International Journal of Entrepreneurship and Business Innovation
ISSN: 2689-9493
Volume 6, Issue 2, 2023 (pp. 163-189)
www.abjournals.org

# TEMPORAL EFFECTS ON PERCEPTION OF ENTREPRENEURIAL ECOSYSTEMS IN SUB-SAHARAN AFRICA: EVIDENCE FROM NIGERIA

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**Cite this article:**

Onwuegbuzie H.N., Agboola O.W. (2023), Temporal Effects on Perception of Entrepreneurial Ecosystems in Sub-Saharan Africa: Evidence from Nigeria. International Journal of Entrepreneurship and Business Innovation 6(2), 163-189. DOI: 10.52589/IJEBI-FGH8XJMT

**Manuscript History**

Received: 27 Aug 2023

Accepted: 19 Oct 2023

Published: 15 Nov 2023



**ABSTRACT:** ***Purpose****: The motivation for this study stemmed from inconsistent attribution of sources of business challenges by entrepreneurs at the beginning and the end of a 3-month entrepreneurship development programme. While the entrepreneurs' general perception was that Nigeria's business environment was not conducive to entrepreneurship, some opinions shifted from inadequate funding to A lack of entrepreneurial skills by the end of the training. This study uses Nigeria as a case study to investigate the role of temporal effects on entrepreneurs' perception of entrepreneurial ecosystems in Sub-Saharan Africa.* ***Methodology:*** *Quantitative time series analysis was deployed to analyse variables that are representative of the elements of the entrepreneurship ecosystem within the frameworks of the autoregressive distributed lag (ARDL) and mixed data sampling (MIDAS) models.* ***Findings****: The study provides evidence that temporal effects may confound entrepreneurs' assessment of the impact of certain entrepreneurial ecosystem elements on entrepreneurial outcomes.* ***Originality****: The study contributes to the attribution theory of entrepreneurial learning by providing evidence that temporal effects have the potential to influence entrepreneurs' attribution of business failure and the entrepreneurial learning that may arise from there.*

**KEYWORDS***:* Entrepreneurial Ecosystem, Temporal Effects, Macroeconomic Variables, Entrepreneurial Learning, Mixed Data Sampling (MIDAS) Model, Attribution Theory, Entrepreneurial Perception, Business Challenges, Time Series Analysis, Business Environment, Autoregressive Distributed Lag (ARDL) Model



Article DOI: 10.52589/IJEBI-FGH8XJMT
DOI URL: https://doi.org/10.52589/IJEBI-FGH8XJMT

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## INTRODUCTION

This study investigates the role of temporal effects on entrepreneurs' assessment of the impact of selected entrepreneurial ecosystem elements on entrepreneurial outcomes in Nigeria. Discussions of causal mechanisms within the evolution of and complex interactions among entrepreneurial ecosystem elements have not received adequate attention until recently (Wurth *et al.*, 2021; Audretsch *et al.*, 2021; Stam & van de Ven, 2019; Stam & Spiegel, 2017; Alvedalen & Boschman, 2017). Cause-effect relationships among entrepreneurial ecosystem elements are especially important for efficient entrepreneurial decisions as well as entrepreneurial learning (Munawaroh *et al.*, 2023), which has been identified as a key ingredient for entrepreneurial survival and success (Shen *et al.*, 2021). However, even though the entrepreneurial ecosystem point of view is inherently time-dependent (Audretsch *et al.*, 2021), the role of time in these multifaceted and dynamic relationships has not been explicitly considered.

Given that many of the elements of the entrepreneurial ecosystem are economic in nature and, as such, are characterised by time series data with inherent fluctuating, seasonal, cyclical, secular and trend components, this study aims to investigate the role of time in entrepreneurs' perception of the relationship between certain entrepreneurial ecosystem elements and entrepreneurial outcomes. The motivation for the study stemmed from the observation, based on a survey of 67 entrepreneurs who participated in an intensive entrepreneurship development training jointly sponsored by the Bank of Industry (BOI) and the Lagos Business School (LBS) in Nigeria, that entrepreneurs' perception of the impact of ecosystem elements on their businesses might be susceptible to attribution bias (Heider, 1958; Weiner, 1985).

The participants were asked what constituted the greatest impediment to business in Nigeria among six options that reflect the domains of the entrepreneurial ecosystem (Isenberg, 2014, 2016). The number of participants who cited lack of entrepreneurial skills as the most important impediment to business in Nigeria rose from 26 (38.2%) before the training to 29 (42.6%) after the training. On the other hand, 22 participants (32.4%) cited inadequate funding as the most important impediment before the training, as opposed to 19 participants (27.9%) after the training. The shift in perception suggests that entrepreneurship training disabused the entrepreneurs of a 'wrong' perception.

The significance of this attribution 'error' becomes more appreciable when viewed in the context of the larger business population. For instance, in a national survey of micro, small and medium-scale enterprises (MSMEs) jointly conducted by the National Bureau of Statistics (NBS) and the Small and Medium-Scale Enterprises Development Agency (SMEDAN) in Nigeria, 27.8% of 1.24 million formal MSMEs and 92.4% of 38.4 million informal MSMEs cited lack of funding as their major challenge (NBS-SMEDAN, 2021). The cost of wrong attribution of the sources of business challenges or failure on such a large scale can be significant in terms of the amounts of resources expended in fighting wrong causes. Moreover, such attribution error can hamper the efforts of stakeholders, especially entrepreneurs and entrepreneurship educators, towards improving entrepreneurial learning for better business outcomes (Munawaroh *et al*, 2023; Riar *et al*, 2021).

Attribution bias is inherent in human behaviour, and entrepreneurs are not exempt in the sense that they tend to attribute entrepreneurial success to the self and blame entrepreneurial failure on other factors in their ecosystem. For instance, Isenberg (2014) posits that rather than


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representing a problem with the entrepreneurship ecosystem, entrepreneurs' perceived lack of funding by entrepreneurs is often an intrinsic characteristic of entrepreneurship whereby entrepreneurs feel that risk capital is difficult to raise and in short supply. However, an objective observer will strive to avoid the entrepreneur-centrality error (Isenberg, 2016) and attribute entrepreneurial success or failure to both entrepreneur-related factors as well as external factors. A plausible reason for the difference in perception is that the entrepreneur is typically more concerned about the justification for their performance, while the observer is more concerned about causation (Buss, 1978).

Even though attribution bias could be due to personal and contextual factors, the influence of time in either has often been assumed away. For instance, most of the sources of business challenges cited by business owners in the earlier cited NBS-SMEDAN national survey are contextual, mainly consisting of macroeconomic variables such as exchange rate, interest rate, taxes, inflation, infrastructure, and fuel prices. However, there is the tendency to attribute these variables as sources of business challenges simply based on their past behaviour. In other words, entrepreneurs might simply cite these variables as sources of challenges because they had constituted challenges in the past, even if those variables are no longer posing such challenges currently.

Since emerging economies are characterised by a predominance of institutional voids (Khanna & Palepu, 1997), which can present both opportunities and challenges for businesses, the entrepreneurship researcher must incorporate both the ‘reasons for’ (entrepreneurs’ justifications) and the ‘causes of’ (causal factors uncovered by the researcher) entrepreneurial success or failure, with a view to establishing causal influences that may improve entrepreneurs’ perception of the entrepreneurial ecosystems and boost entrepreneurial learning. Therefore, to derive valuable insights that can improve entrepreneurial learning and boost business performance, this study investigates the influence of time on the evolution of selected entrepreneurial ecosystem elements viz-a-viz entrepreneurs’ perception of the ecosystem.

This study contributes to the literature in two ways. The study yields further insights into the attribution theory of entrepreneurial learning by providing evidence that entrepreneurs often attribute business challenges or failure to their ecosystem with justification from a narrow selection of ecosystem factors. In contrast, other entrepreneurial ecosystem elements may have causal influences contrary to entrepreneurs’ perceptions. Secondly, and more importantly, the study shows that temporal effects may confound entrepreneurs’ perception of the entrepreneurial ecosystem.

The rest of this paper is structured as follows. The following section presents stylised facts relevant to this study. Section 2 presents a brief review of relevant literature, followed by a description of the methodology adopted in pursuing the study's objective in Section 3. Section 4 presents the results, interpretation, and discussion of findings, while the summary, conclusion and recommendation are contained in Section 5.

## Stylized Facts

Sub-Saharan Africa (SSA) is home to 23 low-income and 22 middle-income countries (IMF, 2022) and boasts of over a 1.2-billion-person market (World Bank, 2022), thereby representing great potential for high-impact entrepreneurship. However, macroeconomic instability and socio-political fragility may pose important challenges. For instance, as reported in the IMF


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Volume 6, Issue 2, 2023 (pp. 163-189)

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Regional Economic Outlook (2022), SSA's economy grew at 4.7% in 2021 and is projected to grow by 3.7% in 2023, while the inflation rate in the region was at 11.1% in 2021 and projected to remain double-digit in 2023. Furthermore, most SSA economies are small and least developed, with low income per capita and small markets (Pasara, 2020), while 22 SSA countries are fragile or conflict-affected (IMF, 2022).

