UNIVERSITY OF GHANA

EFFECT OF STEM ON EMPLOYMENT PREFERENCE: A STUDY OF UNIVERSITY OF GHANA LEVEL 400 STUDENTS

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DECLARATION

I, Rebecca Ashong, hereby declare that this thesis is original research undertaken by me under the guidance of my supervisors, and except for references to other people's work which have been duly cited, this thesis has neither in part nor in whole been submitted for another degree elsewhere.

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ABSTRACT

This study investigates how Science, Technology, Engineering, and Mathematics (STEM) education influences the employment preferences of final-year undergraduate students at the University of Ghana. Ghana's educational policies have sought to boost youth involvement, particularly among females, in light of the global emphasis on STEM as a driver of economic growth. However, there is still much to learn about how gender and educational background—STEM or non-STEM affect students' career decisions. Using data from final year students, this research employs Propensity Score Matching and Logit Regression models to assess the causal effect of the type of education on employment preferences. The findings show that students with a STEM background are significantly more likely to prefer employment in STEM-related fields. However, gender was not a statistically significant predictor of preference, even though males were more likely to gravitate toward fields like engineering and computer science, while females leaned toward life sciences and education-related roles. Employment earnings and working conditions, such as hours and job security, were major factors influencing students' preferences.

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CHAPTER ONE

INTRODUCTION

1.1 Research Background

In the rapidly changing dynamics of education and workforce development, Science, Technology, Engineering, and Mathematics (STEM) education has become a key driver in shaping both employment preferences and economic prospects (Archer 2013). STEM education offers substantial benefits, including the development of skilled labor, access to higher wage premiums, advancements in technological innovation, and brings about employment growth, which together help reduce unemployment and stimulate economic expansion (Baah-Boateng, 2021; Croak, 2018; Gyeke-Dako et al., 2016; Walker & Zhu, 2013).

In Ghana, efforts have been made to promote STEM education through curriculum reforms and targeted interventions, especially to improve female participation. However, the proportion of Ghanaian youth engaged in STEM-related careers remains low. According to the International Labour Organization (ILO, 2023), out of over 2.3 million employed youths aged 15–24 in Ghana, only 18,200 are engaged in STEM-related fields, representing less than 1% of total youth employment. This underrepresentation exists despite increasing demand for skilled STEM labor both locally and globally. The link between tertiary STEM education and employment preferences is particularly critical, as the career decisions of final-year university students directly influence the country's skilled labour supply and future innovation capacity and hence contributes to ongoing debates on how to align education systems with labor market demands, particularly in the context of Ghana's youth-dominated population and aspirations for socio-economic transformation.

Employment choice is an important decision for undergraduate students as it defines their professional aspirations. In making these choices, students often struggle with matching their employment preferences with their academic abilities and achievements (Koech et al., 2016). The literature suggests that parents significantly influence children's higher education choices (Ampofo, 2020; Owusu et al., 2018). Okyere (2021) further noted that students' employment preferences are shaped by factors such as limited job availability, lack of job awareness, and workplace discrimination. Gender disparities in STEM employment preferences and participation continues to be a major challenge. Sadler et al. (2012) found that while males tend to sustain interest in STEM careers throughout high school, females experience a notable decline in interest. These gender gaps remain apparent, with women less inclined to pursue STEM careers (Saw et al., 2018; Sadler et al., 2012). Mentorship programs have emerged as a potential solution, as Appel and Mansouri (2022) argue that such initiatives can effectively boost STEM employment interest, particularly among underrepresented groups.

The choices of male and females in STEM employment is different. We find less females than males in the fields of engineering, computer science and information technology, mathematics and statistics. Where in the field of physical and life sciences, there are few females than males in the fields of physics and chemistry many more females gravitate towards the biological and health sciences which Smith and White (2022) term as ‘caring’ profession.

Gender diversity leads to economic growth and innovation (Smith & White, 2022). Different teams bring about diverse perspectives and problem-solving approaches, which can lead to more effective solutions and advancements in technology and science. With the relatively limited number of women in these fields, we limit the potential for innovation and economic growth.

According to the World Development Indicators (2023), 57% of Ghana's population is composed of youth under the age of 25. The International Labour Organization (ILO, 2017) reported that 2,385,500 individuals between the ages of 15 and 24 were employed in Ghana, with only 18,200 involved in STEM fields (10,200 males and 8,000 females), representing 43.96% of females in STEM employment. Despite governmental and organizational efforts, females remain significantly underrepresented in STEM employment (Lloyd et al., 2018).

Employment in STEM occupations has seen significant growth in recent years, yet there remains a substantial demand for skilled professionals to meet the challenges of this rapidly evolving field. The effect(s) of STEM education on employment preferences carries broad implications, not only for individual students but also for Ghana's socio-economic landscape compared to other fields of study (Bishop, 2015). Policy makers and scholars alike express growing concerns about the limited pool of STEM labor to meet global demand and emphasize the importance of fostering undergraduate interest and orientation toward STEM careers (Badmus & Jita, 2023).

Understanding the factors that influence employment choice is important, as this decision shapes expectations for the future and affects job satisfaction. Globally, students often face dilemmas when choosing a career path (Koech et al., 2016). Many students make poor employment choices due to ignorance, lack of experience, peer pressure, or advice from friends, parents, and teachers. Some are drawn to certain careers because of the prestige associated with them, often without proper guidance or career counselling.

This study, therefore, examines the influence of STEM education on the employment preferences of undergraduate students. Technological innovations, a subsection of STEM, drives a faster economic growth (Gyeke-Dako etal, 2016; Croak 2018). The focus on final year students is intentional. They are at the point of entering the labor market, where their career decisions will significantly shape their future. Focusing on a cohort, who are transitioning into the workforce, offers valuable insights into the factors driving their employment preferences.

1.2 Overview of policies on STEM Education and STEM Employment

1.2.1 STEM Education Policies - Global

STEM education policies have gained global prominence as governments increasingly recognize their pivotal role in driving economic progress, technological innovation, and global competitiveness. Many nations have implemented targeted initiatives to strengthen their STEM sectors, tailoring policies to address local challenges and capitalize on global opportunities.

In Asia, countries such as Hong Kong, Malaysia, China, Japan, South Korea, and Singapore have embraced STEM education through comprehensive national policies. These initiatives aim to foster innovation, grow a highly skilled workforce, and enhance their competitive edge in global markets (Chen et al., 2021; Halim et al., 2021; Li et al., 2020). For instance, China has integrated STEM into its national development strategies, aligning it with its ambitions in fields such as artificial intelligence and robotics. Similarly, South Korea has developed specialized STEM curricula in schools to address the country's demand for technology professionals. Singapore, known for its highly successful education system, places strong emphasis on STEM through early education and continuous professional development for educators.

In North America, both the United States and Canada have demonstrated strong commitment to STEM through significant policy developments and investments. For example, the United States has introduced multiple STEM education initiatives, such as the "STEM Education Strategic Plan(2018)," which highlights the importance of interdisciplinary learning, problem-solving, and preparing students for future careers in STEM-related fields (Johnson et al., 2020). Canada has made significant strides in promoting STEM at all educational levels, investing heavily in research and innovation infrastructure while encouraging partnerships between universities and industry to align STEM education with labor market needs.

In Europe, STEM education policies have been integral to regional and national strategies aimed at fostering innovation, improving competitiveness, and addressing skills shortages in science and technology fields. At the European Union (EU) level, the European Commission has launched initiatives such as the European Skills Agenda and the Digital Education Action Plan (2021–2027), which emphasize strengthening STEM learning from early education through to higher education and vocational training. These frameworks encourage interdisciplinary approaches, promote gender balance in STEM fields, and support cross-border collaboration in research and innovation.

Individual countries have also developed tailored policies to address their specific STEM-related challenges. For example, the United Kingdom's STEM Education and Skills Strategy focuses on improving STEM teaching quality, expanding access to practical laboratory experiences, and fostering partnerships between schools, universities, and employers to ensure that curricula align with industry demands. Germany's MINT Aktionsplan (where MINT stands for Mathematics, Informatics, Natural sciences, and Technology—the German equivalent of STEM) invests in digital learning resources, supports teacher training, and promotes STEM engagement through extracurricular programs targeting underrepresented groups, including women and rural students. Similarly, Finland integrates STEM across its renowned national curriculum, emphasizing inquiry-based learning, coding, and problem-solving from early grades to prepare students for a technology-driven economy.

As the global economy becomes more dependent on technological advancements and innovative solutions, the role of STEM education policies in shaping the future workforce cannot be overstated. These policies do not only enhance the employability of students but also contribute to national development by positioning countries to lead in scientific research, technological breakthroughs, and economic growth.

1.2.2 STEM Education Policies in Africa

Recent research underscores the critical role that STEM education plays in Africa's socio-economic development, while also acknowledging the considerable challenges that hinder its growth and impact. Among these challenges are resource limitations, such as inadequate infrastructure and funding, gender disparities, and inadequate teacher training (Onyebuchi Nneamaka et al., 2024). These factors contribute to a relatively low participation rate in STEM fields across the continent, with less than 25% of African higher education students pursuing STEM qualifications, and of this group, only 30% are female (Mutsvangwa & Zezekwa, 2021).

The integration of STEM education is also crucial for achieving the broader developmental goals outlined in Agenda 2063, Africa's ambitious 50-year development plan. This blueprint highlights the importance of STEM in driving technological advancement, industrial growth, and overall economic transformation (Formunyam, 2020). STEM education equips students with the skills needed to meet the challenges of a rapidly evolving global economy, from solving complex problems to fostering innovation.

1.2.3 STEM Education Policies in Ghana

Ghana has made commendable strides toward implementing STEM education. However, it continues to struggle with significant challenges. These obstacles include inadequate teaching materials, limited number of certified teachers, lack of infrastructure, and insufficient professional development opportunities for educators (Bardoe et al., 2023). Addressing these issues require a multifaceted approach, with key recommendations including the development of comprehensive

STEM policies, the establishment of systematic frameworks for STEM integration, and a curriculum overhaul to make STEM more relevant and accessible (Bardoe et al., 2023).

The successful integration of STEM education in Ghana hinges on capacity building for teachers and fostering student interest in STEM subjects, ensuring that both teachers and students are well-equipped to engage with modern technological advancements (Takyi-Bondzie et al., 2022). Enhancing pre-tertiary STEM education is critical for nurturing the human capital necessary to support the country's Science, Technology, and Innovation (STI) system, aligning with national goals for socio-economic growth and development (Akon-Yamga et al., 2024).

Efforts, particularly to boost girls' participation in STEM remain hindered by socio-cultural factors, including school dropouts due to unintended pregnancies, which continue to undermine girls' educational prospects and engagement with STEM fields (Dzisi & Asare, 2022). Addressing these gender-specific barriers is essential to ensuring equitable access to STEM education for all.

