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Trends of higher education enrolment, graduation, and employment in Ethiopia: an empirical analysis

Berhanu Mekonnen Yimer^a , Adane Hailu Herut^b, Mesfin Molla Demissie^c, Misganu Legesse Bareke^c, Birhanu Haile Agezew^c, Negash Haile Dedho^d and Mulugeta Fufa Lebeta^b

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ABSTRACT

To deal with the dynamic nature of global and socioeconomic conditions, it is critical to rethink the interplay between the efficiency of the higher education system and the employability outcomes of graduates. The purpose of this study was to investigate trends in undergraduate enrolment, graduation, and employment in Ethiopia. It looked at data from the past 15 years of enrolment and graduation and unemployment trends. For enrolment, we used the ARIMA (0, 1, and 0), Holt–Winter, and Simple models. Results showed that enrolment increased dramatically, whereas graduation went the other way, and this pattern is expected to continue. It is expected that higher education enrolment and graduation will continue to rise over the next ten years, while labor market demand will fall. Rethinking competence-based and job-driven education policy formulation, strengthening graduation-labor market alignment, and sustaining development qualification systems were all strongly recommended as ways to improve these trends.

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Introduction

In today's world, it is recognized that investing in human capital is the key to achieving sustainable development, and education plays a crucial role in providing the required human capital (Mateja & Palvin, 2012; Bareke et al., 2021; Adeleye et al., 2022; Yizengaw, 2004). According to UNESCO, higher education has reached a thriving status in Sub-Saharan Africa between 2000 and 2010, with enrolments more than doubling, rising from 2.3 million to 5.2 million (UNESCO-IESALC, 2021). However, the Sub-Saharan enrolment rate remains less than 7%, which is far from the global rate of 29% (UNESCO, 2021). Enhancing graduates' employability has emerged as a top priority in the region due to the rapid expansion of higher education (Mateja & Palvin, 2012).

The country's population is growing, and many graduates will join a competitive and rapidly changing job market (CSA & ICF, 2023). Higher education institutions are expected to instil skills in their graduates. These include the ability to adapt to new situations, awareness of ethical values, independent learning, problem-solving, information management, critical thinking, teamwork, applying knowledge to practice, self-confidence, and responsibility. It is also asserted that increased access to higher education

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could help reduce youth unemployment, and by ignoring this educational benefit, we run the risk of underestimating how macroeconomic shocks will affect young people (Hermannsson et al., 2019). This is a requirement for higher education institutions, indicating that in addition to creating job opportunities, one of their performance indicators is the employability of their graduates.

As a result, Sub-Saharan African nations face a significant challenge in finding employment for the region's rising graduate population (Al'Abr, 2011). Even though these countries invest heavily in education, they are still challenged by the rising rate of graduate unemployment and the mismatch between higher education and the labor market (British Council, 2014; Al'Abr, 2011). Therefore, development cannot be guaranteed by merely producing a large number of graduates; it must also be guaranteed by creating employment opportunities. This is essential to ensuring a significant match between graduate supply from higher education systems and graduate demand from the labour market.

Ethiopia, with a burgeoning population of 123 million as of 2022 and an annual growth rate of 2.6% (CSA & ICF, 2023; CSA, 2022), holds the second-highest population growth in sub-Saharan Africa (SSA). Projections from the United Nations indicate a substantial rise, estimating the population to reach nearly 150 million by 2030—an increase of 27% from the 2020 estimate of 117 million (UNDP, 2022). The economic landscape mirrors this demographic surge, as Ethiopia now boasts the largest economy in East Africa, amounting to US\$111.3 billion in 2021, closely trailing Kenya. Furthermore, it ranks as the fourth-largest economy in sub-Saharan Africa (SSA). Despite these strides, Ethiopia retains its classification as a least-developed country by the United Nations, with the World Bank designating it as a low-income country. However, there is a concerted effort to elevate its status to lower-middle-income by 2025. This economic progress is also evident in the evolution of the education sector. The undergraduate participation rate, indicative of higher education supply, has witnessed significant growth—from 0.7% in 1996 to 12% in 2019 (MoE, 1997, 2020). This surge signifies an ample supply of higher education, resulting in a substantial number of graduates across diverse fields, showcasing the promising trajectory of Ethiopia's educational landscape.