The above indicators imply a rather weak and harsh regional entrepreneurial ecosystem. So, the first step toward putting the necessary structures in place for developing high-impact entrepreneurship in SSA is to understand the challenges from an ecosystem perspective and identify the areas that require collective action (OXEPR, 2021). Against the backdrop of a seemingly harsh entrepreneurial ecosystem, venture capital and angel investments are on an upward trend in Sub-Saharan Africa, indicating a clear surge in high-growth entrepreneurial ecosystems in the region (OXEPR, 2021). However, funding gaps still exist at every stage of the entrepreneurial process. For instance, about 59% of entrepreneurs in Sub-Saharan Africa report failure to secure start-up finance as opposed to 31% in Eastern Europe and 34% in Latin America and the Caribbean (Legas, 2015).

This study focuses on Nigeria as a case study, given the country's position as the largest economy by GDP and population in Africa. The latest data from the World Bank's World Development Indicator (WDI) indicates that Nigeria will account for about 30% of Sub-Saharan Africa's GDP and about 18% of the region's population in 2021.

Furthermore, with over 40 million micro, small and medium-scale enterprises (MSMEs) as of 2021, Nigeria is the largest destination of venture capital in SSA as well as the 4$^{th}$ largest source of venture capital in Africa (OXEPR, 2021). However, Nigeria also has the 6$^{th}$ highest inflation rate in the region in 2021. The IMF categorises it as one of the countries in fragile and conflict-affected situations as of 2021. This representative mix of opportunities and risks positions Nigeria as a suitable candidate for investigating the impact of the macroeconomic environment on entrepreneurship in Sub-Saharan Africa.

Between 2017 and 2020, the number of formal enterprises in Nigeria shrank by 4.5% or about 56,000 businesses (the informal segment shrank by 7.4% or 3,065,527 businesses), leading to 3.5% reduction in the sector's contribution to GDP within those three years (NBS-SMEDAN, 2021). Over the same period, self-employment dropped slightly from 81.48% to 81.37%; economic growth slowed from 0.8% to -1.8%, while the human capital index rose from 1.92 to 2.01. The foregoing suggests instances of factors that could be supportive of entrepreneurship as well as those that may deter it. When examined over the 31 years of observation of this study, self-employment (ENT) declined from 89.4% in 1991 to 79.7% in 2021, while economic growth as a proxy for the macroeconomic environment rose from 0.4% to 3.6%.

The human capital index (HCI) as a proxy for individual factors that could trigger entrepreneurship also rose from 1.2 to 2.01, while the corruption index (COR) declined from 2.0 to 1.19.

Furthermore, credit to the private sector (CPS) increased from ₦41 billion to ₦32.9 trillion, while the monetary policy rate (MPR) decreased from 16% to 11.5%. Even though all the foregoing are expected to create expansionary effects that should boost entrepreneurship, the period also witnessed a worsening of inflation (INF) from 13% to 17% while the exchange rate (EXR) depreciated from ₦10/$ to ₦400/$1 and crude oil price (OILP) rose from $20 per barrel


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Volume 6, Issue 2, 2023 (pp. 163-189)
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to $71 per barrel. However, these trend observations do not show how time influences the impact of macroeconomic variables on entrepreneurial outcomes, requiring a more rigorous investigation.

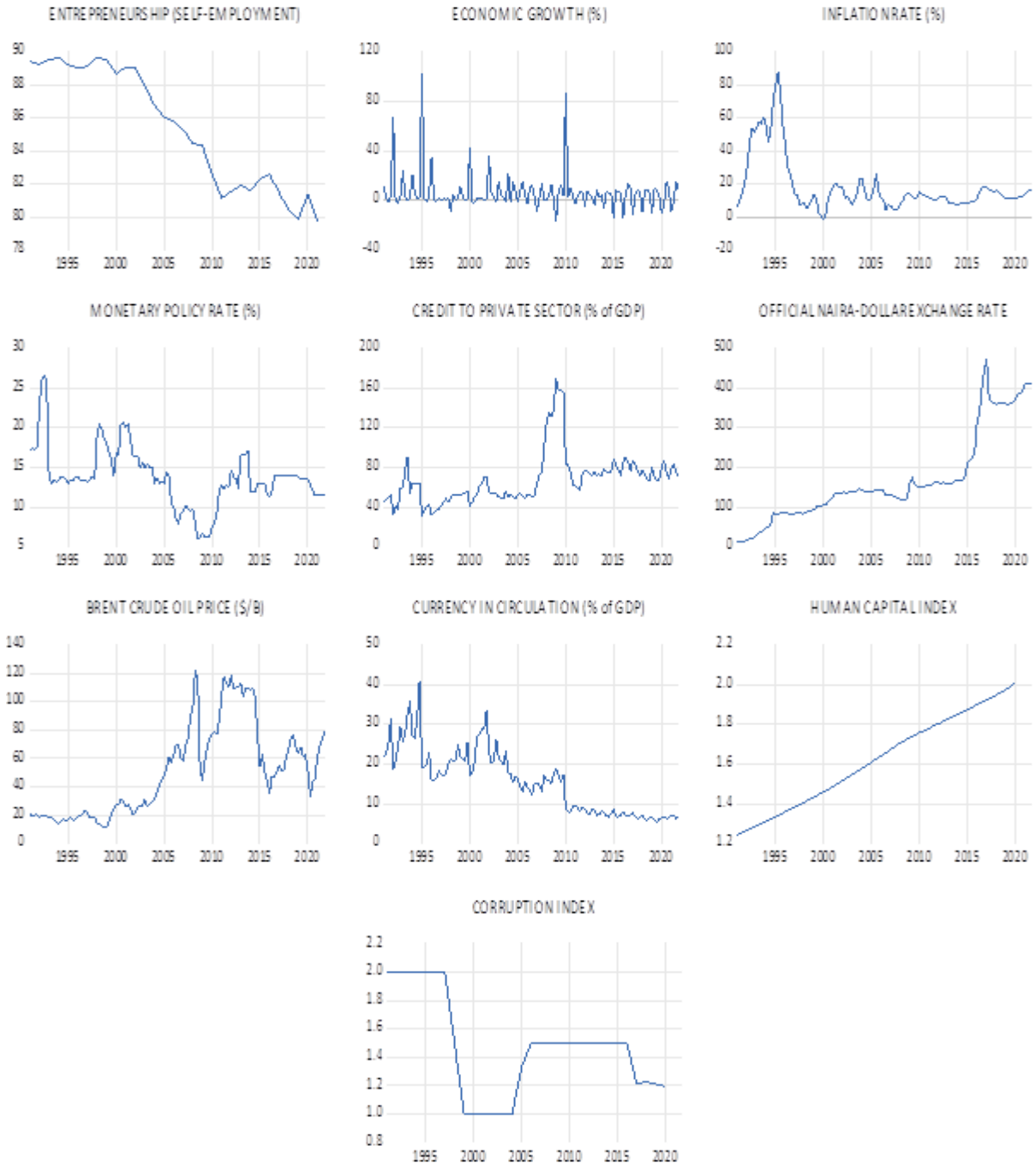


**Figure1: Trend of Entrepreneurship and Macroeconomic Variables in Nigeria (1991 – 2021)**

**Source:** *Authors' Computation (2023)*


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## THEORETICAL AND EMPIRICAL PERSPECTIVES

Several theories have explained entrepreneurship as determined by factors internal to the individual entrepreneur as well as by external factors. Generally, internal theories posit that entrepreneurship arises from individual characteristics such as uncertainty-bearing (Knight, 1921), motivation for achievement (McClelland, 1961), opportunity-alertness (Kirzner, 1973), self-efficacy (Bandura, 1977), ambiguity tolerance (Schere, 1982), planned behaviour (Ajzen, 1991), internal locus of control (Mueller & Thomas, 2000), among others. On the other hand, external theories generally maintain that entrepreneurship arises due to external factors such as transaction costs (Coase, 1937), culture (Cochran, 1965; Davidsson & Wiklund, 1997), x-efficiency (Leibenstein, 1978), social identity (Tajfel & Turner, 1979), social cognition (Bandura, 1989), social capital (Walker *et al*., 1997), institutional factors (North, 1991; Bruton *et al*., 2010), institutional voids (Khanna & Palepu, 1997), knowledge spillover (Acs *et al*., 2009), among others.

