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MEDIATING EFFECT OF ACADEMIC SPIN-OFFS ON ACADPRENEURSHIP AND FOOD SECURITY IN NIGERIA

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Abstract:

This paper examines the mediating effect of academic spin-offs [ASO] on the relationship between acadpreneurship [AE] and food security [FS] in Nigeria. Driven by the Endogenous Growth Theory [EGT] (Romer, 2011), the study adopted Cochran's (1977) finite sample size method to profile 662 graduate students in entrepreneurial universities in Nigeria. A purposive electronic close-ended version of the AESFSQ instrument was used for data collection. The proposed structural model was assessed through established GOF indices. While specified hypotheses were tested using SEM. The psychometric validation of the measurement model shows that it largely fits the sample participants. The fit indices of the hypothesized structural model provided further empirical support for the collected data. SEM direct hypothesis testing revealed that the standardized structural path estimates are practically and statistically significant, indicating that AE and ASO can enhance FS. The indirect effect outcome of ASO on AE and FS shows that the product of the direct paths standardized co-efficients is substantial. Hence, ASO exists as a mediating variable. The bootstrapping outcome indicates that ASO has a significant partial mediating effect between AE and FS. This posits that ASO focused on agricultural sector can greatly reduce poverty, promote eco-friendly agricultural practices, increase the standard of living, and enhance FS in Nigeria. Ditto, to other nations. This paper has multi-faceted implications. Firstly, it extends literature on entrepreneurship by providing theoretical insights into the empirical interaction between its understudied variables. Secondly, it opens up a wide range of research

recommendations from academia for policymakers on FS. Thirdly, it is designed practically for researchers, students, as well as players in the agricultural industry and public service who are interested in AE phenomena such as the commercialization of research. Besides being cross-sectional, the non-inclusion of farmers as participants are some limitations that may have biased the study's outcomes. Hence, several recommendations and potential areas for further studies were made in light of these outcomes.

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Acadpreneurship [AE], Academic Spin-Offs [ASO], Food Security [FS], Entrepreneurial Universities, Agricultural Industry, Nigeria.



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Introduction

As custodian of knowledge, there is the increasing urge for the academia to re-align their mission with the 21st century challenges (Correia et al., 2024). The mission of the academia should not only be to teach and research (Belitski & Aginskaya, 2018), in recent years, there has been substantial demand for the academia involvement in economic and social development (Link et al., 2015; Pacheco et al., 2024). In specific, the commercialization of their research or discoveries (Presse & Terzidis, 2018), otherwise called academic entrepreneurship [AE], or *acadpreneurship* through academic spin-offs [ASO], given our study context. The motivation for acadpreneurship are driven by factors such as the need: for technology-based economies (Markuerkiaga et al., 2014), to establish entrepreneurial cultures among students and academics (Roncancio-Marin et al., 2022), to implement innovative strategic changes (Romano et al., 2025), to facilitate the transfer of technology from universities to firms, i.e., spin - offs (Siegel & Wright, 2015b), and for academia to become entrepreneurial universities (Ilie & Budac, 2025). Caputo et al. (2022) argue that the establishment of academic spin-offs [ASO] is the 'third mission' of the academia. We advocate that academia third mission is achievable through exploitation of research results or through industry collaboration.

Acadpreneurship [AE] is an emerging concept that connects the narrow and broader scope of the academia together (Correia et al., 2024). Literature has defined AE in a number of ways. Miranda et al. (2017) views it as a dynamic process through which individuals, often within the context of universities or research centers, leverage the knowledge generated within research activities to create new venture or spin-off companies. Formica et al. (2008) refer to these individuals as academic entrepreneurs [henceforth, *acadpreneurs*] who are most often professors, Ph.D. students or post-doc researchers with the intent to set up a business in order

to commercialize their laboratory discoveries or innovations. Karlsdottir (2023) says AE is part of the third mission or the emerging perspective of academia, where spin-offs are created from technological development to generate income. Fuchs et al. (2023) note that AE presents a paradigm shift in educational system such that researchers' knowledge and technological development is now considered as sources of entrepreneurial opportunities to the advantage of the university community, the academics, students, and society at large.

Acadpreneurship [AE] is an interdisciplinary context that has gained interest across the globe. However, far-reaching research on the multifarious implications of AE is imperative, given the food security [FS] status in Nigeria. World Food Summit in 1996 (FAO, 1996) describes food security [FS] as "when all people, at all times, have physical and economic access to sufficient, safe, and nutrition food that meets their dietary needs and food preferences for an active and healthy life". Aye et al. (2025) note that a food-secured individual is someone who has unlimited, reliable, and uninterrupted access to suitable food for continuous existence. Apparently, for food security objectives to be realized, dimensions such as physical availability of food, economic and physical access to food, food utilization, and stability must be fulfilled simultaneously (World Bank Group, 2025). However, this is often not be feasible or attainable because reports indicate that FS is one of many challenges facing the Southern Hemisphere, primarily in Africa, Asia, and Latin American (Kotur et al., 2024; Shoaib et al., 2022)]. GRFC (2024) note that in Africa, 46 million people or more faced hunger in 2020 compared to 2019. WHO (2024) report revealed a 58% prevalence of moderate or severe food insecurity in Africa in 2023, a rate which is nearly double the global average.

International agencies [such as UN, World Bank, FAO] and government joint efforts to alleviate food crises are encouraging, but these have only achieved short-term results (Prosekov & Ivanova, 2018), as the challenges on food security prevails (Kotur et al., 2024; Oluwafemi et al., 2024; Tkemaladze, 2025). Despite the food aid programs, initiatives and interventions by these agencies, the number of malnourished and hungry people is growing globally (Beyene, 2023). The 11th Global Food Security Index (GFSI, 2022) reveals that the global food environment is witnessing reversed growth as compared to the food security gain experienced between 2012 and 2015. A report by FAO in 2023 shows that 28.9% [2.33 billion] people globally did not have regular access to food supply (FAO, 2024). GRFC (2024) reported that nearly 282 million people in 59 countries experienced acute food insecurity, representing a 24 million people increase from 2022 to 2023. In 2024, the World Bank noted that 83 million people in 45 countries were starving when compared to the previous year (World Bank Group, 2025). A recent study by Tkemaladze (2025) posit it that 820 million people globally are currently suffering from hunger.

Nigeria is assumed the 4th largest economy (Ndiomaluke et al., 2025) and most populous country in Africa, playing a significant role in regional and global affairs (Morakinyo et al., 2025). However, it faces various development challenges such as food security, corruption, and infrastructural deficient (Atobatele et al., 2025; Danlami, 2024). According to the 11th Global Food Security Index (GFSI, 2022) report, Nigeria ranked 107th overall out of 113 countries on food security. The Index is anchored on food affordability, availability, quality and safety, and sustainability. Out of 28 countries in Sub-Saharan Africa, Nigeria is ranked 25th with 12.7% prevalence of undernourishment, 35.3% of stunted children, 18.4 % of underweight children, and 7.8% of obese population. This is a downward trend, as shown in Figure 1, when compared to 2020 GFSI report. In a recent report by (FAO, 2025), an estimate of 33.1million people is

projected to be food insecure in 2025. The estimate represents a 7 million people increase from 2024.

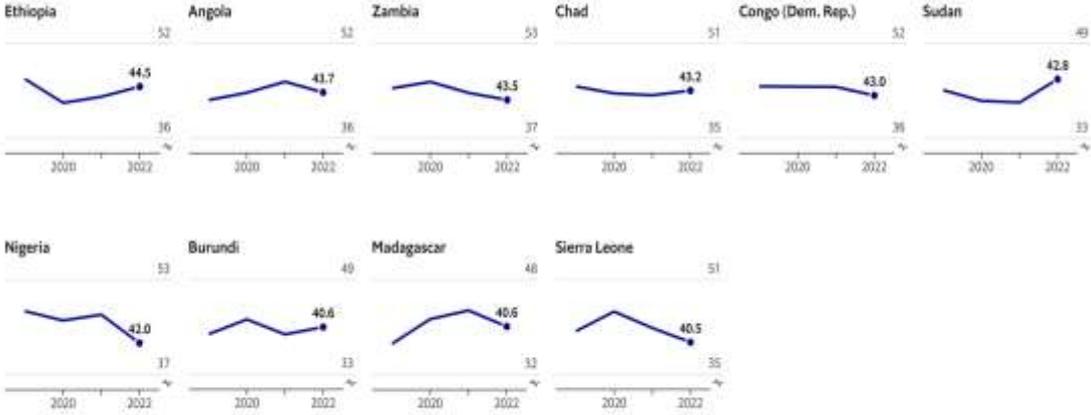


Figure 1. Global Food Security Index Scores for Nigeria in Sub-Saharan Africa
 Source: Global Food Security Index 2022.

The effects of food insecurity cannot be underestimated. It could lead to famines, persistent hunger which can cause malnutrition and stunted growth in children, defects in children cognitive development, and others (Celik et al., 2023; Sultan et al., 2024). The mainstream opinion is that the synthesized tasks of modern agricultural practices, political will, and good logistics of product delivery will optimize food security (Prosekov & Ivanova, 2018). Our study posit that these measures alone may not be sufficient to ensure food security. Hence, we route a different perspective by focusing on the academia to kindle their entrepreneurial will to boost FS through the creation of academic spin-offs [ASO].

Research on entrepreneurship have consistently informed us that it is an interdisciplinary field of study imbued with innovativeness, resilience, risk taking, and adaptability (Ilie & Budac, 2025). However, there seems to be a dearth of research on the relationship between AE, ASO, and FS, except in Okoro (2023), which only examined entrepreneurship development and food security, but not acadpreneurship. Sultan et al. (2024) conducted a systematic review on the role of universities and integrated farming in ensuring food security in Malaysia. Oguegbe and Iloke (2023) carried out an exploratory study on agro-based entrepreneurship and FS in Nigeria, not acadpreneurship. Adisa et al. (2023) conducted an integrative review on AE, but not as a panacea to food security in Nigeria. Hence, our study seeks to overcome gaps regarding the scarcity of empirical studies by addressing the mediating effects of academic spin-offs [ASO] on the relationship between acadpreneurship [AE] and food security [FS] in Nigeria.

Our study represents a departure from the conventional practices wherein existing entrepreneurs in agricultural sector are provided with skills, programs, and aids to enhance agricultural practices. We seek to establish that academia can commercial their research by creating agricultural spin-offs to boost FS. Most of these agricultural spin-offs, such as Adaviv, Horta, Walaibiocontrol Co. Ltd., AgroSustain, Xampla, and so forth existed in other climes, none existed in Nigeria, which may have impacted Nigeria FS status in the Global Food Security Index GFSI (2022) report.

Literature Review

Conceptual Review

Acadpreneurship

A significant resolution reached at the World Food Summit in Rome 2009 (FAO, 1996) highlights that emerging and developing countries should prioritize entrepreneurship as a tool to boost FS. Oguebe and Iloke (2023) proposed a new pattern of thinking that will focus solely on agriculture to salvage the dwindling FS status in Nigeria. Olaoye (2014) asserts that the arduous task of feeding the growing population in Nigeria would require technical strategies and diversification of the nation's resources into more impactful investments. Encouraging investments in AE would lead to more impactful academic spin-offs, which may necessarily resuscitate Nigeria's FS status.

