 2005; Borensztein, De Gregorio, & Lee, 1998; de Mello, 1997). However, according to the market size theory, rapid economic growth that creates new investment opportunities in the host country might also result in more enormous FDI inflows (Mah, 2010; Rodrik, 1999). Furthermore, while most studies imply that FDI has a beneficial impact on economic growth, it is also plausible that FDI has a negative impact on growth by crowding out local investment, raising external vulnerability, and fostering reliance (Lipsey, 2002; Aitken & Harrioson,2009). There may be no causal relationship between FDI and economic growth, confirming the neutrality theory. Meanwhile, the neoclassical growth model defines FDI as physical capital in the production function, but the endogenous growth model includes FDI as a source of physical capital, technology, and knowledge for host economies (Aziz, 2022). Overall, the empirical research paints a complex and varied picture of the FDI-growth link.

Many empirical researches has been conducted to determine the relationship between FDI and economic growth. Herzer (2008) used panel analysis to find that outbound FDI had positive long-run effects on domestic output in 14 industrialized nations from 1971 to 2005. The findings also revealed that the long-run causality between outbound FDI and domestic output is bidirectional. Furthermore, the impact of foreign capital inflows volatility on economic growth in Nigeria was investigated by Nwosa, Ugwu and Ehinomen (2020) via the ARDL technique using real GDP per capita as economic growth proxy, while FDI, FPI, foreign capital flows volatility, investment in health, and other investment flows as indicators for foreign capital flows; meanwhile, they control the model with trade openness and inflation rate. In Nigeria, FDI inflows fluctuations negatively affected economic growth,

while the capital inflows components depicted a diversified influence on economic growth in magnitude and significance.

Meanwhile, Adekunle and Sulaimon (2018) re-examined the relationship between foreign capital flows and economic growth in Nigeria from 1986 to 2016, using the ARDL approach. They used real GDP as the dependent variable, gross capital formation, net FDI, net FPI, net foreign aid received, net external debt, net foreign remittances received, trade openness, and financial development as the regressors. They further captured the 2008-2009 global financial crisis as a dummy variable as CRISIS in the model. The empirical analysis established the absence of a long-run relationship between economic growth and the independent variables.

Liang, Shah, and Bifei (2021) examined the relationship between FDI and the economic growth of developing countries in a panel data framework from 2000 to 2019. The study used FDI net inflows as a percentage of GDP (Yeboua (2020) also used this) against FDI inflows employed by Sahu (2020), Joshua, Adedoyin and Sarkodie (2020), Ketteni and Kottaridi (2019), Adekunle and Sulaimon (2018), while opting for GDP in contract to real GDP employed by Joshua *et al*. (2020), Tahir *et al*. (2020), and real GDPPC used by Nwosa *et al*.(2020) and Sahu (2020). The study submitted a positive and significant relationship between FDI and GDP, as exposed previously by Yusuf, Shittu, Akanbi, Umar and Abdulrahman (2020), Tahir *et al*. (2020) and Sahu (2020).

Meanwhile, Abbes *et al.* (2015) researched the causal interactions between FDI and economic growth. The researchers adopted cointegration, fully modified Ordinary least square (FMOLS), Dynamic OLS (DOLS), and panel Granger causality tests for the empirical analysis. The GDP is the explained variable, and FDI denotes the independent variable. The cointegration approach showed a long-run relationship between FDI and GDP. The FMOLS and DOLS showed that FDI has a positive and significant long-run effect on economic growth in all the sampled countries and geographical regions. On the contrary, the panel Granger established a unidirectional causality between FDI and GDP for Asia and oceanic, Middle East, North America, North Africa and Central Africa, while it was bidirectional causality for Latin America and Europe.

Encinas-Ferrer and Villegas-Zermeño (2015) researched foreign direct investment and economic growth using Granger casualty, VAR, and analysis of variance (ANOVA). The study used GDP as the dependent variable and FDI as the explanatory variable. The researchers established through the causality test that there is no causal link between FDI and GDP in Brazil, South Korea, Peru, and Mexico. In China, that relationship is established, where GDP cause FDI, but not vice versa. While using ANOVA, the results show that the causal link between FDI and GDP is vital during the study period. The restriction of the author to only FDI is not sufficient for economic illustrations, as other variables that might not correlate with FDI but could also influence GDP ought to be included in the study.

In establishing the causal relationship between FDI and real GDP in 13 European Union (EU13) countries, from 2002 to 2018, Bilas (2020), employing the Dumitrescu-Hurlin panel causality test established no casualty between RGDP and FDI. The FDI did not impact RGDP in the EU13 countries. Meanwhile, in a similar study conducted on some developing countries, Dinh, Vo and Nguyen (2019) affirmed that FDI stimulates economic growth in the long run despite its negative impact in the short run for the developing countries studied. The study conducted by Tahir *et al*. (2020) on foreign inflows and economic growth in Pakistan using the ARDL and ECM approach employed real GDP as a proxy for economic growth, foreign aid net, external debt, remittances, FDI inflows as the explanatory variables, with inflation and employment rates used as control variables. The result showed that in the long

run, all inflows, FDI, debt, official development assistance and remittances positively and significantly influence real GDP.

Finally, the empirical studies reviewed explicitly show literature is still inconclusive regarding the relationship between FDI and economic growth in the short or long run, as different scholars made divergent conclusions, despite employing various methodologies in unraveling the phenomenon. The maiden wavelet methodology – which has the potential to reveal relationships between economic variables in the time-frequency space – is, therefore, relevant to this study, as it allows us to simultaneously assess how variables are related at different frequencies and how such a relationship has changed over time. On the one hand, capturing the time dimension is essential for evaluating time-varying behaviour in a constantly shifting economic environment. Furthermore, there is no reason to think that economic variables should exhibit the same relationship across all frequencies, as claimed by Granger (2003). Therefore, considering the frequency dimension might also be crucial for economic research.

3. Data and methodology

The data sets considered in this study are monthly observations of FDI and real GDP; the variables were in their yearly and quarterly series before being interpolated into monthly series using Dento's (1971) interpolation approach. The data for the FDI inflows is the net FDI inflows gathered from the world development indicators (WDI). The data for real GDP was extracted from the Central bank of Nigeria (CBN) statistical bulletin. We have a sample of 480 monthly observations from 1980(1) to 2019 (12). The methodology required series to be in their return forms; therefore, real GDP and FDI are in their return series, which are obtained by converting them into their logarithmic difference.

