POLICY BRIEF

Addressing the Math Gap:

Improving Nigeria's Secondary School Curriculum to Prepare Future Economists

By Obiageli (Oby) Ekwunwa, Adejo Moses Adejo, Chinecherem Jacinta Orji

Introduction

In Nigeria's secondary schools, students are typically grouped into one of three subject streams: Science and Technology (Sciences), Humanities (Arts), or Business Studies (Social Sciences). This grouping is typically done at the start of senior secondary school. The system is intended to align students' education with their intended career paths, ensuring they take subjects required for national examinations, such as the West African Senior School Certificate Examination (WASSCE) and the Unified Tertiary Matriculation Examination (UTME).

However, this well-intentioned structure can inadvertently narrow learning opportunities. A prominent example is that students placed in the Social Sciences stream who hope to study Economics at university are often unable to take Further Mathematics, a course where calculus, a fundamental skill for advanced Economics, is first introduced. This results in a likely gap in mathematical preparedness that scholars have called "the mathematics problem".

This challenge is not unique to Nigeria; many Economics students worldwide report being unprepared for the level of mathematical rigour required in their programmes. Evidence from the Economics Network Student Survey in Scotland, for instance, revealed that over 80% of students found their Economics degree involved far more mathematics than they had anticipated. Globally, studies have shown that a robust mathematical background acquired during secondary school is a crucial predictor of academic success and retention for students pursuing Economics at university. For instance, a study in Spain found that students from the Technological stream, which offers Advanced Mathematics, including more extensive math concepts and geometry modules, outperformed their peers from the Social Sciences stream at university, despite being the recommended stream for Economics-Business students in secondary school. Similarly, research at the Erasmus School of Economics in the Netherlands demonstrated that science-preparatory students with strong math foundations achieved higher first-year credit attainment (45% vs. 30%) and lower dropout rates (under 25% vs. 45%) compared to non-science students. Collectively, these studies emphasise the essential role of advanced mathematics instruction at the secondary level in enhancing students' academic outcomes in university Economics programs.

Despite empirical evidence linking strong maths preparation to economic success, few studies have examined the association between exposure to advanced mathematics and the academic performance of economics students in Nigerian universities.
The objective of this study is to address this critical gap by exploring the relationship between exposure to advanced mathematics and the performance of economics students in math-intensive courses in Nigeria. To achieve this objective, the study surveyed 375 economics undergraduates across 10 federal, state, and private universities. It employed descriptive analysis to provide foundational evidence on exposure to advanced mathematics and academic outcomes among Nigerian economics undergraduates. The rest of this brief is organised as follows: Section 2 provides background on Nigeria's subject streaming system; Section 3 describes the survey methodology and presents the results; Section 4 concludes the brief by summarising the key findings and discussing policy recommendations.

Nigeria's Secondary Education Streaming

In Nigerian secondary schools, students are streamed into three academic streams: Sciences, Arts, or Social Sciences. Across all streams, students take a set of four core compulsory subjects that form the foundation of their education: English Language, General Mathematics, one trade subject with entrepreneurship studies, and Civic Education. Students supplement these core subjects with specialised subjects determined by their chosen stream. This stream also determines the subjects students take for key national examinations, such as the WASSCE and the UTME, which are critical for university admission.

Students in the science streams typically take courses such as Further Mathematics, Chemistry, and Physics in preparation for STEM fields. Meanwhile, students in the Arts and Social Sciences streams, who often pursue careers in Economics, Law, or Commerce, enrol in subjects like Economics, Government, Literature, or Commerce. While it is possible for students to take elective subjects outside their core academic stream, scheduling constraints and limited resources often lead schools to prioritise certain courses within each stream, thereby limiting these opportunities. This structural exclusion often deprives aspiring economists of early exposure to calculus, thereby creating the math gap before university.

