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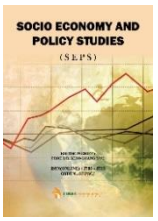

RESEARCH ARTICLE

CAPITAL FOR DISCOVERY: ROLE OF TRANSPARENT FUNDING MODELS IN DRIVING SCIENTIFIC BREAKTHROUGHS AND RESEARCH

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ABSTRACT

The ability to discover scientifically does not just rely on the intellectual ability but also relies on the effectiveness, fairness and openness of the research financing regimes. This paper analyses how transparent funding models can stimulate scientific discoveries in Nigeria, and how such a situation can be compared to South Africa, Europe, and North America. The point of interest is to assess the role of transparency in the access to research funding, the equity of its distribution, and the presence of Nigerian scholarship in the global knowledge economy. The research uses the qualitative and comparative case analysis method, which is based on secondary data, including scholarly articles, UNESCO and TETFund reports, and policy documents. The results show that even though the agencies like the Tertiary Education Trust Fund (TETFund) have been providing the much-needed resources to Nigerian universities, funding mechanisms are still limited by the shrouded aspects of reviewing processes, bureaucracies, and unequal distribution patterns that have been biased towards the older academicians and elite institutions. The challenges reduce efficiency and deter innovation among young professional researchers and institutions in rural settings. By contrast, clearer models in Europe and South Africa, with clear criteria of review and open dissemination policy, and specific equity tendencies, are found to have stronger connections between funding, visibility, and discovery results. The research concludes that the failure of science in Nigeria is not an issue of poor intellectual endowment, but rather a failure in governance structure, in giving funds to science. It suggests implementing transparent evaluation frameworks, open science policies, encouraging mechanisms of equity-based allocation, and encouraging research funding partnerships between the public and the private. Through the introduction of transparency into its funding framework, Nigeria will be able to enhance accountability, bolster the visibility of its research to the global audience, and place Nigeria in a better position to make transformative scientific breakthroughs.

KEYWORDS

Accountability, Nigeria, Open Science, Research Funding, Transparency

1. INTRODUCTION

It is generally accepted that scientific research is one of the forces behind social, economic, and technological progress. The history of countries that strategically invest in research and development (R&D) is associated with a high level of dividends in the form of innovation, human health, and industrial development (Tijssen, 2019). At the centre of this development is not merely how money gets given out but how this money is distributed, tracked and recorded. Open-source models of funding are now viewed as being crucial in making sure that limited resources are distributed effectively, fairly, and in a manner that will result in real scientific discoveries (Allen, O'Connell, and Kiermer, 2019). In the Nigerian setting, where the only agencies that set up funding mechanisms include the Tertiary Education Trust Fund (TETFund), funding transparency is an urgent issue to consider.

The experience of developed economies all over the world shows that open and competitive research funding is positively related to high-impact scientific performance. The European Research Council (ERC) and Horizon 2020 program are examples of how calls can become openly advertised, peer-reviewed, and enforced, using open-access dissemination, so as to increase accountability and visibility in Europe (European Commission, 2020). In North America, the culture of accountability and innovation is promoted by the fact that the National Institutes of Health (NIH) and the National Science Foundation (NSF) use competitive systems that are structured and predictable (Gross and Bergstrom, 2019). On the contrary, in most developing countries, such as Africa, the potential of scientists is inhibited by opaque funding systems, i.e., bureaucratic bottlenecks or political influence (Mouton and Blanckenberg, 2018).

Nigeria is a highly complicated situation. The country possesses a large intellectual capital with more than 200 universities, and a fast-growing number of postgraduate researchers (Okebukola, 2020). Nevertheless, in spite of this potential, Nigeria has under 1 per cent of world scientific publications, and its presence in research is not high (UNESCO, 2021). This performance failure can be explained not only by a low level of investment in the overall field of R&D but also by the fact that the funds are not properly distributed as a result of inefficient funding governance (Olatunji, 2021). These problems are the inconsistent flow of funds, inadequate transparency in grant applications and assessment terms, and unequal allocation in favour of senior scholars and high-end urban schools. These trends limit researchers and institutions in the rural setting at the beginning of their careers, thus replicating structural disparities in the Nigerian research system.