Despite this, the country faces significant challenges in terms of maintaining economic growth, which necessitates the creation of jobs for graduates. Other difficulties encountered include a lack of competitiveness, which limits the development of manufacturing, the creation of jobs, and the increase in exports (World Bank, 2019). There are also possible elements that influence the employability outcomes of higher education graduates in a recent study (Demissie et al., 2021). Therefore, development cannot be guaranteed by merely producing a large number of graduates; it must also be guaranteed by creating employment opportunities. This is essential to ensuring a significant match between graduate supply from higher education systems and graduate demand from the labour market (Demissie et al., 2021; Hermannsson et al., 2019). As a result, the country's higher education and employability status are not functioning well, and the education-job mismatch is both vertical and horizontal, affecting more than a third of graduates (UNESCO, 2020). From this, it is reasonable to conclude that there is a need to reconsider the external efficiency of the country's higher education system in terms of enrolment, graduation, and employability. This is because examining the system's trending features enables readers to make further implications for the country's education development in terms of Agenda 2030's Goal 4 of Sustainable Development.

To that end, the objective of this study was to determine the extent to which the alignment between the input (enrolment to graduation) and the output (employment) in Ethiopian higher education systems in the past trends and forecasts the system's future fate. Finally, a discussion of the relationship between enrollment, graduation, and employment as well as the underlying causes of the two variables' alignment has been conducted, with implications being suggested. In view of the above, this study was guided by the following research question: What are the trends in undergraduate enrollment, graduation, and employment in Ethiopia?

Literature review

The development of higher education: Global imperatives

Higher education, it is argued, is necessary for world countries to succeed in a global economy where knowledge has become a critical competitive advantage, implying that enhancing employability skills

through higher education is crucial. An increase in students and university graduates has been a hallmark of the development of higher education systems in recent years (Hermannsson et al., 2017). This is the fundamental idea behind why increasing higher education enrolment, graduation rates, and employability is crucial. One of the developing characteristics of higher education institutions is the implementation of quality assurance policies, strategies, and procedures, as well as the adaptation of university curricula to the demands of global labour market dynamics (Corominas et al., 2010). Globalization, as a crucial reality of the twenty-first century, necessitates a critical evaluation of higher education's function and mission amid the profound, changing necessities of a global society (Zhu, 2015). Graduates are accustomed to rapid access at any time and any place in today's dynamic global educational economy (Jones & Skinner, 2014). As a result, higher education institutions are promoting themselves as entrepreneurial models in the national and international markets (Lane et al., 2015). Thus, in order to be globally competitive, every country, big or small, is attempting to restructure higher education in order to make it more of a service to the country (Altbach, 2013; Anderson, 2015; Barrett, 2017).

According to Korka (2020), three domains have been identified as universities' contributions to economic development in the knowledge era: (i) developing and accumulating human capital, (ii) generating, disseminating, and applying knowledge, and (iii) innovating and inventing new information and technology. Thus, it has been determined by a number of recent studies (Tran, 2019; Borsi et al., 2022) that the main objective of higher education is to prepare students for employment. The role that higher education institutions ought to play in graduate employment is seen from two different angles (Korka, 2020). Beginning by gathering extensive data that can be analyzed in terms of gender, ethnicity, and subject discipline studied degree categorization, salary obtained, institution providing degree, and other factors to ascertain what is happening in terms of graduates entering the labor force (Holmes, 2013; Tran, 2019; Korka, 2020; Demeke, 2022). The idea of employability is to be used to index the second factor. Higher education institutions cannot ensure employability outcomes because they have no control over the labor market (and no other agency can in a free market and economy). They can, it is claimed, take action to increase the likelihood that their graduates will find suitable and stable employment. Governments may also reasonably anticipate that higher education institutions will comply (Holmes, 2013; Korka, 2020; Demissie et al., 2021).

Alignment of higher education and the labor market

The term "higher education-labour market alignment" describes a system that ties together various programs and tactics. Around the globe, graduate employment and higher education are viewed as "two sides of the same coin" (Mueller & Robert, 2021, p. 19). This indicates that colleges are working hard to carry out ambitious internationalization goals as employability gains traction in higher education. These agendas include a range of initiatives that support social change, global citizenship, community engagement, and graduate employability by aligning with universities' roles in training qualified personnel capable of making positive contributions in rapidly changing environments. These initiatives include outbound as well as inbound student mobility, international recruitment, language and cross-cultural learning opportunities, international internships, and partnerships (Crossman & Clarke, 2009; Green et al., 2019; Mueller & Robert, 2021). To this effect, the availability of a robust post that regulates the development of higher education and its alignment with the labour market has paramount importance, as the high-performing countries' trends indicate.

