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From Classroom to Workplace: The Combined Effects of Cognitive and Non-Cognitive Skills on Youth Labor Market Outcomes in Kenya

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Abstract: The evolving labor environment underscores the critical role of cognitive and non-cognitive (soft) skills in fostering workforce adaptability and enhancing labor market outcomes. This study investigates the combined influence of these skills on the probability of employment, focusing on the Kenyan labor market, where high youth unemployment and job market mismatches persist despite government interventions and education sector reforms. Traditionally, emphasis has been placed on cognitive skills, with limited integration of non-cognitive skills into educational curricula, exacerbating the disconnect between youth competencies and market demands. Using binary logistic regression, this study evaluates factors influencing youth employment, highlighting the complementarity of cognitive and non-cognitive skills. Findings reveal that individuals possessing a blend of these skills have higher employment prospects, with notable improvements for young women possessing agreeableness and digital literacy. Additionally, factors such as marital status and higher education levels positively influence employability. These results underscore the equal importance of personality traits and cognitive abilities in labor market success. Policymakers are urged to prioritize curriculum reforms that integrate non-cognitive skill development and encourage employers to include assessments of these skills in hiring practices to address persistent labor market mismatches.

Keywords: cognitive skills; non-cognitive/soft skills; labor market outcomes

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1. Introduction

Rapid technological advancements and shifting economic paradigms have continued to affect the labor market in developing countries (He et al., 2024; Okoro et al., 2023; Nicola et al., 2018). Among the key issues of interest is the capacity of the workforce to adapt to the changing times and the dynamic nature of the workplace (Lim & Lee, 2024). This adaptability is not solely determined by cognitive skills—those involving logic, reasoning, and analytical capabilities (Pierre et al., 2014)—but is also influenced by soft skills, commonly referred to as non-cognitive skills, which encompass a range of personal traits, attitudes, and motivations (F. S. Mohammed & Ozdamli, 2024; Zadorina et al., 2023; Nunoo, 2020; Nicola et al., 2018; Green, 2011; Borghans et al., 2008). Understanding the interplay between these two dimensions of human capital is critical for navigating the complexities and dynamism of modern workplaces. In today's workplaces, the ability to collaborate,

communicate effectively, and respond to change is considered just as important as technical abilities (F. S. Mohammed & Ozdamli, 2024; Colbert et al., 2016).

Historically, economists and policymakers have laid disproportionate emphasis on cognitive skills, focusing on academic achievements while neglecting non-cognitive skills, which are equally pivotal in ensuring success in all facets of life, including job effectiveness and performance (Subramanian et al., 2024; Barton, 2023). This oversight has been particularly pronounced in lower-income and lower-middle-income countries (LMICs) such as Kenya, where government initiatives have continuously aimed at empowering the youth through educational reforms. However, these reforms have not yielded the expected outcomes in terms of employment rates and workforce readiness (Brewer & Comyn, 2015). Despite consistent investments in the education sector, youth unemployment rates remain alarmingly high at 2–4 times higher than adult unemployment (International Labor Organization (ILO) (2020); Sylvia & Aisha, 2017). Among the contributing factors are graduates' limited ability to adapt to the dynamic labor market and a persistent mismatch between the skills they acquire and the demands of the job market (Anindo et al., 2016; UNESCO, 2017). This state is not merely a reflection of the educational system's shortcomings but also highlights the critical need for a holistic approach that recognizes the importance of non-cognitive skills in fostering a competent and adaptable workforce (Subramanian et al., 2024).

Further, the educational curricula in Kenya have been primarily focused on cognitive development, leaving little room for the cultivation of critical non-cognitive skills. This approach has continuously produced graduates who are technically proficient but lack the critical interpersonal skills necessary for effective collaboration and problem-solving in the current dynamic work environments (F. S. Mohammed & Ozdamli, 2024). As firms increasingly prioritize adaptability and resilience in their employees, the absence of these key non-cognitive skills poses a significant barrier to employment and career advancement for many young individuals (Subramanian et al., 2024; Chakravarty et al., 2017).

To be more specific, Kenya's education sector has expanded, yet it continues to fall short in producing a workforce equipped to meet labor market demands, particularly middle-level human capital critical for national development (Brewer & Comyn, 2015). Key challenges include limited information on the skills required for employment and insufficient collaboration between education institutions and industries, leading to a persistent skills mismatch (Anindo et al., 2016; UNESCO, 2017). In an effort to address this, the government introduced tools like the Kenya Labor Market Information System (KLMIS) to gather data on graduate employability and market needs. However, these tools predominantly emphasize cognitive or occupational-specific skills while neglecting non-cognitive skills—such as teamwork, communication, professionalism, and resilience—critical for success in the modern workplace. This oversight has contributed to structural unemployment.