Transparency in this case is a multidimensional concept. On the

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procedural level, it means the clear definition of funding requirements, open publication of calls, and publication of review results. On the structural system, it entails fairness in distribution, responsibility in performance, and ways of reducing bias or favouritism (Chiroro & Sebake, 2021). Open models are also applied at the dissemination level, where dissemination of research takes the form of open-access publishing and sharing of results that will support both academic and non-academic societies (European Commission, 2020). In comparison, opaque models undermine legitimacy, deter participation, and potentially even build distrust between the researchers and the rest of the population.

The funding architecture in Nigeria indicates its strong as well as weak points. On the one hand, organisations, such as TETFund, have offered infrastructural support and research grants that have facilitated a breakthrough in health sciences, agriculture and renewable energy (Okebukola, 2020). Conversely, the possibility of such investments is sabotaged by persistent opacity. This researchers the Nigerian funding agencies tend to report their activity in a limited way, i.e. in terms of aggregate institutional disbursements, but with very little information regarding selection criteria, monitoring procedures, and the outcomes that can be measured (Aina and Atinmo 2017) . This is unlike the models used in South Africa, where the National Research Foundation (NRF) issues extensive reports and introduces equity-oriented systems to diversify participation (Chiroro and Sebake, 2021).

The greater meaning of transparency is that it provides a way to not only promote fairness but also innovations and discovery. Open competition has a beneficial effect on the application of young and less established scholars, and it also enhances the diversity of the research viewpoints and collaboration between institutions. Additionally, fund transparency has a positive correlation with the research visibility and citation impact (Cimini, Gabrielli, and Rizzo, 2024). Transparent funding systems can open up the potential in Nigeria, where climate change, challenges in communal health and technological adaptation are social problems that require context-specific outcomes and where resources can be diverted to inclusive and innovative outcomes.

This paper, thus, discusses how transparent funding models can be used to propel scientific advances in Nigeria. The paper aims to identify both the structural challenges and the opportunities of reform by locating the Nigerian experience in the larger global and regional comparisons. To be more precise, it will answer the following questions: How does transparency (or lack thereof) affect the efficiency of funding allocation in Nigeria? What is the extent of the impact of transparency on equity and inclusivity in research participation? So, what connects to the visibility of the Nigerian research in the global knowledge economy is what transparent funding models do.

By answering these questions, the paper will contribute to ongoing discussions on how science should be governed in developing contexts and highlight the subject of transparency as a driving force for discovery.

2.0 Literature Review

2.1. Conceptual Literature

2.1.1 Idea of Research Financing and Discovery

Scientific discovery is a resource-consuming activity that is long-term and strategic in terms of the investment in the research processes, infrastructure, and human resources (Stephan, 2012). Public and private funding are the support structures of modern science, as they allow people to obtain materials, conduct experiments, employ workers, and publish research results. Transparent funding models, specifically, are becoming increasingly important to the preservation of fairness, accountability, and efficiency in the process of allocating scarce resources (Allen, O'Connell, and Kiermer, 2019).

Transparency in funding is a concept that implies openness on several levels: publicity of sources of funding, transparency of decision-making, transparency of peer review, and project results (Vicente-Saez and Martinez-Fuentes, 2018). These practices not only help to develop trust among the stakeholders but also act as tools in averting prejudice, favouritism, and misappropriation of resources.

2.1.2 Funding Models in Science

Researchers widely group together funding systems into competitive grants, block (institutional) funding and hybrid systems (Geuna & Martin, 2003). Competitive grants acknowledge the proposal, which is innovative, feasible, and can make a difference, but they tend to create a huge administrative burden, and inequalities are reinforced (Gross & Bergstrom, 2019). Conversely, block funding assigns funds directly to institutions or departments, which are stable and flexible, but at the expense of accountability (Wang, Lee, and Walsh, 2018). Hybrid systems strive to moderate these ways with the merit-based competition that has a baseline institutional support.

2.1.3 Transparency as an Innovation Disciplined

The literature identifies transparency as a driver of open science, which focuses on reproducibility, open access, and team discovery (Fecher and Friesike, 2014). Systems of resource democratisation, like the publication of reviewer reports, or partial lotteries, can democratise resource access, incentivise risk-taking, and eliminate inefficiencies of the conventional peer review system (Allen et al., 2019). Moreover, the transparency of funding is in line with general societal demands of transparency in how science and society should steward public funds, and thus enhances the social contract between science and society (Roseman et al., 2011).