1.2.4 Policy on STEM employment

Research reveals that women face significant barriers in STEM fields, including unconscious biases, unequal burden of domestic responsibilities, and workplace harassment. These, according to (Greider et al., 2019), create obstacles to their advancement and retention

Policy approaches to increase women's participation in STEM include the enforcement of Title IX provisions to prevent gender discrimination in STEM employment (Walters & McNeely, 2010), the integration of STEM education into school curricula from an early stage and the implementation of employment guidance measures tailored to women. Title IX is a component of the Education Amendments of 1972 that forbids sex-based discrimination in educational programs that receive federal funding. Title IX which built upon the Civil Rights Act of 1964, was subsequently renamed the Patsy T. Mink Equal Opportunity in Education Act. The fact that 42% of college students were female at the time represented a step forward for educational gender equality. Furthermore, high-skilled immigration plays a critical role in U.S. STEM employment, with immigrants accounting for a disproportionate share of jobs in these fields, highlighting the importance of global talent in maintaining STEM advancements. For example, 42% of physical scientists, 29% of doctors, and 45% of software developers are immigrants in the United States. In 2013, a sizable portion of STEM jobs were held by foreign-born workers: 19.2% had a bachelor's degree, 40.7% had a master's degree, and 54.5% had a doctorate. These figures demonstrate the crucial contributions made by immigrants to advanced STEM positions, especially in research and development.

In Africa, STEM policies have predominantly focused on labor supply strategies, such as entrepreneurship training, but they often fail to address demand-side constraints, such as the limited availability of jobs in STEM sectors (Schwebel et al., 2019). To promote more productive employment in the region, scholars recommend policy reforms in teacher training, curriculum development, and increased attention to gender equity.

The socioeconomic revolution of many countries now heavily relies on Science, Technology, and Innovation (STI). This fact is addressed in the major policy papers of Ghana, such as the Growth and Poverty Reduction Strategy II (GPRS II) and the Medium-Term Development Plan (UNCTAD,2011).

Thus, there have been some initiatives over the years to raise the proportion of female students in STEM in Ghana. The Science, Technology, and Mathematics Education (STME) clinic was established in 1987 by the Ghana Education Service (GES) with the intention of providing teachers the opportunity for professional development (Sutherland-Addy, 2002).

STME aimed to provide unique student programs on scientific and technological breakthroughs. In order to promote non-discriminatory enrollment in education and the general public, the Ministry of Education also established the Girls' Education Unit (GEU) in 1997.

When examining employment preferences in STEM, gender differences become apparent. For males, economic factors largely influence their career choices, while females are often driven by external motivations, such as encouragement from mentors and family members (Wrigley-Asante et al., 2022). On one hand, men typically pursue STEM careers due to financial stability, high earnings, and career growth opportunities. Demand from the market and long-term financial gains frequently influence their choices. On the other hand, support networks that help women get above social and cultural obstacles are usually associated with their involvement in STEM. Their goals are significantly shaped by their family, teachers, and mentors. According to Jacobs, Chhin, and Bleeker (2006), girls' self-confidence and skills were influenced by their parents' views. Reinforcement of traditional gender norms, often influence their decisions to pursue careers that perceived to be gender-conforming. Their enthusiasm and involvement in STEM subjects may be restricted by this early influence, which adds to the pervasive gender gap that has been documented worldwide. Wang and Degol (2017), Tikly et al. (2018), and Hartung, Porfeli, and Vondracek (2005) further emphasize how parental and cultural expectations still influence the proportion of women in STEM fields.

1.2.5 Opportunities of STEM

The United States derives significant economic benefits from the contributions of foreign STEM talent, including both workers and students. In 2019, the average STEM worker both native and foreign-born added $139,605 in value to the U.S. Gross Domestic Product (GDP). Specifically, the contributions of the foreign-born STEM workforce ranged between $367 billion and $409 billion in labor value-added, accounting for 1.7 to 1.9 percent of U.S. GDP in that year. These foreign-born workers, along with international doctoral students in STEM fields, play a crucial role in enhancing total factor productivity by driving innovation and advancing research.

On a per capita basis, each foreign-born STEM worker and doctoral student contributed an estimated $12,225 to $13,568 to U.S. GDP in 2019, highlighting the individual economic impact of foreign talent. Furthermore, foreign-born entrepreneurs have been pivotal in establishing companies, particularly in R&D-intensive industries, generating substantial economic returns. These companies' total value-added is estimated to be between $260 billion and $394 billion, representing 1.2 to 1.8 percent of GDP. STEM workers are increasingly helping Ghana's economy by fostering innovation, advancing research, and supporting important industries including manufacturing, energy, healthcare, and agriculture. Technology firms are expanding quickly, especially in Accra and Kumasi, which demonstrates the industry's ability to create jobs and diversify the economy. Entrepreneurship and business formation are greatly aided by STEM workers, especially in businesses that rely heavily on research and development. STEM personnel have additional opportunity to excel because of initiatives like the National Entrepreneurship and Innovation Programme (NEIP). Ghana's economy benefits greatly from STEM education, especially when it comes to the Information and Communication Technology (ICT) industry. The ICT sector's share of Ghana's GDP increased from GH¢4.4 billion to GH¢21 billion between 2016 and 2022, which is about 4% of the country's total GDP.

1.3 Problem Statement

In recent years, the intersection between STEM education and employment has gained significant global attention, because it has a crucial role of driving economic growth, technological innovation, and addressing labor market demands (Archer et al., 2013). Despite this increasing focus, there remains a critical gap in understanding factors such as how STEM education and gender influence the employment preferences of students at the tertiary level. Understanding the factors that affect these students' employment preference will enable policy makers enact policies and laws that will create and enhance STEM fields.

STEM students often face considerable explicit costs, such as high tuition fees, and implicit costs, such as foregone leisure due to mandatory internships or practical attachments required by their programs (Xu, 2012). While these investments in STEM education are expected to lead to greater employment opportunities and higher earning potential, the costs incurred by students do not always translate into a preference for STEM-related careers post-graduation (Bishop, 2015). This disconnect raises important questions about the factors including gender that influence students' employment choices and the perceived value of a STEM degree in the job market.

A prominent issue within the STEM workforce is the persistent underrepresentation of women, particularly in leadership and decision-making positions. Despite growing efforts to close the gender gap, studies show that women in STEM face unique barriers to entry and career advancement. These barriers include gender bias, discrimination, and a lack of institutional support, such as mentorship and networking opportunities, which are critical for career growth (Lloyd et al., 2018). Furthermore, societal expectations and cultural norms often discourage women from pursuing STEM degrees, compounding the challenge (Isma'il, Abbas & Ibrahim, 2023). Consequently, while initiatives aimed at promoting STEM education among women have increased, the systemic obstacles remain significant and continue to impede the progress of women in STEM fields.

Although previous research has recognized the impact of STEM education and gender inequality on career choices, the current study makes a clear distinction between three major factors. The first is structural constraints, which include things like persistent gender prejudice in hiring and promotion practices and a lack of employment openings in some industries. The second category is internal dispositions, which encompasses factors such as self-efficacy, professional interests, and individual motivations that influence job choices. The third is labor market signals, which are represented by metrics like working conditions, employment security, and perceived earning potential. By making these distinctions explicit, the study's justification acknowledges the larger elements that influence employment decisions generally while staying firmly focused on the impact of STEM education on occupational preferences.

In the context of Ghana, most existing studies on employment preferences have focused on senior high school students, particularly in relation to general career aspirations (Okyere, 2021). However, there is a research gap in understanding the employment preferences of tertiary-final students, especially those studying in STEM fields.

Additionally, there is limited understanding of the gender differences in employment preferences among STEM students at the tertiary level in Ghana. While existing research has provided some insights into the general factors influencing employment choices, such as job availability, financial incentives, and personal interests, the specific factors that affect male and female students differently, particularly in STEM fields, remain underexplored. Understanding these gender dynamics is crucial for developing targeted interventions that promote gender equity in STEM careers and help bridge the gap in female representation in this critical sector. Diverse ideas enrich policies. Gender equity helps in the formulation of representative policies in STEM and Non-STEM fields.

The study seeks to fill this research gap by assessing the effect of STEM education on the employment preferences of final-year undergraduate students at the University of Ghana. The research focuses on identifying the key factors that influence students' employment preferences, with particular emphasis on gender differences. By exploring the barriers and motivations shaping these preferences, the study aims to provide insights that can inform policy recommendations and programs designed to encourage more equitable participation in STEM careers, both in Ghana and beyond.

1.4 Research Objectives

The study aims to provide insights into how STEM education influences employment preferences among final year students at the University of Ghana. Specifically, the study seeks to achieve the following objectives:

1. To examine the effect of the type of education (STEM and Non-STEM Education) on employment preferences of students.

2. To assess the motivating factors that influence employment choice of students.
3. To document if there is any gender disparity in the employment preference of students.

1.5 Research Questions

Based on the study objectives, the following research questions can be formulated:

1. What is the effect of STEM and Non-STEM education on employment preferences of students?
2. What are the motivating factors that influence employment choice of students?
3. What are the gender disparities in the employment preferences of students?

1.6 Significance of the Research

The findings of this study would aid policy makers, educational leaders, and stakeholders by enhancing our understanding of the association between STEM education and employment preferences. The study also aims to provide insights into the gender disparity in students' employment preferences. These findings would assist in guiding policies aimed at ensuring gender equity in capacity building within STEM fields

Additionally, the findings of this study would be relevant for policymakers and tertiary education providers in making science studies an attractive option for tertiary level students in Ghana. The results would also help identify the underlying reasons for the low levels of interest in the study of sciences among university students in the country.

1.7 Scope of the Study

This study explores STEM education at the tertiary level, using the University of Ghana (UG), Legon Campus in Accra, as a case study. The rationale for selecting UG is the availability of a diverse student population in both STEM and non-STEM disciplines, exhibiting characteristics similar to other universities in Ghana. The research focuses on final year students. The university's collegiate system comprising the College of Basic and Applied Sciences and the College of Health Sciences are categorized as STEM, while the College of Education and College of Humanities are classified as non-STEM for this study.

1.8 Organization of the study

The study is structured as follows: Chapter One introduces the background, problem statement, objectives, research questions, significance, scope, definition of terms, and chapter outline. Chapter Two reviews the theoretical and empirical literature. Chapter Three details the University of Ghana profile, research method, sampling techniques, sample size, data collection instruments, sources of data, data analysis approach and respondent profiles. Chapter Four presents the study results, and discussion. Chapter Five concludes with a summary of findings, recommendations, limitations, and suggestions for future research. This structure ensures a comprehensive exploration of the study's objectives.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The chapter provides the relevant literature on the factors that influence students' employment preferences. Section 2.2 discusses the theoretical literature which entails "social cognitive theory and the traits and factor theory. Section 2.3 provides the conceptual literature which assesses the factors that influence students' preference. Section 2.4 reviews the empirical studies on students' employment preferences while Section 2.5 presents the chapter summary.

2.2 Theoretical Literature

This study discusses key theories relevant to understanding employment preferences and decisions. These include the Trait and Factor Theory. This emphasizes the alignment of personal traits with career factors, suggesting that individuals are most successful when their attributes match job requirements. The Social Cognitive Theory explores how personal experiences, behaviors, and environmental factors influence career choices. Finally, the Theory of Vocation Types categorizes individuals into vocational types based on personality, linking these types to preferred career paths.

2.2.1 Trait and Factor Theory

The Trait and Factor Theory, introduced by Parsons (1906), posits that individuals possess a unique set of traits such as abilities, interests, and values—that can be reliably measured. According to this theory, career success and job satisfaction are closely linked to how well a person's traits align with the specific demands or factors of a particular occupation. The theory emphasizes the importance of matching individual characteristics to job requirements, suggesting that the better this match, the more likely an individual is to succeed and find fulfilment in their career.