The implications of these skill mismatches extend beyond individual employability; they also have broader socio-economic consequences. Research indicates that high rates of youth unemployment lead to increased poverty, which, if unaddressed, may result in social unrest and a decline in overall economic productivity (F. S. Mohammed & Ozdamli, 2024; Uchegbue & Ifedi, 2023; Serifat, 2020). As a result, addressing this issue is twofold: enhancing individual career prospects and achieving national development goals. For the government's efforts to reform the education system to yield sustainable gains, these reforms must include a concerted focus on integrating soft skills training into the curriculum at all levels (Tohit & Haque, 2024; Li et al., 2024).

In light of these considerations, this study delves into the complexities of cognitive and soft skills as they relate to labor market outcomes in Kenya. The study analyzes the existing literature on the significance of both skill sets and their collective impact on employability.

By expanding the definition of human capital to include both cognitive and non-cognitive dimensions, we can better equip young individuals with the tools they need to thrive in the dynamic labor market (Subramanian et al., 2024).

This paper answers the following question: How complementary are non-cognitive skills with cognitive domains and their joint effect on youth employability and youth wages considering gender distribution and employment status?

The contribution of this study is to add to the body of knowledge on the interaction of non-cognitive skills and cognitive skills and their joint effect on two labor market outcomes. First, we assessed the interaction between the big five personality traits and cognitive domain and investigated the joint effect on youth wages using the multinomial logit model. Second, we controlled for the joint interaction of cognitive and non-cognitive skills and assessed the effect on youth employability (employed and unemployed) using the binary logit model. This is the first in-depth analysis of the interaction of comprehensive personality traits on cognitive skills and the joint relation to youth employability outcomes in the Kenyan context.

In the following sections, we will provide a concise review of the relevant literature (Section 2). Afterwards, we describe the methodology (Section 3) and data and variables (Section 4). We then present the results in (Section 5). Finally, we present our conclusions in (Section 6).

2. Background

Human Capital Theory suggests that investments in education, training, skills, talents, and experiences increase an individual's productivity (Goode, 1959). The theory argues that the more human capital a person accumulates, the more productive they become, which increases their value and access to better-paying and competitive job markets (Blanden & Machin, 2010). It also states that different levels of education and training correspond to different levels of wages and salaries.

However, Signaling Theory provides a slightly different perspective. It suggests that education does not necessarily increase productivity but instead serves as a "signal" to employers about an individual's abilities. People with higher abilities use their education as proof of their skills, making it easier for them to gain well-paying and prestigious jobs. This paper uses Human Capital Theory to examine Kenya's social and economic changes and to propose strategies for improving youth access to the labor market, thereby driving wealth creation.

The labor market operates on a demand-and-supply basis. Employers looking to hire workers represent the demand side, while individuals willing and able to work form the supply side. Demand for labor is influenced by macroeconomic factors such as technological advancements, globalization, inflation rates, foreign direct investment (FDI), and gross domestic product (GDP) (Beata, 2021). On the supply side, factors like demographics, the level of skills acquired, and access to education and vocational training play a significant role. Historically, human capital research has focused narrowly on formal education and informal training, which has contributed to the ongoing mismatch between education outcomes and labor market needs. Therefore, this study examines supply-side factors rooted in Human Capital Theory to understand how they influence labor market outcomes and to provide recommendations for improving education and training curricula.

According to the study's framework (Figure 1), labor market outcomes are directly influenced by demographics, cognitive skills, and non-cognitive skills. Furthermore, non-cognitive skills indirectly impact labor market outcomes by enhancing cognitive skills.

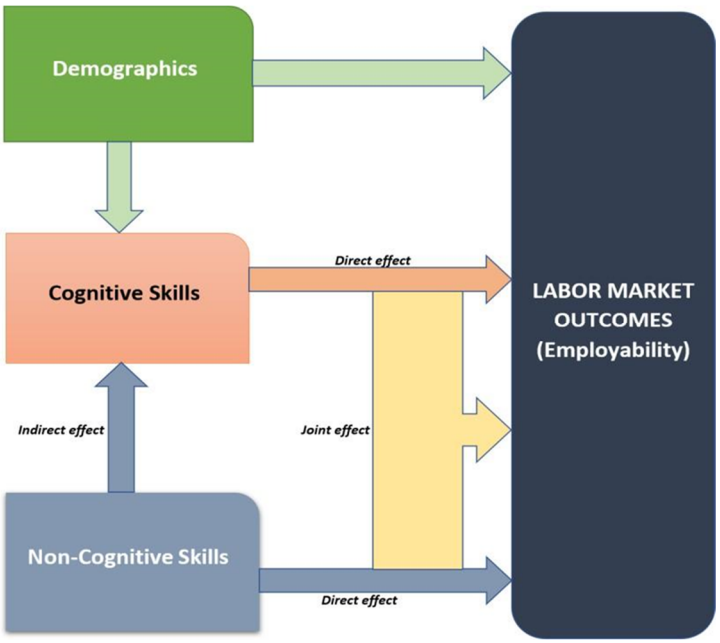

Figure 1. Theoretical framework.