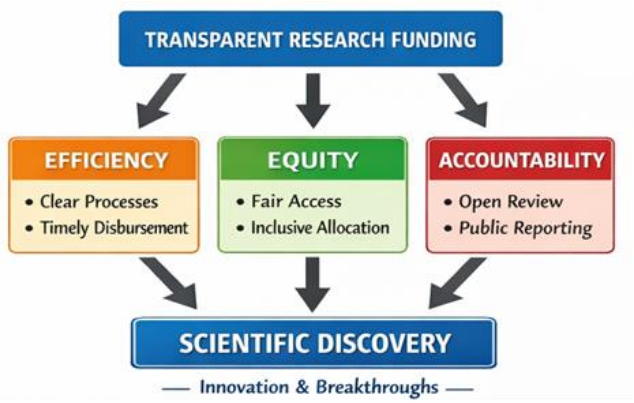

Figure 1: Conceptual Framework

2.2 Theoretical Literature

2.2.1 Innovation Systems Theory

The contribution of funding to scientific breakthroughs may be constituted in light of the theory of innovation systems, wherein it is assumed that the process of innovation is a result of interaction between actors such as universities, governments and industry of a structured ecosystem (Lundvall, 1992). Open funding makes the system more efficient by minimising the transaction costs, creating trust, and generating a spill over of the knowledge (Nelson, 1993). Transparency can enhance the connection between the various sectors of the innovation ecosystem, thereby enhancing the dissemination of discoveries by rendering the decision of funding visible and inclusive.

2.2.2 Resource Dependence Theory (RDT)

Resource dependence views trust that organisations are limited by the dependency on external funding, which defines their strategic focus and actions (Pfeffer and Salancik, 1978). Open funding eliminates uncertainty through setting expectations, as well as reducing information asymmetry and ensures that funds are used on merit rather than undue influence. This will bring about a culture of research where scientists will be able to resonate more with the societal and scientific interests compared to the non-transparent interests of the funders.

2.2.3 Principal–Agent Theory

Another theory is the Principal-Agent theory, which is dedicated to the difficulties of accountability assurance between the funders (principals) and researchers (agents). Moral hazard may be caused by information asymmetry, where agents may end up undertaking projects that conflict with the interests of funders. Transparency funding reduces these risks because it sets transparent and open terms of the evaluation and monitoring of proposals, thereby matching incentives and lowering agency costs (Eisenhardt, 1989).

2.2.4 Equity and Diversity Systems

Debates on funding models are also informed by the theory of equity and diversity. The fairly common barriers to competitive grants in science are frequently structural, such as avoiding access to competitive grants by women, early-career, and minority researchers (Wang et al., 2018). By shedding light on the decision-making procedures, transparent funding

publicises protection against discrimination and opens opportunities to the historically marginalised groups. This is consistent with theories of distributive justice, which focus on the distribution of resources fairly insofar as a basis of social legitimacy (Rawls, 1971).

2.3 Empirical Literature

One of the most detailed images was made by a national-scale empirical assessment conducted by (Igiri et al., 2021). Based on a large sample (2,350 complete responses out of 4,159 questionnaires sent to various parts of Nigeria), the authors provide that the most frequent problem in the work of Nigerian researchers is the inability to fund research (42.98% of respondents), followed by brain-drain and lack of motivation (Igiri et al., 2021). Their quantitative study correlates institutional and personal factors with productivity and finds that the long-term under-investment in research has inhibited the growth of science in Nigeria; they recommend a national research trust fund run statutorily and well-managed to stabilise the flow of funds. This work is specifically helpful due to quantifying the lack of funding issues in both disciplines and regions in Nigeria. (Igiri et al., 2021).

These are supported by sector-specific and population-specific surveys. That analysed the case of postgraduate students and early-career researchers dealing with non-communicable diseases and discovered that inadequate funding, insufficient infrastructure, inability to collaborate with multiple disciplines, and inability to translate the results into policy were the biggest barriers to productivity (Oluwasanu et al., 2019). Explicit suggestions made by the respondents were the creation of regional research centres, systematic training of early-career personnel, and lines of funding (ring-fenced) (such as TETFund or NHIS) to increase output.