In the context of this study, the Trait and Factor Theory is relevant for understanding the employment preferences of STEM and non-STEM students at the University of Ghana. By analysing how students' traits such as their interest in STEM fields, academic strengths, and career aspirations align with the demands of various job markets, the study can assess the factors influencing their employment choices. For instance, students with a strong interest in problem solving, innovation, and technology may be more inclined toward STEM careers, while those with different traits may find fulfilment in non-STEM fields.

This theory also helps explain gender differences in employment preferences, as men and women may perceive certain industries or careers to be a better fit for their personal traits. By applying the

Trait and Factor Theory, the study can explore how intrinsic factors such as personal interest, self-efficacy, and career values contribute to the decisions students make regarding their future employment. This understanding is crucial for designing educational and career guidance programs that support students in aligning their personal traits with suitable career paths, particularly in encouraging more women to pursue and succeed in STEM fields.

2.2.2 Holland Theory of Vocational Types

Holland's Theory of Vocational Types, developed in 1959, asserts that career choices are deeply connected to an individual's overall personality (Holland, 1959). According to Holland, people tend to seek work environments that align with their personality types, and their level of satisfaction in a given career is determined by the compatibility between their work circumstances and their personality style. The theory identifies six primary personality types, Realistic, Investigative, Artistic, Social, Enterprising, and Conventional (RIASEC)—which correspond to different vocational environments. The better the alignment between a person's personality and their work environment, the more satisfied and successful they are likely to be.

However, Holland also highlights that a lack of self-awareness or limited employment information can hinder individuals from making appropriate career choices. When people choose jobs that do not align with their core personality types, they may experience dissatisfaction and poor job performance due to a mismatch between their personality and their occupational environment.

In relation to this study, Holland's theory is particularly useful in examining how STEM students at the University of Ghana make employment choices based on their personality types. It provides a framework for understanding why certain students are more inclined toward STEM careers, which often require traits like Investigative (analytical, curious) or Realistic (practical, hands-on). Conversely, students whose personality types align with more Artistic or Social career environments may be drawn to non-STEM fields (Okyere, 2021).

The theory also sheds light on gender disparities in STEM employment. For example, societal expectations and stereotypes may discourage women whose personalities align with STEM fields from pursuing careers in those areas, leading to a mismatch between their potential and their chosen career path. By applying Holland's theory, this study can explore how the alignment between students' personalities and their chosen employment sectors impacts their career satisfaction, particularly in STEM-related fields, and offer insights for career counselling and educational policy to ensure better personality-occupation fit.

2.2.3 Social Cognitive employment Theory

The Social Cognitive Employment Theory, proposed by Lent et al. (2008), explores how individuals develop their academic and employment interests, and how these interests influence their educational and career choices. The theory posits that career decision-making is influenced by three key cognitive constructs: choice goals, outcome expectations, and self-efficacy. Choice goals refer to the aspirations and career paths an individual aims to pursue; outcome expectations are the perceived consequences or benefits of choosing a particular career; and self-efficacy is the individual's belief in their ability to succeed in a given job or field.

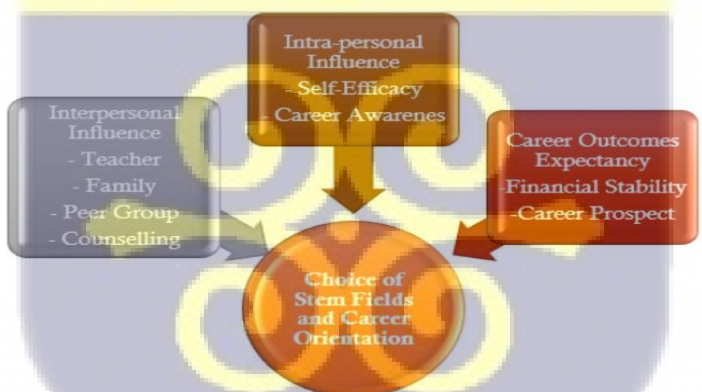
This theory emphasizes that these cognitive factors are not developed in isolation, but are shaped by a variety of external influences, including personal experiences, family background, peer influence, and encouragement from teachers. For example, a student's confidence in pursuing a STEM career (self-efficacy) may be significantly shaped by positive feedback from teachers or family, as well as their perception of the job market and future success (outcome expectations). Similarly, peer support and societal norms can impact the goals students set for themselves.

In the context of this study, the Social Cognitive Employment Theory helps explain how STEM students at the University of Ghana develop their career interests and make employment choices. It provides a framework for understanding the role of self-efficacy and external influences in shaping their preferences, particularly in relation to gender differences and STEM-related career paths.

2.3 Conceptual Literature

This study adopts the conceptual framework by Badmus and Jita (2023) in analyzing the factors that influence students' choice of STEM employment. As depicted in Figure 1, the choice of career is influenced by interpersonal factors (lecturer/teacher, family, peer groups), intra-personal factors (self-efficacy and employment awareness) and employment outcomes expectancy (financial stability and employment prospect).

Figure 1: Conceptual framework

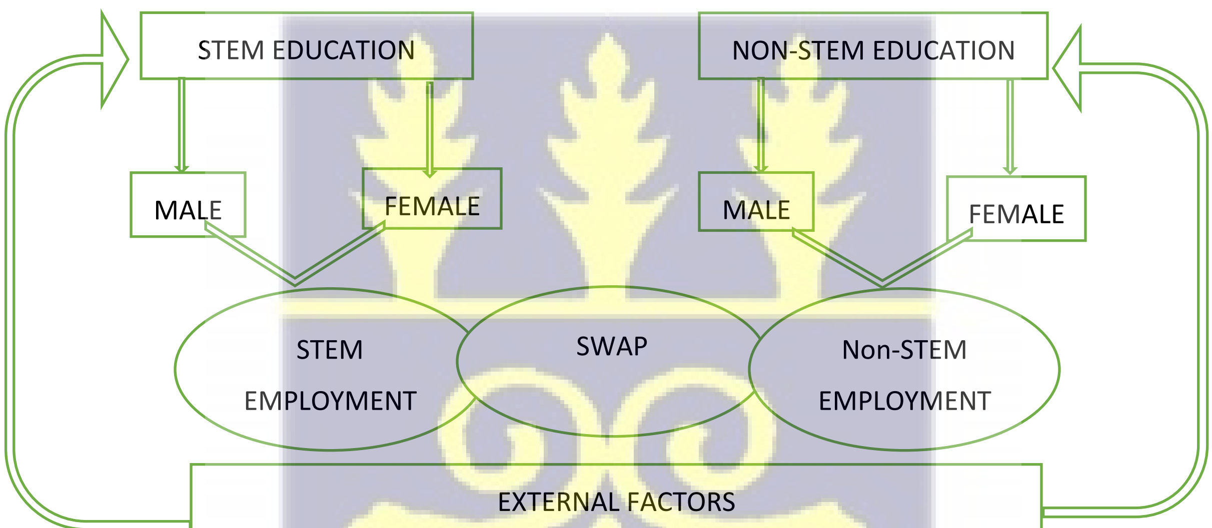


Source: Badmus and Jita (2023)

According to Badmus and Jita (2023), interpersonal factors relate to people and environmental interactions with the decision to study STEM subjects. Interpersonal factors comprise family influence, peer pressure, teacher's counsel and parent's discipline formed. The second component which is intrapersonal factors refers to personal conviction, academic ability, self-efficacy, champion mind-set, professional interest, personality, personal growth, spirituality, and morality.

The third component is employment outcome expectancy which entails professional opportunities and prospects, financial security, independence, ability to support family's financial demands and economic expectations.

Figure 2: Conceptual framework II



Source: Author's Own Elaboration based on Badmus &Jita (2023)

Given that Students pursue STEM or Non-STEM education, we expect that STEM students will prefer STEM employments while Non-STEM will prefer Non-STEM employment fields regardless of being male or female. Due to the numerous external factors such as parents' socioeconomic background, parents (or siblings)' background in STEM or Non-STEM Education and Employments, Teachers' and peer influence, career aspirations, intellectual ability and personal interests that affect their choice of STEM or Non-STEM education. A change in these factors can cause students to swap from the initial expectations, hence the situation then becomes that some STEM students choose Non-STEM employment fields while Non-STEM students choose STEM employments.

The framework also explains two concepts that correspond with the employment reality Ghanaian graduates face. The first is systemic underemployment, in which graduates, including those in STEM fields, frequently hold jobs below their qualifications since there are not enough jobs available in their field of expertise. Due to this reality, students may choose non-STEM jobs that pay right away over STEM jobs that require more time to enter the workforce. The second is the function of graduate placement programs, such National Service posts and the Nation Builders Corps (NABCO), which can influence long-term employment paths in addition to offering first work experience.

2.4 Empirical Literature

The existing literature on students' employment preferences ranges from high school level to the tertiary level. Most of the studies have examined the factors that influence students' career aspirations as well as the gender differences with regard to those choice. Wrigley-Asante, Ackah and Frimpong (2022), examined the career aspirations of male and female students studying

Science Technology Engineering and Mathematics (STEM) subjects at the tertiary level in Ghana whereas this study investigates the employment preferences of both STEM and Non-STEM students. Their study employed the mixed methods research approach. The sample included 400 students in the STEM departments who were in their second (Level 200) to fourth (Level 400) year. The findings of the study revealed that, there was no significant difference in the career aspirations of male and female students. However, there were differences in the factors that influence career aspirations of male and female students. Economic prospects had significant effect for male student's interest in pursuing an employment in STEM while female students were influenced by external factors such as encouragement and motivation from role models.

Owusu et al. (2018), investigated the factors that influence Ghanaian tertiary students' employment choices. The study employed the quantitative research approach. The study utilized a sample size of 365 undergraduate students (business and Management Information Technology, Science and Engineering students) at all levels (100-400) from the Ashesi University College in Ghana. Using the Factor analysis and the *t*-test, the results showed that, university students in Ghana place much premium on intrinsic value and employability/financial prospect in their employment choice decisions rather than factors such as prestige and desired working conditions.

Ocansey (2005) examined the employment and educational preferences of secondary school students in Ghana. The study adopted a cross-sectional descriptive survey and the quantitative research approach on 2340 students (1265 girls and 1075 boys) from 22 senior secondary schools in Ghana. The study used the questionnaire in garnering data and the chi-square and Analysis of Variance (ANOVA) in analyzing the data. The findings indicated that, students had the desire to pursue university education with business programme as the most preferred programme. The evidence of the study also showed that, students preferred to work in government sector, enterprising work environment and work abroad. In addition, the factors that influence students' employment preference include gender, school setting, academic programmes, place of residence and school type.

Badmus and Jita (2023) examined the student's choice of STEM field and employment orientation in public universities in Nigeria. The study employed the quantitative research approach. The study adopted the purposive sampling to select 204 undergraduates in STEM related programmes. Findings indicate that undergraduate students' choice of STEM areas was significantly influenced by intrapersonal characteristics. Participants cited a champion mentality, the prestige of STEM programs, being the first in the family to enroll in any STEM program, spirituality, and morality as reasons for their career choice. It is noteworthy that cognitive factors play a significant role in career decision-making. Using the ANOVA in analyzing data, the results showed that, students' expectation of employment outcome is outclassed both interpersonal and intrapersonal factors as reason for employment choice.