Hypothesis 1. *There is a significant relationship between the interaction of big five personality traits (non-cognitive skills) and cognitive skills and labor market outcomes in Kenya.*

Palczyńska (2020) investigated the complementarity between cognitive and non-cognitive skills and their combined effect on individual earnings in Poland. Using a semi-logarithmic model, the study assessed the extent to which character traits interacted with cognitive skills to influence salaries, with separate estimations for men and women. The findings revealed that non-cognitive abilities significantly impact labor market outcomes both independently and in combination with cognitive skills. Specifically, emotional stability (low neuroticism) complemented cognitive skills (numeracy), as neurotic individuals exhibited lower wage returns compared to their emotionally stable peers. However, the study acknowledged limitations, such as potential endogeneity issues and the inability to establish causal links between personality traits and earnings. Palczyńska (2020) suggested further research with larger samples to explore whether specific non-cognitive skills influence job selection across occupational categories.

Weinberger (2010) similarly explored the role of cognitive and non-cognitive skills, anchoring the study in Utility Theory. Workers were categorized into three groups: those with cognitive skills, those with soft skills, and those with both skill sets. The results showed that multi-skilled workers—those capable of combining cognitive and non-cognitive skills—achieved higher wage and productivity premiums. Specifically, individuals with strong math scores and participation in leadership or extracurricular activities during high school were in greater demand and earned higher wages. These findings underscore the long-recognized importance of cognitive and social abilities in wage determination. However, the study highlighted the need for further research on how cognitive scores influence women's entry into jobs, narrowing the gender gap, and how they shape the development of social skills for high-level tasks.

Deming (2017) examined the returns to social skills in the human capital framework and analyzed complementarities between cognitive and social domains using the Mincer Wage Model and STEM data. By regressing hourly wages on skill proxies while controlling for covariates, the study demonstrated a clear complementarity between cognitive and social skills, both of which were associated with positive labor market returns. Individuals

with strong social skills were found to be more likely to work in occupations demanding high levels of interpersonal interaction, which offered significantly higher wages.

Glewwe et al. (2022) explored the dual role of cognitive abilities—such as literacy and numeracy and non-cognitive traits like personality, motivation, and behavior on adult wages in rural China, demonstrating that cognitive skills strongly predicted a 12.9% increase in wages with a one standard deviation increase in general cognitive skills (Glewwe et al., 2022). They also observed gender differences in the returns to non-cognitive skills. For instance, externalizing behavior (e.g., assertiveness or aggression) positively affects wages for males but negatively impacts wages for females, suggesting the influence of cultural and gender norms on labor market valuations (Glewwe et al., 2022). Cabus et al. (2021) conducted a meta-analysis revealing that conscientiousness and openness correlate with higher earnings, while neuroticism (low emotional stability) and agreeableness tend to lower earnings. Gender-specific benefits were noted, with older and female participants gaining more from non-cognitive skill development programs. This may be due to better-designed programs for older participants, or it could reflect younger participants' reluctance to engage, potentially stemming from negative experiences during formal schooling. While skills generally develop more quickly in younger individuals, non-cognitive skills remain more adaptable than cognitive skills even in later stages of life (Cabus et al., 2021).

Allemand et al. (2023) provided experimental evidence from Senegal showing that conscientiousness training significantly improved job retention and wages among workers, indicating that non-cognitive skills can be enhanced even in adulthood for substantial labor market benefits (Allemand et al., 2023). Deming and Silliman (2024) proposed a new framework where cognitive skills enhance task productivity and non-cognitive skills determine task allocation (Deming & Silliman, 2024).

Alderotti et al. (2023) conducted a comprehensive meta-analysis examining the relationship between the big five personality traits and earnings. Their findings reveal that conscientiousness, extraversion, and openness are positively associated with higher earnings. In contrast, agreeableness and neuroticism tend to be negatively related to income. Conscientiousness, which encompasses qualities like diligence and reliability, was found to be the most robust predictor of higher earnings, as it is directly linked to job performance and perseverance. Extraversion also showed a positive correlation with earnings, potentially due to its association with leadership and social interaction skills. On the other hand, agreeableness was found to be inversely related to earnings, as individuals who score high on this trait may prioritize relationships over assertiveness in negotiating salaries or promotions (Alderotti et al., 2023).

Similarly, Vella (2024) explored the relationship between the big five traits and earnings, confirming many of Alderotti et al.'s findings. One of the key contributions of this study was highlighting the differential impact of these traits based on employment sectors, with traits like extraversion being more highly rewarded in roles that involve significant interpersonal interaction, such as sales or management positions. Openness was found to have a more nuanced relationship with earnings, where creativity and adaptability are rewarded in innovative sectors but may have limited impact in more routine or structured roles (Vella, 2024).