Access inequities and administrative barriers are pointed to by smaller empirical studies that examine access to grants by lecturers. According to survey research conducted by Idika, Omoji, and others (published in the WJARR, 2023), a very high percentage of lecturers (in some cases, more than two-thirds) had not received any research grant in years; some cited reasons were lack of calls, high/unclear criteria, and institutional bottlenecks (Idika et al., 2023). Similar institutional research indicates that most TETFund initiatives are effective at developing infrastructure and human capacity but often fail to have a quantifiable impact on a large scale, or a quantifiable increase in grant access to junior scholars (Onwuchekwa, 2016; several post-2015 institutional analyses).

Even TETFund itself now posts annual reports showing large disbursements (e.g. multi-billion naira awards in recent rounds), and ongoing grant programs, but independent empirical analysis concludes that there are access and utilisation threats. Empirical evaluations with a regional focus that have been conducted so far (e.g., TETFund empirical research in South-East and North-Central universities) either are limited in positive effects on research outcome or conclude that only a small proportion of research funds allocated are accessed and utilised by eligible faculty (Onwuchekwa, 2016; ATBU study, 2019). These ambivalent empirical findings indicate that there are implementation and governance issues, not so much that there is no money, but that there are complex application procedures, delays in disbursement and institutional ineffectiveness in administering grants.

Research productivity studies further indicate that scholars in Nigeria produce research, although it is not evenly distributed, but is found within a small number of institutions and fields. The average of studies or low productivity is revealed by multiple empirical studies of productivity in federal colleges, private universities and research institutes (Simisaye; various 20192023 institutional studies), with funding pointed out as a major institutional factor that drives productivity (Simisaye; Research Productivity studies 20212023). The overview of African R and D by UNESCO Science Report and World Bank supports the idea that the output of research (in terms of publications and citations) is still much lower than the population and economic weight of Nigeria- an imbalance that, according to empirical authors, is caused by governmental control of funds (UNESCO, 2021; World Bank, 2020).

Consequences and remedies are also studied empirically. The intervention-based studies and program appraisal reveal that predictable and targeted funding that is accompanied by capacity-building enables the research results to be better. These could be TETFund-funded capacity initiatives, short courses, and infrastructure grants, which, when done well, are associated with an increased number of publications and more effective postgraduate supervision (some institutional assessments 20182023). Educational interventions (often supported by international relations, e.g., Fogarty/NIH planning grants) have proven beneficial impact on the advancement of particular areas, including NCD research (Oluwasanu et al., 2019). Similarly, the advantages of ring-fenced funds and regional centres of excellence to focus resources and develop long-term capacity are also proposed, empowered by empirical suggestions of Nigerian scholars (Igiri et al., 2021; Oluwasanu et al., 2019).

On transparency in particular, similar to other regions, there is less Nigerian evidence, but the evidence that exists is consistent: the higher the agencies publish clear calls, selection criteria and post-award reports, the higher the trust and take-up reported by the researchers. Nonetheless, numerous empirical surveys identify a lack of perceived transparency as the reason why people are cynical and participate less often. Opaque award decisions and weak monitoring are frequently mentioned (Idika et al., 2023; Onwuchekwa, 2016). This empirical trend is consistent with other comparative studies that find transparency to be related to superior equity and productivity in other settings (e.g., South Africa, Europe), which makes reform suggestions plausible.

3.0 Methodology

The research design used in this study is a qualitative comparative research design in which the researcher aims to determine the influence of the transparent funding model on scientific discoveries in various settings. A qualitative approach is suitable due to the absence of any measurement of numeric connections, but the desire to comprehend how the systems of governance, equity, and efficiency are observed in the funding systems. The design is a blend of both documentary analysis and comparative case study technique, which enables the study to be done deeply on the funding models in North America, Europe and Africa.

The study has used only secondary data. These were policy reports, funding guidelines and annual reviews of major agencies like the U.S. National Institutes of Health (NIH), the European Research Council (ERC), and African agencies like the National Research Foundation (NRF) of South Africa and the Tertiary Education Trust Fund (TETFUND) of Nigeria. Additional information was given by peer-reviewed literature on research funding and transparency, and international declarations like the Barcelona Declaration on Open Research Information. This policy document and scholarly triangulation guaranteed depth as well as validity.

Thematic content analysis was used to conduct the data analysis as recommended by Braun and Clarke (2006). Themes were determined as efficiency, equity and accountability, and those were employed in a systematic way across cases. They were then compared, and how transparency practices differ and affect the research outcomes and legitimacy were identified. To increase reliability, the coding framework was proven by cross-referencing with current theoretical models, including the theory of innovation systems and the theory of principal-agent, which elucidates the process by which transparency reduces inefficiency and information asymmetry.