Acadpreneurship [AE] is a blended word for academic entrepreneurship or the fusion of academics and entrepreneurship (Erdoş, 2009; Garcez et al., 2025). Pioneered by Ivor Royston in 1978 (Toledano & Gonzalez-sanz, 2024), AE gained traction in 1980 with the adoption of the Bayh-Dole Act (Siegel & Wright, 2015b) wherein university are allowed to own the patents that arise from research grants. Also, the study on Triple helix Model by Etzkowitz (1983) is pivotal in understanding AE as a concept. The model suggests that industry, government, and academia are three helices of economic development. The pursuit of acadpreneurship comes in two folds. Firstly; the use of academic research to identify problems (Garcez et al., 2025). Secondly, the expression of entrepreneurially virtuous behaviours to create entrepreneurial opportunities to solve identified problems that pursue the triple bottom line (Ramadini et al., 2025). The triple bottom line are social [people] welfare, environment protection / development, and economy [profit making] (Camelo-Ordaz et al., 2025). By so doing, policy makers view academia as a fundamental platform for economic growth, local, and regional development through the commercialization of their intellectual property or discoveries from their laboratories (Pacheco et al., 2024).

Wood (2011 p. 153) describe AE "as the efforts and activities that universities and their industry partners to undertake in hopes of commercializing the outcomes of faculty research". In essence, acadpreneurship [AE] implies identifying environmental needs and providing solution through a business enterprise (Garcez et al., 2025). In Oluwafemi et al. (2024), AE is about identifying, evaluating, and pursuing business opportunities either on or off the territorial space of a business. Sengupta (2021) asserts that AE is the valorisation of academic research, such that, the academic research are turned to marketable products through creation of spin-offs or university based companies; with the involvement of the academia / university researchers as stakeholders or part of the organizational structure (Miranda et al., 2018; Siegel & Wright, 2015a). Considerably, AE theory describes the perspective of commercialization of research in higher education to benefit the society (Ramadini et al., 2025).

What distinguishes *acadpreneurs* from the *conventional entrepreneurs* is that the former use academic research, which leads to the creation of opportunities, to bring something new to the economic space while still being linked in some ways to their university, faculty members or research students (Montonen, 2025; Pacheco et al., 2024; Soompon, 2025). The latter only tend to focus on societal impact and proliferation of their products with no formal or informal link with the university (Djurayeva, 2025). Though, some scholars argue that being an

academia and entrepreneur is mutually exclusive (Belitski & Aginskaya, 2018; Etzkowitz, 2016) due to time constraints, conflict of interest, impact on quality teaching, etc., but our paper argue in contrary. In an emerging 21st century that leverage on data-driven strategies to unlock new values (Dabić, 2021; Mäkinen & Esko, 2022), academic exercises should transcend beyond its conventional modus operandi (Sultan et al., 2024; Toledano & Gonzalez-sanz, 2024). Dhekney et al. (2025) suggested the need for academia involvement in industrial and economic development. Their involvement have been applauded as yielding positive narratives on economic, social, and sustainable development (Fuchs et al., 2023; Hirvonen & van Langenhove, 2021; Leišytė, 2021; Sengupta, 2021). Montonen (2025) argue that academia can drive technological advancement and social impact when they perform their third task, which is promoting entrepreneurship and the commercialization of research in the form of university spin-off companies. Supposedly, entrepreneurial activities channelled towards agricultural practices could boost FS, provide employment, reduce poverty, and enhance GDP.

Features of Acadpreneurship

Research Expertise

Abiola and Adeniyi (2023) assert that acadpreneurs, given their research landscape, are poised with the requisite knowledge to proffer workable solutions to social and environmental challenges. Wang et al. (2021) assert that acadpreneurs [such as Faculties, postdocs, and students] are imbue with certain skills to identify potential commercial opportunity and its embedded value potentials to stakeholders. Hence, they can help in repositioning agricultural research system, particularly, in Nigeria.

Innovativeness

The pursuit of AE is the pursuit of novel opportunities and the practical applicability of research outcomes to various stakeholders (Michele, 2017). According to Sooampon (2025), AE is an innovative process to transform scientific discoveries into commercialized products by the university or citadel of learning. In this regards, acadpreneurs uncover new commercial opportunities through their research (Ramadini et al., 2025) or through close bonds with particular industries (Mei et al., 2020), which often lead to the establishment of spin-offs or businesses where Faculties also form part of the organization structure to provide support (Bolzani et al., 2021).

Collaboration

Adisa et al. (2023) termed this concept as 'expanded developmental periphery'- whereby acadpreneurs reach across institutional boundaries to solve critical problems. Collaboration provides avenue to acadpreneurs to secure better funding and networking for resources. Research indicts that, through collaboration, acadpreneurs gain access to awards, research grants, finance, and consultancy jobs to launch spin-offs successfully (Walter et al., 2018). By collaboration, acadpreneurs are seen as interdisciplinary in a structured educational institution comprising a community of specialists performing different tasks bound by rules and regulations, such as intellectual honesty (Fini et al., 2020; Gupta & Mishra, 2024).

Ethical Orientation

Acadpreneurs are not only heroic (Sengupta, 2021), they are adjudged as having ethical connotations (Leišytė, 2021; Siegel & Wright, 2015b) in the discharge of their responsibilities. The society uphold this positive perception because of the standard of excellence that guide the profession and the philosophical principles of the universities in which they are engaged (Hirvonen & van Langenhove, 2021). Hence, acadpreneurs are legitimized as the moral compass for knowledge development and conduct research for the upliftment of the society (Al Ameri & Mohajeran, 2025).

Academic Spin-Offs [ASO]

Academia, with their vast intellectual resources, should be a breeding ground for innovative enterprises (Michele, 2017), otherwise, referred to as academic spin-offs [ASO]. Sultan et al. (2024) assert that universities play an indispensable role by conducting cutting-edge research that provide solutions to economic problems. Borges and Filion (2013) explains that academic spin-offs are technological ventures born inside a mother organization [university], and which receive a range of support from that organization. This is the basic principle of the Bayh-Dole Act (Balven et al., 2018). The Act stipulates that academia [especially, TTO personnel] and Faculty should work together to patent, licence, or start a new company aimed at commercializing an invention or discovery (Link et al., 2015). ASO refers to the start-up of a new business in the universities by researchers / academics [i.e., acadpreneurs], and the transfer of specific technology and knowledge developed in the universities to that business, wherein they [i.e., acadpreneurs] participate in the ownership of the business (Bolzani et al., 2021; Toledano & Gonzalez-sanz, 2024).

What distinguishes academic spin-offs from the conventional start-ups is that the former is often initiated from a research discovery and not necessarily form a clearly defined product and market need (Michele, 2017). Academic spin-offs, unlike the conventional spin-offs are mostly created by professors, researchers, and graduate students, who are themselves entrepreneurs (Musleh et al., 2025). While academic spin-offs have been achieved in some sectors of the Nigerian economy, such as, Cassava Energy, a spin-off company engaged in the conversion of cassava to biofuel by University of Lagos (Udoisoh, 2024). Energy Kiosk is another academia spin-off by academia which serves as potential solution to bridge energy access amongst undeserved communities (Abiola & Adeniyi, 2023). Similar feat is zero to none in the agricultural sector. This is a huge oversight that both academia and government should consider to enhance Nigeria FS status. Aye et al. (2025) note that the agricultural sector is among the most vulnerable sectors in Nigeria. Thus, the urgent pursuit of ASO focused on agriculture to salvage the country's FS status.

Food Security [FS]

In 1948, the Universal Declaration of Human Rights proclaimed that the right to food is a vital yardstick for adequate standard of living (Sultan et al., 2024). Thus, it is a constitutional right for every citizen to have sufficient food for consumption. Based on the 1996 World Food Summit, if all people, at all times have physical, social, and economic access to sufficient, safe, and nutritious diets that meets their consumption preference for sustainable living, then, food security is assumed to have been established (World Bank Group, 2025).

Ameh (2023) wrote that FS is a benchmark on how individuals, groups, or households get both the availability and accessibility to food for immediate consumption without compromising future consumption. According to Uduji and Okolo-Obasi (2023), FS is both the satisfactory supply and the capacity to produce the needed amount of food to the population unceasingly at a cost they can afford. Aluko (2020) describe FS as resilience to potential food supply shortages or disruption in the future. Aye et al. (2025) say that FS is ensuring that produced or imported food meets the dietary needs a country's population at national, regional, and local levels. Hence, FS is undoubtedly importance as it serves as the safety net to the society.

Oluwafemi et al. (2024) posit that 50% of the Nigerian population are living below the poverty line of \$1.9 [N1, 600.00] per day. Global Food Security Index (GFSI, 2022) report placed Nigeria as 107th out of 113 countries, and 25th out of 28 Sub-Saharan African countries on food security, with a total average score of 42.0%. This makes Nigeria one of the least food secure countries globally.

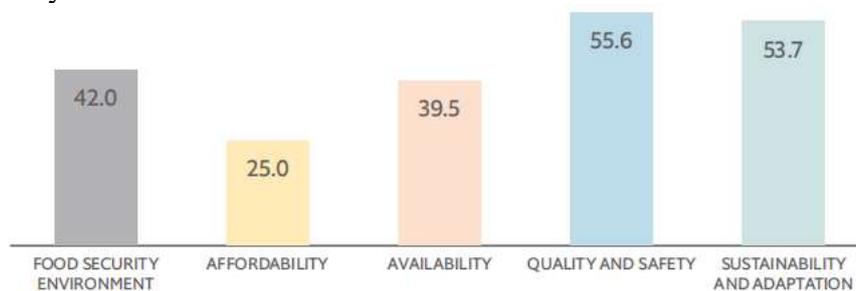


Figure 2. Global Food Security Index Scores for Nigeria in Sub-Saharan Africa
Source: Global Food Security Index 2022.

As shown in Figure 2, Nigeria highest scores across the four dimensions is 55.6 in the quality and safety category. However, the rising cost of food couple with majority of households living on poor per capita income creates affordability challenges for the population. Affordability had a score of 25, which apparently is the lowest score globally (GFSI, 2022). While government has waded in to salvage the situation through various programs, persistent hunger and poverty have continued to bedevil successive regimes, making it difficult for government alone to bring down food insecurity rising rate to a complimentary level. If necessary precautions are not implemented Nigeria may be left out to FAO call to eliminate hunger by 2030 (Oluwafemi et al., 2024). At this instance, GFSI (2022) recommends that developing and underdeveloped countries should embark on agricultural and development projects.

The world Food Summit in Rome, 1996 identified four potential pillars of FS which include availability, access, utilization, and stability (FAO, 1996). Two other pillars of agency and sustainability & adaptation (FAO, 2021) were added bringing FS pillars to six (Hassoun et al., 2025). However, according to the World Health Organization (WHO, 2004), the three pillars to determine FS are food availability, food access, and food use and misuse. In this study, four pillars are discussed.

Availability

This refers to the physical availability of food for consumption. Hassoun et al. (2025) note that food availability lay emphasis on food supply, which is often driven to a large extent on food production, stock levels, distribution, and net trade. Achieving FS requires that food gets to

expected consumers through effective food distribution system. Okparavero et al. (2024) states that food distribution system should have adequate storage facility to reduce food waste, reliable transportation system, and effective marketing strategies. GFSI (2022) ranked Nigeria 108th globally and 26th in the Sub-Saharan region on availability. A score of 39.5 points indicate a very weak FS status.

Affordability

Availability and affordability both impact FS, but they are distinct. World Bank Group (2025b) argue that an adequate supply of food does not literally translate to household level FS. While the former is driven by physical or digital proximity to food, the latter is driven by cost of the food (Igwe et al., 2024). Both interplay through the word 'access', but the access dimension of affordability is beyond physical, it includes consumer purchasing power and their preferences to foods of their choices (Uduji & Okolo-Obasi, 2023). Nigeria ranks last [113th] in GFSI (2022) report with a score of 25.0 points. This indicates very weak FS status and is major concern on FS in the country.