Meanwhile, the wavelet model specification for real GDP and FDI follows the work of de Melo, Maslennikov, Popova, Bezrukova, and Kyksova (2015), where bivariate two time-dependent functions were used to perform wavelet transformation (WT). Hence, we formulated the cross-correlation function of $WT(rGDP)$ and FDI;

$$\psi(rGDP,\ \mathrm{FDI})(t,\sigma) = \int_{-\infty}^{+\infty} WT(rGDP)[\tau + t,\sigma]\ WT(FDI)[\tau,\sigma]^{*}\, d\tau \qquad (1)$$

Equation (1) is the cross-correlation function, depicting the causal relationship between $rGDP$ and FDI

Where:* denotes the complex conjugate and t the point in a time series with restricted observations where the wavelet is applied. (σ) is the scaling or dilation factor (τ) is the location parameter.

4. Empirical Analysis

4.1 Wavelet Decomposition

There are many periods in the datasets of different variables, and not just the two can represent the appropriate time scales in the detailed analysis (Gallegati, Gallegati, Ramsey & Semmler,2011; Raza *et al.,* 2017**). As a result, we used the time-frequency-based method known as "wavelets" to examine the time horizons in the time series to analyze the link between FDI and RGDP. The application of wavelet analysis in Economics is a very promising tool that improves on Fourier analysis because it allows one to consider both the time and frequency domains in a single framework, allowing one to simultaneously evaluate how variables are related at various frequencies and**

how such a relationship has changed over time.. Figures 1 and 2 illustrate the multi-resolution analysis (MRA) of order $J = 6$ for the RGDP and FDI using the maximal overlap discrete wavelet transform (MODWT) based upon the Daubechies' (1992) Least Asymmetric (LA) wavelet filter[1]. These figures (1&2) were plotted using the orthogonal components $(D_1, D_2, D_3, ...D_6)$ to illustrate the different frequency components of the original series in detail, with a smoothed component (S_6). The variables' wavelet decomposition was carried out in four different time periods. The short-run is captured as $(D_1 + D_2)$ representing the medium run, $(D_5 + D_6)$ connotes the long run, and (S_6) serves as the very long run. The orthogonal components were plotted to show the different diverse frequency components and smooth series of the original series (Sharif *et al.*, 2017; Sharif & Afshan, 2016).

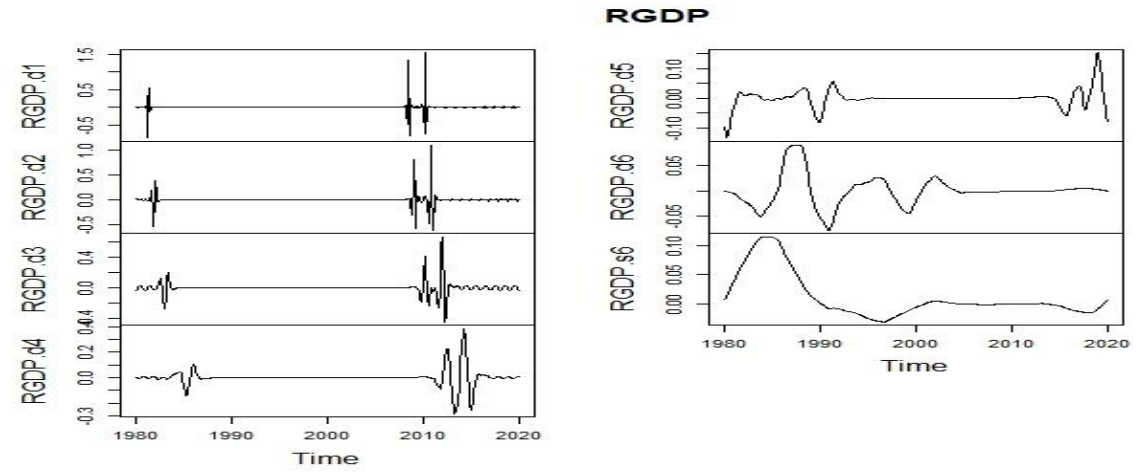

Figure 1 MODWT Decomposition of RGDP on *J=6* wavelet levels
Source: Authors' computation (2022)

The relative importance of short-medium-long term dynamics of the series is explained using the energy of each scale of all the variables. The energy is analogous to the variance of each detail level, and it is shown as a percentage of overall energy (Raza *et al.*, 2017)**. Table 1 presents the energy explanation of each of these variables at each wavelet scale. The movements are discussed by using the four significant periods. The result indicates that in the RGDP series, the short-run explains most of the variance, as the variance in the series occurred at 64.88%, 23.45%, 45.65% and 6.02% in the short, medium, long and very long run, respectively. Furthermore, it shows that volatility depreciates as the period expands from short to long run, whereas it raises little from the long-run to the very long run.**

Table 1 Energy Decomposition for RGDP and FDI

Wavelet Scales	RGDP(%)	FDI(%)
D1(2-4 MC)	40.77	77.02
D2(4-8 MC)	24.11	19.61

[1] Least asymmetric wavelet filter is a widely used wavelet because it provides the most accurate time alignment between wavelet coefficients at various scales and the original time series, and it is applicable to a wide variety of data types (Daubechies, 1992)

D3(8-16 MC)	14.30	3.28
D4(16-32 MC)	9.15	0.05
D5(32-64 MC)	2.77	0.02
D6(64-128 MC)	2.88	0.01
S6(>128 MC)	6.02	0.01

Source: Authors' estimation (2022); *MC represents month cycles

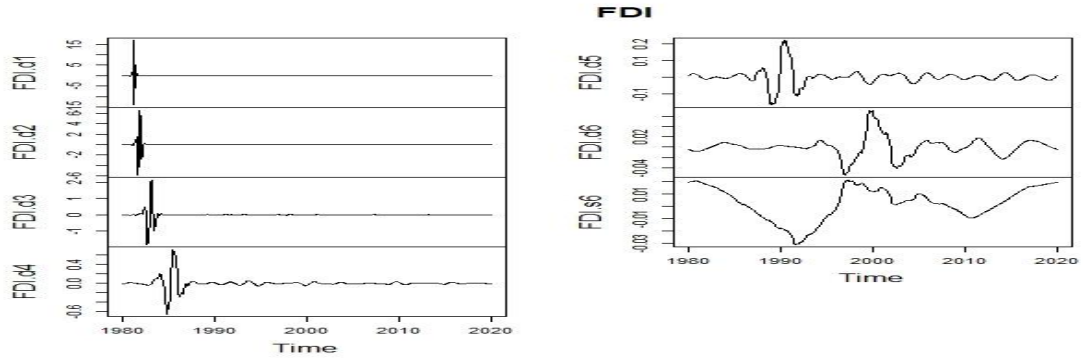

Figure 2 MODWT Decomposition of RGDP on *J=6* wavelet levels
Source: Authors' computation (2022)

Figure 2 shows that most of the volatility in the FDI series occurred during the early periods of the short run, as that period contributed 96.64% to the total variances, as shown in Table 1. In contrast, the medium run has minor variances compared to the short-run but is relatively higher than the long-run variance. The medium, long and very long run accounts for 3.33%, 0.02% and 0.01% volatility, respectively, establishing that the series became more stable from the long-run and maintained that till the very long-run.