Even though entrepreneurship is influenced by a complex interplay of factors cutting across personal, social, economic, and spatial factors, and many theories support the influence of both internal and external factors (Becker, 1994; Robinson & Sexton, 1994), most studies hold external factors constant and focus on individual characteristics and behaviours of the entrepreneur (Shane, 2003; Shane & Venkataraman, 2000; Van de Ven, 1993). However, more recently, increasing emphasis is being placed on drifting away from an individualistic, personality-based approach to a system perspective towards understanding the context of entrepreneurship in particular territories (Stam & Van de Ven, 2021; Acs *et al.*, 2017; Isengerg, 2014; Lundstrom & Stevenson, 2005; Gynyawali & Fogel, 1994) and as a more viable strategy toward the development of entrepreneurship (Wennekers & Thurik, 1999; Audretsch *et al*., 2002; Lundstrom & Stevenson, 2005; Isengerg, 2014).

For instance, Isenberg (2014) posits that viewing entrepreneurship from the ecosystem approach is more productive because this captures the role of every stakeholder, including entrepreneurs, the government, financial institutions, educational institutions, corporations as well as civil society organisations (See Figure 2). However, discussions have merely provided descriptions of entrepreneurial ecosystem constructs and elements that have yet to offer information about how these constructs and elements are related to each other and to entrepreneurial outcomes (Stam & van de Ven, 2021).


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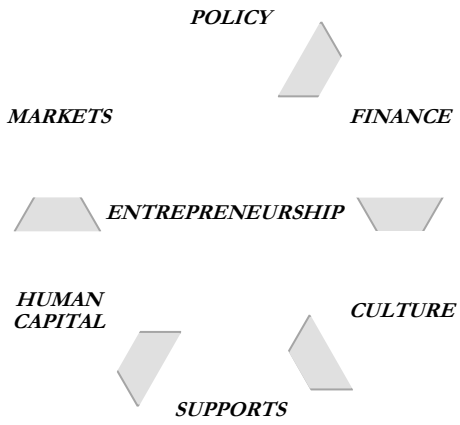


**Figure 2: Domains of the Entrepreneurial Ecosystem**

Source: *Isenberg (2016)*

Most studies in the context of entrepreneurship have adopted qualitative methods, including opinion surveys and case studies which may not be adequate for capturing causal effects among entrepreneurship ecosystem elements. In addition, these studies often focus on a small cross-section of entrepreneurs and may not adequately represent the broad elements of entrepreneurial ecosystems. More importantly, these studies fail to capture how temporal effects might influence the impact of ecosystem elements on entrepreneurial outcomes. Without gainsaying that such studies often offer deep insights into a narrow set of drivers of entrepreneurship, their findings are seldom generalisable and may often produce inaccurate perceptions of the impact of the entrepreneurial ecosystem on entrepreneurial outcomes.

The importance of temporal effects on entrepreneurial outcomes, and especially on entrepreneurial learning from such outcomes, is more pronounced in the context of entrepreneurial ecosystem elements that are macroeconomic in nature. This is because many macroeconomic variables that influence entrepreneurial outcomes are time series and hence require the treatment of the influence of time (Auerswald & Dani, 2017). However, despite that recent discussions on drivers of entrepreneurship are increasingly tending towards integrated and eclectic approaches that combine both internal and external factors, and despite many of the ecosystem elements being macroeconomic in nature, only very few studies adopt a macroeconomic approach (Khyareh & Rostami, 2021; Del Olmo-Garcia *et al.*, 2020; Amoros et al., 2016; among others) while much fewer studies have focused on developing countries (Innesa *et al.*, 2019, among others).

For instance, macroeconomic variables that are found to impact entrepreneurial outcomes significantly include tax rates, foreign investment, inflation, business start-up costs, unemployment and access to finance (Khyareh & Rostami, 2021); tourism sector wages (Tleuberdinova *et al.*, 2021); quality of formal institutions, entrepreneurial culture and social norms, and efficiency of the goods markets (Del Olmo-Garcia *et al.*, 2020); macroeconomic freedoms (Kinnunen & Georgescu, 2020); share of gross expenditures on non-current assets


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(Innesa *et al.*, 2019); human capital and financial capital (Estrin *et al.*, 2017); inflation and corruption (Amoros et al., 2016), economic growth (Osakwe *et al*, 2015); and economic development (Grosanu *et al*, 2015).

However, even though some of these studies found both short-run and long-run impacts, none of them explicitly investigated the role of temporal effects in the relationship between entrepreneurial ecosystem elements and entrepreneurial outcomes. Furthermore, recent studies that have focused on the role of temporal effects in the complex entrepreneurial ecosystem relationships have done so within the context of how time, as an evolutionary element, shapes and forms the context for entrepreneurial outcomes, including entrepreneur and network profiles in a region (Audretsch *et al.*, 2021).

Considerations of time in these discussions have generally related to the evolutionary nature of entrepreneurial ecosystems in terms of 'formational' time (time required for new venture births) (Aldrich, 1990), 'transitional' time (time required for new venture survival and growth) (Brown & Mason, 2017), and 'evolutional' time (time required for complete industrial life cycle) (Auerswald & Dani, 2017). However, discussions have also included the effects of time on opportunity evaluation (Tumasjan et al., 2013), how time influences entrepreneurial decisions (Miller & Sardais, 2015) and the role of time in how entrepreneurs learn from failure (Byrne & Shepherd, 2015). However, it is still uncertain whether time should be incorporated retrospectively, contemporaneously, longitudinally, or trajectorially (Audretsch *et al.*, 2021). The present study contributes to this nascent literature by investigating the role of time in entrepreneurs' perception of their ecosystem using time series analysis of macroeconomic variables that broadly represent many entrepreneurial ecosystem elements.

## DATA AND METHODS

### Variables, Measurement, Data, and Sources

This study focuses on investigating how temporal effects influence the impact of selected entrepreneurial ecosystem elements on entrepreneurship. To achieve this, the study conceptualises the entrepreneurial environment as the overall economic, sociocultural, and political factors that influence people's willingness and ability to undertake entrepreneurial activities as well as the availability of assistance and support services that facilitate the start-up process (Gnyawali & Fogel, 1994). Thus, the study analysed how time changes the effect of macroeconomic variables that broadly reflect entrepreneurship ecosystem elements (Isenberg, 2014 2016) as determinants of entrepreneurship.

As the most widely used indicator of the state of the macroeconomy, economic growth (GRO) is included as it can significantly impact entrepreneurship in a country. Periods of growth are often accompanied by higher spending and greater optimism, which send positive signals to both existing and potential businesses for expansion and start-up, respectively. Inflation is also included as an important gauge of the state of the macroeconomy because it indicates how stable the economy is. To a large extent, price stability promotes entrepreneurship. In addition, the monetary policy rate (MPR) is included as a macroeconomic policy instrument is also included because changes in the MPR create expansionary and contractionary effects that impact entrepreneurship.


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ISSN: 2689-9493
Volume 6, Issue 2, 2023 (pp. 163-189)

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As an oil-dependent and import-dependent economy, changes in the international crude oil price and the exchange rate (Naira-to-Dollar) are expected to tremendously affect entrepreneurship in a country or region. The human capital index was included to control individual factors, while the corruption index was included to control institutional factors. Finally, consistent with Hill *et al* (2022) in the latest release of the Global Entrepreneurship Monitor (GEM) and many entrepreneurship studies (See Evans & Leighton, 1989; Sexton & Robinson, 1989; Blau, 1987; Gnyawali & Fogel, 1994; Perry-Rivers, 2016, among others), entrepreneurship is defined as self-employment.

Annual data on self-employment were obtained from the database of the World Development Indicator (WDI) of the World Bank to proxy entrepreneurship, while quarterly data on macroeconomic variables (nominal economic growth rate, monetary policy rate, inflation rate, Naira to Dollar exchange rate, credit to private sector, and currency in circulation) were all obtained from the Central Bank of Nigeria (CBN)'s Statistical Bulletin. In addition, quarterly data on (Brent) crude oil prices was obtained from the Federal Reserve Economic Data (FRED) database of the St. Louis Federal Reserve Bank. Furthermore, annual data on the human capital index was obtained from the Penn World Tables, while annual data on the corruption index was obtained from the International Country Risk Guide (ICRG) database. All the data used span from 1991 to 2021. However, it is noteworthy that the human capital index and the corruption index for 2020 and 2021 were extrapolated using Excel.