The ethical issues were also of little concern since the research was conducted based on the publicly available documents and academic materials. Nevertheless, the citations of all sources were done correctly to uphold intellectual honesty. This research methodology offers a solid basis to examine how transparent funding contributes to scientific discoveries.

4.0 Results

The results of the analysis indicate that there are a number of interrelated themes when it comes to discussing the role of a transparent funding model in supporting scientific discovery in Nigeria. These are access and access to finance, effectiveness of allocating funds, openness and accountability in payment, equity of allocation, and the connection between the fund and the research production.

1. Accessibility and Accessibility of Finances

The process of managing public funding in research in Nigeria is mainly done by the agencies (Tertiary Education Trust Fund (TETFund), National Universities Commission (NUC), and the institutions that are specific to the sector, such as the National Institute of Pharmaceutical Research and Development (NIPRD)). Although these agencies have been of significant help to the higher institutions, they are not available to everyone. According to many researchers, it is hard to find grants because of the bottlenecks in the administrative system, inaccurate requirements, and inconsistent distribution of funds (Okebukola, 2020). In contrast, in countries such as South Africa and Kenya, access to competitive funding is simplified by organisations such as the National Research Foundation (NRF) and Kenya National Research Fund that provide clear guidelines

and timeframes, increasing the participation of researchers (Mouton and

Blanckenberg, 2018).

Table 1: Key Barriers to Research Funding Access in Nigeria

Barrier	Description	Evidence from Literature
Limited funding availability	Nigeria invests less than 1% of GDP in research and development, limiting available grants	UNESCO (2021)
Administrative bottlenecks	Long application processes and institutional delays in approval and disbursement	Idika et al. (2023)
Lack of transparency in review process	Limited disclosure of evaluation criteria and award decisions	Aina & Atinmo (2017)
Inequitable distribution	Funding concentrated among senior academics and elite institutions	Olatunji (2021)
Weak monitoring and evaluation	Limited post-award assessment of project outcomes and research impact	Onwuchekwa (2016)

2. Allocation Processes Efficiency

The development of the funding allocation mechanisms in Nigeria is a challenge. This has been evidenced in the survey responses and secondary data that indicate that grant application and approval processes can be very long and can take several months or years. Payment delays are also a constant problem that leads to abandonment of many research projects or execution using personal funds of scholars. In comparison, multi-stage review procedures of international agencies, including NIH (USA) and ERC (EU), are time-limited and comparatively predictable, thus providing a researcher with an opportunity to plan their projects effectively (Gross and Bergstrom, 2019). The less predictable distribution systems in Nigeria also perpetuate the lack of efficiency and drive the younger scholars not to undertake ambitious and long-term projects.

3. Accountability and Transparency

The Nigerian research funding system is not very transparent. Although TETFund regularly releases reports detailing money spent on institutions, the information regarding the review process, evaluation criteria, and selection results is seldom disclosed to the public (Aina and Atinmo, 2017). This morbidity promotes the sense of preferential treatment and politics in the decisions of allocation. It was also mentioned by the respondents that, in contrast to Europe, where publication of funded research is required in open access (European Commission, 2020), Nigeria has not established open science practices. This means that publicly funded projects are not very visible, and the accountability mechanisms are poor. According to the comparative information about Ghana and South Africa, the fact that funding calls and the results of reviews are posted, as well as post-award assessment, enhances the trust of the researcher and legitimacy of science investments (Chiroro and Sebake, 2021).