Gender-specific analyses of the big five traits and earnings have yielded valuable insights, particularly regarding the differential rewards for these traits across labor markets. I. Mohammed et al. (2021) explored how gender differences in personality traits influence earnings in wage-employment versus self-employment contexts. Their research found that men generally receive higher returns on traits like conscientiousness and extraversion in wage-employment settings, whereas women benefit more from these traits in self-

employment. Moreover, the study highlighted that gender disparities in labor markets are exacerbated by societal expectations around personality traits, with women who score high in agreeableness being penalized in waged employment, while men tend to benefit from traits associated with assertiveness and dominance (I. Mohammed et al., 2021).

Volery and Mattes (2022) contributed to the literature by examining the impact of the big five traits on self-employment survival. Their study found that conscientiousness and emotional stability (low neuroticism) are strong predictors of business success and long-term self-employment survival. Extraversion and openness were also positively associated with entrepreneurial survival, particularly in industries where networking and innovation play significant roles. However, agreeableness showed a weaker link to self-employment success, potentially due to the competitive and assertive nature required in entrepreneurial endeavors (Volery & Mattes, 2022).

3. Methodology

To examine the combined effects of cognitive and personality traits on youth employment, the study conducted a comparative analysis of youth skills and values, stratified by gender. Descriptive statistics, including percentages, summarized the data, while inferential statistics, such as t-tests, were employed to assess significant differences in employment status across demographic groups. The relationship between cognitive and non-cognitive skills, as well as their interaction effects on youth employment in Kenya, was estimated through an empirical model.

Given the dichotomous nature of the dependent variable—youth employment status (1 = employed, 0 = unemployed)—the study used a binary logistic regression model to identify factors influencing youth employment separately for male and female respondents. The choice of this model is supported by its ability to handle binary outcomes effectively and to estimate the odds of employment based on various predictors. The regression model is expressed as follows:

$$Y_i = ln\left(\frac{p}{1-p}\right) = \beta_0 + \sum_{i=1}^{n} \beta_i X_i + \varepsilon \quad (1)$$

where Y represents the employment status of a young person (either employed or unemployed); p is the probability of being employed; $(1 - p)$ is the probability of being unemployed; $p/(1 - p)$ denotes the odds of being employed; $i = 1$ to n represents the total number of covariates; β_0 is the intercept term; β_i measures the effect of a change in X_i on the probability of being employed; X_i captures the explanatory variables or covariates; and ε is the stochastic term. Thus, Y is defined as the odds of being employed relative to being unemployed among the youth, modeled as a function of the explanatory variables and the stochastic term to account for omitted variables.

The covariates included in the binary logistic regression model were informed by prior empirical research on youth employment determinants and the skills required in the 21st century (Ignatowski, 2017; Ndagijimana et al., 2018; Alawad et al., 2020; Fajaryati & Akhyar, 2020; Dean & East, 2019). These independent variables were categorized into four groups: socio-economic and demographic characteristics, which include variables such as gender, age group, marital status, education level, presence of biological children, and household size; non-cognitive skills which encompass personality traits as defined by the BFI dimensions, including extraversion, agreeableness, openness, conscientiousness, and emotional stability; cognitive skills assessed through measures of digital literacy, numerical literacy, and general literacy levels; and asset ownership variables which captured the ownership of items such as a television, basic phone, smartphone, or PC/laptop.

The variables contain a mixture of continuous and discrete values. Non-cognitive skills were assessed using a five-point Likert scale to gauge the extent of agreement with value statements and confidence in skill-related statements, including intrapersonal, interpersonal, and decision-making abilities, as captured in the data collection tool.

Following the parameter estimation, marginal effects were computed to evaluate the magnitude of changes in the conditional probability of employment status resulting from changes in the covariates while holding other variables constant (Greene, 2012). For categorical variables, marginal effects indicated the change in the conditional probability of employment as the variable transitioned from 0 to 1, controlling for all other factors. The marginal effects for a bivariate probit model are expressed as:

$$\frac{\partial \phi_2\left(X_1'\beta_1, X_2'\beta_2, \rho\right)}{\partial X_i} = \varphi(X_i'\beta_i)\phi_2\left(\frac{X_2'\beta_2 - \rho X_1'\beta_1}{\sqrt{1-\rho^2}}\right)\beta_i,\ i = 1,2 \tag{2}$$

This equation highlights the conditional probability changes in response to variations in both continuous and categorical covariates, thereby providing nuanced insights into the factors influencing youth employment in Kenya.