The bivariate association between the pairs of financial inflows indicators FDI and RGDP is examined using the MODWT-based wavelet covariance analysis, indicating covariance between two variables in a particular time scale. The MODWT-based covariance measures how the series co-varies over different frequency domains and how and how the variables move over a given wavelet scale. It further ascertains whether the movement is positive or negative over the given period. The covariance is positive when the black line lies between (0e+00) -(2e0-4) vertically, depicting the variables are moving in the same direction, whereas when the black line falls between (0e+00) -(-2e-04) on the vertical axis, it means there is negative covariance between the two variables; hence they are moving in the opposite direction.

Figure 3 represents the result of the covariance between RGDP and FDI series. The result indicates the existence of positive covariance between RGDP and FDI in the short-run (1-4) and medium-run (4-8) period, while it was maintained toward the beginning of the long-run (8-16) period, the variables do not co-vary at a time in the long run as the black line (representing the wavelet covariance) touches the intercept (0e+00), before the two variables show a negative covariance, depicting that RGDP and FDI co-vary in the opposite direction during this short period of the long run. Meanwhile, the negative covariance continues from the long to the very long (16-32) period but not as strong opposition as in the long run. It will take no time before the variables co-vary in the same direction in the very long run period. This result means that in the short run and medium run periods, an increase in FDI leads to a rise in RGDP, but in the long run and very long run periods, an increase (decrease) in FDI leads to a decrease (increase) in RGDP

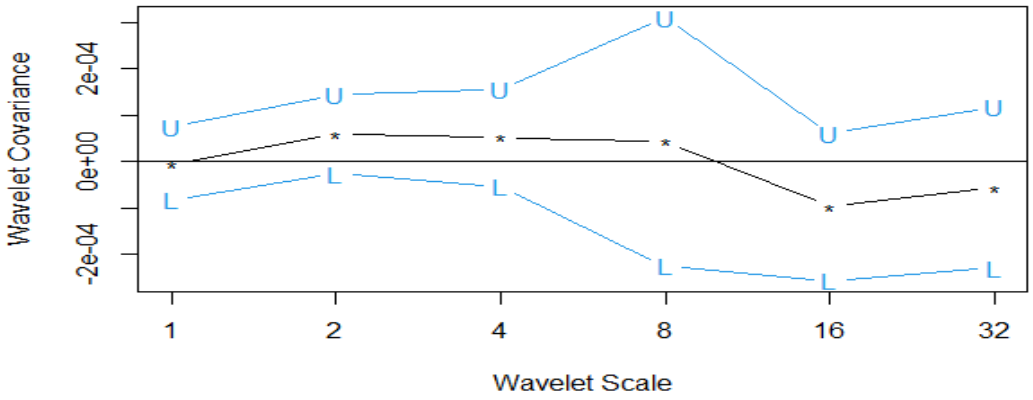

Figure 3 Wavelet covariance between RGDP and FDI in Nigeria
Source: Authors' estimation using RStudio
Note: The upper and lower bound are represented with 'U' and 'L' respectively at the 5% significance level, while the black dotted line represents the covariance between RGDP and FDI in Nigeria

The wavelet correlation between RGDP and FDI establishing whether a positive or negative nexus exists between the two series is shown in figure 4. When the wavelet correlation line lies between 0.0 and 0.5, it signals a positive correlation, demonstrating that the variables exhibit a positive relationship. Meanwhile, it is negative when the wavelet correlation line switches between 0.0 and -0.05 on the vertical line. Furthermore, the wavelet correlation, as was the case in wavelet covariance, is measured on a four (4) horizontal wavelet scale of (1-4), (4-8), (8-16) and (16-32), representing short run, medium run, long run and very long run period respectively. Figure 4 indicates a weak positive correlation between RGDP and FDI throughout the short-run. In contrast, this positive and weak correlation was maintained at the beginning of the medium run but started declining back to a weaker positive correlation towards the end of the medium run. The long-run period witnessed a weaker positive correlation between RGDP and FDI within a short time in the long-run but later turned to a weak negative relationship at the end of the long-run, which was maintained to the very long run, where a weak negative relationship between RGDP and FDI was established.

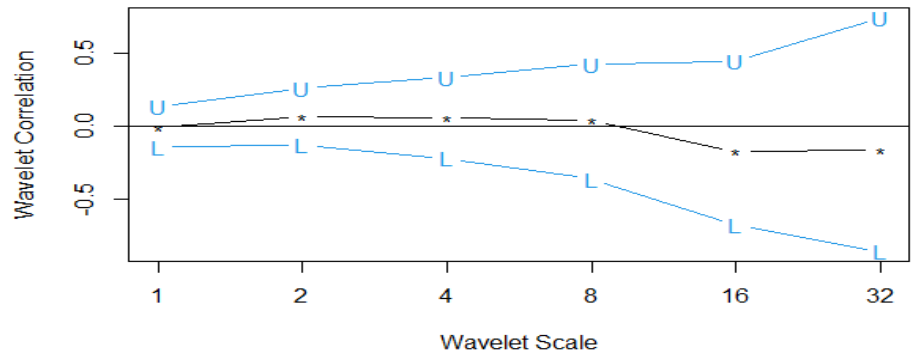

Figure 4. Wavelet correlation between RGDP and FDI in Nigeria
Source: Authors' estimation using RStudio

4.2 Continuous Wavelets Transform (CWT)

The continuous wavelet power spectrum shows the movement of the series (RGDP and FDI) in a three-dimension contour plot: time, frequency and colour code. The time displayed on the horizontal axis is divided into five such that 0-100, 101-200, 201-300, 301-400 And 401-479 for 1980M02-1988M06, 1988M07-1996M11, 1996M12-2004M04, 2004M05-2012M09, 2012M09-2019M12 respectively. Meanwhile, the vertical axis represents the period such that (0-8), (8-32), (32-64) and (64-128) connotes short run, medium run, long run and very long run periods, respectively. In figures 5 and 6, only items inside the U area, hereafter cone of influence (COI), could be interpreted as it is the region that shows the statistical significance of the series variability. Furthermore, the red regions explained high variability, while the blue depicts area(s) with low variability in the series. The black line represents the 5% significance level; thus, the areas located inside the cone contain the dynamic patterns, which are statistically significant at 95%. All the areas outside the cone are out of consideration as yellow explains the lower version of red.