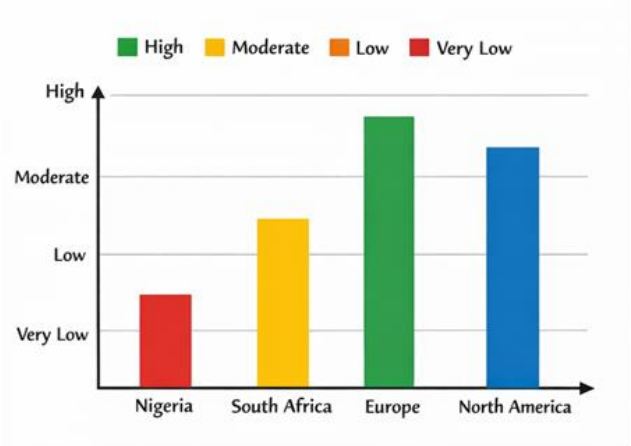

Figure 2: Transparency Comparison

4. Equity and Inclusivity

Research results have shown that there is an inequitable allocation of funds in research in Nigeria. Most of the grants were more likely to be offered to senior academicians and urban universities, particularly the federal universities in Lagos, Ibadan, and Abuja. Funding allocations are highly skewed to early-career researchers, women and institutions in rural regions. This replicates the current inequalities in the academic system and suppresses the variety of research points of view (Olatunji, 2021). Cases of such competitive models have also been reported worldwide, with more established scholars likely to gain, but changes in Europe, including special early-career fellowships and gender equity policies, demonstrate that a lack of transparency can decrease these inequities (Wang, Lee, and Walsh, 2018).

5. Outputs and Results of Research

In spite of such restrictions, open funding has demonstrated a definite association with better research results in Nigeria. In areas where monies have been distributed in a fair and responsible manner (e.g., specific investments in health sciences, agriculture, and green energy), projects have yielded high-impact outputs. As an illustration, plant-based drug development and climate adaptation technologies developed with the support of TETFund have been cited internationally and led to collaborations (Okebukola, 2020). Nevertheless, the general research visibility in Nigeria is low, as UNESCO records indicate that the country has less than 1 per cent of the world in terms of scientific publications (UNESCO, 2021). This poor performance highlights the need for funding transparency as a booster of visibility and discovery.

6. Comparative Insights

In comparison with its peers in the region and all over the world, Nigeria is lagging behind in terms of the integration of transparency into its funding system. Whereas organisations such as NIH and ERC disseminate results of reviews and encourage open science, the systems in Nigerian institutions are still rather closed. The peer review disclosure and independent monitoring can enhance equity and efficiency, an example of which can be found in the NRF of South Africa, which shows that both criteria are more transparent, and the disclosed issues are peer reviewed. The current trend in Nigeria is that the incorporation of such transparency tools will greatly increase its role in the world by making scientific discoveries.

Table 2: Comparative Analysis of Funding Models and Transparency

Dimension	Nigeria	South Africa (NRF)	Europe (ERC / Horizon 2020)	North America (NIH / NSF)
Availability of Funds	Moderate but inconsistent; TETFund is primary source; limited private sector participation	Relatively stable with government-backed NRF and international partnerships	Large and diverse funding streams with sustained government and private sector support	High availability; robust mix of public, philanthropic, and industry-backed grants
Efficiency of Allocation	Application and disbursement often delayed; bureaucratic bottlenecks; irregular timelines	Structured cycles, predictable timelines, and competitive peer-review	Multi-stage review process with clear deadlines; staged evaluations reduce inefficiency	Competitive but structured peer review; success rates declining (<20%) but timelines reliable
Transparency of Processes	Limited disclosure of selection criteria and outcomes; reports not detailed; weak open science policies	Calls and review criteria published; evaluation outcomes shared; moderate adoption of open science	High transparency: clear criteria, open review outcomes, and mandatory open-access publication	Moderate transparency: closed peer review but reforms toward reducing bias and increasing accountability
Equity and Inclusivity	Favors senior academics and urban universities; limited access for early-career researchers, women, and rural institutions	Stronger inclusivity measures; targeted support for young researchers and underrepresented groups	Deliberate equity mechanisms: fellowships for early-career scholars, mobility programs, gender balance targets	Persistent inequalities but some reforms for equity and diversity; early-career grants available

Discussion

This study has also shown that the funding system of scientific research in Nigeria is crippled by inefficiency, lack of transparency, and inequity in distribution. This is in line with previous studies, which point to weaknesses in the systems of African research per se, where inconsistent funding periods, political influence, and the absence of accountability measures impede the development of science (Mouton and Blanckenberg, 2018; Tijssen, 2019). In particular, the Nigerian example demonstrates how the lack of transparency in how the disbursement process is conducted, which includes unannounced reviewing criteria and the inability to understand the selection results, affects the level of trust in the system and deprives the country of a chance to generate high-impact studies.