Quality and Safety

This is also known as the utilization dimension of FS. World Bank Group (2025b) describe utilization as the way the body makes the most of various nutrients in the food. Tweeten (1999) refers to utilization as the metabolism of food by individuals. Metabolism is a vital process that sustains healthy living. Metabolism helps to generate energy from consumed food, breakdown nutrients, and helps maintain growth (Alves et al., 2024). Thus, for FS to be achieved, the food consumed must be of good quality and safe to provide individual with the expected nutritional status when metabolized (Akem, 2022). Nigeria was ranked 79th overall and 7th in Sub-Saharan Africa in this category, making this dimension the highest among the four dimensions as shown in Figure 2. A score of 55.6 points indicate a good FS status.

Sustainability and Adaptation

The sustainability dimension emphasizes the stability of FS over time (Sultan et al., 2024). This implies that the availability, affordability, quality, and safety of food intake today should not jeopardize future intake (Tkemaladze, 2025). In this category, Nigeria ranks 57th and 8th around the globe and in Sub-Saharan African respectively, with 53.7 points, indicating a moderate FS status as shown in Figure 2.

Theoretical Review

Our study explores the Endogenous Growth Theory [EGT] (Romer, 2011) to explain the relationship between Acadpreneurship [AE], academic spin-offs [ASO], and Food Security [FS]. Developed in the mid-80s, by growth theorists like Kenneth Arrow, Paul Romer and Robert Lucas (Barro & Sala-i-Martin, 2004; Romer, 1994), EGT holds that investment in human capital, innovation, and knowledge are significant contributors to economy development (Romer, 1994). Hence, in our study, we posit that AE and ASO are critical components impacting FS trajectory in Nigeria. We allude that a sustained FS status is better owed to endogenous variables [e.g., policies that supports cutting-edge innovative research and knowledge transfer, which consequently result in a spin-off], rather than sole reliance on external forces [e.g., food aids from international agencies]. EGT focuses on academia as the

determinants for economic viability (Adisa et al., 2023), such that AE act as catalyst for human capital, innovation, and knowledge transfer (Guerrero et al., 2016; Imene et al., 2025) within an ecosystem. Howitt (2007; 2010) claim that economies that cease to transform themselves are destined to fall off the path of economic growth. Research indicates that innovation-driven start-ups established by entrepreneurial universities can generate additional income and sustain economic growth (Fischer et al., 2018). Similarly, Ugbor et al. (2025) claim that human capital, innovation, and knowledge spill-overs are drivers of economic growth. Consequently, our study reassert previous research that have considered EGT to clarify AE (e.g., Sandström et al., 2018; Ugbor et al., 2025; Urbano & Guerrero, 2013).

Hypotheses Development

Research has shown that one of the factors that may contribute to a new venture success is the academia (Abiola & Adeniyi, 2023). The academia is a citadel of knowledge that comprises of the professors, post-doc researchers, graduate students, and undergraduates (Formica et al., 2008). Camelo-Ordaz et al. (2025) contend that academics who are imbue with entrepreneurial orientation are more likely to develop product or business concept that can be explored for commercial, social, and economic benefits. The integrative review by Adisa et al. (2023) revealed that AE can significantly enhance socioeconomic development through the creation of spin-offs or technology transfer offices. Adisa et al. (2023) cited examples of academic students whose spin-offs have yielded positive impact such as NTim Cook [Apple Inc.], Larry Page and Sergey Brin [Google Inc.], Elon Musk [Tesla], and so forth.

Imene et al. (2025) interviewed students who received innovative label grant at Eltart University, Algeria; and found their willingness to transfer their entrepreneurial competencies to filed practices in the form of start-ups or spin-offs. Imene et al. (2025) study revealed that students considered their projects as a lever to support the economy in areas such as food security, education, water security, and health care. The study of Gunartin et al. (2023) on entrepreneurship skills and development among graduating students show great relevance on business start-ups. Musleh et al. (2025) argue that a blend of academic knowledge and entrepreneurial competencies can contribute to the creation of ventures for economic survival and growth. A study by Camelo-Ordaz et al. (2025) analyzed the effect of entrepreneurial team heterogeneity on university spin-offs. A positive effect was established indicating that the 'third mission' of the academia portends greater benefits to the economy.

According to Caputo et al., (2022), a successful ASO in the form of a rapidly growing technology, especially in an impoverished economic region is highly desirable for both the academia and policy makers. Okoro (2023) asserts that entrepreneurship development has a strong relationship with economic development of a society. Hence, it serves as an impetus to combat unemployment, social menace, and food insecurity. Egwu (2014) indicate that entrepreneurship development is a significant predictor of FS, job creation, poverty reduction, and sustainable economy. Sultan et al., (2024) investigated the role of universities and integrated farming in FS and found that Student Farmer Entrepreneur program is positively correlated with FS. This revealed that the program is crucial for promoting FS because it increases agricultural productivity, enhances food production locally, encourages sustainable agricultural practices, and supports rural development.

Szulczewska-Remi (2022) indicates that AE presents opportunities leveraged on entrepreneurial process to create spin-offs that become an integral part of the academia, society, or community. Ramadini et al. (2025) alludes that AE is an approach to transforming knowledge into tangible results that benefit the society and the economy. Verma and Shrivastava (2021) posit that entrepreneurial activities focused on agricultural opportunities could contribute immensely to boost food productivity and security. Oguegbe and Iloke (2023) claim that agriculture induced SMEs are vital in the economic growth and emancipation of African countries like Nigeria. Oguegbe and Iloke (2023) note that an entrepreneurial-based agricultural sector will enhance effective utilization of agricultural resources, promote economic development, provide food for the populace, reduce poverty rate, and improve the GDP of a nation. Simane et al. (2025) found a significant relationship amongst regional growth, FS, industrial growth, and employment generation. Given these empirical studies on AE, ASO, or FS, we hypothesize as follows:

H₁: Acadpreneurship [AE] has a significant effect on academic spin-offs [ASO]

H₂: Academic Spin-offs [ASO] have significant effect on food security [FS]

H₃: Academic Spin-offs [ASO] mediate significant effect between acadpreneurship [AE] and food security [FS]

Methodology

Study Participants

Through purposive sampling, graduate students in entrepreneurial universities in Nigeria, whose research has the potential of being monetized were used as our study participants. According to Statista report, 242,333 graduate students enrolled in Nigerian Universities in 2018 / 2019 academic session (Sasu, 2022). Entrepreneurial universities are those who have established business and entrepreneurship schools / departments, or who teach entrepreneurship as a course (Etzkowitz, 2017). We chose entrepreneurial universities because they have the potentials to use academic research to create university based companies [i.e., ASO] that are marketable (Adisa et al., 2023; Miller et al., 2018; Ramadini et al., 2025).

Sample Size

Given the sampling frame, 662 participants represent the sample size using Cochran (1977) formula on finite sample size determination. A threshold of 99% and $\pm 5\%$ was adopted as confidence level and margin of error respectively. The adequacy of the sample size is seemingly justified, using Tabachnick and Fidell (2013 p.123) recommendation, which posits that sample size $[N]$ should be calculated with respect to the numbers of independent variables in a study, i.e., $N > 50 + 8m$ (where m = number of independent variables).

Constructs Measurement and Scaling

We adapted existing measurement instrument to develop Acadpreneurship, Spin-Off, and Food Security Questionnaire [AESFSQ]. AESFSQ has three constructs [AE, ASO, & FS] and 40 observable items as shown in Table 1. All constructs were anchored on a five-point Likert-Scale with "1" denoting "Strongly Disagree" and "5" denoting "Strongly Agree" in the AESFSQ measurement instrument.

| Table 1. AESFSQ Measurement Constructs, Sources, and Items Adapted | | |
|---|-------|--|
| Measurement Instruments | Items | Adapted Sources |
| Acadpreneurship Scale [AE] | | Pacheco et al., (2024) |
| Research Expertise [RE] | 5 | Sidrat & Boujelbene (2020) |
| Innovativeness [IN] | 5 | Todorovic et al., (2011) |
| Collaboration [CL] | 5 | |
| Ethical Consideration [EC] | 4 | |
| Academic Spin-Off Scale [ASO] | 5 | Onwualu (2016) Balven et al., (2018) Abiola and Adeniyi (2023) |
| Food Security Scale [FS] | | Cafiero et al., (2018) |
| Availability [AV] | 4 | FAO (2022) |
| Affordability [AF] | 4 | GFSI (2022) |
| Quality and Safety [QS] | 4 | |
| Sustainability and Adaptation [SA] | 4 | |
| Total Items | 40 | |

Instrument and Data Collection

An electronic close-ended version of AESFSQ instrument, designed through Google Form as standard questionnaire, was used for data collection. More recent studies are opting for Google Form to reach respondents (e.g., Pacheco et al., 2024). Besides aiding computation into statistical software like the IBM SPSS version 28 used in our study, Sekeran and Bougie (2013 p. 159) argue that “electronic questionnaire is taking an increasing role in research with the increase in computer literacy”. The Google Form was opened from 2/3/2025 to 20/7/2025. Prior to the main study, a pre-test was carried out in two entrepreneurial universities to ensure the quality and effectiveness of AESFSQ measurement instrument. Due to the peculiarity of the study, respondents were approached purposefully [physical and virtual] to solicit their consent as participants in our study. The informed consent afforded us the opportunity to explain the purpose and procedures of the study while guaranteeing the confidentiality of the information solicited. Thereafter, an electronic questionnaire was directly mailed to the participants. The pre-survey meeting with the participants provided our research team the opportunity to compile the list and emails of participants. Necessary follow-ups were made during the data collection period. Our study is cross-sectional. Hence, responses were solicited once from participants.

Data Analysis

A case of missing data was not established due to the electronic form adopted. However, we screened for outliers through multivariate Mahalanobis Square of Distance (D^2) using a critical value of 18.47 for analysis with four independent variable (Pallant, 2020; Tabachnick & Fidell, 2013). The descriptive statistics of participants' socio-demographic data was analyzed using percentages and frequency tables with the aid of the Statistical Package for Social Sciences (SPSS v. 28) data editor for windows. To validate the stated hypotheses, we deplored a Structural Equation Model (SEM) analysis for the estimates. SEM is a two-system approach

instrumental for hypotheses and answering research questions (Hair et al., 2020). To confirm the factorial structure of AESFSQ measurement instrument, we first had to examine the reliability and validity of the items used to measure our theoretical constructs. We examined both internal consistency test, i.e., Cronbach's Alpha ($\alpha \geq 0.70$) [pilot and main study] and construct reliability test ($CR \geq 0.70$) [main study]. We examined the validity of the measurement instrument through construct, convergent, discriminate validate, and average variance extracted (AVE) tests. In our analysis, we employed renowned Goodness-of-Fit [GOF] indices such as $RMSEA \leq 0.08$; $CFI > 0.90$; $TLI > 0.90$; to access the theoretical framework (Browne & Cudeck, 1993; Marsh & Hocevar, 1985). The test of mediation was investigated through AMOS using non-parametric percentile bootstrapping approach with a sample of 2000 (Hair et al., 2019; Hayes et al., 2017; Preacher & Hayes, 2008). The significance of the mediation analysis was further confirmed with 95%BootLLCI-ULCI.

Results

Response Rate

606 participants responded to the Google Form out of the expected 662 responses. However, 34 responses were screened out based on satisficing responses as recommended by Ron et al. (2015 p. 688). Analysis of the Mahalanobis Square of Distance (D^2) revealed that only 3 responses [cases] were outliers because they were above the critical value of 18.47. Pallant (2020) notes that it is usual for large data set to have about 5 per cent of outliers. Hence, we did not remove these responses given the size of our data set that makes the outliers inconsequential. Besides, the 5% trimmed mean and mean values of each construct are mostly similar [see Table 3]. Therefore, we analysed only 572 participants' responses. This translates to 94.38% usable response rate.