4. Data and Variables

This study utilized data from a national cross-sectional survey conducted in 2018 by a tripartite partnership between Dalberg Research, Dalberg advisors and ZiziAfrique under the Ujana 360 program. The program engaged three distinct youth groups: those not in employment, education, or training (NEET), those enrolled in Technical and Vocational Education and Training (TVET) institutions, and those employed in both formal and informal sectors. The survey employed a multistage sampling technique, which ensured the engagement of a representative sample of youth across Kenya. Specifically, 250 enumeration areas (EAs) were selected proportionate to population size and stratified by rural and urban locations, allowing for a comprehensive analysis of youth experiences across diverse settings.

In each selected EA, households containing youth were listed, and respondents were chosen using systematic random sampling with a predetermined skipping interval. Approximately ten youths aged 15–25 years were targeted for interviews in each EA. In instances where multiple eligible respondents resided in a household, the "last-birthday" method was employed to select the interviewee, ensuring a random selection process. This method resulted in a robust dataset, successfully capturing data from 2361 youth across all 47 counties in Kenya.

The questionnaire used in this survey was designed to primarily collect quantitative data on various demographic and socio-economic characteristics, youth awareness and perceptions of TVET institutions, employment status, economic outlook regarding youth employment, capabilities and values, work and life outcomes, and the factors influencing these outcomes. Additionally, a human-centered design component was incorporated to assess youth capabilities in literacy and numeracy.

The measurement of personality traits in this study was informed by Clark and Watson's (1999) evaluation of personality measurement methodologies, which considers various approaches for assessing personality traits and non-cognitive abilities. Watson's framework distinguishes between humanistic-oriented models, which emphasize self-perception and personal aspirations, and psychodynamic-oriented theories, which highlight the influence of unconscious mechanisms on emotions, motives, and behaviors. The latter necessitates alternative assessment methods beyond direct self-reporting (Clark & Watson, 1999).

To capture these dimensions effectively, the study employed objective tests, utilizing standardized response options (e.g., true/false; strongly disagree to strongly agree). Responses were evaluated against predetermined scoring criteria. For instance, self-assessments on constructs such as locus of control, social orientation, resistance to peer pressure, and assertiveness were aggregated to generate an overall score for the personality trait of extraversion.

The Dalberg questionnaire incorporated the big five inventory (BFI) framework, which categorizes personality traits into five dimensions: extraversion, agreeableness, openness, conscientiousness, and neuroticism. Each trait was measured on a continuum, with individuals assigned scores across each dimension. The survey included 52 general questions organized into four thematic categories. Capabilities and values, which assessed trust, self-confidence, opportunism, hope, persistence, dependability, openness, locus of control, social orientation, loyalty, and conviction; intrapersonal skills, which evaluated self-esteem, emotional regulation, stress management, and self-awareness; interpersonal skills which assessed peer-pressure resistance, assertiveness, effective communication, interpersonal relations, empathy, and negotiation; and decision-making skills which focused on problem-solving, curiosity, critical thinking, and creative thinking.

Each capability or skill within the "capabilities and values" category was assessed through three questions using a five-point Likert scale (1 = Strongly Disagree, 2 = Disagree, 3 = Neither Agree nor Disagree, 4 = Agree, and 5 = Strongly Agree). Individual scores for each capability ranged from 1 to 15, with higher scores indicating greater alignment with the trait. For the remaining three categories—Intrapersonal Skills, Interpersonal Skills, and Decision-Making Skills—individual scores ranged from 1 to 5 for each skill.

To align the measured values and skills with the BFI framework, the variables across the four categories were mapped to the five BFI dimensions (Appendix A). This mapping facilitated a comprehensive analysis of individual traits on a positive Likert scale, allowing for nuanced insights into personality traits and their implications for youth employment outcomes.

5. Results

This section presents the results of the analysis of socio-demographic characteristics, personality traits, and values among youth based on employment status and gender, which reveal significant disparities. As shown in Table 1, the gender distribution of employed respondents indicates a stark contrast, with 51% of employed respondents being male compared to only 24% female. This gender disparity in employment is statistically significant at the 1% level, indicating a pronounced gap in employment opportunities available to young men and women.

Table 1. Descriptive statistics by gender.

	Male (*n* = 871)	**Female (*n* = 1489)**	**Total**	**Chi square/*t*-Statistic**
Age group (%)	36.91	63.09		
15–17 years	3.68	3.65		0.47
18–22 years	39.39	40.76		
22–25 years	56.93	55.59		
Employment status				
Employed (%)	0.51	0.24		13.54 ***
Education of the respondent				
No formal education (%)	3.41	4.93	4.19	4.55 ***
Primary schooling (%)	36.63	37.09	36.86	
Secondary schooling (%)	52.01	51.23	51.61	
Post-secondary schooling (%)	7.95	6.74	7.33	