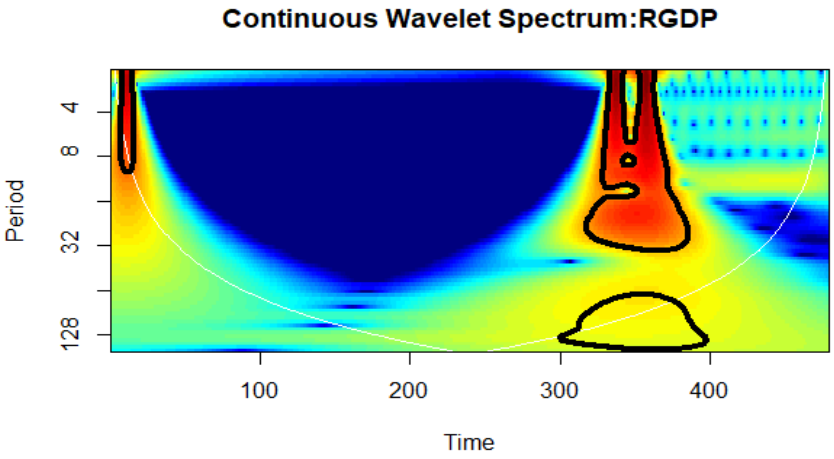

Figure 5: The continuous wavelet spectrum of RGDP return series
Source: Authors' estimation using RStudio
Notes: Figure 4.10 represent the continuous wavelet spectrum of return series of RGDP from January 1980 to December 2019. The thick black contour represents the significance level are 5% for the region in cone of influence (COI) against the red noise. The code of the colour for power ranges from blue (low power) to red (high power).

Figure 5 interpretation: The following could be deduced from the continuous wavelet spectrum of RGDP:

1980M02-1988M06 (0-100) frequency/ period: At the beginning of the short-run period (0-8), with the presence of deep red areas at the early time of 1980, it connotes an extreme and high variability, but, from the middle to the end of this time (0-100), there is the presence of blue areas, signaling low levels of variability. Meanwhile, the black colour shows the series is significant at 5%. The early medium run (8-32) has a slight mark of deep red, meaning a high variance of the series in the early period of the 1980s. At the same time, the colour gradually fainted to yellow as the months went by until it was blue by the end of June 1988, showing the presence of no variability in the series. Meanwhile, the series is significant at 5% due to the black line presence in the early months.

In the long period (32-64), the months commenced with fainted blue areas before it became slight blue towards the end of May 1998, establishing low levels of variability in the later months of the series. Meanwhile, the series is not significant. Meanwhile, in the very long-run (64-128), a light blue at the beginning of this period connotes very low variability in the last months within this time scale; hence there is no variability in the series, with no significance level recorded.

1988M07-1996M11 (101-200) frequency/ period: The presence of blue areas depicts low variability in short-, medium-, long-and very long-runs

1996M12-2004M04 (201-300) frequency/ period Short-run period (0-8): The short-run begins with deep blue, indicating low variability with no significance. Meanwhile, the medium run period (8-32) starts with the blue areas but starts fading out towards the tail end of the second month in 2004, and by April 2004, it has turned to light blue. This means that the variance during these months was very weak, thereby portraying a low level of variability rather than the stability of the series. The presence of slight deep blue at the beginning of long run period (32-64) shows a low level of variability, but the tainted yellow signals that the series might be exhibiting variance soonest. Finally, the very long-run period (64-128) witnessed the complete appearance of yellow, showing the series is near to volatility, which is also significant as the black line was seen in this period.

2004M05-2012M09 (301-400) frequency/ period: Short-run period (0-8): The slight appearance of the yellow colour at the beginning of this period paves the way for the variance of this series, as it does not take time before the volatility is witnessed around August 2004. From September 2004 till almost July 2008, the series exhibited a high level of significant fluctuations as indicated by the deep red and black line. However, the series exhibited a relatively low variance within these months, as shown in figure 4.11. Meanwhile, the presence of a blue area toward the end of September 2009 signals the stability of the series.

The medium run period exhibited the presence of average red turning to orange, which shows that relaxation in the volatility level of the series in these periods, as the yellow colour, still surrounds it. This variance was maintained towards the end of August 2009, as the series stabilized after that. The medium run maintained its stability toward the tail end of the time frame. Meanwhile, the yellow witnessed in the medium run fully surfaced in the long run, showing that the series continues its stability has embarked toward the end of the medium run. Meanwhile, it is also significant at a 5% level, as the black line tangentially shows in the period. Finally, the series continues the stability ushered from the medium to the long run, as the yellow colour remains significant.

2012M09-2019M12 (401-479) frequency/ period: Following the terminal state in the previous months, the short-run period of this time-frequency commenced with slightly light blue areas, establishing a low level of variability in the series, and it was maintained till the last months of 2019, although not significant. Moreover, the medium run period (8-32) continues to battle for the series' stability during the previous time scale, as maintained by this short-run frequency period. This was shown through the light blue area at the beginning and toward the middle of the medium run period. Meanwhile, in the middle of this period, the series started witnessing yellow, the lighter version of red, but later turned to blue at the end of the medium-run period. This period also is not significant at 5% level. The presence of light blue in the early long-run period shows a low level of variability in the series from September 2012 to around April 2013 or thereabout as the remaining months are outside the COI coverage. Very long-run period (64-128): The series' long run was outside the bounds of the COI; hence it is out of consideration.