Participants' Socio-Demographic Characteristics

A cross-tabulation of participants' socio-demographic characteristics, as shown in Table 2, revealed with respect to the female participants that 323 [56.5%] males took part in the survey. This implies that Nigerian universities enrol more male than female graduate students (Aderinto & Yenizzar, 2025). This is evident as our survey revealed more male Ph.D. [146; 26.0%] participants. 152 [26.6%] male participants spent between 5 - 7years on their academic research. This is about the maximum time duration for graduate programs in Nigerian academia, particularly, Ph.D. program (Abiodun-oyebanji, 2024). Most male participants [109; 19.1%] are employed as research associates providing research consulting services for firms in the industry. 66 [11.5%] male participants are CEO or directors of research spin-offs firms / academia business enterprises, while 84 [14.7%] male participants are holding managerial roles in similar kind of firms / enterprises.

Table 2. Cross-Tabulation Participants' Socio – Demographic Characteristics

| | Gender | | | | Total | |
|------------------------|--------|---|--------|---|-------|---|
| | Male | | Female | | Count | % |
| | Count | % | Count | % | | |
| <i>Academic Status</i> | | | | | | |

| | | | | | | |
|------------------------------------|------------|-------------|------------|-------------|------------|------------|
| Post-Graduate Diploma | 29 | 5.1 | 31 | 5.4 | 60 | 10.5 |
| M. Sc. [Master] | 99 | 17.3 | 74 | 12.9 | 173 | 30.2 |
| Ph. D. | 149 | 26.0 | 106 | 18.5 | 255 | 44.6 |
| Post - Doc. | 46 | 8.0 | 38 | 6.6 | 84 | 14.7 |
| Academic Research Length | | | | | | |
| 1 - 4 years | 117 | 20.5 | 86 | 15.0 | 203 | 35.5 |
| 5 – 7 years | 152 | 26.6 | 116 | 20.3 | 268 | 46.9 |
| 8 – 10 years | 37 | 6.5 | 32 | 5.6 | 69 | 12.1 |
| Above 10 years | 17 | 3.0 | 15 | 2.6 | 32 | 5.6 |
| Academic Spin-Offs Position | | | | | | |
| CEO / Director | 66 | 11.5 | 53 | 9.3 | 119 | 20.8 |
| Managerial Level / Role | 84 | 14.7 | 64 | 11.2 | 148 | 25.9 |
| Research Associates | 109 | 19.1 | 82 | 14.3 | 191 | 33.4 |
| Not Applicable | 64 | 11.2 | 50 | 8.7 | 114 | 19.9 |
| Industry Career Length | | | | | | |
| 1 - 3 years | 58 | 10.1 | 49 | 8.6 | 107 | 18.7 |
| 4 - 7 years | 68 | 11.9 | 64 | 11.2 | 132 | 23.1 |
| 8 - 10 years | 95 | 16.6 | 66 | 11.5 | 161 | 28.1 |
| 10 years Above | 60 | 10.5 | 38 | 6.6 | 98 | 17.1 |
| Not Applicable | 42 | 7.3 | 32 | 5.6 | 74 | 12.9 |
| Total | 323 | 56.5 | 249 | 43.5 | 572 | 100 |

Source: Field Survey (2025).

Constructs' Items Descriptive Analysis

Table 3 shows that constructs' items were reasonably normally distributed given the mean and SD values of each construct. The skewness and kurtosis of the items mostly fell within the acceptable critical value of $z = \pm 2.58$; $p = 0.01$ (Pallant, 2020). The Normal P-P plot for each construct shows a reasonably straight diagonal line from bottom to top, suggesting no major deviations from normality (Tabachnick & Fidell, 2019). The Cronbach Alpha value of all 40 items ($\alpha = 0.951$) exceed the threshold of $\alpha \geq 0.70$, indicating good internal consistency (Cronbach, 1951) and the degree to which responses are consistent across the items within a measure. This suggests all items are measuring their underlying constructs (Hair et al., 2020). By inference, the reliability of our measurement instrument is suitable for practical research.

Table 3. Average Mean, Standard Deviations, and Reliability

| Constructs | Items | Mean | SD | 5% Trimmed Mean | Alpha (α) |
|--------------------------|-------|-------|------|-----------------|--------------------|
| Acadpreneurship [AE] | 19 | 78.00 | 9.26 | 78.39 | 0.951 |
| Academic Spin-Offs [ASO] | 5 | 15.17 | 3.47 | 15.39 | |
| Food Security [FS] | 16 | 61.21 | 9.62 | 61.51 | |

Source: SPSS Output Table (2025).

Psychometric Validation

Assessing the Measurement Model Fit and Validity

We followed a two-step SEM process to assess the hypothesized model validity [Hair 2019]. In the first step, the reflective measurement model fit was tested through Maximum Likelihood Estimates [MLE] method (Kline, 2015), using CFA statistical Goodness-of-Fit [GOF] indices and other elements of construct Validity (Browne & Cudeck, 1993; Marsh & Hocevar, 1985) as shown in Tables 4 and 5 respectively.

Table 4. Model Results

| Goodness-of-Fit Statistics | Measurement | Structural | Threshold | Remarks |
|---|-------------------|-------------------|-------------------|-----------------------------------|
| | Model | Model | | |
| | 40 Items | | | |
| Chi-Square (χ^2) / <i>df</i> | 2674.271 / 724 | 2720.510 / 725 | Sensitive to size | |
| Absolute Fit Measures | | | | |
| P-value | 0.000 | 0.000 | $P > 0.05$ | |
| Normed Chi-square (CMIN/DF) | 3.693 | 3.752 | $r < 5^*$ | Supported |
| Root M. Sq. Err of Appr. (RMSEA) | 0.062 | 0.061 | $\leq 0.08^{**}$ | Supported |
| Incremental Fit Indices | | | | |
| Comparative Fit Index (CFI) | 0.911 | 0.908 | $> 0.92^{***}$ | Reasonable Fit^a |
| Tucker-Lewis Index (TLI) | 0.907 | 0.905 | $> 0.92^{***}$ | Reasonable Fit^a |
| Parsimony Fit Measures | | | | |
| Parsimony Normed Fit Index (PNFI) | 0.614 | 0.612 | $> 0.6^{****}$ | Supported |

Source: AMOS Output Table (2025)

^aCut-off values are relaxed for complex model (Hair et al., 2019; Marsh et al., 2004)

*Ratios not greater than 5 indicate a reasonable fit (Zainudin, 2014)

**Values of about 0.08 or less would indicate a reasonable fit (Browne & Cudeck, 1993)

***Values closer to 1 indicate a very good fit (Bentler, 1983; Zainudin, 2014)

****No commonly agreed cut-off, but > 0.06 indicates good fit (Shadfar & Malekmohammadi, 2013)

Both AE and FS are specified as second-order constructs, with their respective first-order latent factors having a minimum of four observable items [indicators] respectively, indicating that the model is statistically identified (Byrne, 2016). All 40 items have standard factor loading, each between $0.5 \geq x \leq 0.88$ values, indicating the fulfilment of unidimensionality assumption. That means, all items loaded highly on their respective constructs (Anderson et al., 1987; Hattie, 1985). The outcome of the measurement model demonstrated a reasonable data-fit with Normed Chi-Square (χ^2/df ratio; $2674.271 / 724$) = 3.693, RMSEA = 0.062, CFI = 0.911, TLI = 0.907, and PNFI = 0.614. All values are mostly within CFA recommended threshold values (Byrne, 2016; Hair et al., 2019), suggesting that the measurement model largely fits the sampled participants. This submission was further verified by investigating the model construct validity through convergent validity, discriminate validity, construct reliability (CR), and average variance extracted (AVE). The outcome, as shown in Table 5, demonstrated expected statistical support for the hypothesized model. For instance, the convergent validity outcomes indicate that all 40 items of the measurement instrument converged and shared a high

proportion of variance in common to measure the constructs under review (Cooper & Schindler, 2014). Also, the discriminate validity values indicate that when the constructs are analyzed separately, they are unrelated (Sekeran & Bougie, 2013). This implies that each construct captures different phenomena.

Table 5. CFA Validity and Reliability Assessment Test

| | CR | AVE | (α) | AE | ASO | FS |
|----------------------------------|-------|-------|--------------|--------|------------------|----------------|
| AE | 0.947 | 0.500 | 0.895 | 1 | 0.44** | 0.47** |
| ASO | 0.839 | 0.513 | 0.847 | 0.667* | 1 | 0.41** |
| FS | 0.945 | 0.522 | 0.918 | 0.689* | 0.639* | 1 |
| | | | | | Threshold | Remarks |
| Construct Reliability (CR) | | | | | CR \geq 0.70 | Supported |
| Average Variance Extracted (AVE) | | | | | AVE \geq 0.50 | Supported |
| Cronbach's Alpha (α) | | | | | $\alpha >$ 0.60 | Supported |
| Convergent Validity | | | | | CR $>$ AVE | Supported |
| Discriminant Validity | | | | | MSV $<$ AVE | Supported |

Legend: Significance Level: *0.01 (2-tailed) = correlation estimates among constructs.

**Maximum Shared Variance (MSV) = values above the diagonal are squared

AE = Acadpreneurship, ASO = Academic Spin-Offs, FS = Food Security, CR = Construct Reliability, AVE = Average Variance Extracted.

Assessing the Baseline Structural Model Validity

In the second step, we transitioned from the measurement model to the structural model to produce validated empirical results. This enabled us to investigate the causal relationship and specify the nature of relationship amongst our constructs. The structural model outcomes, as shown in Table 4 and depicted in Figure 3, revealed $p = .00$, Normed Chi-Square (χ^2/df ratio; $2720.510 / 725$) = 3.752, RMSEA = 0.061, CFI = 0.908, TLI = 0.905, and PNFI = 0.612. Minimal discrepancies existed between values of the measurement and structural model. This is due to the latter having fewer structural paths to run its course (Kline, 2015; Sharma et al., 2005). The p -value is expected to be non-significant (Hooper et al., 2008), but this is frequently unrealistic, often due to the sensitivity of the chi-square (χ^2) to large sample size (Hair et al., 2019). Hence, reliance on other GOF indices, i.e., at least one absolute fit index and one incremental fit to examine the structural model validity. Holistically, the structural model results in Table 4 are within statistical allowance (Hu & Bentler, 1999; Shadfar & Malekmohammadi, 2013). The results imply that the hypothesized model represented the sampled population [i.e., data-fit], produced reasonable GOF statistics, and is theoretically valid.

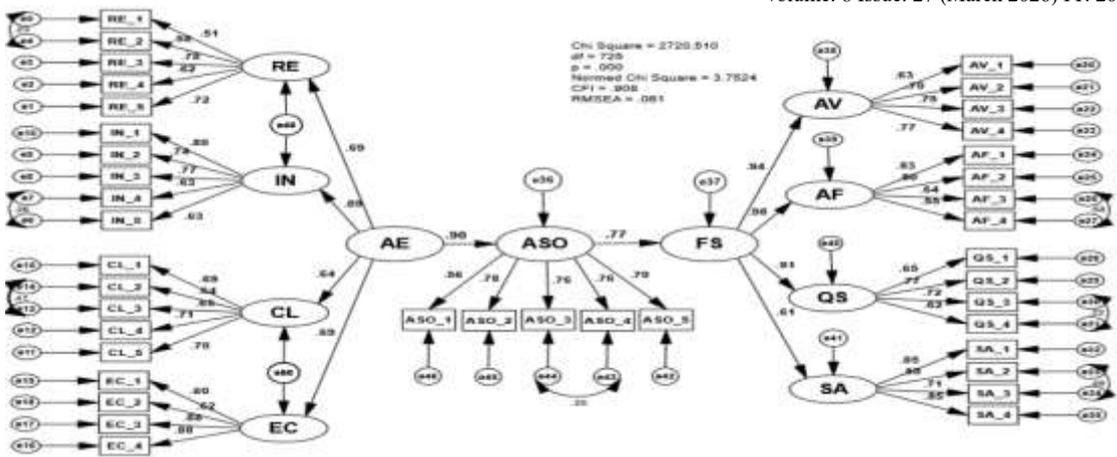


Figure 3: Structural Model

Notes: RE = Research Expertise, IN = Innovativeness, CL = Collaboration, EC = Ethical Orientation, ASO = Academic Spin-Offs, AV = Availability, AF = Affordability, QS = Quality and Safety, SA = Sustainability and Adaptation, AE = Acadpreneurship, FS = Food Security.