Table 1. *Cont.*

	Male (n = 871)	Female (n = 1489)	Total	Chi square/t-Statistic
Marital status of the respondent				
Single (%)	84.72	52.96	68.36	276.90 ***
Married (%)	14.76	43.83	29.73	
Widowed/divorced (%)	0.52	3.21	1.91	
Respondent has a child	0.17 (0.011)	0.66 (0.014)		−24.26 ***
Own a TV	0.09 (0.008)	0.05 (0.006)		3.29 ***
Own a basic phone	0.46 (0.015)	0.45 (0.014)		0.52
Own a smartphone	0.44 (0.015)	0.34 (0.014)		5.22 ***
Own a PC/laptop	0.03 (0.005)	0.01 (0.003)		3.19 **
Household size	4.591 (2.586)	5.132 (2.562)	4.870 (2.587)	−4.23 ***
Cognitive skills (%)				
Digital literacy	0.93 (0.008)	0.88 (0.009)		3.765 ***
Literacy	0.92 (0.008)	0.91 (0.008)		1.103
Numerical literacy	0.81 (0.012)	0.74 (0.013)		4.078 ***
Non-cognitive skills/personality traits (Scores)				
Agreeableness (out of 55)	14.11 (1.947)	13.82 (1.926)	13.96 (1.941)	3.69 ***
Conscientiousness (out of 25)	11.83 (1.406)	11.70 (1.345)	11.76 (1.376)	2.28 **
Emotional stability (out of 65)	31.12 (3.072)	30.95 (3.032)	31.03 (3.052)	1.38
Extraversion (out of 50)	15.12 (1.970)	15.03 (1.907)	15.07 (1.938)	1.12
Openness (out of 45)	19.64 (2.112)	19.33 (2.126)	19.48 (2.125)	3.57 ***

** $p < 0.05$, *** $p < 0.01$. Source: Author's calculation based on Dalberg data (Ujana360—Zizi Afrique Foundation).

The study findings further reveal that educational attainment showcases differences between genders. For instance, almost equal proportions of males (52%) and females (51%) reported completing secondary education, while for both genders, those who only attained primary education were similar at 37%. These educational disparities were also statistically significant at the 1% level, indicating a pressing need for targeted interventions aimed at improving educational outcomes for youth beyond secondary education. Marital status data reflects additional gender disparities: while 68% of respondents were single, only 17% of males reported having children compared to 66% of females. This discrepancy underscores a significant divergence in family responsibilities between genders.

The ownership of assets among respondents varied significantly. Approximately 7% owned a television, 46% owned a basic phone, and 39% owned a smartphone, while access to personal computers or laptops was notably low, with less than 2% reporting ownership. The findings indicate low access to devices that promote digitalization, which is crucial in the current dynamic work environment. Furthermore, household size also differed significantly between genders; on average, male respondents came from households with

an average of four members, whereas females came from larger households averaging five members, which was statistically significant at the 1% level.

In terms of cognitive skills, most youths exhibited moderate digital literacy but demonstrated poor performance in literacy and numerical skills. These findings are concerning, given that they are essential and critical for employability and adaptability in the modern labor market. Non-cognitive skills, assessed through the big five personality traits (extraversion, agreeableness, and openness), were low for both genders. Emotional stability scored slightly higher, with a mean of 30 out of 65 for both genders, while conscientiousness averaged 11 out of 25. These results emphasize the critical role of both cognitive and non-cognitive skills in shaping youth adaptability and, therefore, employability.

The findings suggest that while digital literacy offers opportunities to the youth, deficiencies in broader cognitive skills and personality traits may be the contributor to limited employment prospects. Therefore, there is a need to integrate cognitive and non-cognitive training into educational curricula and youth development programs to contribute to the creation of young people who are adaptable, thus, improving employability outcomes and addressing the ongoing challenge of youth unemployment.

The study analyzed the interactions between digital literacy and each of the five BFIs and their joint effect on employability holding other cognitive skills constant, as shown in Table 2. In regards to direct effects on employment probability, the findings show that male and female respondents aged 22–25 years had a 24% and 14% higher probability of being employed, respectively, compared to those aged 15–17 years. These results were statistically significant at the 1% and 5% levels, respectively. Furthermore, married male youth exhibited a 21% greater likelihood of employment compared to their single counterparts, with this effect being significant at the 1% level.

Table 2. Joint effects of cognitive (digital literacy) and non-cognitive skills on employability.

	Male	**Female**
	Margins (dydx)	**Margins (dydx)**
Digital literacy (yes/no)	0.568	−0.032
	(0.645)	(0.580)
Age group (Ref. = 15–17 years)		
18–22 Years	0.074	0.044
	(0.086)	(0.062)
22–25 Years	0.244 ***	0.141 **
	(0.088)	(0.064)
Education level (Ref. = no formal education)		
Primary schooling	0.224 *	0.016
	(0.121)	(0.107)
Secondary schooling	0.140	−0.060
	(0.127)	(0.116)
Post-secondary schooling	0.144	−0.040
	(0.135)	(0.123)
Marital status (Ref. = single)		
Married	0.214 ***	−0.030
	(0.050)	(0.028)
Widowed/divorced	−0.055	0.032
	(0.188)	(0.072)
Has a child		
Yes	−0.023	0.046
	(0.051)	(0.030)
Agreeableness score	−0.006	−0.033
	(0.027)	(0.023)