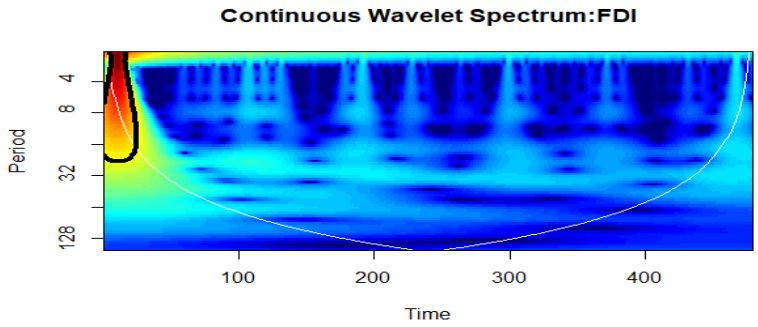

Figure 6: The continuous wavelet spectrum of FDI return series

Source: Authors' estimation using RStudio
Notes: Figure 4.11 represent the continuous wavelet spectrum of the return series of FDI from January 1980 to December 2019. The thick black contour represents the significance level are 5% for the region in the cone of influence (COI) against the red noise. The code of the colour for power ranges from blue (low power) to red (high intensity).

The following could be deduced from the continuous wavelet spectrum of FDI:

0-100 frequency/ period: At the beginning of the short-run period, with the presence of deep red areas in the early time of 1980, it connotes an extreme and high variability, but from the middle to the end of this time (0-100), there is the presence of blue areas, signalling low levels of variability. Meanwhile, due to the black colour, it shows the series is significant at 5%. The early medium run has a slight mark of deep red, meaning high variance of the series in the early period of the 1980s, while colour gradually fainted to yellow briefly, then blue areas took over till the end of the time in 1988, showing the presence of low level of variability in the series. Meanwhile, the series is significant at 5% due to the black line presence in the early months. Furthermore, the long-run period (32-64) was slightly covered in the COI towards the tail end of the last month of 1988 with slightly blue areas, depicting a low level of variance in the series during these months. Meanwhile, the series is not significant

101-200 frequency/ period: The presence of blue areas depicts low variability through the short-run to the very long-run periods and is not significant.

201-300 frequency/ period: The short-run begins with deep blue, indicating low variability with no significance. Whereas, the medium run period starts with the blue areas but starts fading out towards the tail end of the second month in 2002, and by April 2004, it has turned to a lighter blue. This means that the variance during these months was very weak, showing a low level of variability rather than the stability of the series. At the beginning of the long run period, there is a lighter blue, which faded away as the period elapsed and gradually became lighter with a rare blue area at the end of April 2004. Finally, the variance intensity is also weak in very long run period as the blue area presence is slightly seen.

301-400 frequency/ period: The short-run to the very long run periods begins with deep blue, indicating low variability with no significance. This was also repeated in the 2012M09-2019M12 (401-479) frequency/ period, except in the long run period that begins with the presence of fainting blue, indicating a very low variability at the beginning, which was the only period within the COI, and it was short-lived for only a few months in 2013, and it is with no significance.

4.2 Wavelet Transform Coherence

The wavelet coherence is used to establish the lead-lag effect of two variables. It explicitly displays how one variable cross and causes others in frequency bands and frequency intervals. It is used to strengthen and reveal the causality between RGDP and FDI.

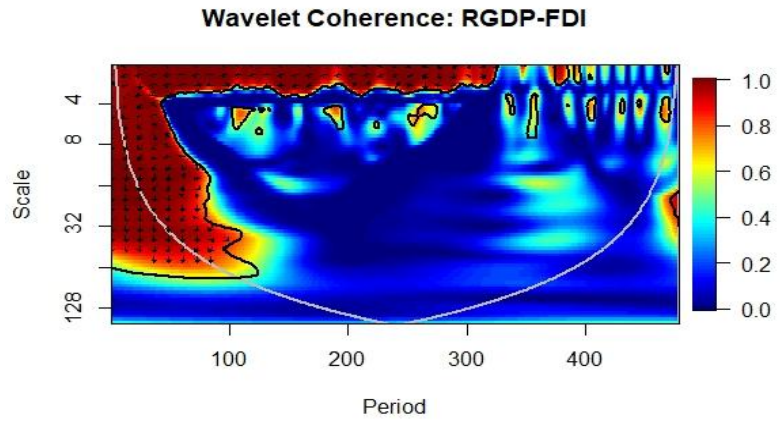

Figure 7: Wavelet Transform Coherence of RGDP and FDI return series
Source: Authors' estimation using RStudio
Notes: The thick black contour represents the significance level are 5% against the red noise. The cone of influence specifies the region affected by edge effects and is displayed outside the black line. The colour code for coherence ranges from blue (low) to red (high). The Arrows indicate the phase difference between the two series. Arrows pointing to the right mean that the variable is in phase. Arrows pointing to the left suggest that the variables are out of phase. In phase indicates the variables have cyclic effects and out of phase or anti-phase connotes anti-cyclical effects on each other.

In figure 7, the periods are 0-100, 101-200, 201-300, 301-400 and 401-479 on the horizontal axis, while the frequency period is short-run (0-8), medium-run (8-32), long run (32-64) and very long run (64-128) on the vertical axis.

Figure 7 exposed that in the short run period between 0-8 months cycle during 1980M02-1988M06(0-100), the arrows were left down and left up simultaneously, indicating variables are exhibiting out phase effects with RGDP leading and lagging simultaneously. However, in similar months during 1988M07-1996M11 (101-200), the arrows pointed left and left down, reflecting the variables are out-phase with FDI lagging and RGDP leading. Meanwhile, in these same months' cycles during 1996M12-2004M04 (201-300), the arrows pointed right up and left down, indicating in-phase and out-phase association with RGDP leading and FDI lagging simultaneously in both phases. However, in the early times of 301-400, the arrows turned right down, reflecting in-phase with FDI leading and RGDP was lagging. Meanwhile, from 401-475, there is no evidence of short-run period causality between the variables.

In the medium run (8-32) months' cycle, for 0-100, the early time witnessed left down arrows indicating out-phase association, with RGDP leading and FDI lagging, whereas, towards the end of 0-100, we have both left up and right down reflecting out and in-phase respectively, with FDI leading and RGDP lagging in both. Meanwhile, in these same months' cycles during 1988M07-1996M11 (101-200), 201-300, 301-400 and 401-479; it failed to find evidence of causality between the variables.

The long-run period covering (32-64) months' cycle for 0-100 has arrows pointing both left down and right down, indicating both in-and out-phase scenarios, meaning that RGDP is leading and lagging simultaneously. Meanwhile, in these same months' cycles during 1988M07-1996M11 (101-200), 201-300, 301-400 and 401-479; it failed to find evidence of causality between the variables.

However, the very long-run period results have failed to find any causality between the variables, as it is outside the consideration of the cone of influence.