**Table 1: Data, Measurement and Sources**

| S/N | VARIABLE | DEFINITION & MEASUREMENT | SOURCE | FREQUENCY |
|---|---|---|---|---|
| 1 | ENTREPRENEURSHIP (ENTP) | The number of self-employed (GEM, 2022), % of total employment | World Development Indicator (WDI) | Annual |
| 2 | ECONOMIC GROWTH (GRO) | % change in GDP | Central Bank of Nigeria (CBN) | Quarterly |
| 3 | INFLATION (INF) | % change in the consumer price index (CPI) | Central Bank of Nigeria (CBN) | Quarterly |
| 4 | MONETARY POLICY RATE (MPR) | Baseline interest rate set quarterly by the Central Bank of Nigeria (CBN) | Central Bank of Nigeria (CBN) | Quarterly |
| 5 | CREDIT TO PRIVATE SECTOR (CPS) | Commercial bank credit to private sector | Central Bank of Nigeria (CBN) | Quarterly |
| 6 | OFFICIAL EXCHANGE RATE (EXR) | Official Value of the Naira relative to US$, period average | Central Bank of Nigeria (CBN) | Quarterly |
| 7 | CRUDE OIL PRICE (OILP) | Brent crude oil price in US$ per barrel | Federal Reserve Economic Data (FRED) | Quarterly |
| 8 | CURRENCY IN CIRCULATION (CIC) | Currency outside the vaults of Central Bank, % of GDP | World Development Indicator (WDI) | Quarterly |


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| | | | | |
|---|---|---|---|---|
| 9 | HUMAN CAPITAL (HCI) | Human capital index (years of schooling & returns to education) | Penn World Tables (PWT) | Annual |
| 10 | CORRUPTION (COR) | Corruption index | International Country Risk Guide (ICRG) | Annual |

## Methods

Given that real-world phenomena are often characterized by complex relationships, with some observed variables exhibiting erratic behaviour in the short run and then co-moving in a stable and predictable way with other variables over longer time horizons (Kripfganz & Schneider, 2018), it is imperative to adopt techniques of analysis that reveal how time dynamics affect the impact of the macroeconomic environment on entrepreneurship. Typical investigations in the field of entrepreneurship have focused on cross-sectional analysis, which provides snapshots of the phenomenon being investigated and, by implication, assumes away both short-run dynamics and long-run processes that often characterise such relationships. However, while cross-sectional snapshots provide useful information, it is necessary to complement them with models that can incorporate and distinctly reveal short-run dynamics and long-run relationships between entrepreneurship and its determinants, provided that suitable time series variables are available to measure the entrepreneurial phenomenon of interest. Consequently, we opted for a time series analysis with a macroeconomic focus as a complementary alternative to a cross-sectional analysis with a microeconomic focus.

Four alternative models were estimated. The first model is the aggregated model, which involves using the series in annual frequency. This implies that the variables observed at higher frequencies were annualised. The second model, the disaggregated model, involves the use of quarterly series, whereby the annual series were disaggregated. The third model is a mixed data sampling (MIDAS) model whereby a lower-frequency target variable is combined with higher-frequency explanatory variables. This third model is necessary to preserve timing information, an advantage over the first model, where important timing information is lost in the simple aggregation adopted. The fourth model is the threshold model, which investigates threshold effects within the MIDAS framework.

The rationale for adopting alternative time perspectives is to isolate the role of time. Differences in the effect of any macroeconomic variables on entrepreneurship would imply the influence of time, which entrepreneurs seldom factor into their perception of the ecosystem. For instance, while the short run in the aggregated model indicates year-on-year effects of macroeconomic variables on self-employment, the short run in the disaggregated model portrays quarter-on-quarter effects. Meanwhile, the judgement of the typical entrepreneur about the influence of ecosystem elements on businesses often needs to be made aware of the long-term effects, which may be different from short-term effects. The models are described below.


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**Autoregressive Distributed Lag (ARDL) Models**

Both the aggregated and the disaggregated models were estimated within the framework of the autoregressive distributed lag (ARDL) with bounds testing technique (Pesaran et al., 2001). The autoregressive distributed lag (ARDL) model with bounds testing offers the advantage of investigating as well as separating both short-run and long-run relationships in the same estimation, especially when it is not known with certainty whether the underlying regressors are trend- or first-difference stationary. The technique has been utilised to investigate a wide range of issues, hence its adoption in this study. Another justification for the use of ARDL is its ability to combine both stationary and non-stationary series in the same estimation. The aggregated and disaggregated ARDL models estimated in this study are specified in Equations 1 and 2 below.

$$y_{t_a} = \alpha_{1,0} + \sum_{i=1}^{p} \theta_{1,i} y_{t_{a-i}} + \sum_{i=0}^{q} \beta_{1,i} x_{t_{a-i}} + \varepsilon_{1,t_a} \quad (1)$$

$$y_{t_q} = \alpha_{2,0} + \sum_{i=1}^{p} \theta_{2,i} y_{t_{q-i}} + \sum_{i=0}^{q} \beta_{2,i} x_{t_{q-i}} + \varepsilon_{2,t_q} \quad (2)$$

where $y_{t_a}$ is the low frequency dependent variable (sampled annually in this case) while $x_{t_q}$ is the high frequency independent variable (sampled quarterly in this case so that q = 4 for every y); $\alpha_0$ is the intercept of each of the regression models; $\beta_i$ is the coefficient of each observation of the high frequency variable in each regression while $\varepsilon_{i,t}$ is the white noise error term.

**Mixed Data Sampling (MIDAS) Models**

The use of the MIDAS regression technique (Ghysels et al., 2004) in this study is justified based on limitation in data availability, whereby data on self-employment, which is used to proxy entrepreneurship as the dependent variable, is available in annual frequency while data on macroeconomic variables used as regressors are available in quarterly frequency. According to Ghysels *et al.* (2004), such a situation can be modelled using the following relation:

$$y_{t_a} = \alpha_{3,0} + \sum_{j=0}^{q} \theta_j x_{t_q - j/q} + \varepsilon_{3,t}, \quad (3)$$

where $y_{t_a}$, $x_{t_q}$ and the parameters are as earlier defined and $\theta_j$ is the coefficient of each observation of the high-frequency variable. Equation 1 is known as the unrestricted MIDAS (U-MIDAS) model, which can normally be estimated using the ordinary least squares (OLS) to produce consistent estimates. However, due to the characteristic problem of over-parameterization of MIDAS regressions that arises when q out-samples T (for instance, in our case, there are 124 quarters and 31 years), Ghysels *et al.* (2004) recommended parsimonious methods such as the normalised exponential Almon polynomial which imposes restrictions on the coefficients of the high-frequency lag polynomial and depends only on a few parameters. With such restrictions, the model effectively becomes a non-linear model (See Equation 2) and requires non-linear techniques such that the solution is then approximated using numerical optimisation routines (Libonatti, 2017).

$$y_{t_a} = \lambda \sum_{j=0}^{q-1} \left( \frac{w_j(\gamma; j)}{\sum_{q-1}^{j=0} w_j(\gamma; j)} \right) x_{t_q - j/q} + \varepsilon_t, \quad (4)$$



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where $\lambda$ is an impact parameter; $\theta_j \equiv w_j(\gamma; j)$ where $\gamma$ is the collection of hyperparameters that characterise the weight function; and the weights $w_j$ are normalised to sum up to unity. For simplicity, we specify Equation 3 above as follows:

$$y_{t_a} = \alpha_{3,0} + \theta_j^* x_{t_q - j/q} + \varepsilon_t, \qquad 5$$

where $\theta_j^* = \lambda \sum_{j=0}^{q-1} \left(\frac{w_j(\gamma;j)}{\sum_{q-1}^{j=0} w_j(\gamma;j)}\right)$ is the coefficient of the high-frequency independent variable which is of particular interest in this study.

**Threshold Effects?**

Because entrepreneurship is a complex phenomenon that can be triggered by both favourable and unfavourable macroeconomic conditions, we envisage and test for threshold effects in the impact of macroeconomic variables on self-employment in Nigeria. To achieve this, we adopt threshold regressions, which help to establish if effects up to a certain level (the threshold) of a given macroeconomic variable differ from effects beyond that level. For instance, a low monetary policy rate (MPR) has expansionary macroeconomic effects, which could promote entrepreneurship. On the other hand, high MPR has contractionary macroeconomic effects that may dissuade entrepreneurship. Therefore, 'low' and 'high' monetary policy rates could affect entrepreneurship differently, hence the need to conduct threshold regression. Similar arguments could be raised for the other macroeconomic variables. For instance, periods of high levels of economic growth are expected to promote entrepreneurship, while periods of low growth may discourage entrepreneurial endeavour. Similarly, higher credit is likely to promote entrepreneurship, while lower credit discourages it.

Threshold effects can also reveal the type of entrepreneurship largely promoted by the Nigerian macroeconomic environment in terms of necessity-driven and opportunity-driven entrepreneurship. Generally, necessity-driven entrepreneurship is implied when higher levels of entrepreneurship are associated with low variables that depict a 'favourable' macroeconomic environment or with higher levels of variables that depict an 'unfavourable' macroeconomic environment. On the other hand, opportunity-driven entrepreneurship is implied when higher levels of entrepreneurship are associated with higher levels of variables that depict a 'favourable' macroeconomic environment or with lower variables that depict an 'unfavourable' macroeconomic environment.