To further validate the data-fit of our hypothesized model, we inspected the structural model free parameters to determine their practical [$\beta > .15$] and statistical [$p < .05$] significance respectively [see, Figure 3]. The outcomes, as shown in Table 6, revealed

Table 6. Estimates of the Hypothesized Structural Model

| | Std. Reg. | | | |
|----------|-----------------------|------|--------|-----|
| | Estimates (β) | S.E. | C.R. | P |
| ASO ← AE | .90 | .141 | 11.574 | *** |
| FS ← ASO | .77 | .052 | 11.832 | *** |

Source: AMOS Output Table (2025)
 Legend: AE = Acadpreneurship, ASO = Academic Spin-Offs, FS = Food Security, Std. Reg. Estimates = Standardized Regression Weights (β value), S.E. = Standard Error of Regression Weights, C.R. = Critical Ratio of Regression Weights, P = p -value at 0.05 significant level

that both hypothesized standardized structural path estimates are practically and statistically significance. Their path estimates, as shown in Table 6, are H_{1ASOAE} : $\beta = .90$, $p = 0.000$ and H_{2FSASO} : $\beta = .77$, $p = 0.000$, indicating that AE and ASO can practically and significantly enhance FS.

Test of Mediation

One hypothesis was specified to test the mediating effect of ASO on the relationship between AE and FS. ASO was specified as a mediator to examine the indirect effect of AE on FS. Hair et al. (2019) contend that indirect effects are those relationships that involve a sequence of relationships with at least one intervening construct. According to Kenny and Judd (2014), ‘part a’ [i.e., ASO ← AE] and ‘part b’ [i.e., FS ← ASO] are the most essential steps required to establish mediation. Hence, we did not specify the direct effects, i.e., part c [c’] in our model.

However, Hair et al., (2019) established that if the product of the standardized co-efficient of 'part a' and 'part b' is greater than 0.08, then mediation exists.

Table 7. Mediation, Indirect Effects, and Bootstrapping Estimates

| Relationship of the Variables | Indirect Effect (β) | Standard Error (S.E) | BootLL 95%CI | BootUL 95%CI | Mediation |
|-------------------------------------|-----------------------------|----------------------|--------------|--------------|-----------|
| FS \leftarrow ASO \leftarrow AE | 0.69 | 0.043 | 0.611 | 0.776 | Partial |

Source: SPSS Output Table (2025)

Legend: Independent variables (AE – Acadpreneurship), Mediator (ASO – Academic Spin-Offs), Dependent variable (FS – Food Security), β – Standardized Path Coefficients, S.E – Standard Error, LL – Lower Level, UL – Upper Level, CI – Confidence Interval

***Significance levels ($p < 0.05$).

We analyzed for indirect effect, as shown in Table 7, to determine if ASO has a full or partial mediation. The standardized co-efficient product [β] of 'part a' [.90] and 'part b' [.77] = .69, indicating the presence of a mediation effect between AE and FS. In addition, we observed that a previously significant direct estimate between AE and FS reduced with the presence of the intervening construct, indicating that variations in AE account for variations in the ASO as a mediator, which consequently led to variations in the outcome variable - FS. Baron and Kenny (1986 p. 1176) posit that once a mediation occurs in an equation, it is expected to change the initial relationship between independent variable and dependent variable or at least, reduce the relationship between independent and dependent variable. Hair et al., (2019) assert that a partial mediation will be assumed if the relationship between 'X' and 'Y' is reduced but remains significant when 'M' is included.

Since, "bootstrapping provides the most powerful and reasonable method of obtaining confidence limits for specific indirect effects under most conditions" (Preacher & Hayes, 2008 p.886), such as testing the significance of a mediating variable. Hence, we tested the significance level of the mediation effect through bootstrapping. Hayes (2013) say that if the confidence interval (CI) of indirect effect does not cross zero or zero is not included in the confidence interval, then mediation is assumed to be significant. Our indirect effect bootstrap outcome of AE on FS through ASO, i.e., H_3 : [Indirect Effect, β] IE = .69, SE = 0.043, $p < 0.05$; 95% CI = 0.611 - 0.776, is practically and statistically significant. Given these analyses, we submit that ASO has a significant partial mediating effect on the relationship between AE and FS.

Decision Rule

The outcomes of H_1 , H_2 , and H_3 have significant structural path coefficients. Hence, all specified alternate hypotheses were accepted as predicted, indicating the mediating effect of academic spin-offs on acadpreneurship and food security in Nigeria.

Discussion

The uniqueness of our study is to establish an empirical relationship between AE, ASO, and FS. Most literature examined these constructs individually (Aye et al., 2025; Caputo et al., 2022; Garcez et al., 2025; Ilie & Budac, 2025). Hence, there is seemingly a dearth of research on these constructs holistically, such as being pioneered by our study. However, fragmentarily,

aspects of our findings are consistent with existing literature. For instance, the descriptive analysis of participants' socio-demographic characteristics aligns with Ayeni et al. (2024) and Sasu (2022) statistics on reduced gender disparity amongst graduate students in Nigeria. In our study, this is represented as 56.5% and 43.5%, in ratio 1.29:1, for male and female respectively. The outcome of H_{IASOAE} , shows that AE significantly predicts ASO. We established support for this fragmentary outcome in the literature. Ferretti et al., (2020) note that academia are not only seen as educators, but have evolved to modern-day researchers who contributes to societal and economic exploitation through their research discoveries, intellectual property [IP], or tacit knowledge. Correia et al., (2024) argue that AE has trajectory arose the third mission of universities, which is the establishment of ASO or other related academia-industry linkage projects such as Technology Transfer Offices (TTO), consultancy services, incubation centers, university enterprises, professorial chairs, and so forth (Compagnucci & Spigarelli, 2020; De Jong et al., 2014; Onwualu, 2016; Todorovic et al., 2011). Our study found a positive significant interaction between AE and ASO, indicating that entrepreneurial opportunities or business enterprises can be successfully achieved when academia transfer innovative ideas, and share core technologies for industry use. Our findings show that research conducted by students and academia can be a starting point for entrepreneurial orientation, confirming prior studies. For instance, Pacheco et al. (2024) view academia transfer of knowledge and technology as a multidisciplinary approach that can influence entrepreneurial activities in higher education institutions. Adisa et al. (2023) revealed that AE can significantly enhance socioeconomic development through the creation of spin-offs or technology transfer offices. Hence, our results conform to the demand and inclusion of AE in public and economy service, as a third mission that must be embraced by academia in the 21st century.

Other fragment finding in our study also show that ASO can predict FS stability [H_{2FSASO}]. In Nigeria, and substantial parts of the Globe, maintaining FS has been quite a challenging task (Kotur et al., 2024; Oluwafemi et al., 2024; Tkemaladze, 2025). We argue that FS should not be left only at the beehive of government, it should be a multifaceted effort of theory, policy, and practice in synergy to place food at the request of every household at all times. Hence, we charted an empirical interaction between ASO and FS. Our results show that ASO is positively related to FS, confirming extant studies (Dhekney et al., 2025; Perez-Ruiz et al., 2013; Sultan et al., 2024). Our position was recently advocated for by Sharubutus (2025) who reiterated the need for Nigerian universities to establish ASO. The implication is that ASO can boost innovative agricultural solutions, enhance sustainable agricultural practices, lead to the development of new food technologies [e.g., precision agriculture, food processing quality and availability], and can impact policy or decision making related to FS. Statistics reveal that the establishment of ASO, such as Adaviv, an AI-assisted farm optimization MIT spin-off in other clime, have contributed immensely to their FS (Onyeaka et al., 2024). A full fleshed ASO or university spin-off is yet to materialize in Nigeria, except individual self-entrepreneurial efforts who moved their knowledge or discoveries from the laboratories to the market (Udoisoh, 2024). Oguegbe and Iloke (2023) claim that agriculture induced SMEs are vital in the economic growth and emancipation of African countries like Nigeria. Therefore, an entrepreneurial-based agricultural sector, in the form of ASO, will reduce poverty rate, provide food for the populace, and improve GDP of Nigeria.

Another finding from our study is that ASO will partially mediate a significant relationship between AE and FS [H_3]. This explains that AE can indirectly stimulate FS, thus, contributing to economic growth. The implication is that ASO established through AE can yield broader research into agricultural challenges, leading to better trained graduates (Musleh et al., 2025),

who can later impact FS through their contributions. Indirectly, AE can develop skilled workers through ASO entrepreneurial activities to support sustainable agriculture and food-related industries. Academia research, discoveries, and innovative outputs through commercialization [i.e., ASO] can shape FS policies. Existing research have highlighted the relevance of agricultural improved policy decisions on farmers and food system of a country (Dhekney et al., 2025). Siegel and Wright (2015a) emphasized that academia are encouraged to link their work more closely to the economic needs of the society. Wang et al. (2021) posit that if universities stay awake to their mission [i.e., creation of spin-off or the transfer of knowledge for commercial use], indirectly, they will become key players in promoting national and regional economic and social development, such as FS. AE through ASO can lead into forming partnership with companies, NGOs, and government agencies to enhance FS. The implication of such network is the sharing of agricultural knowledge, funding, and resources that supports FS. Indirectly, AE will enhance FS initiatives, when ASO begins to attract venture capital or agric-technology food innovations. Consequently, leading to healthier communities, improved nutrition awareness, and enhanced sustainable consumption pattern.

Given these findings, we thus advocate a paradigm shift, demonstrating the significant mediating effect of ASO on the interaction between AE and FS. We show that this effect has the propensity to improve long-term food availability, affordability, quality and safety, sustainability, reduce food waste, and boost rural economies. Thus, it becomes essential for universities to establish ASO, wherein academic research, innovations, or discoveries can be turned to marketable agricultural solutions.

Conclusion

Literature is replete with studies on entrepreneurship but shows dearth of research establishing interactions between acadpreneurship [AE], academic spin-offs [ASO], and food security [FS], particularly, in Nigeria. In our study, we established that AE, which is the commercialization of academic discoveries, innovation, or intellectual property through ASO can drive economic growth such as FS. Our results support our argument that if academia transfer their research findings and technologies to the industry by creating ASO, new agricultural business models, practices, products or services can evolve to enhance food security. Hence, we conclude that collaboration between the academia, industry, and government can bring research-based agricultural innovations to the market to improve the food basket of the Nation.

Implications of the Study

The present study in intended to contribute to the discussion on different issues related to AE. This is focused on diverse perspectives based on experiences drawn from the entrepreneurial universities in Nigeria. Hence, the implication of our study comes in three hold folds - theoretical, policy, and practical implications.

Theoretical Implications

Our research fills some lacuna in the literature. It added to body of knowledge on entrepreneurship, particularly, one that establishes an empirical interaction between AE, ASO, and FS. Most studies have only investigated the relationship between academia and entrepreneurship, or considered the relationship between academic entrepreneurship [AE] on spin-offs, but very few studies have examined the three variables [i.e., AE, ASO & FS]

holistically (Oguebe & Iloke, 2023), in order to examine their interaction effects. Our study pioneered this investigation, thus, providing further theoretical insights on their underlying dynamics and relationships. By implication, our results extend the literature on entrepreneurship, academic spin-offs, and food security.