4.3. Wavelet-Based Granger Causality Test

The granger causality test based on MODWT provides the opportunity to empirically analyze whether FDI causes the change in high, medium and low frequencies of the RGDP series.

Table 2: Results of Wavelet-Based Granger Causality Test at Different Time Scale

	Time Domain	Frequencies bands (months)						
	RGDP							
		D1	D2	D3	D4	D5	D6	S6
FDI	Raw series	2-4 M	4-8M	8-16M	16-32M	32-64M	64-128M	>128M
$H_0$1:	FDI does not cause RGDP							
	0.0025	0.0016	5.88e-06	0.0139	0.0031	0.0023	0.0189	6.78e-07
$H_0$2:	RGDP does not cause FDI							
	0.0003	1.98e-06	1.66e-11	1.78e-11	9.43e-13	1.57e-14	1.54e-13	2.2e-16
Remarks	BD	BD	BD	BD	BD	BD	BD	BD

Source: Authors' compilation form R studio

Note: The F-test P-values show the rejection of the null hypothesis of no causality if its less than 5% (i.e., p-values <0.05, we accept the causality at 5%)

BD and UD connote bidirectional and unidirectional, respectively

Table 2 empirical results indicate that the raw series of FDI has bidirectional influence over the raw series of RGDP in Nigeria. Furthermore, it was shown that throughout the periods of short-run (D1-D2), medium-run (D3-D4), long-run (D5-D6) and very long (S6), the result depicts the bidirectional causal influence of FDI on the Nigeria RGDP. This implies that the two series Granger causes one another throughout the periods, displaying co-movement in both ramifications. This submission of the wavelet-based Granger causality somehow concerns the result of the wavelet coherence. The wavelet-based Granger causality test depicted a similar but expanded view from the wavelet coherence. The latter only exhibited lead-lag effect (causes) from the short run through the long run, while the former depicted bidirectional causality throughout the periods. Furthermore, the wavelet-based Granger causality test enlightened us more on the whole series stances at each period against the wavelet coherence that disintegrated the series into different month cycles. Hence, the study adopts the duo of wavelet coherence and wavelet-based causality as the decision course.

The wavelet covariance ad wavelet correlation results seem to be the same, as they both recorded the same level of co-movement between the two series. For instance, the wavelet covariance reported positive covariance between RGDP and FDI in the short run, exhibiting that increase in RGDP led to a decrease in FDI or vice versa in the short run, as this could be related to the submission of the wavelet-based Granger causality that later shows which one first make a move and causes other. The wavelet correlation in the short run also depicted a positive correlation. Still, it was later bolstered by the wavelet coherence and wavelet-based Granger causality reflecting the leading and lagging series in the direction of movement, as such details were missing in the wavelet correlation. Following this, we can conclude based on the accuracy and detailed information of the wavelet-based Granger causality that as FDI causes RGDP in the long run, RGDP caused FDI in the short run, as attested to by the wavelet coherence. This implies that FDI inflows into a different economic sector are followed by an increase in the RGDP in the short-run period.

Furthermore, the medium run could say the same, as there was a bidirectional casualty between RGDP and FDI. However, this was also the case under wavelet coherence, where the two variables caused one another during the 0-100 time period. The long-run and very long-run period also recorded bidirectional causality under the wavelet-based Granger causality. The wavelet coherence could not account for that time scale. The result indicated that higher economic growth boosts foreign investors' confidence in the domestic economy and vice-versa. Finally, based on the dual decisions of wavelet coherence and wavelet-based Granger causality test, we submitted that FDI has a causal relationship with RGDP.

4.4 Discussion of Findings

The results obtained in this study exhibited a high degree of similarity with what Abbes *et al*. (2015) study established as a unidirectional causality between FDI and economic growth in Asia and oceanic, MENA regions, and central Africa, while bidirectional causality with FDI causing economic growth (GDP) for Latin America and Europe. The submission of Abbes was sustained in this study, as the wavelet-based Granger causality recorded a bi-directional causality between FDI and RGDP during the short, medium, long and very long-run periods. Our result upholds the causality despite the variant in the economic growth indicator deployed in the previous study and the number of observations. It could be further ascertained that FDI not only causes RGDP empirically, RGDP also causes FDI.

Meanwhile, Encinas-Ferrer and Villegas-Zermeño's (2015) study on some countries revealed no causal link between FDI and economic growth in Brazil, South Korea, Peru, and Mexico. In China, it was unidirectional, with economic growth causing FDI. The unidirectional causality in China is also tallied with Abbes *et al*.'s (2015) report on unidirectional causality between FDI and economic growth in Asia and Oceanic, as China was part of the Asian countries. Hence, the Villegas-Zermeno report is upheld by this study. Furthermore, Olusanya's (2013) study, where the Nigerian economy was disaggregated into three phases, showed that GDP (economic growth) causes FDI during the pre-deregulation era alone. This submission contradicts what was obtained in this study, as revealed via the wavelet-based causality and wavelet coherence that economic growth did not only cause FDI in Nigeria, but FDI also caused Nigeria's economic growth.

Finally, the wavelet-based Granger causality result was invariant with the submission of the Dumitrescu-Hurlin panel causality test employed by Bilas (2020), where it was established that there is no casualty between RGDP and FDI in the EU13 countries studied

5. Conclusion and Recommendations

The current study indicates that FDI significantly influences economic growth in the host country. As conventional analysis approaches based on autoregressive models, linear models, or cointegration models, susceptible to the difficulties of non-stationary, were used, the conclusions from earlier studies are ambiguous and conflicting. As a result, we used the wavelet transform methodology to examine the connection between FDI and RGDP in Nigeria. This method allows for the deconstruction of time series at various time frequencies and offers particular outcomes for each time-frequency based on the short, medium, long, and very long run. The relationship between FDI and RGDP in Nigeria was examined in this study using MODWT, wavelet covariance, wavelet correlation, continuous wavelet power spectrum, wavelet coherence spectrum, and wavelet-based granger causality analysis with a sample of 480 monthly observations from 1980M01 to 2019M12.

The CWT results identify a mixture of the low and strong variability in the short, medium, long, and very long periods for RGDP. As for FDI, the high variance is visible only in the short run, with low variability occurring in the remaining periods. The wavelet coherence for FDI and RGDP displayed RGDP leading and lagging simultaneously in some months' cycles during the short run. In contrast, FDI led RGDP in some cycles in the same period. In the medium run period, FDI led (caused) RGDP in some months' cycle, while RGDP led in some, bringing a bi-directional causality, as an indication for bidirectional was also recorded for some months' cycle in the long run. The wavelet-based Granger causality agreed with the wavelet coherence; though it leapt further to establish bidirectional causally in the very long run.