The overriding expectation for a developing country like Nigeria is the predominance of necessity-driven entrepreneurship, whereby more people are 'pushed' into entrepreneurship by an unfavourable macroeconomic environment. To test for threshold effects within the MIDAS framework, we follow the novel approach by Motegi and Dennis (2022), wherein a low-frequency target variable was combined with a high-frequency threshold variable. Using this approach, we specify the following Mixed-Data Sampling-Threshold Autoregressive (MIDAS-TAR) model:

$$y_{t_a} = \{\alpha_1 + \sum_{j=1}^{\rho} \beta_{1,j} x_{t_q - j} + \varepsilon_{1,t}; \quad if\ x_{t_q - \delta/q} < \mu,\ \alpha_2 + \sum_{j=1}^{\rho} \beta_{2,j} x_{t_q - j} + \varepsilon_{2,t}, \quad if\ x_{t_q - \delta/q} \leq \mu, \qquad 6$$

where $y_{t_a}$ and $x_{t_q}$ are as earlier defined, $\mu$ is the threshold parameter and $\beta_1$ and $\beta_2$ are the regression parameters for regime 1 (the period before the threshold or lower regime) and


Article DOI: 10.52589/IJEBI-FGH8XJMT
DOI URL: https://doi.org/10.52589/IJEBI-FGH8XJMT

regime 2 (the period above the threshold or upper regime), respectively; $\delta$ is the delay parameter. We use an autoregressive lag length ($\rho$) of 2 as a rule of thumb (since the low-frequency dependent variable is annual) and allow up to 8 lags for the autocorrelation function. We also set the delay parameter ($\delta$) at 3 to allow for at most three-quarters of the delay in the threshold effect of each macroeconomic variable on entrepreneurship.

## FINDINGS

### Aggregated and Disaggregated Autoregressive Distributed Lag (ARDL) Models

Before proceeding with the ARDL regressions, we computed descriptive statistics to provide a glimpse into the distributional properties of the data deployed in this study. Results (Table II) indicate that the variables do not have an asymptotically normal distribution except for inflation and monetary policy rate. However, we rely more on a post-estimation investigation of the overall model. To ascertain the suitability of the ARDL model and its underlying estimation technique for this study, some pre-estimation analyses become necessary. Specifically, we conduct unit root, correlation, and descriptive analyses to ascertain the time series properties of the variables.

The augmented Dickey-Fuller (ADF) and the Phillip-Perron (PP) unit root tests indicate that monetary policy rate was level-stationary with drift at the 5% level of significance, while only the ADF supported the same conclusion for the corruption index. Both tests indicate that all the remaining variables, to the exception of human capital index (HCI), are difference-stationary at the 5% level. However, the natural log of HCI was level-stationary with drift at the 10% significance level. This implies that the ARDL model is applicable in our situation.

**Table 2 Descriptive Statistics and Unit Root Properties**

**Table 2: Descriptive Statistics and Unit Root Properties based on ADF and PP Tests**

| | ENTP (A) | GRO | INF | MPR | CPS | EXR | OILP | CIC | HCI (A) | COR (A) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Mean** | 85.43 | 6.39 | 18.73 | 13.96 | 67.25 | 155.36 | 50.32 | 16.24 | 0.47 | 0.36 |
| **Median** | 85.78 | 3.27 | 12.56 | 13.50 | 62.74 | 139.38 | 44.48 | 16.18 | 0.49 | 0.41 |
| **Maximum** | 89.68 | 102.13 | 87.83 | 26.70 | 169.14 | 472.49 | 122.22 | 40.91 | 0.70 | 0.69 |
| **Minimum** | 79.73 | -16.99 | -1.88 | 6.00 | 30.95 | 11.59 | 11.50 | 5.30 | 0.22 | 0.00 |
| **Std. Dev.** | 3.62 | 15.73 | 17.54 | 3.88 | 26.40 | 102.06 | 32.88 | 8.04 | 0.14 | 0.23 |
| **Skewness** | -0.16 | 3.70 | 2.09 | 0.61 | 1.87 | 1.25 | 0.68 | 0.51 | -0.17 | -0.07 |
| **Kurtosis** | 1.40 | 20.41 | 6.70 | 4.55 | 7.12 | 4.02 | 2.25 | 2.65 | 1.73 | 2.02 |
| **Jarque-Bera** | 3.44 | 1745.19 | 151.77 | 19.05 | 151.22 | 35.58 | 11.87 | 5.72 | 8.42 | 4.73 |
| **Probability** | 0.18 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.06 | 0.01 | 0.09 |


Article DOI: 10.52589/IJEBI-FGH8XJMT
DOI URL: https://doi.org/10.52589/IJEBI-FGH8XJMT

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Observations** | 31 | 124 | 124 | 124 | 124 | 124 | 124 | 124 | 31 | 31 |
| **Unit Root** | I(1)*** | I(0)*** | I(1)*** | I(1)*** | I(1)*** | I(1)*** | I(1)*** | I(0)*** | I(0)* | I(0)** |

Note: ENTP = self-employment rate; GRO = economic growth rate; INF = inflation rate; MPR = monetary policy rate; CPS = Credit to the private sector; EXR = Exchange rate; OILP = Crude oil price; CIC = Currency in circulation; HCI = Human capital index; COR = Corruption index; (A) = annual frequency; ADF = Augmented-Dickey Fuller; PP = Phillip-Perron; (***), (**) and (*) = indicates statistical significance at 1%, 5% and 10% level, respectively.

Results of the Pearson pairwise correlation test (Table III) reveal that each economic growth and corruption index has a weakly positive correlation with self-employment, while inflation and monetary policy rate each has a moderately positive correlation with self-employment. All the other variables are strongly negatively correlated with self-employment. Furthermore, apart from economic growth and corruption index, which are not statistically significant, all the remaining seven correlation coefficients are significant at the 5% level.

**Table 3 Correlation Analyses**

**Table 3: Pairwise Correlation Estimates**

| | GRO | INF | MPR | CPS | EXR | OILP | CIC | LHCI | LCOR |
|---|---|---|---|---|---|---|---|---|---|
| ENTP (A) | 0.01 | 0.43*** | 0.46*** | -0.91*** | -0.85*** | -0.81*** | -0.90*** | -0.95*** | 0.18 |
| ENTP (D) | 0.11 | 0.42*** | 0.44*** | -0.91*** | -0.78*** | -0.82*** | -0.96*** | -0.95*** | 0.16* |

Note: ENTP (A) = self-employment in annual frequency; ENTP (D) = self-employment in disaggregated into quarterly frequency; (***), (**) and (*) = indicates statistical significance at 1%, 5% and 10% level, respectively.

### Autoregressive Distributed Lag (ARDL) and Mixed Data Sampling (MIDAS) Models

Each of the aggregated and disaggregated models was found to be adequate based on the diagnostic tests conducted (Table VIII as well as Figs. 3 and 4 in the Appendix). The Breusch-Godfrey serial correlation LM tests indicate that both models are free from serial correlation, while the Breusch-Pagan-Godfrey heteroscedasticity tests as well as CUSUM stability tests, show that the models are homoscedastic and stable. These diagnostic results clearly indicate that the estimates of the regression models are reliable.

### Short-Run Effects (Short-Term and Medium-Term Effects)

Based on the results of the year-on-year model (Table IV), economic growth, oil price and currency in circulation have a negative impact on self-employment rate in the short run. Specifically, a 1% increase in economic growth reduces the self-employment rate by about 0.06% ($\beta$ = -0.061; $\rho$ = 0.0023), while a 1% rise in the Brent crude oil price reduces the self-employment rate by about 1.8% ($\beta$ = -1.881; $\rho$ = 0.0000). Similarly, an increase in currency in circulation by 1% triggers a fall in the self-employment rate by about 28.76% ($\beta$ = -28.76; $\rho$ =


Article DOI: 10.52589/IJEBI-FGH8XJMT
DOI URL: https://doi.org/10.52589/IJEBI-FGH8XJMT

0.0163). On the other hand, the human capital index has a positive impact, with 1% increase in the human capital index raising self-employment by 2.36% (β = 236.99; ρ = 0.0000). All the other variables (credit to the private sector, monetary policy rate, inflation, exchange rate, and corruption index) have no significant short-run impact on self-employment.

Conversely, as indicated by the results of the quarter-on-quarter model, oil price retained its negative impact on self-employment with a reduced magnitude (β = -0.175; ρ = 0.0000), while human capital index also retained its positive impact with a reduced magnitude (β = 206.216; ρ = 0.0000). However, economic growth and currency in circulation are no longer significant. In addition, the monetary policy rate now has a negative, one-quarter delayed effect on self-employment. Furthermore, self-employment has a positive one-quarter delayed effect on itself, thereby indicating that self-employment is self-reinforcing. On the other hand, human capital has a negative one-quarter delayed effect on self-employment, which suggests that the positive effect of the human capital index on self-employment is only transient. The quarter-on-quarter model, however, confirms the results of the year-on-year model that inflation, credit to the private sector, exchange rate, and corruption index have no significant impact on self-employment.