Okyere (2021), identified the factors that influence employment choice and preference among second cycle students in Tema Metropolis of Ghana. The study employed the mixed method research approach, using the purposive and the random sampling techniques a sample of 313 students using questionnaire as instruments of data collection. The one way ANOVA was employed in the analysis of the results and it revealed that, intrinsic factors such as intellectual ability, feeling of importance, and opportunity to be original and creative influenced the employment choices of students. The results also showed that extrinsic factors such as good salary, attractive work conditions and improved social status (prestige) influenced the students' employment choices. Further, the evidence of the study revealed that relatives, teachers and friends were influential in the employment choices of students.

Ampofo (2020), explore the employment choices of students of Wa Senior High Technical School in the Wa Municipality of the Upper West Region of Ghana. The study employed a more descriptive approach based on a sample of 80 students and 20 teachers. The study found that the perception of coworkers and peer pressure, teachers' influence, societal perceptions, the availability of additional training, and occupational security are the five most significant factors, ranked highest, among all three factor groups (intrinsic, intrinsic, and inter-personal factors) influencing students' career choice. According to the survey, the main problems that prevent students from making the right career decisions are parental influence, a lack of career advice services, and a lack of proper career knowledge.

Blotnicky et al. (2018), explored students' future employment interests, preferences for particular employment activities, and their likelihood to pursue a STEM employment in Canada. Grades 7 and 9 from Atlantic Canada completed an online survey during school hours. Schools were selected using purposive sampling to ensure geographic representation, and data were weighted by grade level across the four provinces. The final sample included 1,448 students, with a gender distribution of 58% female and 42% male. For categorical variables with more than two response levels, analysis of variance (ANOVA) was utilized to assess significant differences between average ratings and measurements. Research problems involving interval and ratio-scaled variables were investigated using logistic regression. To account for deviations from homogeneity of variance, ANOVA was combined with Brown-Forsyth exact tests. For significant ANOVA results, Bonferroni post hoc tests were utilized to identify significant group differences. To represent the student population, data were weighted by the results indicated that, students with higher mathematics self-efficacy (MSE) and STEM employment knowledge were more likely to choose a STEM employment. In addition, students with greater interest in technical and scientific skills were also more likely to consider a STEM employment than those who preferred employment activities that involved practical, productive, and concrete activities.

Bahar and Adiguzel (2016), examined factors that influenced American and Turkish students to pursue a degree or employment in STEM related fields. The study employed the quantitative research approach and 86 high school students in the United States and Turkey were sampled for the study. The findings indicated that, self-motivation was the most influential factor of interest in STEM employment for American students while income of occupation was the influential factor for Turkish students. Lloyd et al. (2018), assessed the influence of parents on the preference of children towards STEM employments in Australia. The study adopted the mixed-method approach with data collected from 6,492 students in Year 3- 12. The findings revealed that, students who expressed an interest in STEM were typically high achieving and just over 90% of their parents had preference for them to attend university. The results also showed that, parents created a supportive environment, albeit there was little evidence to indicate girls were encouraged to pursue STEM.

White and Smith (2022) investigated how much male and female STEM graduates' outcomes on the job market differ in relation to: employment and unemployment rates, employment at the graduate level, work in highly specialized STEM fields, and work in professional and managerial roles. The kinds of jobs male and female STEM graduates pursue that differ from one another in the United Kingdom (UK). Graphs and percentages were used in analyzing their cross sectional data obtained from every UK graduate's information collected for the First Destinations survey by the UK Higher Education Statistics Agency (HESA) about six months after they graduated from college. White and Smith found that over the past few decades, more women have pursued science degrees; nevertheless, these advances have mainly been limited to biological sciences, medically related fields, and other fields like psychology. Not much has changed about the established gendered participation patterns. In the year following graduation, there were notable and enduring disparities between the employment prospects of STEM graduates who were male and female. Female STEM graduates were less likely than their male colleagues to: attain graduate-level employment; work in STEM jobs; and work in managing positions. Though there were clear within-subject variations as well, these were mostly associated with varying rates of participation in various STEM fields, with the biggest variations occurring in the most male-dominated fields. The biggest variation in results was that compared to their male counterparts, female graduates were also far more likely to hold lower-status "caring" jobs.

Recent Ghana-specific tertiary-level research offers valuable insights into the link between STEM education and employment preferences. Asare and Essilfie (2021) examined the career aspirations of STEM and non-STEM graduates from three public universities in Ghana, finding that while STEM graduates generally preferred private sector and technical roles, many were compelled to accept non-STEM jobs due to limited openings in their fields. Baah-Boateng and Ewusi (2022) analysed graduate labour market outcomes and highlighted that STEM graduates, though more employable, faced underemployment when labour market absorption was slow. Similarly, Quartey and Dzorgbo (2023) investigated how academic discipline and gender shape graduate employment choices, revealing that female STEM graduates were more likely than their male counterparts to opt for roles with perceived work-life balance, even when such roles offered lower pay. These studies underscore the importance of understanding both gender and field of study in shaping employment preferences at the tertiary level. Unlike earlier studies such as Ocansey (2005), which provided a largely descriptive account, these recent works employ more robust methodologies, including mixed-methods designs and nationally representative graduate tracer surveys, thereby offering richer evidence.

A review of the literature reveals three key patterns. First, STEM graduates generally enjoy better employment prospects than their non-STEM counterparts, yet this advantage is moderated by gender, with female graduates often prioritizing work-life balance over higher-paying technical roles. Second, studies conducted at the secondary school level frequently attribute employment preferences to early exposure and subject choice, whereas tertiary-level evidence points to labour market realities, such as underemployment and limited sectoral openings, as stronger determinants. Third, while international studies offer useful comparative perspectives, their applicability to Ghana is constrained by differences in economic structure, gender norms, and policy frameworks. Despite recent contributions, there remains a notable gap in longitudinal research tracking how STEM and non-STEM graduates' preferences evolve over time, and an empirical work, that integrates structural, personal, and market-related factors in a unified analysis.

2.5 Chapter Summary

From the reviewed literature, employment outcome expectancy (economic/financial prospect) and self-efficacy were the most influential factors of students' choice. Other factors include parental influence, peers and teachers. The gender disparity also indicated that, female student enrolment in a STEM degree is lower than that of a male student.

Despite the numerous studies on students' employments choice, there are very few studies that have focused on the effect of STEM education on students' employment preference in Ghana at the tertiary level. Studies such as Okyere (2021) and Ampofo (2020) have explored the determinants of students' career aspirations at the secondary level while ignoring the gender differences in employment preference of students. This study therefore, examines the effect(s) of STEM education on employment preferences (career aspirations is used interchangeably with employment preference in this study) of students among fourth-year undergraduate students at the University of Ghana.

CHAPTER THREE

METHODOLOGY AND MODEL SPECIFICATION

3.1 Study Context- University of Ghana

The University of Ghana, located in Legon, a suburb of Accra, was founded on August 11, 1948, originally as the University College of the Gold Coast. It is the oldest public university in the country and gained full university status in 1961, adopting its current name. The university operates on a collegiate system, comprising several colleges such as the College of Basic and Applied Sciences, College of Education, College of Health Sciences, and College of Humanities. It is committed to research and education, with a focus on becoming a top research-intensive university. The main areas of study at the University of Ghana are poverty monitoring, development policy, food production and processing, climate change adaptation, and malaria research. Through creative, technology-driven, and human-centered research, teaching, and learning, it aims to make a global impact.

The university has 53,725 undergraduate students, 672 international students, 6,999 graduate students and 6, 614 faculty and staff (UG Public affairs directorate-Facts and Figures, 2022). The university is administered through a central administration which includes a collegiate system comprising the following colleges and a School of Graduate Studies: College of Basic and Applied Sciences, College of Education, College of Health Sciences and College of Humanities. The

College of Basic and Applied Sciences (CBAS) comprise of five (5) schools which are, School of Physical and Mathematical Sciences, Biological Sciences, Agriculture, Engineering Sciences and Veterinary Medicine. The College of Health Sciences comprises six (6) schools. They are; School of Biomedical and Allied Health Services, Nursing and Midwifery, Pharmacy, Public Health and the University of Ghana Dental as well as Medical school. The College of Humanities comprises six (6) schools which are Business School, School of law, Languages, Social Sciences, Arts, and Performing Arts. The College of Education comprises three (3). They are School of Continuing and Distance Education, Education and leadership as well as Information and Communication Studies.

A number of STEM-related courses are available at the University of Ghana, mostly through the College of Health Sciences and the College of Basic and Applied Sciences (CBAS). STEM programs can be found at CBAS in the Biological Sciences, Agriculture, Engineering Sciences, Veterinary Medicine, and School of Physical and Mathematical Sciences. STEM courses are also available through the College of Health Sciences' six schools, which include the University of Ghana Dental and Medical Schools, the School of Biomedical and Allied Health Services, Nursing and Midwifery, Pharmacy, and Public Health. Also, while the College of Humanities focuses on arts, economics, and law, it also encourages multidisciplinary STEM programs, especially in fields like information and communication studies, which have connections to innovation and technology. Additionally, the College of Education offers Information and Communication Studies courses that connect STEM fields with pedagogical training.

3.2 Study Population and Sample Size

3.2.1 Population

Administrative data from the University of Ghana Computing Systems (UGCS) based on students' academic registration for the 2023/2024 academic year revealed that the population for the study is made up of 5,894 level 400 students at University of Ghana (Legon Campus) in Accra, Ghana. This comprises 858 STEM and 5,036 Non-STEM students. The rationale for choosing University of Ghana UG is the need to maximize scarce resource which is time and financial constraints. The population of students in STEM and Non-STEM groups exhibit similar characteristics as students in other universities in Ghana.

3.2.2 Sampling Techniques and Sample Size

In choosing the sample, the study employs the stratified and simple random sampling techniques. The sample was obtained from Strata, STEM and Non-STEM. The sample size consists of Nine hundred and thirty four students (934) students. The College of Basic and Applied Sciences constitute the STEM strata and The College of Humanities constitutes the Non-STEM strata. Nine hundred and thirty-four (934) level 400 students were sampled, out of which five hundred (500) were Non-STEM and Four hundred and thirty four students (434) were STEM Strata (Bullen & Bullen, 2018). The large sample size increases the reliability and prediction of the results.

3.3 Data Collection

Data collection was conducted over the course of one month and the data collection methods include questionnaires, emails, interviews, and observational studies. An email of invitation to participate in the survey was distributed to the population of the study by UGCS in order to minimize time spent on inviting students to participate in the survey. This study employs a questionnaire programmed on computer assisted personal interviews (CAPI) as instrument for data collection.

The structured questionnaire is designed to obtain sufficient and relevant information from the participants and are based on the objectives of the study. The questionnaire for this study is adopted from the extant literature on STEM education (Wrigley-Asante et al., 2021) and is organized into several modules, each focusing on different aspects of students' employment preferences and experiences in STEM fields. These modules are as follows: Demographic Information (which includes age, gender, marital status and household characteristics), Educational background and current program of study to explore the participants' academic history, current program of study and their classification as either STEM or Non-STEM, Employment Preference to explore students' choice regarding the type of work they prefer (it includes job type, industry, working conditions, whether there is security in the occupation or not etc.). This helps to group students' job preference as whether they prefer STEM occupations or Non-STEM occupations. The questionnaire also focuses on Individual Particulars used on campus being it watch, a car, motorcycle, fridge, microwave etc.