Policy Implications

The relevance of the academia is increasingly been sought after (Siegel & Wright, 2015b), with huge pressure to link their work more closely to the economic needs of the society (Martin, 2012). By implication, our results suggest that the interactions of AE, ASO, and FS will provide the opportunities for academia to influence policy formulation in the food industry or the agricultural sector. Indirectly, academia can help to improve policy decisions that benefit farmers, food producers and consumers. The creation of ASO can be a facilitation platform where different stakeholders partake in decision making to enhance food security. Hence, our integration of ASO as a mediator between AE and FS is multi-purposeful.

Practical Implications

While our list is not exhaustive, we group the practical implications of our results in multi-layers; the individuals, the community / Society, and the government. The individual like the faculty or students benefit through the commercialization of their research, indicating a form of economic empowerment. Besides, Faculty and students can use ASO to leverage on collaboration and partnership with other researchers, NGOs, and governmental agencies. Members of the community benefit with respect to employment opportunity through ASO, community development such as access to nutritious food, promotion of environmentally friendly agricultural practices that enhances food sustainability, establishing training outreach and extension services that facilitate capacity building, providing research support for local and small scale farmers and so forth. Apart from the collaboration on policy making, practically successful ASO or start-ups can generate tax revenue for government. ASO can augment government's creation of job opportunities. ASO can stimulate economic growth through development of innovative-driven industries, thus, helping to address societal challenges such as food insecurity. Given these implications, we assert that acadpreneurs can play pivotal role in the agricultural sector to help reduce poverty, increase standard of living, and enhance FS in Nigeria. Ditto, to other nations.

Limitations and Future Research

Limitations are evident in terms of common method bias, given that our study is cross-sectional. Future research may opt for longitudinal study through a case study approach on some ASO to investigate their variation effects on FS. Our study was limited by the scarcity of databases on AE, ASO, and FS as a one-stand literature. Hence, we fragmentarily sourced for literature to holistically bring the three variables together in a single study. Future research is encouraged in this direction to verify our results. Our study did not consider any moderators. Moderating variables often have directional effect change on the outcome variable, in our case, FS. Our results should be interpreted in the light of different moderating variables such as intellectual property ownership [IP], patent and licensing issues, funding, climate change, and regulatory hurdles. Future research may consider a conceptual model to include any of these moderating variables that examines the interaction between AE and FS. Our study did not

include farmers as participants, their input through interview or a qualitative methodological approach can provide insights into the FS of a nation.

Recommendations

Some academia in Nigeria, through the establishment of Entrepreneurship and Skill Development Centres or Departments are promoting entrepreneurial spirit (Adisa et al., 2023). However, more effort is needed on the creation of academic spin-offs, particularly, in the agricultural sector to promote FS in Nigeria. A way to achieve a sustainable ASO can be through university-industry-government-community collaboration and partnerships to ensure efficient transfer of academic knowledge, discoveries and innovations.

Government should place priority on academic research, e.g., provide better funding opportunities and better welfare packages to stimulate the interest of the academia to engage in impactful research for the economy. As being encouraged by the National University Commission [NUC] to make entrepreneurship become a must offered course in higher institution of learning, further step can be taken to give academia the opportunity to mentor students to start a business of their choice as a major discipline, which can subsequently lead to the award of their degree certificate. This will place them better off on full supervision by their Faculties, and may possibly turn out as academic spin-off companies [ASO] affiliated to the university. Imene et al. (2025) disclosed that this practice can project academia in a more suitable position to establish spin-offs for societal benefits. Onwualu (2016) posited that steps should be taken to ensure that research projects for undergraduate and graduate [i.e., B.Sc., M.Sc., and Ph.D.] degrees should be tailored towards solving a regional, national, or global problem. Though, Oguegbe and Iloke (2023) posit that entrepreneurship in agriculture is still at its fancy stage, the outcome of this study should have significant push to the drive on acadpreneurship in our institutions of learning. It may further capture the minds of the Gen-Z cohort whose interests are focused on other sectors of the economy. If well implemented, AE may be a pathway to reinforce the crusade on FS.

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References

- Abiodun-oyebanji, O. J. (2024). Student factors as correlate of completion time of Ph.D. programmes in public universities in Southwestern Nigeria. *International Journal of Research and Innovation in Social Science*, 8(7), 2395–2401. <https://doi.org/10.47772/IJRISS.2024.807187>
- Abiola, F. O., & Adeniyi, I. S. (2023). Academic Spin-Off in Nigeria with an energy kiosk as an illustrative: a literature review. *International Journal of Innovative Science and Research Technology*, 8(9), 1138–1143. <https://doi.org/IJISRT23SEP909>
- Aderinto, S., & Yenizzar, Y. (2025). Higher education professional feminine deficits in health sciences in Nigeria. *Getsempena Health Science Journal*, 4(1), 33–40.
- Adisa, T. A., Adekoya, O. D., Abdulraheem, I., & Sani, K. F. (2023). Academic entrepreneurship: promoting economic and societal developments. In I. Abdulraheem & T. A. Adisa (Eds.), *Academic Entrepreneurship in Nigeria: A Book of Reading* (Issue March, pp. 113–140). University of Abuja Press: Nigeria.
- Akem, T. E. (2022). Public Health and Food Security, focusing on utilization. *Medical Representative Case Study*, 7(1).
- Al Ameri, A. N. H., & Mohajeran, B. (2025). Analysis of the relationship between moral intelligence and social adaptation, academic resilience and academic self-efficacy: the mediating role of academic ethics. *Ethics in Science and Technology*, 20, 187–197.
- Aluko, O. I. (2020). Agricultural policy and food security in Nigeria: a rational choice analysis. In *The palgrave handbook of agricultural and rural development in Africa* (pp. 475–491). Springer.
- Alves, V., Furtado, G. D. F., & Alves Macedo, G. (2024). Structured lipids: importance in metabolism and health. In *Chemical and enzymatic interesterification for food lipid production* (pp. 47–56). Cham: Springer Nature Switzerland.
- Ameh, E. U. (2023). Effect of bandits' attacks on food security in Nigeria: a review. *African Journal of Agriculture and Allied Sciences*, 3(1), 95–105.
- Anderson, J. C., Gerbing, D. W., & Hunter, J. E. (1987). On the assessment of unidimensional measurement: internal and external consistency and overall consistency criteria. *Journal of Marketing Research*, 24, 432–437.
- Atobatele, A. J., Suleiman Adamu, I., Oladoyin, A. M., Olaoye, O. P., & Dele-dada, M. (2025). X-ray of agricultural development programme and food security in Nigeria. *Agriculture & Food Security*, 14(1), 10.
- Aye, G. C., Kotur, L. N., & Ater, P. I. (2025). Threshold effects of economic- policy uncertainty on food security in Nigeria. *Journal of Risk and Financial Management*, 16(2), 68–88. <https://doi.org/10.3390/jrfm18020068>
- Ayeni, E. O., Jacob, O. N., & Nonyelum, E. I. (2024). Gender mainstreaming and tertiary education in Nigeria: a proposal to replace structural violence with peacebuilding. *American Journal of Education and Evaluation Studies*, 1(2), 31–40. <https://semantjournals.org/index.php/AJEE>
- Balven, R., Fenters, V., Siegel, D. S., & Waldman, D. (2018). Academic entrepreneurship: The roles of identity, motivation, championing, education, work-life balance, and organizational justice. *Academy of Management Perspectives*, 32(1), 21–42. <https://doi.org/10.5465/amp.2016.0127>
- Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, 51(6), 1173–1182. <https://doi.org/10.1177/1350506818764762>

- Barro, R. J., & Sala-i-Martin, X. (2004). *One-sector models of endogenous growth: economic growth* (Second ed.). McGraw-Hill.
- Belitski, M., & Aginskaya, H. (2018). Defining academic spinoffs and entrepreneurial university. In A. Presse & O. Terzidis (Eds.), *Technology Entrepreneurship: Insights in New Technology-Based Firms, Research Spin-Offs and Corporate Environments* (pp. 211–223). Springer International Publishing.
- Bentler, P. M. (1983). Simultaneous equation systems as moment structure models - With an Introduction to Latent Variable Models. *Journal of Econometrics*, 22, 13–42.
- Beyene, S. D. (2023). The impact of food insecurity on health outcomes: empirical evidence from sub-Saharan African countries. *BMC Public Health*, 23, 338.
- Bolzani, D., Rasmussen, E., & Fini, R. (2021). Spin-offs' linkages to their parent universities over time: the performance implications of equity, geographical proximity, and technological ties. *Strategic Entrepreneurship Journal*, 15, 590–618.
- Borges, C., & Fillion, L. J. (2013). Spin-off process and the development of academic entrepreneur's social capital. *Journal of Technology Management & Innovation*, 8(1), 21–34. <https://doi.org/10.4067/S0718-27242013000100003>
- Browne, M. W., & Cudeck, R. (1993). Alternative ways of accessing model fit. In K. A. Bollen & J. S. Long (Eds.), *Testing structural equation models* (pp. 136–162). Sage.
- Byrne, B. M. (2016). *Structural equation modeling with AMOS: Basic concepts, applications and programming* (3rd ed.). Routledge. <https://doi.org/10.4324/9781315757421>
- Cafiero, C., Viviani, S., & Nord, M. (2018). Food security measurement in a global context: the food insecurity experience scale. *Measurement*, 116, 146–152. <https://doi.org/10.1016/j.measurement.2017.10.065>
- Camelo-Ordaz, C., Diáñez-González, J. P., Franco-Leal, N., & Sousa-Ginel, E. (2025). The Social Innovation of Academic Spin-Offs From a Multilevel Approach. *Corporate Social Responsibility and Environmental Management*, 32(3), 3246–3261.
- Caputo, A., Charles, D., & Florentino, R. (2022). University spin-offs: entrepreneurship, growth and regional development. *Studies in Higher Education*, 47, 1–20.
- Celik, Ö. M., Ozyildirim, C., & Karacil Ermumcu, M. S. (2023). Evaluation of food insecurity and its association with food consumption and some variables among college students. *Journal of Health, Population, and Nutrition*, 42, 90.
- Cochran, W. G. (1977). *Sampling Techniques*. John Wiley & Sons.
- Compagnucci, L., & Spigarelli, F. (2020). The third mission of the university: a systematic literature review on potentials and constraints. *Technological Forecasting and Social Change*, 161(120284). <https://doi.org/10.1016/j.techfore.2020.120284>
- Cooper, D. R., & Schindler, P. S. (2014). *Business research methods* (12th ed.). New York, NY: McGrawHill / Irwin.
- Correia, M. P., Marques, C. S., Silva, R., & Ramadani, V. (2024). Academic Entrepreneurship Ecosystems : Systematic Literature Review and Future Research Directions. *Journal of the Knowledge Economy*, 15, 17498–17528. <https://doi.org/10.1007/s13132-024-01819-x>
- Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, 16(3), 297–334.
- Dabić, M. (2021). Entrepreneurial university in the European union — EU in the EU. *Journal of the Knowledge Economy*, 12(1), 115–119. <https://doi.org/10.1007/s13132-018-0579-0>
- Danlami, I. A. (2024). Corruption and economic growth in Nigeria: dynamic causality and asymmetric relationships. *Journal of Financial Crime*, 31(4), 922–937.