**Table 4 Short Run Dynamics**

| **Table 4: Short Run Dynamics** | | | | | |
|---|---|---|---|---|---|
| **Aggregated Model (Year-on-Year Analysis)** | | | | | |
| Dependent Variable | Independent Variables | Coefficient | Std. Error | t-Statistic | Prob. |
| ENTP | D(GRO) | -0.060980*** | 0.016158 | -3.773918 | 0.0023 |
| | DLOG(CPS) | -0.202276 | 0.272199 | -0.743117 | 0.4706 |
| | DLOG(OILP) | -1.881146*** | 0.172325 | -10.91624 | 0.0000 |
| | D(CIC1) | -28.76207** | 10.42797 | -2.758164 | 0.0163 |
| | D(LHCI) | 236.9930*** | 28.44259 | 8.332326 | 0.0000 |
| | CointEq(-1)* | -0.345374*** | 0.038030 | -9.081725 | 0.0000 |
| **Disaggregated Model (Quarter-on-Quarter Analysis)** | | | | | |
| Dependent Variable | Independent Variables | Coefficient | Std. Error | t-Statistic | Prob. |
| ENTP | D(ENTP(-1)) | 0.659246*** | 0.083125 | 7.930799 | 0.0000 |
| | D(ENTP(-2)) | 0.134897 | 0.083059 | 1.624111 | 0.1078 |
| | D(INF) | 0.002506* | 0.001449 | 1.729000 | 0.0872 |
| | D(MPR) | -0.003236 | 0.004194 | -0.771457 | 0.4424 |
| | D(MPR(-1)) | -0.011019** | 0.004325 | -2.547898 | 0.0125 |
| | DLOG(CPS) | -0.073360 | 0.077652 | -0.944728 | 0.3473 |
| | DLOG(CPS(-1)) | -0.137456* | 0.080604 | -1.705326 | 0.0915 |
| | DLOG(OILP) | -0.175252*** | 0.058754 | -2.982813 | 0.0037 |
| | DLOG(OILP(-1)) | -0.007508 | 0.058674 | -0.127969 | 0.8985 |
| | DLOG(OILP(-2)) | 0.166856*** | 0.061056 | 2.732825 | 0.0075 |


Article DOI: 10.52589/IJEBI-FGH8XJMT
DOI URL: https://doi.org/10.52589/IJEBI-FGH8XJMT

International Journal of Entrepreneurship and Business Innovation
ISSN: 2689-9493
Volume 6, Issue 2, 2023 (pp. 163-189)

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| | | | | |
|---|---|---|---|---|
| D(LHCI) | 206.2155*** | 36.12218 | 5.708833 | 0.0000 |
| D(LHCI(-1)) | -91.80121** | 40.52879 | -2.265086 | 0.0259 |
| CointEq(-1)* | -0.080218*** | 0.013125 | -6.111666 | 0.0000 |

The results above suggest that the impact of economic growth and currency in circulation on self-employment takes a longer time to materialise (hence their significance in the year-on-year analysis but not in the quarter-on-quarter analysis) while the effect of monetary policy rate materialises (with a delayed effect, as expected) over a shorter period (hence the significance in the quarter-on-quarter analysis but not in the year-on-year analysis). Furthermore, as indicated by the negative, less than 1 (in absolute value) and statistically significant error correction term in each case, a proportion of short-run displacements is corrected per period. Specifically, in the year-on-year model, about 35% of short-run displacements are corrected annually [CointEq(-1) = -0.345374; p = 0.0000], while only about 8% of short-run displacements are corrected quarterly in the quarter-on-quarter model. This is realistic as the adjustment process over a shorter horizon is expected to be smaller than that over a longer period.

**Long-Run Effects**

ARDL bounds tests reveal the existence of a significant long-run relationship between the self-employment rate and the macroeconomic variables considered in both the year-on-year and the quarter-on-quarter models since the null of 'no level relationship' was rejected in each case (See Table V). The year-on-year and the quarter-on-quarter models reveal that economic growth, inflation, and human capital index each negatively and significantly impact self-employment in the long run. Specifically, the year-on-year model shows that a 1% rise in each of economic growth, inflation, and human capital index reduces self-employment by about 0.4%, 0.1%, and 0.74%. In the quarter-on-quarter model, each of these effects is about 0.01%, 0.01%, and 0.5%, respectively. Both models also indicate that the oil price and corruption index have no significant impact on self-employment in Nigeria.

However, the two models yield different results on the remaining four variables, which are largely policy variables. Whereas the year-on-year model indicates that the four variables have no significant impact on self-employment, the quarter-on-quarter model reveals that currency in circulation has a negative impact on self-employment while monetary policy rate, credit to private sector and exchange rate have positive and significant long-run impacts. The difference in these findings suggests that year-on-year analysis may not capture the effects of policy variables that are implemented every quarter. Furthermore, the long-run models estimated in this section may have been influenced by aggregation bias (in the year-on-year analysis where some quarterly data were annualised) as well as disaggregation bias (in the quarter-on-quarter analysis, annual data were disaggregated to quarterly frequency). These problems were addressed using the MIDAS model, as shown in the next section.


Article DOI: 10.52589/IJEBI-FGH8XJMT
DOI URL: https://doi.org/10.52589/IJEBI-FGH8XJMT

International Journal of Entrepreneurship and Business Innovation
ISSN: 2689-9493
Volume 6, Issue 2, 2023 (pp. 163-189)

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**Table 5 Long Run Dynamics**

| **Table 5: Long-Run Relationships: ARDL Models** | | | | | |
|---|---|---|---|---|---|
| **Aggregated Model (Year-on-Year Analysis)** | | | | | |
| **F-Bounds Test** | | **Null Hypothesis: No levels relationship** | | | |
| | Test Statistic | Value | Significance | I(0) | I(1) |
| | F-statistic | 4.237986*** | 10% | 1.8 | 2.8 |
| | K | 9 | 5% | 2.04 | 2.08 |
| | | | 2.5% | 2.24 | 3.35 |
| | | | 1% | 2.5 | 3.68 |
| **Long-Run Coefficients** | | | | | |
| Dependent Variable | Independent Variables | Coefficient | Std. Error | t-Statistic | Prob. |
| ENTP | GRO | -0.406230** | 0.163402 | -2.486073 | 0.0273 |
| | INF | -0.104937** | 0.040725 | -2.576719 | 0.0230 |
| | MPR | 0.327240* | 0.170426 | 1.920132 | 0.0771 |
| | LOG(CPS) | 3.285737* | 1.583674 | 2.074756 | 0.0584 |
| | LOG(EXR) | 1.887681 | 1.237525 | 1.525368 | 0.1511 |
| | LOG(OILP) | 1.040630 | 0.958313 | 1.085898 | 0.2973 |
| | CIC1 | 72.80051 | 61.18372 | 1.189867 | 0.2554 |
| | LHCI | -74.30213** | 26.42807 | -2.811486 | 0.0147 |
| | LCOR | 3.309254 | 3.546073 | 0.933217 | 0.3677 |
| | C | 66.96361*** | 12.86722 | 5.204203 | 0.0002 |
| **Disaggregated Model (Year-on-Year Analysis)** | | | | | |
| **F-Bounds Test** | | **Null Hypothesis: No levels relationship** | | | |
| | Test Statistic | Value | Significance | I(0) | I(1) |
| | F-statistic | 3. 059472*** | 10% | 1.8 | 2.8 |
| | K | 9 | 5% | 2.04 | 2.08 |
| | | | 2.5% | 2.24 | 3.35 |
| | | | 1% | 2.5 | 3.68 |
| **Long-Run Coefficients** | | | | | |
| Dependent Variable | Independent Variables | Coefficient | Std. Error | t-Statistic | Prob. |
| ENTP | GRO | -0.013374** | 0.006411 | -2.086177 | 0.0398 |
| | INF | -0.013478** | 0.006544 | -2.059635 | 0.0423 |
| | MPR | 0.113058** | 0.051735 | 2.185343 | 0.0314 |
| | LOG(CPS) | 1.656060** | 0.734188 | 2.255635 | 0.0265 |
| | LOG(EXR) | 0.886431** | 0.418531 | 2.117958 | 0.0369 |
| | LOG(OILP) | 0.067496 | 0.407260 | 0.165733 | 0.8687 |
| | CIC1 | -7.859887** | 3.573842 | -2.199282 | 0.0304 |
| | LHCI | -50.28876*** | 7.777319 | -6.466079 | 0.0000 |
| | LCOR | -0.171749 | 0.926272 | -0.185420 | 0.8533 |
| | C | 86.53440*** | 2.982814 | 29.01099 | 0.0000 |



Article DOI: 10.52589/IJEBI-FGH8XJMT
DOI URL: https://doi.org/10.52589/IJEBI-FGH8XJMT

(***) & (**) indicate statistical significance at 1% & 5% level, respectively.