The first part of the structured questionnaire is aimed at eliciting background data on the respondents in order to assess the respondents' profile. This includes age, sex and choice of program, religion, ethnicity, and nationality, marital status of the student as well as the occupation, education, sex and age of the household head. The second section covers occupation preference of both male and female students as well as STEM and non-STEM students. The third section presents employment prospects and external motivation of students in selecting STEM as a program. Nine hundred and forty three (943) students constituted the sample size for the study. Data was collected using structured questionnaires administered through Computer-Assisted Personal Interviews (CAPI) and corrections from the pilot test shaped the questionnaire that was used in collecting data for analysis. The study recognizes that self-reported hypothetical preferences may not perfectly reflect actual employment behaviors; however, the survey design aimed to capture students' informed intentions at the point of graduation, when career decision-making is most active.

3.4 Variable Description

Employment type is the dependent variable indicating whether a student prefers STEM or non-STEM employment. It is a binary variable where the value of 1 represents the respondent's preference for as STEM occupation and 0 represents non-STEM occupation types. STEM occupation which includes high-skilled, technical, and analytical jobs like engineering, computer science, life sciences, and STEM managerial roles. As such four categories were drawn, Computer and Mathematics, Engineering and Surveying, Physical and life Sciences, STEM managerial and Education

Non-STEM occupations, including social sciences, humanities, the Arts, and professional roles like law and administrative services. Three categories were created to represent non-STEM category namely, Education and Humanities, Social science, Arts and, non-STEM professional fields

Employment Earnings was arrived at by attaching hypothetical figures to the seven employment categories (Computer and Mathematics, Engineering and Surveying, Physical and life Sciences, STEM managerial and Education, Non-STEM Education and Humanities, Social science and, Non-STEM Professional fields). STEM wages ranged from GHC 5,694 (Physical and Life Sciences) to GHC 7,862 (STEM managerial roles), while non-STEM wages ranged from GHC 4,353 (Social Sciences) to GHC 6,000 (Professional Fields). In this study, employment earnings were measured to capture students' expectations regarding monthly income from STEM and Non-STEM related employment after graduation. Given that the sample comprises final-year students with limited labor market experience, earnings were assessed based on perceptions rather than actual earnings.

To ensure the responses were grounded in realistic expectations, the income ranges used in the questionnaire were informed by current labor market data from credible sources. For instance, data from the Ghana Statistical Service (2022) indicates that the majority of public sector workers earn below GHS 3,000 monthly, with an average monthly income of approximately GHS 2,594. Furthermore, external reports suggest that starting salaries in some STEM-related fields, such as Information Technology and Engineering may range between GHS 3,000 and GHS 7,000 per month. The exact occupations were then searched on the web and figures discovered were attached to the occupations (Google, 2024).

Education Type serves as the primary explanatory variable in this study, with STEM fields coded as 1 and non-STEM fields as 0. For the purpose of this study, which focuses on students and programs offered solely on the main campus, the College of Basic and Applied Sciences is categorized as the STEM group, while the College of Humanities is categorized as the Non-STEM group. However, students within the College of Humanities who are enrolled in at least one major program in Science, Engineering, Mathematics, Statistics, or Actuarial Science are classified as STEM students.

STEM Employment hours. Students were asked to choose between STEM and non-STEM jobs under varying work-hour scenarios: first scenario was if STEM employment required working for 16 hours per day while the second scenario presents the student with working for 8 hours per day, resulting in long and short work hours respectively.

Secure and Insecure employment type: Students evaluated STEM and non-STEM jobs under scenarios of secured and insecure employment. Employment security was described in terms of turnover rates, workplace hazards, and long-term guarantees of employment: A secured employment was characterized by stability, lower turnover, and safety at work. An insecure job implied high turnover, frequent contract renewals, or potential workplace risks.

Gender is a categorical variable with only two outcomes; male and female. 1 is assigned to females and 0 is assigned to males. Men and women in STEM fields receive different amounts of exposure and mentorship, which contributes to gender-specific disparities in occupational preferences in addition to cultural expectations. Because gender can affect students' propensity to pursue jobs in highly skilled, technical, and analytical STEM occupations, it must be taken into account when examining the factors that influence students' employment choices.

Students' selection for jobs might also be influenced by their age. Younger students could be more likely to investigate a variety of professional alternatives, frequently as a result of peer pressure or trends. As students advance in their academic studies, they frequently turn their attention to career alternatives that complement their skills and potential employment prospects. The decision between STEM and non-STEM professions may be influenced by older students' priorities, especially those in their late 20s or early 30s, which include work-life balance, income potential, and employment security.

A student's preferences for employment may be influenced by the size of their household. STEM careers may be more attractive to students from larger homes with more dependents because they value steady, well-paying employment. Students from lower-income families, on the other hand, might feel more liberated to consider a greater variety of professions, including non-STEM ones. A student's career choices can also be influenced by the educational background and employment of family members; even though STEM jobs might be financially rewarding, students who have family members in non-STEM fields are more likely to pursue similar career paths.

3.5 Model Specification

Based on the theoretical framework outlined in Chapter Two, the empirical model for this research is specified to assess the factors influencing employment preferences among University of Ghana students. The model seeks to capture the effect of education type (STEM vs. non-STEM), gender, and other covariates on the employment choices of the students. The model is presented as follows:

$$Y = \propto_0 + \beta T + \gamma G + \delta X + \varepsilon \quad \textbf{(1)}$$

Where:

Y represents the employment preferences of the students, which is the dependent variable. It reflects whether students prefer STEM-related careers or non-STEM employment.

$\propto_0$ is the constant term, representing the baseline level of employment preference when all other factors are held constant.

β is the coefficient associated with T, which represents the type of education pursued by the student. Here, T takes the value of 1 if the student has a STEM education and 0 if the student has a non-STEM education. The coefficient β will show the effect of STEM education on employment preferences.

γ is the coefficient associated with G, representing the student's gender. Gender is included as a dummy variable, where 1 represents male and 0 represents female. The coefficient γ will capture the gender differences in employment preferences.

δ is the vector of coefficients associated with X, which represents the set of covariates. These covariates include factors such as age, socio-economic background, and parent's educational level, employment preference given hours of work and job security and other relevant variables that could influence employment preferences.

ε is the residual term, which captures the unexplained variation in employment preferences not accounted for by the model.

This model specification allows for an analysis of how STEM and Non-STEM education and gender influence employment preferences while controlling for other factors that might affect the decision-making process of students. By estimating the coefficients, the study can assess the relative importance of these variables in shaping students' employment preferences, especially in understanding gender disparities and the impact of STEM education on career preferences.

3.6.1 Propensity Score Matching (PSM)

Propensity Score Matching (PSM) is a statistical technique employed in this study to estimate the effect of the type of education (STEM vs. Non-STEM) and gender on employment preferences. The PSM is employed in this study to address research question one and to address the issue of selection bias. Selection bias occurs when individuals self-select into groups based on characteristics that also influence the outcome of interest. In this case, students choose their field of study (STEM or Non-STEM), which may correlate with other factors such as socio-economic background, parental education, or academic ability, potentially biasing the results.

Propensity score matching (PSM) technique is employed to examine the effect of the type of education and gender on employment preferences which will be grouped into two sectors of employment (dependent variables), making STEM and Non-STEM students the treated and control group respectively, where STEM is the treatment. PSM is used in evaluating the effect of a treatment (Caliendo & Kopeinig, 2005), given that the treatment status was not randomly assigned.

PSM reduces this bias by creating a statistical comparison group, matching each student who selected STEM (the treated group) with a student who chose Non-STEM (the control group) based on similar observable characteristics. The propensity score is the probability of a student choosing

STEM education, given a set of observable covariates such as age, socio-economic background, parental education, and pre-tertiary STEM experiences. These propensity scores are then used to match students in the treatment and control groups, ensuring that differences in employment preferences are not due to these background variables.

The process of PSM involves several key steps. First, the propensity score is estimated using a logistic regression model, formulated as:

$$P(T_i = 1|X_i) = \frac{e^{\beta_0+\beta_1 X_i}}{1+ e^{\beta_0+\beta_1 X_i}} \qquad \textbf{(2)}$$

Where $P(T_i = 1|X_i)$ is the propensity score (the probability of choosing STEM education), T_i is a binary indicator of whether the student chose STEM (1 if yes, 0 otherwise), and X_i is a vector of covariates, including age, gender, socio-economic status, and parental education.

Once the propensity score is calculated, matching is done between the STEM and Non-STEM groups based on these scores. This creates a matched sample, where the only systematic difference between the groups is the type of education. Balancing tests are then conducted to ensure that covariates are evenly distributed between the matched groups, confirming the validity of the matching process.

Finally, the treatment effect (the effect of STEM education on employment preferences) is estimated by comparing employment outcomes between the treated and control groups. This approach allows for a more accurate estimate of the average treatment effect (ATE). By controlling for observable confounding variables, PSM enhances the credibility and validity of the study's findings.

3.6.2 Logit regression

The Logit regression is used to determine the factors that influence employment choice of students and it is answering research question two. Logit regression is used to examine relationships when the dependent variable is categorical, usually binary. It is frequently used to model the link between a binary result and one or more predictor factors in domains including as marketing, social sciences, healthcare, and economics. Logit regression is specifically made for scenarios where the result variable can take one of two possible outcomes, such as "yes" or "no," "success" or "failure," or "1" and "0," in contrast to linear regression, which is used for continuous dependent variables. The logistic function, a mathematical transformation that converts the linear combination of input variables (predictors) to a probability value between 0 and 1, is the central component of logit regression. Using the log-odds transformation, this is accomplished. Essentially, given a set of predictors, logit regression calculates the likelihood that an event will occur.

The logistic function can be expressed as:

$$P(Y=1) = \frac{1}{1+e^{-Z}} \qquad \textbf{(3)}$$

Where the P(Y=1) represents the probability of the event occurring, e is the base of the natural logarithm, and Z is the linear combination of the predictor variables.

The linear equation Z is typically written as:

$$Z = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_n X_n \qquad \textbf{(4)}$$

Where β_0 is the intercept, $\beta_1, \beta_2, \ldots, \beta_n$ are the coefficients of the predictor variables $X_1, X_2, \ldots, X_n$. these coefficients are estimated through maximum likelihood estimation (MLE), which maximizes the likelihood that the observed outcomes match the predicted probabilities.

Following from (Mwinkume et al, 2024; Kitchen et al, 2022; Field 2009), the study uses the logit regression model to analyze how STEM affects University of Ghana final year students' preference for a STEM job. Logistic regression is useful because employment preference is a binary outcome. That is, choosing a STEM-related employment and a non-STEM related employment. Logistic regression is suitable for categorical options since it maps probabilities between 0 and 1, unlike linear regression, which uses a continuous dependent variable.