- De Jong, S., Barker, K., Cox, D., Sveinsdottir, T., & Van den Besselaar, P. (2014). Understanding societal impact through productive interactions: ICT research as a case. *Research Evaluation*, 23(2), 89–102. <https://doi.org/10.1093/reseval/rvu001>
- Dhekney, S. A., Zebelo, S., Sardaru, P., Natarajan, P., Tubene, S. L., Nindo, C., Mukwa, L. F. T., Dida, M. M., & Kairo, M. T. (2025). Addressing global food security in Africa through training of next generation of researchers in plant pest diagnostics, in vitro culture, and clean plant production. *In Vitro Cellular & Developmental Biology - Plant*, 1–20. <https://doi.org/10.1007/s11627-024-10512-2>
- Djurayeva, M. (2025). Issues of small business and private entrepreneurship development. *International Journal of Artificial Intelligence*, 1(3), 596–598.
- Egwu, I. L. (2014). Entrepreneurship development in Nigeria: a review. *IOSR Journal of Business and Management*, 16(1), 1–7.
- Erdos, K. (2009). The academic entrepreneur: myth or reality for increased regional growth in Europe. *Research Gate*, 3–9.
- Etzkowitz, H. (1983). Entrepreneurial scientists and entrepreneurial universities in American academic science. *Minerva*, 22(1), 198–233. <https://doi.org/10.1007/BF01097964>
- Etzkowitz, H. (2016). The Entrepreneurial University: Vision and Metrics. *Industry and Higher Education*, 30(2), 83–97. <https://doi.org/10.5367/ihe.2016.0303>
- Etzkowitz, H. (2017). Innovation Lodestar: the entrepreneurial university in a stellar knowledge firmament. *Technological Forecasting and Social Change*, 123, 122–129.
- FAO. (1996). *Rome declaration on food security and world food summit plan of action*. Available at. <http://www.fao.org/docrep/003/w3613e/w3613e00.htm>
- FAO. (2021). *The state of food security and nutrition in the world 2021: transforming food systems for food security, improved nutrition and affordable healthy diets for all*, In brief (p. 7). Available at. <https://doi.org/doi:10.4060/cb5409en>
- FAO. (2022). *2.1 Food security indicators: latest updates and progress towards ending hunger and ensuring food security*. Available at. https://openknowledge.fao.org/server/api/core/bitstreams/6ca15_%0A10c-9341-4d6a-b285-5f5e8743cc46/content/sofi-2022/food-security-nutrition-indicators.html
- FAO. (2024). *The state of food security and nutrition in the world 2024*. Available at. <https://doi.org/doi:10.4060/cd1254en>
- FAO. (2025). *FAO in Nigeria: food and nutrition insecurity analysis*. Available at. <https://www.fao.org/nigeria/news/detail-events/en/c/1720792/>
- Ferretti, M., Ferri, S., Fiorentino, R., Parmentola, A., & Sapio, A. (2020). What drives the growth of academic spin-offs? Matching academics, universities, and non-research organizations. *International Entrepreneurship and Management Journal*, 16(1), 137–163. <https://doi.org/10.1007/s11365-018-0497-4>
- Fini, R., Grimaldi, R., & Meoli, A. (2020). The effectiveness of university regulations to foster science-based entrepreneurship. *Research Policy*, 49, 104048. <https://doi.org/10.1016/j.respol.2020.104048>
- Fischer, B. B., Schaeffer, P. R., Vonortas, N. S., & Queiroz, S. (2018). Quality comes first: university-industry collaboration as a source of academic entrepreneurship in a developing country. *The Journal of Technology Transfer*, 43, 263–284.
- Formica, P., Varblane, U., & Mets, T. (2008). *Knowledge Matters*. Palgrave Macmillan. https://doi.org/10.1057/9780230582262_2
- Fuchs, L., Bombaerts, G., & Reymen, I. (2023). Does entrepreneurship belong in the academy? Revisiting the idea of the university. *Journal of Responsible Innovation*, 10, 1–19. <https://doi.org/10.1080/23299460.2023.2208424>

- Garcez, A., Franco, M., & Silva, R. (2025). The influence of the pillars of digital academic entrepreneurship on university students' entrepreneurial intention. *European Journal of Innovation Management*, 28(2), 210–234.
- GFSI. (2022). *Country report: Nigeria - Global Food Security Index 2022*. Available at. <https://impact.economist.com/sustainability/project/food-security-index/>
- GRFC. (2024). *Global report on food crises*. Available at. <https://www.fsinplatform.org/report/global-report-food-crises-2024/>
- Guerrero, M., Urbano, D., Fayolle, A., Klofsten, M., & Mian, S. (2016). Entrepreneurial universities: emerging models in the new social and economic landscape. *Small Business Economics*, 47, 551–563.
- Gunartin, A., Pratikto, H., Winarni, A., & Restuningdiah, N. (2023). The role of entrepreneurial competencies: successful key SMEs — a literature review. *International Journal of Professionals*, 8(7), 1–13.
- Gupta, C. P., & Mishra, M. (2024). The relation between intellectual honesty and research integrity as the fundamental principles of research. In V. K. Ahuja & K. Baishya (Eds.), *Research and Publication Ethics* (p. 151). Knowledge Resource Centre. National Law University and Judicial Academy, Assam.
- Hair, J. F. (Jr.), Black, W. C., Babin, B. J., & Anderson, R. E. (2019). *Multivariate data analysis* (8th ed.). Annabel Ainscow (Cengage).
- Hair, J. F. (Jr.), Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2006). *Multivariate data analysis* (6th ed.). Prentice Hall.
- Hair, J. F. (Jr.), Howard, M. C., & Nitzl, C. (2020). Assessing measurement model quality in PLS-SEM using confirmatory composite analysis. *Journal of Business Research*, 109(vember), 101–110. <https://doi.org/10.1016/j.jbusres.2019.11.069>
- Hassoun, A., Mhlanga, D., Rejeb, A., Bhat, Z., Buheji, M., & Bigliardi, B. (2025). The role of industry 4.0 in global food security: a promising pathway to ending hunger. *Smart Agricultural Technology*, 11(March), 100974. <https://doi.org/10.1016/j.atech.2025.100974>
- Hattie, J. (1985). Methodology review: assessing unidimensionality of tests and items. *Applied Psychological Measurement*, 9, 139–164.
- Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. The Guildford Press. <https://doi.org/10.1111/jedm.12050>
- Hayes, A. F., Montoya, A. K., & Rockwood, N. J. (2017). The analysis of mechanisms and their contingencies: PROCESS versus structural equation modeling. *Australasian Marketing Journal*, 25(1), 76–81. <https://doi.org/10.1016/j.ausmj.2017.02.001>
- Hirvonen, P., & van Langenhove, L. (2021). Understanding academic entrepreneurship as fields of moral orders: theoretical and methodological perspectives of positioning theory. In P. Eriksson, U. Hytti, K. Komulainen, T. Montonen, & P. Siivonen (Eds.), *New Movements in Academic Entrepreneurship* (pp. 236–252). Edward Elgar Publishing Limited, Cheltenham.
- Hooper, D., Coughlan, J., & Mullen, M. R. (2008). Structural equation modelling : Guidelines for determining model fit. *Electronic Journal of Business Research Methods*, 6(1), 53–60.
- Howitt, P. (2007). *Growth and development: a Schumpeterian perspective*. www.cdhowe.org/pdf/commentary_24%0A6.pdf
- Howitt, P. (2010). Endogenous growth theory. In *Economic Growth* (pp. 68–73). Palgrave Macmillan, UK.

- Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis : Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, 6(1), 1–55.
- Igwe, A. N., Eyo-Udo, N. L., & Stephen, A. (2024). Strategies for mitigating food pricing volatility: enhancing cost affordability through sustainable supply chain practices. *Strategies*, 13(9), 151–163.
- Ilie, L., & Budac, C. (2025). An overview of the effectiveness of entrepreneurship education in universities. *Studies in Business and Economics*, 20(1), 293–303.
- Imene, M., Sarra, A., & Soufyane, B. (2025). *The role of university support bodies in developing entrepreneurial competencies and establishing start-ups - A case study of the University of Eltarf*. 8(01), 39–56.
- Jan, M. T. (2012). *The impact of customer relationship management related critical success factors on customer satisfaction: An empirical study of the banks in Malaysia*. (Unpublished Doctoral Thesis), International Islamic University Malaysia.
- Karlsdottir, V. (2023). Assessing academics' third mission engagement by individual and organisational predictors. *Administrative Sciences*, 13(9), 1–14. <https://doi.org/10.3390/admsci13010009>
- Kline, R. B. (2015). *Principles and practice of structural equation modeling* (5th ed.). The Guildford Press.
- Kotur, L. N., Aye, G. C., & Ayoola, J. B. (2024). Asymmetric effects of economic policy uncertainty on food security in Nigeria. *Journal of Risk and Financial Management*, 17(3), 114–123.
- Leišytė, L. (2021). University spin-offs. In L.-P. Dana (Ed.), *World Encyclopedia of Entrepreneurship* (2nd ed., pp. 637–641). Edward Elgar, Cheltenham.
- Link, A. N., Siegel, D. S., & Wright, M. (2015). *The Chicago handbook of university technology transfer*. University of Chicago Press.
- Mäkinen, E. I., & Esko, T. (2022). Nascent academic entrepreneurs and identity work at the boundaries of professional domains. *The International Journal of Entrepreneurship and Innovation*, 24(3), 167–177. <https://doi.org/10.1177/1465750321106389>
- Markuerkiaga, L., Errasti, N., & Igartua, J. I. (2014). Success factors for managing an entrepreneurial university: developing an integrative framework. *Industry and Higher Education*, 28(4), 233–244. <https://doi.org/10.5367/ihe.2014.0214>
- Marsh, H. W., Hau, K.-T. H., & Wen, Z. (2004). In search of Golden Rules: Comment on hypothesis: Testing approaches to setting cutoff values for fit indexes and dangers in overgeneralizing Hu and Bentler's (1999) findings. *Structural Equation Modeling*, 11(3), 320–341. <https://doi.org/10.1207/s15328007sem1103>
- Marsh, H. W., & Hocevar, D. (1985). Application of confirmatory factor analysis to the study of self-concept: First- and higher order factor models and their invariance across groups. *Psychological Bulletin*, 97(3), 562–582.
- Martin, B. (2012). Are universities and university research under threat? Towards an evolutionary model of university speciation. *Cambridge Journal of Economics*, 36, 543–565.
- Mei, H., Lee, C. H., & Xiang, Y. (2020). Entrepreneurship education and students' entrepreneurial intention in higher education. *Education Sciences*, 10(9), 257. <https://doi.org/10.3390/educsci10090257>
- Michele, M. (2017). *Academic Entrepreneurship*. Wiley.
- Miller, K., Alexander, A., Cunningham, J. A., & Albats, E. (2018). Entrepreneurial academics and academic entrepreneurs: a systematic literature review. *International Journal of Technology Management*, 77, 9–37.