One of the themes that comes out in the findings is the connection between transparency and legitimacy. The introduction of transparent funding models helps not only to allocate the funds justly but also to inspire the researchers and the general population in the importance of science (Allen, O'Connell, and Kiermer, 2019). Research in such a scenario as Europe, where not only the evaluation procedures are publicly available but also the open-access publication of the results is imposed, becomes more visible and policy-relevant (European Commission, 2020). The inability of Nigeria to incorporate such practices means that the country has poor research visibility, with the contribution of Nigeria at less than 1 per cent of all publications in the world (UNESCO 2021).

Equity in the funding of research is another theme. It has been demonstrated that Nigerian grants are disproportionately awarded to senior scholars and established universities in cities. It resonates with the international fears of competitive funding that always breeds inequalities (Wang, Lee, and Walsh, 2018). As in the case of South Africa in the National Research Foundation (NRF) model, however, access can be balanced by targeted intervention towards young-career researchers, women and historically disadvantaged institutions. The absence of such carefully designed equity in Nigeria keeps alive the tradition of academic elitism and discourages diversity in scientific enquiry.

Lastly, the findings give priority to the efficiency of funding. Slow payments, unstable schedules and excessive bureaucracy were found to be the main obstacles. These inefficiencies deter risks and innovations, especially for young scholars. It compares to Europe and North America, where inefficient performance may be alleviated by implementing streamlined multi-stage evaluation processes and time-restricted funding cycles, without impairing the level of peer review (Gross & Bergstrom, 2019).

Altogether, the discussion highlights that Nigeria cannot be restricted in the development of its scientific field by the absence of intellectual ability, but by the weak organisation of the infrastructure in terms of financing by the government. Transparent models, thus, play a driving force in science discovery as they create a sense of accountability, equity and efficiency.

Conclusion

This paper aimed to investigate how transparent funding models can be used to promote scientific discovery in Nigeria. The findings indicate that, although serious efforts have been undertaken by using agencies like TETFund, the system is still limited by its opaque nature, lack of equity in its distribution, and unproductive nature. Nigeria is worse in entrenching transparency within its funding ecosystem when compared to international best practices, and this adversely impacts the visibility of research and competitiveness at the international level.

The problem in the Nigerian case is that transparency is not only an administrative but a structural determinant of scientific discovery. Transparent models make them more accountable, inclusive, and innovative, as they make sure that the decisions that are made by funding agencies rely on merit and can be publicly explained. Nigeria may remain a marginal country in the global knowledge economy unless reform is done. On the other hand, by matching its practices with the models used in South Africa, Europe and North America, it can contribute greatly to science, especially in areas that are of priority like health, agriculture and renewable energy.

Recommendations

Funding bodies like TETFund, the National Universities Commission and sector-specific institutes need to embrace increased transparency and accountability in their business to enhance Nigeria's ability to make scientific discoveries. Making the criteria of the grants evaluations transparent, providing the results of the reviews, and insisting on the open publication of the research funded by the state would help to increase the level of trust in the researchers and to popularise the Nigerian scholarship. Open science policies, which are practised in Europe in the context of Horizon 2020, need to be domesticated in such a way that the public investment in research would be turned into the knowledge that is accessible to everyone and that has a social impact that can be measured.

Equity in the distribution of resources, in addition to transparency, should become a policy priority. The existing trends in funding, including the older academics and the high-class cities, have led to structural inequalities that kill innovations. Specialised initiatives could be offered to early-career scientists, women, and institutes in underserved areas to make the resources more democratic and distribute the research agenda. The example of the National Research Foundation (NRF) in South Africa is also beneficial because it shows that specific equity policies can address the imbalance and help unlock new talent. Following the same frameworks, Nigeria will be able to develop an inclusive research culture that requires the creative potential of the whole academic community.

Lastly, there should be efficiency and sustainability in funding mechanisms. Delays in disbursement, inconsistent schedules and bureaucracy in the bottleneck discourage the scientists and hinder the scientific output. Institutionalisation of streamlined application processes based on predictable funding cycles should also be adopted, as well as

independent monitoring and evaluation frameworks that monitor results. In addition to government backing, Nigeria must also reward public–private collaboration and philanthropic involvement in research by tax advantages and co-funding programs. These changes in funding can almost guarantee that Nigeria is not as dependent on the tight state budgets and that the research ecosystem is sustainable, progressive, and capable of making a substantial contribution to the global breakthrough of science.

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