Methodology and Survey Results

3.1 Methodology

Ten universities from federal, state, and private institutions across Nigeria were selected using a random sampling method. Within these universities, 375 undergraduate Economics students participated in the study. Data collection was conducted via a structured questionnaire distributed online through Google Forms, facilitated by board members of the National Economic Students Association (NESA), which operates across the universities. The questionnaire collected information on students' educational backgrounds, courses taken in secondary school, their self-reported academic performance in math-intensive Economics courses, and their perceptions of advanced mathematics. The type of mathematics course, whether Further Mathematics or General Mathematics, captured students' mathematical preparedness based on their secondary school mathematics exposure. Additionally, we measured students' perceptions of the role of Further Mathematics in the Economics curriculum at the secondary school level. Therefore, the three main variables used in this study are mathematical preparedness, academic performance of Economics students, and students' perceptions of their mathematical preparedness. Descriptive analysis was employed to summarise and interpret the collected data, providing foundational insights into the relationship between subject streaming and the performance of economics students in math-intensive courses.

3.2. Results

The Results are presented under three key themes: Subject Streaming and Mathematics Preparedness, Subject Streaming and Academic Performance of Economics Students, and Subject Streaming and Students' Perceptions on Mathematical Preparedness. Collectively, this section assessed the roles of advanced mathematics exposure in secondary school on academic performance at the university level for Nigerian economics programmes.

Subject Streaming and Mathematical Preparedness for Economics Students

In the survey, mathematical preparedness was measured based on secondary school mathematics exposure, specifically the type of mathematics studied: either General Mathematics only or both General and Further Mathematics. Building on the international evidence from Spain and the Netherlands, students who studied Further Mathematics are considered mathematically prepared.

The survey results show that 52.4% of Science stream students took both General and Further Mathematics, compared to 27.2% of Social Science stream students and 18.1% of Arts stream students (Figure 1). This descriptive data indicates clear differences in mathematics exposure across streams, with Science stream students much more likely to have taken Further Mathematics than their Social Science or Arts counterparts

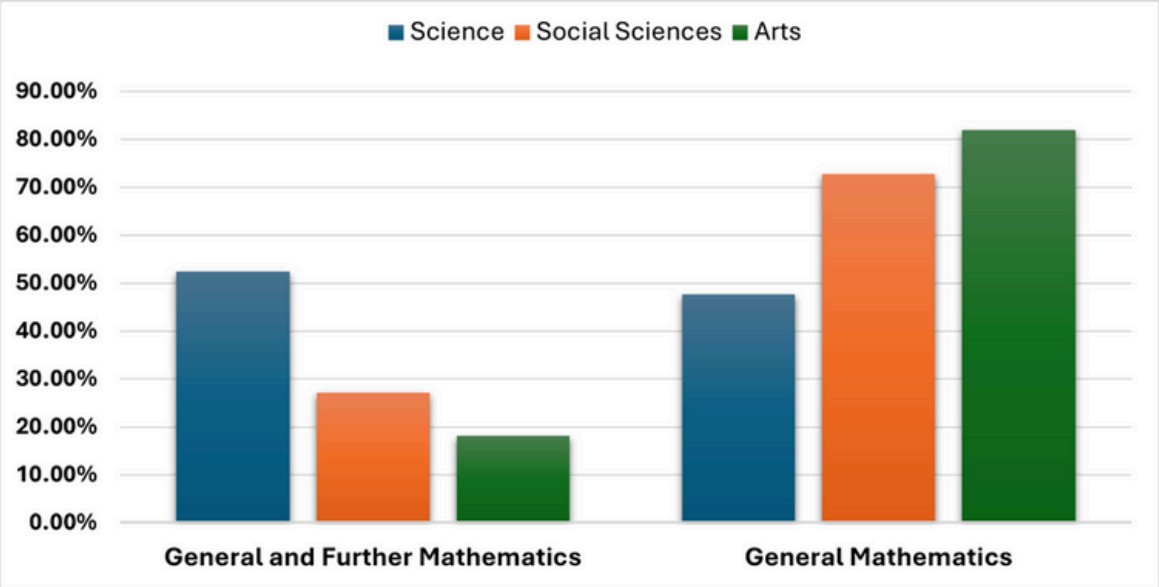

Figure 1: Distribution of Economics Students by Subject Stream and Type of Math Subjects Studied in Secondary School

Subject Streaming and Academic Performance of Economics Students

Students in the science stream had greater exposure to Further Mathematics, which has been demonstrated in other global settings to influence math preparedness for Economics programs, as referenced earlier in this policy brief. Therefore, students with higher levels of mathematical preparedness would be expected to perform better in math-intensive economics courses.