MIDAS regression analyses yield similar results (See Table VI). However, two important departures of the MIDAS models from the ARDL models estimated previously are noteworthy. One, since the MIDAS framework combines data with mixed frequencies, it bypasses the limitations of data aggregation or disaggregation. Consequently, the explanatory variables unavailable at the quarterly frequency (HCI & COR) were dropped from the MIDAs regressions. Two, while the ARDL models were multivariate, the MIDAS models were bivariate, meaning that the impact of each explanatory variable on the response variable was examined separately. As shown in Table VI, results from the MIDAS model reveal that the monetary policy rate has a positive and statistically significant effect on self-employment in Nigeria. On the other hand, an official exchange rate (EXR), crude oil price (OILP) and credit to the private sector (CPS) were all found to negatively impact self-employment, while economic growth, inflation rate, and currency in circulation have no significant impact on self-employment rate in Nigeria.

**Table 6: Long Run Relationships: MIDAS Model**

**Table 6: Long Run Relationships: MIDAS Model**

| **Dependent Variable: Entrepreneurship (Self-Employment)** | | | | |
|---|---|---|---|---|
| **Independent Var.** | **Parameter** | **Estimate** | **Standard Error** | **t-Stat** |
| **Growth Rate of Gross Domestic Product (GRO)** | C | 8.2555 | 4.1523 | 1.9882 |
| | B | -0.0984* | 0.0523 | -1.8817 |
| | *Goodness of fit: 0.96914; Noise variance: 0.48559; Log likelihood: -28.3851* | | | |
| **Inflation Rate (INF)** | C | 0.4077 | 3.6252 | 0.1125 |
| | B | 0.0057 | 0.0087 | 0.6569 |
| | *Goodness of fit: 0.95783; Noise variance: 0.66351; Log likelihood: -33.0679* | | | |
| **Monetary Policy Rate (MPR)** | C | 1.4928 | 3.3046 | 0.4517 |
| | B | 0.0825** | 0.0411 | 2.0080 |
| | *Goodness of fit: 0.96241; Noise variance: 0.59149; Log likelihood: -31.3443* | | | |
| **Credit to Private Sector (CPS)** | C | 34.0197 | 11.3136 | 3.0070 |
| | B | -0.6453*** | 0.2101 | -3.0718 |
| | *Goodness of fit: 0.96745; Noise variance: 0.51163; Log likelihood: -28.0709* | | | |
| **Exchange Rate (EXR)** | C | 11.6623 | 6.4948 | 1.7956 |
| | B | -0.6751** | 0.3360 | -2.0090 |
| | *Goodness of fit: 0.96178; Noise variance: 0.60082; Log likelihood: -30.4008* | | | |
| **Crude Oil Price (OILP)** | C | -1.4029 | 2.7841 | -0.5039 |
| | B | -0.0462*** | 0.0137 | -3.3811 |
| | *Goodness of fit: 0.97227; Noise variance: 0.4359; Log likelihood: -25.7481* | | | |


Article DOI: 10.52589/IJEBI-FGH8XJMT
DOI URL: https://doi.org/10.52589/IJEBI-FGH8XJMT

| | | | | |
|---|---|---|---|---|
| | C | 2.9671 | 7.6290 | 0.3889 |
| | B | 0.0200 | 0.0439 | 0.4559 |
| **Currency in Circulation (CIC)** | *Goodness of fit: 0.95757; Noise variance: 0.66755; Log likelihood: -33.1589* | | | |

(***), (**) & (*) indicate statistical significance at 1%, 5% and 10% level, respectively.

The positive effect of MPR on entrepreneurship ($\beta$ = 0.0825; p < 0.05) implies that increasing the monetary policy rate to combat price instability through its contractionary effects leads to higher self-employment. Specifically, raising the MPR by 1% leads to about 0.08% increase in self-employment. Conversely, the negative impact of EXR on entrepreneurship ($\beta$ = -0.6751; p < 0.05) suggests that 1% depreciation/devaluation of the Naira against the US Dollar leads to about 0.68% reduction in self-employment while the negative impact of OILP on entrepreneurship ($\beta$ = -0.0462; p < 0.05) suggests that a 1% increase in the price of crude oil price brings about approximately 0.05% reduction in self-employment in Nigeria. Furthermore, the negative effect of CPS on entrepreneurship ($\beta$ = -0.6453; p < 0.05) implies that an increase in credit to the private sector by 1% results in about a 0.65% drop in self-employment.

Some findings in this study align with theoretical expectations. For instance, the positive effect of MPR on self-employment implies that self-employment rates increase during periods when the monetary authority increases the policy rate. Given that raising the policy rate is primarily intended to induce macroeconomic stability, it is intuitive to expect that more people go into self-employment since a higher MPR signals greater macroeconomic stability. The negative effect of the exchange rate on entrepreneurship is also in line with theoretical expectations given the import-dependent nature of the Nigerian economy, whereby a great proportion of the populace relies on the importation of raw materials, machinery, technology, spare parts, and accessories, and even finished products to meet market demand. Thus, devaluation or depreciation makes importation costlier and deters self-employment.

Similarly, being an oil-dependent economy, an increase in the international price of crude oil drives up costs of production in practically every sector while also raising costs of living and thereby reducing consumer spending. The combination of these production and consumption effects of an increase in crude oil price might indeed dissuade self-employment. On the other hand, while the findings that higher credit to the private sector (CPS) discourages self-employment diverge from theoretical expectations, they raise questions about the efficiency of bank credit to the private sector. In other words, the negative impact of credit to the private sector on self-employment might suggest that the credit made available to the private sector is not attractive in terms of amount, associated interest rates or accessibility, thereby making credit to the private sector inefficient.

Our findings that inflation does not significantly impact entrepreneurship align with Nnamani *et al.* (2021). However, our findings that economic growth has no significant impact on self-employment contrast with Osakwe (2015), who found that economic growth positively impacts SME growth in Nigeria. In addition, our findings of a negative impact of credit to the private sector on entrepreneurship contrast with Herkenhoff *et al*. (2021), who established that formal employment declines with more access to credit in the United States, as well as with Osakwe (2015) who found that credit to the private sector has no significant impact on SME growth in


Article DOI: 10.52589/IJEBI-FGH8XJMT
DOI URL: https://doi.org/10.52589/IJEBI-FGH8XJMT

the Czech Republic. The divergence in findings is suspected to be due to differences in the measurement of entrepreneurship, the development status of the countries involved, and the method of investigation.

Lastly, even though the threshold estimates yield quite interesting results, it was necessary to ascertain the statistical significance of inter-regime differences further by conducting Wald tests. Following Motegi and Daniels (2022), the null hypothesis of no threshold effects ($H_0$: $\beta_1 = \beta_2$) was tested with the wild bootstrap using 2000 iterations. However, the null of the no-threshold effect cannot be rejected at the 5% level for all the macroeconomic variables investigated. This means that there is no significant difference between the lower and upper regimes in each case, thereby implying that the high-frequency macroeconomic variables do not exhibit threshold effects on entrepreneurship. Consequently, we resort to the earlier results obtained in the baseline (non-threshold) MIDAS model.

## CONCLUSION, IMPLICATIONS AND RECOMMENDATIONS

This study reveals that the economic growth rate has no significant impact on self-employment over the short term but may have a negative impact over the medium term while having no impact on self-employment over the long term. This suggests that while economic growth impairs self-employment over a yearly horizon, quarterly changes in self-employment cannot be attributed to changes in economic growth. Given that quarterly and annual economic growth rates might differ since the latter (to the exclusion of the former) is influenced by the trajectory of the previous year's GDP (Minguel & Carrascal, 2019), the perception that economic growth impairs entrepreneurial outcomes may only be valid in the context of a reference time horizon. Similar arguments can be made for the monetary policy rate, credit to the private sector, and exchange rate.

The quarterly monetary policy rate impairs self-employment (with a one-quarter lag). However, it has no impact over an annual horizon and a positive impact over the long term, especially when aggregation effects are accounted for. Both credit to the private sector and the exchange rate have no impact on self-employment in the short term to medium term but have a negative impact over the long-term horizon. Thus, different time horizons also yield contrasting impacts of economic growth, monetary policy rate, credit to the private sector, and exchange rate on elf-employment (See Table VII).