These results contrast earlier studies on Nigeria (Olusanya, 2013: Nwosa, *et al*.,2020: Akinlo, 2004: Carkovic & Levine, 2002). The present work employs a more sophisticated and flexible approach that may improve the analysis and offer new insights to the real GDP and FDI nexus, in contrast to previous empirical works in this regard, where the attention is focused on standard and well-known methodologies to explore the causality links or perhaps simple correlation between FDI and economic growth, without distinguishing between the different time horizons. By analyzing the interaction between FDI and real GDP in the time-frequency domain, this study contributes to the body of knowledge on the co-movement between significant financial inflows' variables and macroeconomic performance indicators.

These results are the result of a specific methodological framework that could not have been achieved using more conventional methodological approaches (Vacha & Barunik, 2012). Understanding the direction of causality is essential for gaining insights that help formulate sensible policy. We assert that our results have many economic and financial implications based on our findings. First, foreign investors and economy managers may have improved their understanding of the dynamic link between FDI and economic growth by knowing the existence of long-run bi-directional causality. Notably, the economic managers should target foreign investors who are most likely to respond, such as the national Diasporas, with attractive bonuses and compensation as this will draw them to invest in the domestic economy. The government should also improve the security of lives and properties, as this is a yardstick for any foreigners and national diasporas to have untainted and absolute faith to invest in the Nigerian economy. Second, the country could benefit from increased FDI inflows into the oil sector if the sector is fully integrated into the economy through oil sector liberalization. Liberalization automatically increases private participation and higher employment with possible economic multiplier effects.

Although this study highlights the shortcomings of the bivariate approach, future research may re-examine the link using a multivariate approach. Other financial inflows variables, such as foreign portfolio investment, debt inflows, official development assistance, and economic growth, which can be reasonable on theoretical considerations in an economic framework, can be added to the study in the future.

References

Abbes, S. M., Mostéfa, B., Seghir, G., & Zakarya, G. Y. (2015). Causal interactions between FDI, and economic growth: Evidence from dynamic panel cointegration. *Procedia Economics and Finance*, *23*(2015), 276–290

Abramovitz, M. (1986). Catching up, forging ahead, and falling behind. *The journal of economic history*, *46*(2), 385-406.

Adekunle, W., & Sulaimon, M. (2018). *A Re-examination of the Relationship between Foreign Capital Flows and Economic Growth in Nigeria.* University Library of Munich,Germany.

Aitken, B. J., & Harrison, A. E. (1999). Do domestic firms benefit from direct foreign investment? Evidence from Venezuela. *American economic review*, *89*(3), 605-618.

Akinlo, A. E. (2004). Foreign direct investment and growth in Nigeria: An empirical investigation. *Journal of Policy modeling*, *26*(5), 627-639.

Albulescu, C. T. (2015). Do foreign direct and portfolio investments affect long-term economic growth in Central and Eastern Europe? *Procedia Economics and Finance*, *23*(2015), 507– 512

Aziz, O. G. (2022). FDI inflows and economic growth in Arab region: the institutional quality channel. *International Journal of Finance & Economics*, *27*(1), 1009-1024.

Bengoa, M., & Sanchez-Robles, B. (2003). Foreign direct investment, economic freedom and growth: New evidence from Latin America. *European Journal of Political Economy*, *19*(3), 529–545

Bilas, V. (2020). FDI and economic growth in eu13 countries: Cointegration and causality tests. *Journal of Competitiveness*, *12*(3), 47–63

Borensztein, E., De Gregorio, J., & Lee, J. W. (1998). How does foreign direct investment affect economic growth?. *Journal of international Economics*, *45*(1), 115-135.

Borensztein, E., De Gregorio, J., & Lee, J. W. (1998). How does foreign direct investment affect economic growth?. *Journal of international Economics*, *45*(1), 115-135.

Brambila-Macias, J., & Massa, I. (2010). The global financial crisis and sub-saharan Africa: The effects of slowing private capital inflows on growth. *African Development Review*, *22*(3), 366–377. https://doi.org/10.1111/j.1467-8268.2010.00251.x

Caus, V.-A., Badulescu, D., & Gherman, M. C. (2017). Using Wavelets in Economics. An application on the analysis of wage-price relation. *Oradea Journal of Business and Economics*, *2*(1), 32–42. https://doi.org/10.47535/1991ojbe015

Combes, J. L., Kinda, T., Ouedraogo, R., & Plane, P. (2019). Financial flows and economic growth in developing countries. *Economic Modelling*, *83*(November 2018), 195–209.

Busse, M., & Hefeker, C. (2007). Political risk, institutions and foreign direct investment. *European Journal of Political Economy*, *23*(2), 397–415

De Gregorio, J. (2005). The role of foreign direct investment and natural resources in economic development. In *Multinationals and Foreign Investment in Economic Development* (pp. 179-197). Palgrave Macmillan, London.

de Melo, F., Maslennikov, V. V., Popova, E. V., Bezrukova, T. L., & Kyksova, I. V. (2015). Quantitative analysis in economics based on wavelet transform: A new approach. *Asian Social Science*, *11*(20), 66–73. https://doi.org/10.5539/ass.v11n20p66

Denton, F. T. (1971). Adjustment of monthly or quarterly series to annual totals: An approach based on quadratic minimisation. *Journal of the American Statistical Association*, *66*(333), 99–102. https://doi.org/10.1080/01621459.1971.10482227

Dinh, T. T. H., Vo, D. H., & Nguyen, T. C. (2019). Foreign direct investment and economic growth in the short run and long run: Empirical evidence from developing countries. *Journal of Risk and Financial Management*, *12*(4), 1-11.

Edozien, E. G. (1968). Linkages, direct foreign investment and Nigeria's economic development. *The Nigerian Journal of Economic and social studies*, *10*(2), 191-204.

Encinas-Ferrer, C., & Villegas-Zermeño, E. (2015). Foreign direct investment and gross domestic product growth. *Procedia Economics and Finance*, *24*(July), 198–207.

Fadhil, M. A., & Almsafir, M. K. (2015). The role of FDI inflows in economic growth in Malaysia (time series: 1975-2010). *Procedia economics and finance*, *23*, 1558-1566.