Table 2. *Cont.*

	Male	**Female**
	Margins (dydx)	**Margins (dydx)**
Conscientiousness score	−0.030	−0.040
	(0.049)	(0.038)
Emotional stability score	−0.006	0.006
	(0.021)	(0.015)
Extraversion score	0.026	−0.003
	(0.036)	(0.025)
Openness score	0.023	0.041
	(0.035)	(0.029)
Digital * agreeableness	0.030	0.049 **
	(0.028)	(0.024)
Digital * conscientiousness	0.036	0.037
	(0.050)	(0.040)
Digital * emotional stability	−0.005	−0.002
	(0.022)	(0.016)
Digital * extraversion	−0.029	0.010
	(0.037)	(0.026)
Digital * openness	−0.017	−0.039
	(0.036)	(0.030)
R-squared		
N	1139	1207
Wald test of rho = 0: chi2(1)	5.277	12.2592
Prob > chi2	0.0216	0.0005

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

In terms of joint effects, the interaction between non-cognitive traits and digital literacy revealed significant outcomes. The results show that female respondents with higher levels of agreeableness demonstrated a significant advantage, with their digital literacy contributing to a 5% increase in employability, significant at the 5% level. These results underscore the importance of integrating both cognitive and non-cognitive skills in the education systems to enhance youth employability and adaptability.

The findings in Table 3 show the interactions between literacy and each of the five BFIs and their joint effect on the probability of employment holding other cognitive skills constant. The results further show the direct effects of the non-cognitive skills on literacy (reading). Controlled for in the model are the social statistics and demographic characteristics. This estimated model showed direct effects between the social demographic characteristics and the non-cognitive skills on the probability of employment, though there were no joint effects. Similar to the previous model in Table 2, both male and female respondents in the age group of 22–25 years increased their probability of employment by 26 percent and 15 percent, respectively, both at a 1 percent significance level relative to those who were in the 15–17 years age group. Male and female youth increased their probability of employment by 27 percent, 25 percent, and 26 percent if they had primary, secondary, and post-secondary schooling, respectively, at a 1 percent significance level relative to if they had no formal education. Married male youth had an 18 percent probability of being employed relative to single male youths at a 1 percent significance level. Further, an agreeable male youth increased their probability of employment by 5 percent at a 5 percent level of significance, though if the male respondent had a unit increase in their emotional stability score, they would decrease their probability of employment by 3 percent at a 5 percent level of significance.

Table 3. Joint effects of cognitive skill (literacy) and non-cognitive skills on employability.

	Male	**Female**
	Margins (dydx)	**Margins (dydx)**
Literacy (yes/no)	−0.624	0.318
	(0.502)	(0.403)
Age group (Ref. = 15–17 years)		
18–22 years	0.109	0.061
	(0.068)	(0.042)
22–25 years	0.259 ***	0.154 ***
	(0.070)	(0.044)
Education Level (Ref.—no formal education)		
Primary schooling	0.387 ***	0.164 ***
	(0.057)	(0.030)
Secondary schooling	0.346 ***	0.152 ***
	(0.057)	(0.029)
Post-secondary schooling	0.347 ***	0.168 ***
	(0.070)	(0.047)
Marital Status (Ref. = single)		
Married	0.185 ***	−0.035
	(0.047)	(0.024)
Widowed/divorced	−0.056	0.012
	(0.173)	(0.061)
Have a child		
Yes	−0.015	0.044 *
	(0.045)	(0.024)
Agreeableness score	0.050 **	−0.004
	(0.020)	(0.013)
Conscientiousness score	0.017	0.004
	(0.031)	(0.021)
Emotional stability score	−0.028 **	−0.002
	(0.014)	(0.010)
Extraversion score	−0.005	0.004
	(0.015)	(0.016)
Openness score	0.007	0.008
	(0.020)	(0.017)
Literacy × agreeableness	−0.033	0.015
	(0.021)	(0.014)
Literacy × conscientiousness	−0.010	−0.012
	(0.033)	(0.024)
Literacy × emotional stability	0.022	0.006
	(0.014)	(0.011)
Literacy × extraversion	0.003	0.001
	(0.017)	(0.017)
Literacy × openness	−0.001	−0.004
	(0.022)	(0.018)
R-squared		
N	1139	1207
Wald test of rho = 0: chi2(1)	15.79	0.000119
Prob > chi2	0.0001	0.9913

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

6. Discussion

The results from this study provide valuable insights into the growing body of literature examining the role of cognitive and non-cognitive skills in determining youth employability, with a specific focus on female youth. Notably, the findings highlight the

significance of agreeableness and digital literacy as key determinants of employability for female youth, expanding upon previous research that has explored these traits in different contexts.