The marginal effects, which represent the change in probability brought about by a one-unit change in a predictor variable, must be computed in order to translate the odds ratios into real probabilities. Researchers can benefit from the marginal effect interpretation since it offers more intuitive insights into how changes in variables affect the likelihood of the result. The marginal effect for a continuous predictor variable can be calculated by taking the derivative of the logistic function with respect to that predictor. The formula for the marginal effect of a predictor Xi on the probability P(Y=1) is:

$$\frac{\partial P(Y=1)}{\partial X_i} = \beta_i . P(Y = 1).(1 - P(Y = 1)) \qquad \textbf{(5)}$$

This expression shows how the probability of the event occurring changes as the predictor variable X_i increases by one unit. The term P(Y = 1) is the predicted probability of the outcome occurring, and (1-P(Y=1)) represents the probability of the outcome not occurring. Therefore, the marginal effect depends on the value of the predicted probability itself. By calculating the marginal effects, we can see how changes in the predictors influence the actual probability of an outcome.

3.7 Chapter Summary

This chapter provided the research methods used in the study. The study adopted the quantitative research methods. In selecting the sample, the study used the purposive and stratified sampling methods to obtain participants in STEM and Non-STEM that were available and were well informed to provide essential information to the research objectives. The instrument for collecting data was a structured questionnaire which consisted of open and closed ended questions". Administrative data was obtained at the office of the University of Ghana, Legon Campus. Prior to the research, the sought ethical approval from the ethics committee of the University of Ghana.

CHAPTER FOUR

RESULTS AND DISCUSSION OF FINDINGS

4.1 Introduction

The chapter continues the descriptive analyses, presentation of results and discussion of findings. It provides the empirical findings of the study based on the research objectives.

4.2 Summary Statistics

Table 1 shows the descriptive statistics from the analytical sample. A total of nine hundred and forty-three participants responded to the questionnaire. The field survey recorded a ninety-four (94) percent response rate from the sample of thousand (1000) which results in 500 Non-STEM students and 434 STEM students completing the survey. Out of this, 53 percent are females and 47 percent are males. The average age of students is 23 years and 98.6 percent are single. Most of the students are Ghanaians and 48 percent is from the Greater Accra region. Other regions, such as Central, Ashanti, and Volta, have smaller proportions of students, with regions like Western North and Savannah showing minimal representation. 46.5 percent of those who responded are STEM students with 53.5 being non-STEM students. On average, 44 percent of the students would prefer to pursue careers in STEM fields, while 56 percent would choose non-STEM employment. In terms of household occupations, the data shows that only 7.2 percent of students have household heads working in engineering or surveying, while 4.9 percent have household heads in physical and life sciences. The most common occupation for household heads is in non-STEM social sciences, with 18.3 percent of students coming from households in this field. 33.8 percent have household heads employed in "other" occupations. About 30 percent of students perceive their mother as their primary role model when it comes to career choices, while 7 percent look to their siblings for inspiration. University STEM lecturers, family friends, and teachers whether in STEM or non-STEM subjects are less frequently viewed as role models, with each influencing around 1 to 5 percent of students.

Table 1: ***Summary Statistics***

Variable	Mean	Standard Deviation
Gender	.529	.450
Student Age	22.659	1.650
Marital Status	.986	.117
Nationality	.989	.103
Educational Level of Household head (N0 education as reference)		
Basic	.019	.138
High School	.164	.370
Tertiary	.381	.486
Occupation of Household head (Computer Science and maths occupation as reference)		
Engineering and Surveying	.072	.258
Physical and life Sciences	.049	.217
STEM managerial and Education	.069	.253
Non-STEM Education and Humanities	.123	.329

Non-STEM Professional fields	.124	.330
Non-STEM Social Sciences	.183	.387
Other Occupation	.338	.473
Other	.021	.144
Employment type	.440	.497
Education Type	.464	.499
Employment Earnings	.564	.496
STEM Employment with Long Work Hours	.411	.492
STEM Employment with Short Work Hours	.617	.486
Secured STEM Employment	.653	.476
Insecure STEM Employment	.340	.474
Number of observations	934	

***Source:** Field Survey August 2024*

4.3 Employment Preference of Students by Gender

The results from table 2 is a two-sample proportion test and it is addressing research question 3. The results indicates that there is no statistically significant difference in employment preference for STEM fields between male and female students. The proportion of males preferring STEM employment was 46.36%, while the proportion for females was 41.90%, yielding a difference of 4.46 percentage points. Since the p-value is greater than 0.05 significance level, we fail to reject the null hypothesis, suggesting that there are no significant gender differences for STEM careers.

Table 2 Employment Preference by Gender

Group	Mean Proportion
Male	0.4636
	(0.0238)
Female	0.4190
	(0.0222)
	Difference (Male - Female)
Difference	0.0446
	(0.0325)
Male: 440 observations	
Female: 494 observations	

Note: *standard errors are in parenthesis* ***Source:*** *Field Survey, August 2024*

4.4. Balance Test

The balance test results in table 3 shows that before matching, there were significant differences between the STEM and Non-STEM groups, particularly in employment earnings and STEM-related job involvement. After matching, standardized differences for all covariates were reduced close to zero, and variance ratios became closer to one, indicating that the two groups are now well-balanced. This suggests that the matching process successfully controlled for pre-existing differences, making it more valid to compare employment outcomes between STEM and Non-STEM individuals.

Table 3 Balance Test Table

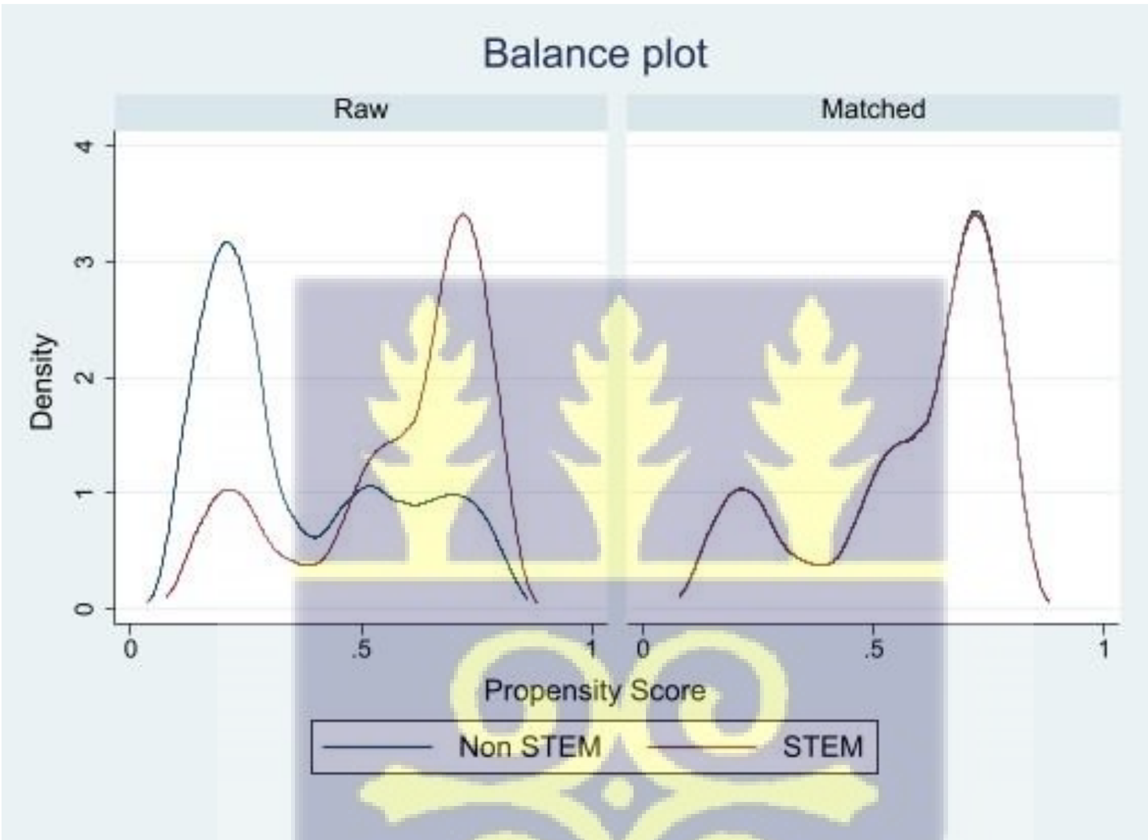
Variable	Standardized Raw	Differences Matched	Variance Raw	Ratio Matched
Gender	-0.117	0.048	1.013	1.003
Student Age	-0.111	-0.052	0.846	0.883
Household Size	0.074	0.079	1.100	1.054
Age of Household Head	0.001	0.060	0.961	0.928
Employment Earnings	0.922	-0.006	0.721	1.008
STEM Employment with Long Work Hours	0.759	-0.028	1.288	1.012
STEM Employment with Short Work Hours	0.733	0.020	0.656	0.972
	Raw	**Matched**		
Number of observations	934	868		
Treated observations	434	434		
Control observations	500	434		

Source: *Field Survey, August 2024*

Overlapping Plot Before and After Matching

The left panel ("Raw") of the balance plot represents the distribution of propensity scores before matching, where the Non-STEM group peaks around 0.3 and the STEM group around 0.7, indicating a clear imbalance in covariates. This suggests that individuals in these groups had significantly different characteristics, making a direct comparison unreliable. In contrast, the right panel ("Matched") shows the distribution after matching, where the two groups overlap almost perfectly. This indicates that the matching process successfully balanced the groups, ensuring that individuals in the STEM and Non-STEM categories have similar propensity scores. Achieving this balance is crucial for causal inference, as it minimizes bias from pre-existing differences and ensures that any observed differences in employment outcomes (Employment Type) are more likely to be due to education type (STEM vs. Non-STEM) rather than other confounding factors.

Figure 3 Balance Plot



Source: Author's plotting from STATA 14

Table 4 Treatment-Effects Estimation (ATET and ATE)

Employment type	Coefficient
STEM vs Non-STEM (ATET)	0.343*** (0.041)
STEM vs Non-STEM (ATE)	0.268*** (0.03)

Note: *standard errors are in parenthesis *, **, *** significant at 10%, 5%, 1%*
Source: *Field Survey, August 2024*

Treatment effect estimation is a powerful statistical tool used to measure the causal effect of an intervention such as pursuing a STEM education on an outcome of interest, like employment in a STEM-related job. The ATET measures the impact of STEM education specifically on individuals who actually chose to pursue STEM fields. Results from table 4 show that, pursuing STEM education increases the probability of being in a specific employment type (STEM-related jobs) by 34.3 percentage points among those who actually studied STEM. This effect is statistically significant ($p < 0.01$), meaning it is unlikely due to chance. The finding highlights that for individuals who chose STEM, their employment prospects are significantly better than if they had pursued Non-STEM education. This results is in line with findings from Yirenkyi et al. (2023).

The Average Treatment Effect (ATE) results show that pursuing STEM education increases the probability of being employed in a specific employment type (e.g., STEM-related jobs) by 26.8 percentage points on average across the entire sample, regardless of whether individuals actually pursued STEM or not. This effect is statistically significant at the 1% level ($p < 0.01$), indicating that it is highly unlikely to have occurred by chance. The ATE reflects the overall impact of STEM education on employment outcomes, suggesting that if everyone in the sample were to study STEM, their likelihood of entering STEM-related employment would increase substantially. In conclusion, the treatment effect estimates underscore the value of STEM education in improving employment outcomes. While the ATET highlights the tangible benefits for those who actively choose STEM, the ATE illustrates the potential positive effect if such educational paths were more broadly adopted.