Fadhil, M. A., & Almsafir, M. K. (2015). The role of FDI Inflows in economic growth in Malaysia (Time Series: 1975-2010). *Procedia Economics and Finance*, *23*(2015), 1558–1566. https://doi.org/10.1016/s2212-5671(15)00498-0

Fan, Y., & Gençay, R. (2010). Unit root tests wiht wavelets. *Econometric Theory*, *26*(5), 1305–1331.

Gallegati, M., & Gallegati, M. (2007). Wavelet variance analysis of output in G-7 countries. *Studies in Nonlinear Dynamics and Econometrics*, *11*(3), 1-29

Gallegati, M., Gallegati, M., Ramsey, J. B., & Semmler, W. (2011). The US wage Phillips curve across frequencies and over time. *Oxford Bulletin of Economics and Statistics*, *73*(4), 489-508.

Gençay, R., Selçuk, F., & Whitcher, B. (2001a). Differentiating intraday seasonalities through wavelet multi-scaling. *Physica A: Statistical Mechanics and Its Applications*, *289*(3–4),543–556. https://doi.org/10.1016/S0378-4371(00)00463-5

Gençay, R., Selçuk, F., & Whitcher, B. (2001b). Scaling properties of foreign exchange volatility. *Physica A: Statistical Mechanics and Its Applications*, *289*(1–2), 249–266.

Ramsey, J. B., & Lampart, C. (1998). The decomposition of economic relationships by time scale using Wavelets: Expenditure and Income. *Studies in Nonlinear Dynamics & Econometrics 3*(1),1-22.

Granger, C. W. J. (1966). The typical spectral shape of an economic variable. *Econometrica*, *34*(1), 150-161.

Grossman, G. M., & Helpman, E. (1993). *Innovation and growth in the global economy*. MIT press.

Hakam, A. N. (1966). The motivation to invest and the locational pattern of foreign private industrial investments in Nigeria. *The Nigerian Journal of Economic and Social Studies*, *8*(1), 49-65.

Herzer, D. (2008). The long-run relationship between outward FDI and domestic output: Evidence from panel data. *Economics Letters*, *100*(1), 146-149.

International Monetary Fund. (2012). Annual Report on Exchange Arrangements and Exchange Restrictions, 2012. *International Monetary Fund*, 1–1665

Joshua, U., Adedoyin, F. F., & Sarkodie, S. A. (2020). Examining the external-factors-led growth hypothesis for the South African economy. *Heliyon*, *6*(5), e04009.

Lee, J. W. (2013). The contribution of foreign direct investment to clean energy use, carbon emissions and economic growth. *Energy Policy*, *55*, 483–489

Liang, C., Shah, S. A., & Bifei, T. (2021). The role of FDI inflow in economic growth: Evidence from developing countries. *Journal of Advanced Research in Economicsand Administrative Sciences*, *2*(1), 68-80.

Lipsey, R. E. (2004). Home-and host-country effects of foreign direct investment. In *Challenges to globalisation: Analysing the economics* (pp. 333-382). University of Chicago Press.

Mah, J. S. (2010). Foreign direct investment inflows and economic growth of China. *Journal of Policy Modeling*, *32*(1), 155-158.

Markusen, J. R., & Maskus, K. E. (2002). Discriminating among alternative theories of the multinational enterprise. *Review of international economics*, *10*(4), 694-707.

Mugableh, M. I. (2015). Time series analysis of inward foreign direct investment function in Malaysia. *Procedia - Social and Behavioral Sciences*, *172* (2015), 679–685

Nerlove, M. (1964). Spectral analysis of seasonal adjustment procedures. *Econometrica*, *32*(3),241-286.

Nwosa, P I, Ugwu, E., & Ehinomen, C. (2020). Volatility in foreign capital inflows and economic growth in Nigeria. *EuroEconomica*, *1*(39), 98–112

Obadan, M. I. (1982). Direct foreign investment in Nigeria: An empirical analysis. *African studies review*, *25*(1), 67-81

Raza, S. A., Sharif, A., Wong, W. K., & Karim, M. Z. A. (2017). Tourism development and environmental degradation in the United States: evidence from wavelet-based analysis. *Current Issues in Tourism*, *20*(16), 1768–1790.

Rodrik, D., & Rodrik, D. (1999). *The new global economy and developing countries: making openness work* (Vol. 24). Washington, DC: Overseas Development Council.

Romer, P. M. (1986). Increasing returns and long-run growth. *Journal of political economy*, *94*(5), 1002-1037.

Rufai, A.A., Aworinde, O.B., & Ajibola, O. (2022). Impact of FDI on exchange rate in Nigeria: A combined cointegration approach. *Journal of Economics and Allied Research, **7***(1),141-158.

Sahu, J. P. (2020). Does inflow of foreign direct investment stimulate economic growth? Evidence from developing countries. *Transnational Corporations Review*, 1–18.

Sharif, A., & Afshan, S. (2016). Tourism development and real effective exchange rate revisited by wavelet-based analysis: Evidence from France. *Journal of Finance & Economics Research*, *1*(2), 101–118.

Sharif, A., Saha, S., & Loganathan, N. (2017). Does tourism sustain economic growth? Wavelet-based evidence from the United States. *Tourism Analysis*, *22*(4), 467–482.

Silajdzic, S., & Mehic, E. (2015). Knowledge spillovers, absorptive capacities and the impact of FDI on economic growth: Empirical Evidence from transition economies. *Procedia Social and Behavioral Sciences*, *195*(2015), 614–623.

Tahir, M., Jan, A. A., Shah, S. Q. A., Alam, M. B., Afridi, M. A., Tariq, Y. Bin, & Bashir, M. F. (2020). Foreign inflows and economic growth in Pakistan: some new insights. *Journal of Chinese Economic and Foreign Trade Studies*, *13*(3), 97–113.

Yeboua, K. (2020). Foreign direct investment and economic growth in Africa: New empirical approach on the role of institutional development. *Journal of African Business*,*22*(3), 361-378.

Thomson, D., & Van Vuuren, G. (2016). Forecasting the South African business cycle using Fourier analysis. *International Business & Economics Research Journal (IBER)*, *15*(4),175–192

Vacha, L., & Barunik, J. (2012). Co-movement of energy commodities revisited: Evidence from wavelet coherence analysis. *Energy Economics*, *34*(1), 241-247.

Yusuf, H. A., Shittu, W. O., Akanbi, S. B., Umar, H. M., & Abdulrahman, I. A. (2020). The role of foreign direct investment, financial development, democracy and political (in)stability on economic growth in West Africa. *International Trade, Politics and Development*, *4*(1), 27–46.