Palczyńska (2020) highlighted the complementarity between cognitive and non-cognitive skills, finding that emotional stability, a non-cognitive trait, complements cognitive skills to influence earnings. While Palczyńska's study focused broadly on the interplay of these skills in determining individual earnings, the findings from our study emphasize the intersection of specific non-cognitive traits—agreeableness and cognitive skills—digital literacy—specifically in relation to female employability. The evidence that agreeable female youth with digital literacy skills are more likely to be employed suggests a unique complementarity, extending Palczyńska's conclusions by showing the specific role of agreeableness in employment outcomes when coupled with technological competence.

Alderotti et al. (2023) reported that agreeableness was inversely related to earnings in wage employment, citing the lower propensity for assertiveness and negotiation as potential factors. However, this study shows that when combined with digital literacy, agreeableness becomes a valuable asset for female youth in the job market. This suggests that cognitive skills like digital literacy may offset some of the drawbacks traditionally linked to agreeableness, such as lower assertiveness in negotiations, and increase the competitiveness of agreeable individuals in technology-driven workplaces.

In most of the literature, emotional stability (low neuroticism) is considered a positive trait in the workplace, enhancing employability by helping individuals manage stress, maintain productivity, and engage well with colleagues. For instance, Palczyńska (2020) found that emotional stability tends to improve employability by supporting individuals in handling workplace challenges and stress. This study's finding of a negative significant effect of emotional stability on male youth employment deviates from this widely accepted understanding, suggesting that emotional stability may not be valued equally across all job roles or industries. It introduces the possibility that certain sectors where emotional adaptability or assertiveness are not prioritized may disadvantage emotionally stable individuals. Exploring industry-specific dynamics could shed light on why emotional stability could be viewed less favorably in particular employment contexts.

On the other hand, the positive effect of agreeableness on male youth employment aligns with some elements of existing literature. Agreeableness, characterized by cooperation and teamwork, is often valued in team-oriented settings. Studies like Alderotti et al. (2023) have shown that while agreeableness may not always translate to higher earnings, it does positively affect employment prospects in collaborative roles. Our findings support this notion, suggesting that male youth with high agreeableness may benefit from employment opportunities where interpersonal skills and teamwork are crucial.

7. Conclusions

This study suggests that for female youths, agreeableness and digital literacy skills have a positive and significant effect on their probability of employment. Individuals who possess these traits may have an advantage in the job market as they are valued for their ability to work well with others and collaborate effectively. Further, they possess skills that are becoming increasingly important in many industries. However, for male youths, agreeableness and emotional stability have a positive and negative significant effect on their probability of employment, respectively. Emotional stability is generally considered a positive trait in the workplace, but the study suggests that specific industries or job roles may not value this trait as highly. Overall, the analysis shows that other factors, such as marital status, level of schooling, and age, can also influence an individual's probability of employment. This study concludes that personality traits are just as significant as cognitive

abilities in the eyes of employers and that employers place more emphasis on personality trait signals than on cognitive skill signals.

Based on the findings of the study, several policy implications can be derived:

1. Education policies should prioritize the development of digital literacy skills, especially among female youths. This can be achieved through incorporating technology-related subjects into the curriculum, providing relevant training and skills development programs, and ensuring access to technology and the Internet.
2. Employers should consider the complementarity between agreeableness and digital literacy skills when recruiting and selecting candidates. This can be achieved by including personality assessments and digital literacy tests as part of the selection process and by recognizing the value of teamwork and collaboration in the workplace.
3. Employers should recognize the importance of emotional stability in the workplace, especially for male youths. This can be achieved by providing support and resources to help employees manage stress and maintain positive mental health.

Overall, the study highlights the importance of considering both cognitive and personality traits in the job market and emphasizes the need for policies and programs that prioritize the development of relevant skills and attributes among youths.

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Appendix A. BFI Definition and Classification

BFI	Definition	Values as Classified
Extraversion	Directing one's interest toward the outer world of people and things rather than the inner world of subjective experiences characterized by positive affect and sociability.	Belief in oneself (Locus of control), Social orientation, peer-pressure resistance, assertiveness
Agreeableness	The tendency to act cooperatively and in an unselfish manner.	Trust, loyalty, interpersonal relations, empathy, negotiation
Openness	Captures one's tendency to be open to new experiences (aesthetic, cultural, or intellectual).	Opportunism, optimistic, openness, curiosity, critical thinking, creative thinking
Conscientiousness	One's tendency to be organized, hardworking, and responsible.	Dependability, effective communication, problem solving
Emotional Stability	predictability and consistency in emotional reactions with the absence of rapid mood changes. Neuroticism is "a chronic level of emotional instability and proneness to psychological distress".	Self-confidence, Hope, Persistence, Conviction, self-esteem, emotions, stress, self-awareness

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