4.5 Results from the Logit Regression

Table 5 addresses research question two and it presents the results of a logistic regression analysis of factors influencing employment preferences, specifically the choice between STEM and non-STEM employment. Gender has a coefficient of 0.013 and it has no significant effect on employment preference. Education type has a positive coefficient of 0.219 and it is highly significant indicating that individuals with higher education are more likely to prefer STEM employment. Student age has a coefficient of 0.011 and it has no significant effect. Household head status has a coefficient of 0.016 and it has no significant effect. Given the student sample, where most are unlikely to be household heads, this variable's relevance is limited and does not significantly influence employment preferences. Household size has a negative coefficient of

-0.003 but it has no significant influence on employment preference. Age of household head has a coefficient of 0.021 but it has no significant effect on employment preference among students.

Employment earnings have a positive coefficient of 0.193 and it is significant indicating a strong positive association with the preference for STEM employment. This indicates that, perceived higher earnings are likely to increase the likelihood of STEM related employment. STEM employment with long work hours has a coefficient of 0.120 and it has a significant positive relationship with employment preference.

STEM employment with short work hours has a coefficient of 0.114 and it is highly significant. Secured STEM employment has a coefficient of -0.016 but it has no significant effect. Insecure STEM employment has a coefficient of 0.074 and it is significant. Basic education has a coefficient of -0.048 with a p-value of 0.639, suggesting no significant impact. High school education has a coefficient of 0.019 and it has no significant effect. Tertiary education has a coefficient of 0.031 and it has no significant influence.

Prior to estimation, basic diagnostic checks, including variance inflation factor (VIF) assessments, were conducted to confirm that multicollinearity among explanatory variables was within acceptable limits. The regression results, presented with corresponding marginal effects, provide important insights into the determinants of employment preferences among final-year students.

The findings indicate that STEM graduates are significantly more likely to prefer STEM-related jobs compared to their non-STEM counterparts. This positive and statistically significant relationship can be explained by the specific technical skills and competencies acquired during

STEM education, which are directly applicable to occupations in science, technology, engineering, and mathematics fields. Additionally, STEM graduates may perceive higher labour market demand, better remuneration prospects, and greater job stability within these sectors, which could further strengthen their preference for STEM-related employment.

Male students are more likely than female students to favor STEM-related careers, demonstrating gender disparities in employment preferences. This might be a result of enduring gender preconceptions about technical and engineering occupations as well as societal and cultural expectations that frequently push women away from STEM fields. Additionally, while choosing a career, female students may take into account aspects like work-life balance and family obligations, which may affect their preference for positions thought to offer more flexible work schedules.

Although the entire sample is the focus of this analysis, breaking down the data by college or program may offer more detailed information about differences in occupational preferences. For instance, although both being STEM, choices within the College of Health Sciences may be very different from those in the College of Basic and Applied Sciences. Findings from these subgroup analyses will be useful for policymakers, especially when developing focused initiatives to motivate underrepresented groups to pursue and stay in STEM-related occupations.

Table 3 Marginal Effects of Logit Estimates of STEM on Employment Preference Dependent Variable: Employment Preference)

Variable	coefficient		
Gender	0.013		
	(0.023)		
Education Type	0.219***		
	(0.019)		
Student Age	0.011		
	(0.07)		
Household head	0.016		
	(0.016)		
Household Size	-0.003		
	(0.005)		
Age of Household Head	0.021		
	(0.022)		
Employment Earnings	0.193***		
	(0.028)		
STEM Employment with Long Work Hours	0.120*** (0.027)		
STEM Employment with Short Work Hours	0.114*** (0.032)		
Secured STEM Employment	-0.016		
	(0.035)		
Insecure STEM Employment	0.074**		
	(0.029)		
Basic	-0.048		
	(0.103)		
High School	0.019		
	(0.052)		
Tertiary	0.031		
	(0.051)		
Pseudo r-squared	0.449	Number of observations	934
Chi-square	575.109	Prob > chi2	0.000

Note: *standard errors are in parenthesis *, **, *** significant at 10%, 5%, 1%*

Source: *Author's computation from STATA*

4.6 Discussion of Findings

The analysis reveals that employment earnings and hours of engagement in STEM fields significantly influence students' preferences for STEM-related careers, aligning with studies that emphasize the role of economic incentives in career decisions (Wrigley-Asante et. al, 2022).

Gender and household characteristics showed limited associations, which contrasts with Cairns and Dickson (2020) findings of Gender and Family (Lloyd et.al., 2018) having and influence in shaping students Employment preference for STEM.

Interpreting the study's results in light of pertinent theories and earlier empirical research can help us better understand them. The Social Cognitive Career Theory, which emphasizes the importance of perceived possibilities, self-efficacy, and learned skills in forming career ambitions, is in line with the substantial impact of STEM education on work preferences. Holland's Vocational Theory, which holds that societal contexts and individual preferences interact to shape career choices, is also reflected in the gender gap in favored sectors. These findings have important policy implications, particularly for promoting gender equity in STEM employment. While male students tend to prefer careers in computers, engineering, and mathematics-related fields, female students show stronger preferences for the physical and health sciences. This suggests a need for targeted interventions that address the uneven distribution of men and women across STEM subfields.

Examples include mentorship programmes, targeted scholarships, and workplace policies that support work–life balance, especially in male-dominated STEM areas.

The findings also suggest other possible reasons for some of the trends. Some STEM students may favor non-STEM careers for a variety of reasons, including early exposure to non-STEM role models, job satisfaction perceptions, or a lack of knowledge about STEM career prospects. Disparities between the results of this study and some evidence from other countries may be due to Ghana's cultural norms, economic incentives, and labor market arrangements.

4.6.1 Employment Preference of Students

The results revealed that, generally the students preferred STEM occupations to non-STEM occupations. This finding affirms the evidence established by Wrigley-Asante, Ackah and Frimpong (2022) which established, students at the University of Ghana aspired to pursue a career in STEM after school. Employment earnings significantly influence students to prefer STEM Employments which aligns with findings from Abe and Chikoko (2020).

Additionally, results indicate the specific employment areas that students want to pursue in relation to STEM employment. The findings suggest that male students prefer to work in computer and math and engineering and surveying related fields compared to female students. In contrast, the female students prefer to work in physical and life sciences and STEM managerial and Education relative to the male students. This finding points to the fact that, employment in health sciences (physical and health care related professions) are of interest to female students owing to their preference in employment that aligns with their nurturing and caretaking roles (Smith & White, 2022)

Employment security is a significant factor to students' preferring STEM employment. Thus, the results suggests that students are concerns about the work turnover, the number of times contracts have to be renewed and generally a safe working environment with STEM students showing 60% concern in choosing a STEM employment.

4.6.2 Factors that Influence Employment Preference

The findings show that siblings and Elementary School non-STEM teachers have a significant influence on STEM students (Abe & Chikoko, 2020) choosing STEM employment with 70% and 90% likelihood of motivating to choose STEM related fields. Fathers, mothers and family members did not significantly motivate STEM students to choose STEM employment as indicated by Lloyd et. al. (2018)'s findings about parents' influencing STEM career choices.

4.7 Implication of Findings

As indicated by final-year students at the time of data collection, "employment preference" in this study refers to a declared goal or aspiration to pursue work in a specific subject. While acknowledging that actual employment outcomes may be influenced by other factors including job availability, economic conditions, and recruitment processes, this measure captures the career route that respondents are most likely to take after graduation. The findings indicate that STEM education significantly influences employment preferences, with STEM graduates showing a higher likelihood of aspiring to STEM-related careers compared to their non-STEM counterparts. Job security and potential earnings emerge as strong drivers of these preferences, consistent with global and Ghana-specific evidence on labour market motivations. While the regression analysis shows that gender is not a statistically significant predictor of STEM employment preference, descriptive results reveal variation in the fields chosen: males more often prefer computers, engineering, and mathematics-related roles, whereas females more often prefer careers in the physical and health sciences.

Additionally, the study reveals that while parental effect seems statistically minor, early-life factors like siblings and non-STEM teachers during early education strongly influence STEM students' inclinations for STEM careers. These results support previous research while highlighting the significance of non-parental role models in influencing career goals. Accordingly, expressed choices should be understood as ambitions influenced by present labor market perceptions rather than as guarantees of employment outcomes, as the availability and awareness of actual work prospects were not directly measured in this study.

4.8 Model Diagnostic Tests

4.8.1 Multicollinearity Test

Multicollinearity arises when two or more explanatory variables in a regression model are highly correlated, which can distort the estimated coefficients and weaken the reliability of statistical inferences. To detect multicollinearity, the Variance Inflation Factor (VIF) was computed after estimating the model. A VIF value above the commonly accepted threshold of 10 indicates problematic multicollinearity, while values closer to 1 suggest no serious concern. Appendix D presents the Variance Inflation Factor (VIF) results of the variables used in the empirical model. It shows that, the mean of the variance inflation factor is less than ten, which indicates low collinearity among the variables. In addition, each of the variables has VIF less than ten, which indicates low collinearity among the variables. This strengthens the confidence in the stability of the estimated coefficients.

4.8.2 Hosmer–Lemeshow Test

The Hosmer–Lemeshow test was employed to assess the overall goodness-of-fit of the logistic regression model. This test groups predicted probabilities into deciles and compares the observed and expected frequencies of outcomes within these groups. A high p-value (greater than 0.05) suggests that the model fits the data adequately, while a low p-value indicates poor fit. The results from the Hosmer–Lemeshow test as presented in appendix E indicates that, the model is well specified, as the null hypothesis of good fit could not be rejected. This demonstrates that the logistic regression model provides a reliable representation of the data.

4.8.3 Link Test

The link test was conducted as a specification test for the logistic regression model. The principle of the test is that if a model is correctly specified, the predicted values (_hat) should be a significant predictor of the outcome, while the squared predicted values (_hatsq) should not. A statistically significant coefficient on _hatsq would indicate potential misspecification. The results of the link test as presented in appendix F shows that, _hat was significant while _hatsq was not, confirming that the model is correctly specified. This provides further assurance that the regression results are robust and the model is appropriate for the study.

4.9 Chapter Summary

The chapter provided and discussed the results of the study on the research objectives. The findings revealed that, both male and female students preferred STEM employment to non-STEM employment. The data showed no statistical differences in employment preference. However, female students are relatively more likely to choose non-STEM employment than male students. The findings revealed that male students prefer to work in computer, mathematics and engineering related fields compared to female students whereas female students preferred to work in physical and life sciences and STEM managerial and Education relative to the male students”. Further, personal networks factors such as siblings and Elementary school non-STEM teacher, as well as financial prospect of employment and attractive work conditions played a vital role in students’ employment preference.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Summary of Findings

The findings of the study reveal several key insights into the employment preferences of students regarding STEM and non-STEM careers. The results indicate that STEM students generally preferred STEM occupations to non-STEM occupations. However, gender does not seem to play a significant role in with respect to students' inclination toward STEM careers.

When examining preferences within STEM fields, male students showed a stronger preference for careers in computer and mathematics fields as well as engineering and surveying, while female students were more inclined toward physical and life sciences and STEM-related careers in management and education. This highlights distinct gender differences in STEM field preferences.