The survey measured student academic performance using their self-reported grades, specifically the proportion of A (70% and above) grades earned in key courses: Mathematical Economics, Statistics, Microeconomics, Macroeconomics, and Econometrics.

On average, students from the Science stream reported higher percentages of A grades across these courses (Mathematical Economics: 68.8%; Statistics: 47.4%; Microeconomics: 46.7%; Macroeconomics: 64.3%; Econometrics: 50.0%) compared to those from the Social Science (31.8%, 34.4%, 27.3%, 32.0%, 24.8%) and Arts streams (26.4%, 25.0%, 24.7%, 18.9%, 23.7%), respectively (Figure 2). These descriptive results show clear performance differences across streams within the Nigerian context. The present finding sets the stage for future research within the Nigerian educational system to rigorously examine the causal relationship between mathematical preparedness and academic performance in economics programmes.

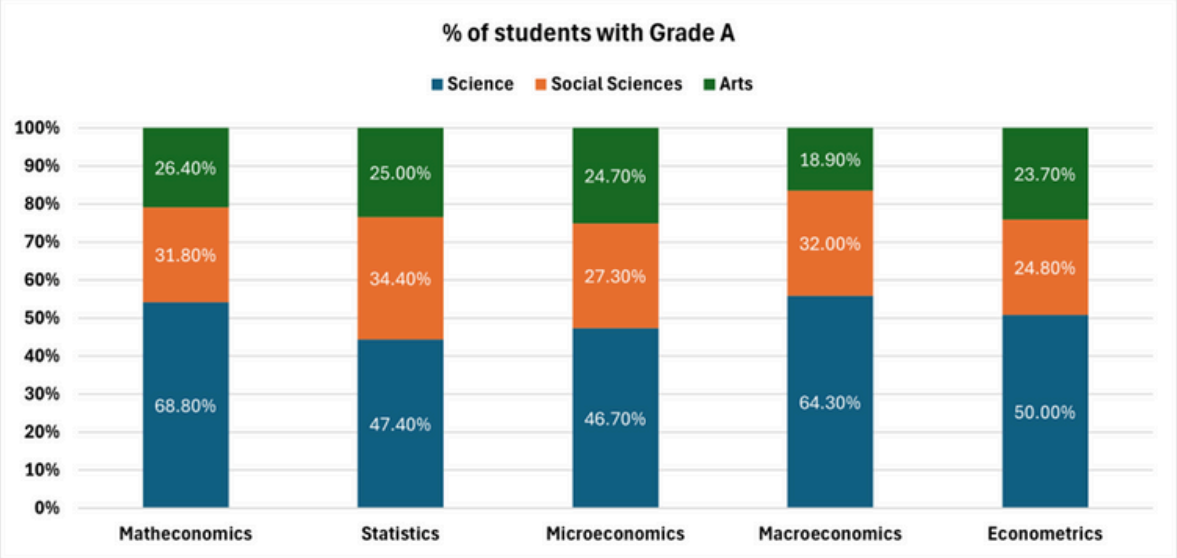

Figure 2: Distribution of Students by Subject Streams and Performance in Math-intensive Economics Courses

Subject Streaming and Economics Students' Perceptions of Mathematical Preparedness

Student perceptions of the role of Further Mathematics in academic progress are crucial for understanding their experiences and academic performance in economics programmes. Research evidence shows that student perceptions in academics provide valuable insights that can help educators and policymakers align curricula more effectively and improve teaching strategies to enhance learning outcomes.

Therefore, students from all streams were asked if Further Mathematics exposure in secondary school would better prepare students from non-science streams for math-intensive economics courses at the university level.

The survey results show that a majority (65.1%) of Economics students agree that exposure to Further Mathematics for Social Science and Arts stream students is important for supporting their academic success in economics at the university level ***(Figure 3)***. This finding highlights the importance that economics students place on access to further mathematics as part of secondary education and reinforces the need to consider student perspectives when designing policies to improve mathematical preparedness for economics programmes.