- Miranda, F. J., Chamorro-Mera, A., & Rubio, S. (2017). Academic entrepreneurship in Spanish universities: an analysis of the determinants of entrepreneurial intention. *European Research on Management and Business Economics*, 23(2), 113–122. <https://doi.org/10.1016/j.iedeen.2017.01.001>
- Miranda, F. J., Chamorro, A., & Rubio, S. (2018). Re-thinking university spin-off: a critical literature review and a research agenda. *Journal of Technology Transfer*, 43, 1007–1038.
- Montonen, T. (2025). Hybrid identity work strategies of academic entrepreneurs: connection building and difference Building. *South Asian Journal of Business and Management Cases, January*, 1–13. <https://doi.org/10.1177/22779779241312307>
- Morakinyo, D., Lawal, N. A., Akintayo, A. A., Raheem, A. J., & Onewo, T. T. (2025). Globalization and the imperativeness of local development in Nigeria. *Acta Politica Polonica*, 59, 21–30.
- Musleh, M. M., Mohamed, I., Sallehudin, H., & Abushawish, H. F. (2025). University spin-off challenges and opportunities: a proposed framework of academic entrepreneurship in developing economies. *Cogent Education*, 12(1), 2530894.
- Ndiomaluke, C., Obi, C., Orajaka, U., Ejefobihi, U., & Percy, N. (2025). Economic diversification strategies for sustainable development in Nigeria. *Journal of Policy and Development Studies*, 18(3), 1–23.
- Oguegbe, T. M., & Iloke, S. E. (2023). Agro-based entrepreneurship and food security in Nigeria: panacea for sustainable development. *West African Journal on Sustainable Development*, 1(1), 231–249.
- Okoro, B. O. (2023). Entrepreneurship development and food security: a conjugate for a sustainable economy. *Journal of Centre for Technical Vocational Education, Training and Research*, 5(1), 8–15.
- Okparavero, N. F., Grace, O. O., Rukayat, Q., Jimoh, O. M., Ishola, T. D., Okunlade, A. F., Haruna, P. B., Isaac, A. Y., & Akande, E. T. (2024). Effective storage structures for preservation of stored grains in Nigeria: a review. *Ceylon Journal of Science*, 53(1).
- Olaoye, O. A. (2014). Potentials of the agro-industry towards achieving food security in Nigeria and other Sub Saharan African countries. *Journal of Food Security*, 2(1), 33–41.
- Oluwafemi, A. M., Ndukwe-Okereke, E. E., & Mbanasor, J. A. (2024). Effect of Livestock Agriprenurship on Rural Food Security in Irele Local Government Area, Ondo State, Nigeria. *International Journal of Agriculture and Earth Science*, 10(10), 120–132. <https://doi.org/10.56201/ijaes.v10.no10.2024.pg120.132>
- Onwualu, P. A. (2016). Fostering university industry linkages in Nigeria: case study of some RMRDC projects. *Research Gate, January 2014*, 1–27. <https://www.researchgate.net/publication/297707866>
- Onyeaka, H., Akinsemolu, A. A., Miri, T., Darlington, N., Emeka, C., Tamasiga, P., Pang, G., & Al-sharify, Z. (2024). Advancing food security: the role of machine learning in pathogen detection. *Applied Food Research*, 4(2), 100532. <https://doi.org/10.1016/j.afres.2024.100532>
- Pacheco, A. I. G., Ferreira, J., Simoes, J., Veiga, P. M., & Dabic, M. (2024). Mechanisms for facilitating academic entrepreneurship in higher education. *International Journal of Entrepreneurial Behavior & Research*, 30(6), 1448–1479. <https://doi.org/10.1108/IJEBr-04-2023-0333>
- Pallant, J. (2020). *SPSS survival manual: A step-by-step guide to data analysis using IBM SPSS* (7th ed.). Open University Press.

- Perez-Ruiz, M., Carballido, J., & Vega, J. A. (2013). University spin-off creation by Spanish researchers in agricultural engineering. *Journal of Technology Management & Innovation*, 8(3), 1–7.
- Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*, 40(3), 879–891. <https://doi.org/10.3758/BRM.40.3.879>
- Presse, A., & Terzidis, O. (2018). *Technology Entrepreneurship: Insights in New Technology-Based Firms, Research Spin-Offs and Corporate Environments*. Springer. <https://doi.org/10.1007/978-3-319-73509-2>
- Prosekov, A. Y., & Ivanova, S. A. (2018). Food security: the challenge of the present. *Geoforum*, 91(March), 73–77. <https://doi.org/10.1016/j.geoforum.2018.02.030>
- Ramadani, F., Mulyana, A., Yunizar, I., & Saefullah, K. (2025). Academic entrepreneurial orientation for sustainable development goals in higher education in Indonesia: a Confirmatory factor analysis. *Journal of Lifestyle & SDG's Review*, 5(e01938), 1–18. <https://doi.org/10.47172/2965-730X.SDGsReview.v5.n01.pe01938>
- Romano, M., Cunningham, J. A., Cuttone, G., Munnia, A., & Nicotra, M. (2025). Intellectual capital-based research impact management: a strategic approach to increase regional intellectual capital. *Journal of Intellectual Capital*, 26(7), 24–42.
- Romer, P. M. (1994). The origins of endogenous growth. *The Journal of Economic Perspectives*, 8(1), 3–22. <https://doi.org/10.1257%2Fjep.8.1.3>
- Romer, P. M. (2011). *Advanced Macroeconomics*. McGraw-Hill Education. New York.
- Ron, D. H., Honghu, L., & Arie, K. (2015). Use of internet panels to conduct surveys. *Behavioral Research Methods*, 47(July), 685–690. <https://doi.org/10.3758/s13428-015-0617-9>
- Roncancio-Marin, J. J., Dentchev, N. A., Guerrero, M., & Diaz-Gonzalez, A. A. (2022). Shaping the social orientation of academic entrepreneurship: an exploratory study. *International Journal of Entrepreneurial Behavior and Research*, 28(7), 1679–1701. <https://doi.org/10.1108/IJEBr-07-2021-0600>
- Sandström, C., Wennberg, K., Wallin, M. W., & Zherlygina, Y. (2018). Public policy for academic entrepreneurship initiatives: a review and critical discussion. *Journal of Technology Transfer*, 43(5), 1232–1256. <https://doi.org/10.1007/s10961-016-9536-x>
- Sasu, D. D. (2022). *Number of university students in Nigeria in the 2018/2019 academic session, by gender and course of study* (pp. 1–4). Available at <https://www.statista.com/statistics/1130794/number-of-university-students-in-nigeria/>
- Sekeran, U., & Bougie, R. (2013). *Research methods for business: a skill building approach* (6th ed.). UK: Wiley.
- Sengupta, S. (2021). Social academic entrepreneurship: contextual understanding. In P. Eriksson, U. Hytti, K. Komulainen, T. Montonen, & P. Siivonen (Eds.), *New Movements in Academic Entrepreneurship* (pp. 203–219). Edward Elgar Publishing Limited.
- Shadfar, S., & Malekmohammadi, I. (2013). Application of structural equation modeling (SEM) in restructuring state intervention strategies toward paddy production development. *International Journal of Academic Research in Business and Social Sciences*, 3(12), 576–618.
- Sharma, S., Mukherjee, S., Kumar, A., & Dillon, W. R. (2005). A simulation study to investigate the use of cutoff values for assessing model fit in covariance structure models. *Journal of Business Research*, 58, 935–943. <https://doi.org/10.1016/j.jbusres.2003.10.007>
- Sharubutus, G. (2025). *All research institutes are mandated to set up spin off companies to commercialise researches, innovations*. (pp. 1–9). Available at.

- Shoaib, S. A., Khan, M. Z. K., Sultana, N., & Mahmood, T. H. (2022). Quantifying uncertainty in food security modeling. *Agriculture*, *11*(1), 33–41.
- Sidrat, S., & Boujelbene, Y. (2020). Towards an entrepreneurial university: case of Tunisia. *Journal of Enterprising Culture*, *28*(1), 31–57. <https://doi.org/10.1142/s0218495820500028>
- Siegel, D. S., & Wright, M. (2015a). Academic entrepreneurship: time for a rethink? *British Journal of Management*, *26*(4), 582–595. <https://doi.org/10.1111/1467-8551.12116>
- Siegel, D. S., & Wright, M. (2015b). University technology transfer offices, licensing, and start-ups. In A. N. Link., D. S. Siegel., & M. Wright (Eds.), *The Chicago handbook of university technology transfer and academic entrepreneurship* (pp. 1–40). University of Chicago Press.
- Simane, B., Kapwata, T., Naidoo, N., Cissé, G., Wright, C. Y., & Berhane, K. (2025). Ensuring Africa's food security by 2050: the role of population growth, climate-resilient strategies, and putative pathways to resilience. *Foods*, *14*(2), 262.
- Sooampon, S. (2025). Academic entrepreneurship: research Commercialization for social impact. In *Fundamentals of managing technology ventures. Applied innovation and technology management* (pp. 69–74). Springer Nature, Singapore. https://doi.org/10.1007/978-981-96-2837-7_10
- Sultan, T. M. H., Shahar, F. S., Mohd Zain, M. I., & Komoo, I. (2024). A systematic review of the role of integrated farming and the participation of universities in ensuring food security: Malaysia's effort. *Italian Journal of Food Safety*, *13*, 11854. <https://doi.org/10.4081/ijfs.2024.11854>
- Szulczewska-Remi, A. (2022). Academic entrepreneurship as a process. In H. Nowak-Mizgalska & A. Szulczewska-Remi (Eds.), *Academic entrepreneurship in theory and practice* (pp. 26–42). Poznań University of Economics and Business Press. <https://doi.org/10.18559/978-83-8211-143-9/2>
- Tabachnick, B., & Fidell, L. (2013). *Using multivariate statistics (6th edn)*. Boston: Pearson Education. Pearson Education.
- Tabachnick, B. G., & Fidell, L. S. (2019). *Using multivariate statistics*. Pearson Education.
- Tkemaladze, J. (2025). Concept to the food security. *Longevity Horizon*, *1*(1), 1–13. <https://doi.org/10.5281/zenodo.14642407>
- Todorovic, Z. W., Mcnaughton, R. B., & Guild, P. (2011). ENTRE-U : An entrepreneurial orientation scale for universities. *Technovation*, *31*, 128–137. <https://doi.org/10.1016/j.technovation.2010.10.009>
- Toledano, N., & Gonzalez-sanz, J. D. (2024). Beyond the good and the right :rethinking the ethics of academic entrepreneurship from a relational perspective. *Research Policy*, *53*(2), 104944. <https://doi.org/10.1016/j.respol.2023.104944>
- Tweeten, L. (1999). The economics of global food security. *Review of Agricultural Economics*, *21*(2), 473–488. <https://doi.org/10.2307/1349892>
- Udoisoh, M. (2024). *From lab to market: the academic's journey to wealth* (pp. 1–5). Available at. <https://www.facebook.com/photo.php?fbid=818558080297260>
- Uduji, J. I., & Okolo-Obasi, E. N. (2023). *Gender and food security in Nigeria: the Role of corporate social responsibility in the oil producing communities* (AGDI Working Paper, No. WP/23/039, African Governance and Development Institute (AGDI), Yaoundé.). <https://hdl.handle.net/10419/298232>
- Ugbor, I. K., Agu, R. A., & Chukwu, E. D. (2025). Financial globalization, entrepreneurship development and economic growth in Africa. *International Journal of Economics and Financial Management*, *10*(1), 96–112. <https://doi.org/10.56201/ijefm.v10.no1.2025.pg96.112>

- Urbano, D., & Guerrero, M. (2013). Entrepreneurial universities: Socioeconomic impacts of academic entrepreneurship in a European region. *Economic Development Quarterly*, 27, 40–55.
- Verma, A., & Shrivastava, P. (2021). Scope and challenges of entrepreneurship in agriculture in India. *International of Education, Modern Management, Applied Science & Social Science*, 32(2), 75–79.
- Walter, T., Ihl, C., Mauer, R., & Brettel, M. (2018). Grace, gold, or glory? Exploring incentives for invention disclosure in the university context. *The Journal of Technology Transfer*, 43(6), 1725–1759. <https://doi.org/10.1007/s10961-013-9303-1>
- Wang, X., Sun, X., Liu, S., & Mu, C. (2021). A preliminary exploration of factors affecting a university entrepreneurship ecosystem. *Frontiers in Psychology*, 12, 1–12.
- WHO. (2004). *Food security*. Available at. <http://www.who.int/trad%0Ae/glossary/story028/en/>
- WHO. (2024). *The state of food security and nutrition in the world 2024*. Available at. <https://doi.org/10.4060/cd1254en>
- Wood, M. S. (2011). A process model of academic entrepreneurship. *Business Horizons*, 54(2), 153–161. <https://doi.org/10.1016/j.bushor.2010.11.004>
- World Bank Group. (2025). *What is food security?* Available at. <https://www.worldbank.org/en/topic/agriculture/brief/food-security-update/what-is-food-security>
- Zainudin, A. (2014). *A handbook on SEM for academicians and practitioners. The step by step practical guides for the beginners*. MPWS Rich Resources.