The study also identified the influence of social networks factors on employment preferences, with family members such as siblings, as well as elementary school non-STEM teacher, playing a significant role in shaping students' choices. Additionally, the economic and financial prospects of a career, alongside attractive work conditions, were found to be crucial factors in determining students' employment preferences, indicating that practical considerations of job security and benefits strongly influence career decisions.

5.2 Summary of the Study

Career choice is a complex decision for undergraduate students since it determines the kind of profession that a student intends to pursue in life. As students try to make career choices, they face problems of matching their career preferences with their abilities in academic performance, Gender disparities in STEM career aspirations and participation continue to be a concern. Sadler et al. (2012) observed that, while males maintain stable interest in STEM careers during high school, females exhibit a decline in interest.

An understanding of the factors that lead to the choice of career is important because that decision establishes expectations for one's future and can affect one's satisfaction with the career. Students all over the world are usually faced with a dilemma in making a career choice decision in their lives (Koech et al., 2016). Some students make wrong career choices due to ignorance, inexperience, peer pressure, advice from friends, parents and teachers, or as a result of prestige attached to certain jobs without adequate guidance and career counseling.

Despite the efforts to promote STEM education among women have increased, research suggests that there are still significant barriers that discourage females from pursuing STEM degrees. Most of the studies in Ghana have identified the factors that influence career choice and aspirations among students at the secondary level. However, there has been limited understanding of the gender differences in career aspiration of students studying STEM courses at the tertiary level and the factors influencing these employment preferences.

This study, therefore, examined the impact of STEM education on employment preference of students among fourth-year undergraduate students at the University of Ghana. Specifically, the objectives were to document the nature of gender disparity in the employment preference of students and to assess the motivating factors that influence employment preference of students.

The theoretical framework for this study was based on the trait and factor theory, theory of vocation types and social cognitive theory. The trait and factor theory posit that; each person has a distinct set of features that can be connected to personal or intrinsic factors. The Holland Theory of Vocational Types emphasizes on making career choices based on the personality types. The social cognitive career theory asserts that, employment preference is premised on three cognitive constructs namely: choice goal, outcome expectation and self-efficacy.

The study employd the PSM technique to assess the effect of STEM education on students' employment preference. In selecting the sample, the study used the stratified and simple random sampling techniques to select respondents. The source of data for this study was from fourth year students (level 400) of University of Ghana (Legon Campus). Ethical approval was obtained from the ethics committee of the University of Ghana. The study sampled a 1,000 final year students and had a 93% response rate, with the sample compreised of 500 non-STEM and 434 STEM. 53% of the sample were females with the mean age of the sample being 23 years old, thus on average University of Ghana level 400 students graduate at the age 23 years.

The findings revealed that, 80% of STEM students preferred STEM occupations to non-STEM occupations. The results also showed that, female students are relatively more likely to choose Physical and life sciences in STEM employment and their male counterparts choose Computer and Mathematics and Engineering and Surveying.

In relation to the factors that influence employment preference, the students indicated that, interpersonal factors such as siblings and Elementary School non-STEM teachers had influence in their employment preference. Additionally, other factors such as good salary, attractive work conditions, regional backgrounds and whether the student chooses their own program or was assigned by the University influenced employment preference of students.

5.3 Conclusions

This study contributes to the literature by providing new empirical evidence on how STEM education influences employment preferences among final-year undergraduates in Ghana. By applying causal econometric techniques, specifically Propensity Score Matching and logistic regression, the research offers robust estimates of the effect of STEM education while controlling for selection bias. The focus on tertiary-level students addresses a significant gap in Ghanaian literature, which has largely concentrated on secondary school contexts. Beyond filling this empirical gap, the study refines existing models of employment preference by distinguishing the role of structural constraints, internal dispositions, and labour market signals in shaping career aspirations. This disaggregation provides a more nuanced understanding of how education type interacts with gender and other socio-demographic factors to influence employment choices. In doing so, the study not only confirms some findings from international literature but also reveals context-specific patterns, such as the influence of siblings and early school teachers on STEM preferences, which may differ from patterns observed in other countries.

The evidence indicates that STEM education has a significant causal effect on the likelihood of aspiring to STEM-related careers, even after accounting for selection bias. This finding underscores the role of tertiary-level STEM programmes in shaping career trajectories and suggests that policies aimed at expanding STEM participation can have direct labour market impacts. Gender, while not statistically significant in the regression models, still shapes the distribution of preferred STEM subfields, pointing to persistent socio-cultural influences. Over the long term, these patterns may contribute to occupational segregation within STEM and influence gender-specific wage outcomes. The study also highlights the role of early-life influences, such as siblings and non-STEM teachers, in shaping career aspirations, suggesting that interventions to promote STEM careers may need to begin earlier in the educational pipeline.

These contributions extend theoretical applications of the Social Cognitive Career Theory and Holland's Vocational Theory to the Ghanaian context, while also offering practical insights for policymakers seeking to design targeted interventions that encourage equitable STEM participation across different fields.

5.4 Recommendations

The policy recommendations which are premised on the evidence of this study are as follows:

i. There is the need for formal and informal STEM related mentorship programmes to encourage students to pursue stem employment. It is important to support programs that focus on developing skills related to the requirements of STEM jobs, especially in science, engineering, and mathematics. Enhancing students' enthusiasm and confidence in these fields should be the main purpose of these programs, since this will have a direct impact on their long-term employment objectives and career decisions in STEM fields. Also, create formal mentorship programs at the collegiate level that match students with STEM professionals, especially women, to offer networking opportunities, career guidance, and advise. The impact of these programs should be tracked and incorporated into the current career services.

ii. Female students in male-dominated fields through internships and scholarships can obtain financial aid and industry experience. By addressing prejudices and guaranteeing a diversity of viewpoints in their curricula, educational institutions can also foster inclusive settings. Employers who want to draw and keep female talent in STEM fields should implement diversity measures. In order to provide equal job prospects for all students, a complete strategy emphasizing education, mentorship, and workplace diversity is required.

iii. Increase the number of scholarships and internship opportunities available to female students pursuing underrepresented STEM subfields like computer science and engineering by offering targeted scholarships, paid internships, and industrial attachments. For finance and implementation, cooperation between academic institutions, governmental organizations, and employers in the private sector will be essential.

iv. Bridging the gap between academic training and labor market demands requires improving industry-university collaboration. Solid collaborations with trade associations can assist in bringing STEM programs into line with the changing demands of the labor market, guaranteeing that graduates possess applicable, in-demand skills. Through cooperative research projects, internships, and industry affiliations, these partnerships can also give students more experience to how their studies are applied in the real world. These programs can improve STEM graduates' transition from school to the workforce by strengthening the bonds between academia and industry and establishing more defined and organized career paths.

v. Addressing the enduring inequities across several subfields requires incorporating gender equity measures into STEM policy. Within national STEM frameworks that actively encourage women's involvement and advancement, policymakers should implement specific initiatives. These steps could include inclusive hiring procedures that lessen bias, leadership development programs that prepare women for decision-making positions, and workplace flexibility rules that promote work-life balance. A more equitable and inclusive STEM environment that not only draws in but also maintains diverse talent can be achieved by incorporating these tactics into legislation.

5.5 Suggestions for Future Research

i. Future research can undertake a larger number of students at different educational levels and institutions (secondary and tertiary) to examine the nature of gender differences within the different STEM disciplines. This would help broaden the scope on STEM and students' employment.

ii. Future studies can also undertake longitudinal research to track students studying STEM courses, particularly females, to determine whether these students actually end up in STEM fields. These are likely to generate more knowledge on the actual impact of science education and programmes on females interested in pursuing careers in STEM.

iii. Other studies can explore individual and external factors that hinders the students from pursuing STEM employment.

5.6 Limitations of the study

This study focused on only observable characteristics to eliminate selectivity bias. While this provides unbiased estimates, it is also important to acknowledge that unobservable such as innate ability, intelligence, personality traits and other characteristics may play an important role in employment preferences. The PSM does is not equipped to handle such unobserved characteristics.

Another limitation of the study relates to the empirical strategy. While Propensity Score Matching (PSM) was used to address selection bias between STEM and non-STEM groups, no additional robustness checks such as sensitivity analysis or the application of alternative matching algorithms were performed. The absence of these checks means that the estimates may still be influenced by unobserved factors not accounted for in the model. Future research could strengthen causal inference by incorporating such tests, alongside qualitative methods, to provide a more comprehensive understanding of the drivers behind students' employment preferences.

This is the main limitation of the current study which could be overcome by employing other econometric techniques with the more data.

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APPENDICES

APPENDIX A: UNIVERSITY OF GHANA ETHICS COMMITTEE FOR HUMANITIES-ETHICAL CLEARANCE LETTER

https://drive.google.com/file/d/1j-7OiJ9D0SyZgLGppNT0mKNfHVRzoSbO/view?usp=sharing

APPENDIX B: PARTICIPANTS INFORMED CONSENT FORM

https://drive.google.com/file/d/1FPmnb-boPsimRGowX6h0F6VYyk9SbvE1/view?usp=sharing

APPENDIX C: QUESTIONNAIRE

https://drive.google.com/file/d/1LESNe6h8COy7l3614omVN01a5WpMHvz_/view?usp=sharing

Appendix D: Test for Multicollinearity Results using Variance Inflation Factor

Variables	VIF	1/VIF
Gender	1.058	.945
Education Type	1.02	.981
Student Age	1.103	.907
Household Head	1.155	.866
Household Size	1.116	.896
Age of Household Head	1.161	.861
Employment Earnings	2.166	.462
STEM Employment with Long Work Hours	2.107	.475
STEM Employment with Short Work Hours	2.199	.455
Secured STEM Employment	2.021	.495
Insecure STEM Employment	1.788	.559
Basic	1.378	.726
High School	5.571	.179
Tertiary	5.674	.176

Mean VIF	**2.108**	.

Appendix E: Hosmer-Lemeshow Goodness of Fit Test

Number of Observations	953
Number of Groups	10
Hosmer-Lemeshow chi2(8)	7.70
Prob > chi2	0.4637

Group	**Prob**	**Obs_1**	**Exp_1**	**Obs_0**	**Exp_0**	**Total**
1	0.054	5	4.7	91	91.300	96
2	0.059	8	5.4	87	89.600	95
3	0.101	5	6.3	90	88.700	95
4	0.236	17	13.700	79	82.300	96
5	0.484	27	34.900	68	60.100	95
6	0.526	47	47.700	48	47.300	95
7	0.761	66	65.000	30	31.000	96
8	0.850	79	77.000	16	18.000	95
9	0.862	85	81.300	10	13.700	95
10	0.909	80	82.900	15	12.100	95

Appendix F: Link Test

Number of Observations	953
LR chi2(2)	491.97
Prob > chi2	0.000
Log likelihood	-407.63041
Pseudo R2	0.3763

Employment Type	**Coefficient**	**Std.Err.**	**z**	**P>z**	**[95%Conf.**	**Interval**
_hat	1.032	0.068	15.250	0.000	0.899	1.164
_hatsq	0.039	0.040	0.980	0.329	-0.039	0.116
_cons	-0.087	0.126	-0.690	0.489	-0.333	0.159