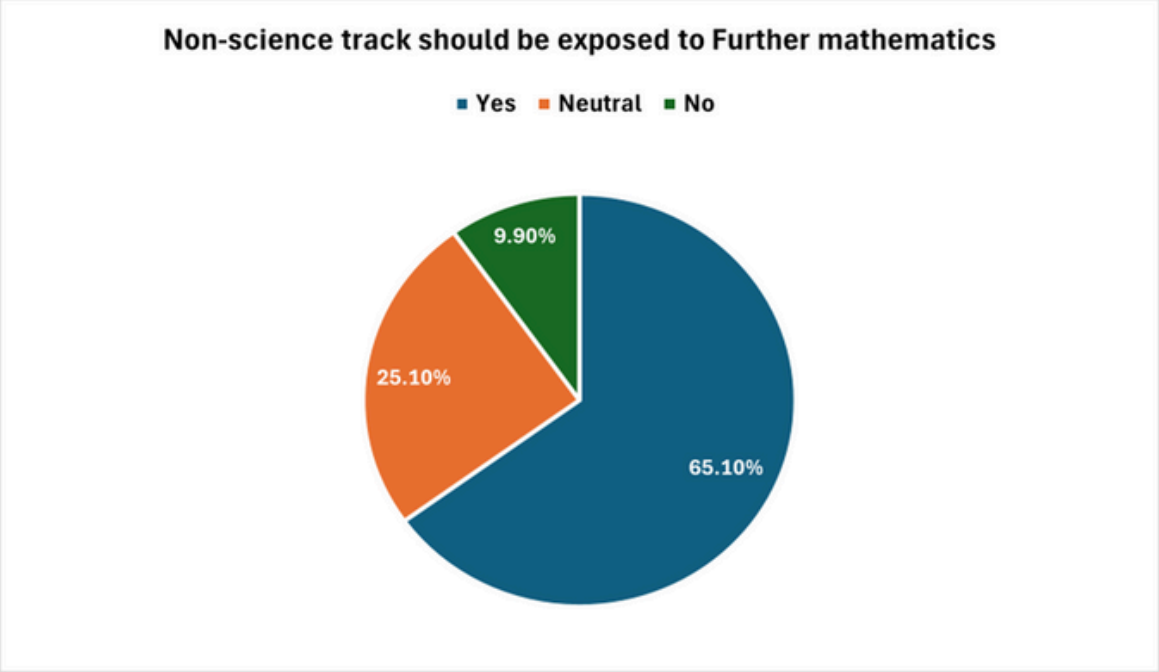

Figure 3: Distribution of Economics Students' Perceptions of Exposing Non-science Stream Students to Further Mathematics at Secondary School.

Key Findings and Policy Recommendations

The findings demonstrate that subject streaming, as currently practised in Nigerian secondary schools, corresponds with significant disparities in mathematical preparedness that tend to disadvantage Social Science and Arts students aspiring to study Economics at university. This streaming system is associated with limited access to advanced mathematics courses like Further Mathematics for non-Science students, along with lower self-reported grades for math-intensive Economics courses at the university level.

Furthermore, the evidence shows that a majority of Economics students in universities recognise the importance of exposure to Further Mathematics for improving their academic preparedness and success. Although this study is based on descriptive analysis, it offers valuable preliminary insights into the link between mathematics preparedness and academic performance. Future studies should build on this groundwork by applying robust empirical methods to examine these relationships more rigorously within the Nigerian educational system.

To promote equitable and adequate preparation for university Economics students in Nigeria, the following policy actions are recommended:

1. Integrate Further Mathematics into Non-Science Streams for Aspiring Economics Students.

The Federal and State Ministries of Education should institutionalise the inclusion of Further Mathematics courses within Social Science and Arts secondary school streams, particularly targeting students preparing for Economics at the tertiary level. This approach aims to expand opportunities for rigorous quantitative preparation and address the mathematical gap associated with current streaming practices and ensure consistency in curriculum delivery across secondary schools.

2. Strengthen Career and Academic Counselling for Secondary Students.

Secondary school authorities should mandate comprehensive training for teachers and guidance counsellors to communicate the importance of Further Mathematics for success in university Economics. Counselling services must actively dispel the misconception that Economics is 'math-light' and guide students who aspire to study Economics from all streams toward informed subject choices that improve their preparedness.

In summary, policymakers and education authorities should prioritise reform that expands equitable access to further mathematics and strengthen career guidance for students pursuing Economics programs. Such measures will enhance academic preparedness, promote fairness in educational outcomes, and build a stronger pipeline of economists capable of designing policies that advance Nigeria's economic growth and social inclusion.