Article DOI: 10.52589/IJEBI-FGH8XJMT
DOI URL: https://doi.org/10.52589/IJEBI-FGH8XJMT

International Journal of Entrepreneurship and Business Innovation
ISSN: 2689-9493
Volume 6, Issue 2, 2023 (pp. 163-189)
www.abjournals.org

**Table 7: Summary of Findings**

| **Table 7: Summary of Findings** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Dependent Variable: Self Employment** | | | | | | | | | |
| **Independent Variable** | **GRO** | **INF** | **MPR** | **CPS** | **EXR** | **OILP** | **CIC** | **HCI** | **COR** |
| **Time Perspective** | **SIGNIFICANCE AT 5% LEVEL (+/-)** | | | | | | | | |
| Short Term (Q-on-Q) | NO | NO | NO | NO | NO | YES (-) | NO | YES (+) | NO |
| Medium Term (Y-on-Y) | YES (-) | NO | NO | NO | NO | YES (-) | YES (-) | YES (+) | NO |
| Long Term (MIDAS) | NO | NO | YES (+) | YES (-) | YES (-) | YES (-) | NO | - | - |
| GRO = economic growth rate; INF = inflation rate; MPR = monetary policy rate; CPS = Credit to the private sector; EXR = Exchange rate; OILP = Crude oil price; CIC = Currency in circulation; HCI = Human capital index; COR = Corruption index | | | | | | | | | |

The study concludes that the Nigerian macroeconomic environment has a mixed effect on entrepreneurship, depending on the variable of focus and the time horizon considered. More specifically, the study finds that different time horizons yield contrasting impacts of each of economic growth, monetary policy rate, credit to the private sector, and exchange rate on entrepreneurship, with the implication that shorter time horizons tend to reveal short-term dynamics such as the effects of fluctuations and seasonality while longer time horizons reveal longer-term patterns such as the effects of cycles and trends. The study also reveals a balanced mix of necessity-driven and opportunity-driven entrepreneurship in Nigeria, as none of the macroeconomic variables investigated exhibited any significant threshold effects on entrepreneurship in the country.

The key takeaways from the above results are as follows. The quarter-on-quarter analysis depicts short-term (quarterly) dynamics that are not captured by year-on-year results. Conversely, year-on-year analysis shows medium-term (yearly) effects that are not revealed by quarter-on-quarter analysis. However, being short run, both quarter-on-quarter and year-on-year analyses do not reveal longer-term effects such as cycles and trends, which may become apparent when a long-term perspective is adopted. Furthermore, high-frequency data from a long-term perspective yields more information about underlying cycles and trends than low-frequency data from the same long-term perspective. Lastly, accounting for time differences between dependent and independent variables (as done by the MIDAS model) can further improve the information about long-term relationships. Thus, the study emphasises the need to incorporate the diversity and dynamism of entrepreneurial ecosystems into research on entrepreneurial outcome drivers.

Thus, the findings in this study have some far-reaching implications. The study provides further insights into the attribution theory of entrepreneurship by providing evidence that under different time horizons, certain entrepreneurial ecosystem elements yield different causal impacts that the perception of entrepreneurs about entrepreneurial outcomes is not likely to incorporate. As such, qualitative opinion surveys and case studies on the relationship between


Article DOI: 10.52589/IJEBI-FGH8XJMT
DOI URL: https://doi.org/10.52589/IJEBI-FGH8XJMT

entrepreneurial ecosystem elements and entrepreneurship ought to be complemented with quantitative methods capable of revealing cause-effect relationships under different time perspectives. Furthermore, by establishing the intertemporal effects of specific components of the macroeconomic environment on entrepreneurship, the study provides insights to entrepreneurs and other stakeholders on how different ecosystem elements and differences in time horizons matter to the impact of entrepreneurial ecosystems on entrepreneurial outcomes.

Specific policy recommendations based on the findings of this study relate to how to strategise around the macroeconomic variables investigated. To avoid the negative impacts of the exchange rate, entrepreneurs could source local alternatives for their human and material inputs while adopting online channels (where applicable) to mitigate the negative impact of oil prices. To make monetary policy more relevant to entrepreneurship in the short to medium term, the Central Bank of Nigeria could improve transparency by being more informative about the direction of monetary policy, as this will mitigate the high uncertainties around the policy rate and exchange rate. Businesses may explore alternative financing sources, such as those that offer low-interest rates and non-interest credits, such as grants and crowdfunding, to avoid the negative impacts of bank credit on the private sector. Furthermore, the Central Bank can make the macroeconomic environment more conducive to entrepreneurship by further decentralising credit allocation to the private sector to engender competition and improve efficiency through reduced access costs or increased amounts of accessible credit for existing costs.

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## APPENDIX

**Table 8: Diagnostics**

| **Table 8: Diagnostics** | | | |
|---|---|---|---|
| **Year-on-Year Model** | | | |
| Model Summary | | | |
| ARDL(1, 1, 0, 0, 1, 0, 1, 1, 1, 0); 512 Models Evaluated; Restricted Constant, No Trend<br>F = 239.7207, p = 0.0000; HAC Standard Errors | | | |
| **Test** | **F-statistic (d.f.)** | **Prob** | **Remarks** |
| Serial correlation test: LM | 0. 921496 (2,11) | 0. 4266 | No Serial Correlation |
| Heteroscedasticity test: Breusch-Pagan-Godfrey | 0. 934472 (15,13) | 0.5546 | No Heteroscedasticity |
| **Quarter-on-Quarter Model** | | | |
| Model Summary | | | |
| ARDL(3, 0, 1, 2, 2, 0, 3, 0, 2, 0); 7812500 Models Evaluated; Restricted Constant, No Trend<br>F = 9268.207, p = 0.0000; HAC Standard Errors | | | |
| **Test** | **F-statistic (d.f.)** | **Prob** | **Remarks** |
| Serial correlation test: LM | 0. 147873 (2,89) | 0. 8628 | No Serial Correlation |
| Heteroscedasticity test: Breusch-Pagan-Godfrey | 0. 784537 (22,91) | 0. 7362 | No Heteroscedasticity |

Source: Author's Computation (2023)



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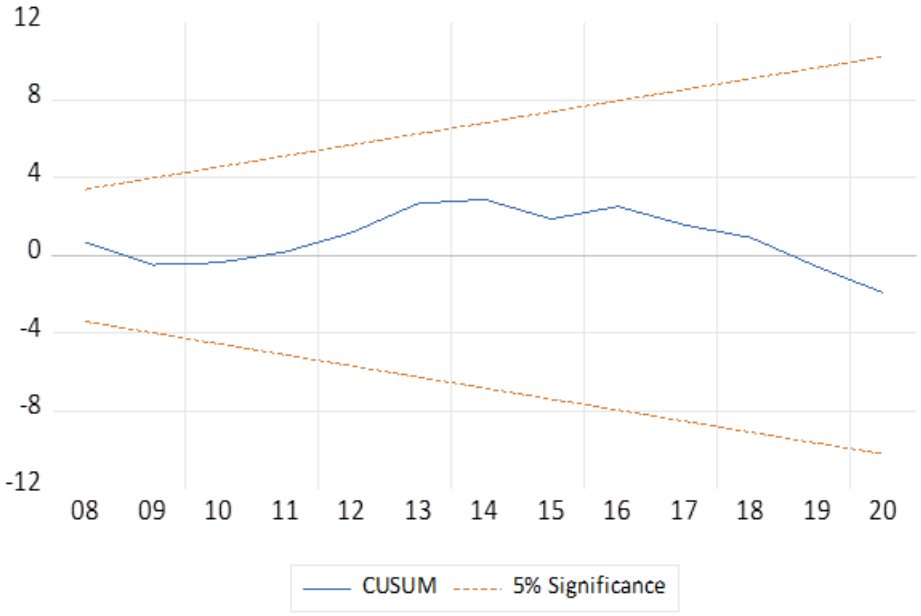


**Figure 4: CUSUM Test (Year-on-Year Model)**

Source: Authors' Computation (2023)

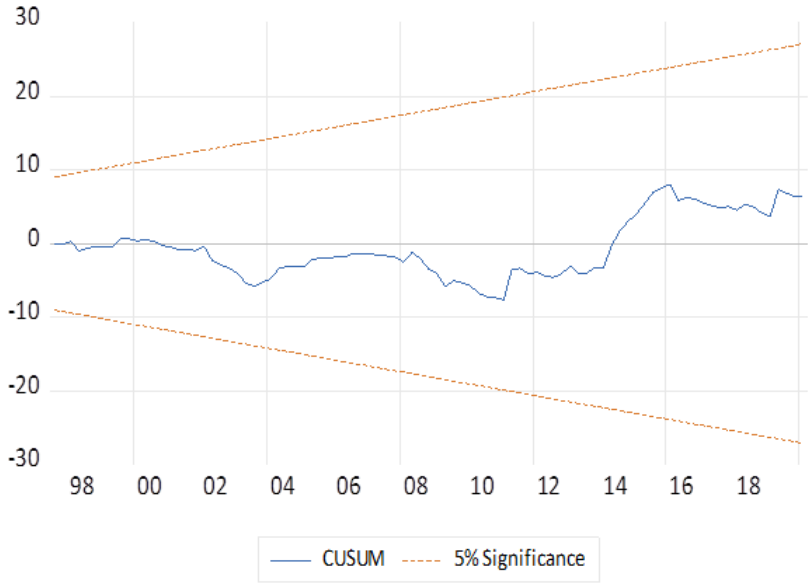


**Figure 4: CUSUM Test (Quarter-on-Quarter Model)**

Source: Authors' Computation (2023)


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