Several countries stand out as models for excellence in the area of higher education and its integration with the labour market. For example, Finland stands out among these nations for its skilful blending of practical and vocational education (European Commission, 2022). This strategy makes sure that during their time at university, students are given the skills and knowledge that are most suitable for the workplace. In Finland, academic and vocational institutions collaborate with businesses to produce research and programs that are specifically suited to the demands of the labour market. The nation's commendably low graduate unemployment rates and its illustrious reputation for cultivating a trained and job-ready workforce are supported by this cooperative alignment (Hyvarinen & Cedersund, 2018; Sahlberg, 2015). Germany is another shining example, known for its dual educational system that skilfully combines in-class instruction with practical experience. German students gain practical experience through

apprenticeships and joint programs with businesses, which results in a solid understanding of industry prerequisites (Hyvarinen & Cedersund, 2018). Furthermore, Germany's strong concentration on engineering, technology, and research produces a well-prepared workforce, which considerably contributes to its economic successes (European Commission, 2021; Spielhofer et al., 2017).

On the other hand, other countries struggle with the complex issue of balancing higher education outputs with job market trends. Nigeria faces challenges in matching academic needs with professional expectations, despite its sizable population and natural potential. The existing higher education environment frequently falls short of the demands of the labour market, creating a disconnect between learned skills and rising graduate jobless rates (Wafa, 2020). The ability of Nigerian colleges to effectively prepare students for professional endeavours is hampered by a lack of resources, out-dated curricula, and few industrial linkages (Adesola et al., 2022; Oni et al., 2021). Venezuela, which is wracked by political and economic unrest, is hardest hit by the misalignment of its higher education system with the demands of the labour market. High levels of hyperinflation and economic fragility have resulted in inadequate support for universities, crumbling infrastructure, and pitiful academic salaries (Ruiz & Delgado, 2017; Nino-Zarazua, 2018). As a result, graduates struggle with limited career opportunities and a lack of industry connections, which makes it more difficult to match education with employability across the country.

Realizing the importance of knowing that the interplay between the advancement of education and its alignment with workforce needs is a dynamic area that varies across nations and eras due to various influences like governmental regulations, shifting socioeconomic conditions, and sociological shifts (Teichler, 2007; Shin & Toutkoushian, 2011) The examples offered here attempt to illustrate broad trends and provide a comprehensive view of global dynamics pertaining to the interplay between graduate job markets and higher education (Bridgstock, 2020; Richardson et al., 2019). Globally, these terms are used in a number of reports and campaigns that require higher education institutions to make sure graduates have the fundamental workplace skills and/or technical abilities that employers' demand, either in place of or in addition to making sure there are an adequate number of graduates available (Fernandez-Santander, et al., 2012).

The development of higher education: Ethiopian context

According to a report, higher education in Ethiopia began in the fourth century AD. However, Addis Ababa University College's founding in 1950 (Yallew, 2020) can be credited with the beginning of higher education in its current form. Between the 1950s and the last decade of the twentieth century, there were only two state-run institutions of higher learning in the nation (Mebratie & Nigussie, 2022; Yallew, 2020). However, expansion activities that began in the last decade of the twentieth century brought the total number of government-led institutions to eight by 2002 (Bishaw & Melesse, 2017). This trend has persisted throughout the last two decades (even since the introduction of the Education and Training Policy in 1994), and one could say that the distinctive features of contemporary Ethiopian higher education are strong government-led expansion and rapid change (Akalu, 2016).

The goals of higher education in Ethiopia can be summed up as preparing knowledgeable, skilled, and emotionally mature graduates through demand-based programs, resulting in the country becoming internationally competent, technologically equipped, and economically self-sufficient (Higher Education Proclamation, 2019). With these objectives in mind, a large number of students were admitted to undergraduate programs in 2017/18. The regular program had 825,003 students enrolled. Since then, undergraduate enrolment in regular programs has increased significantly. In Ethiopia, the undergraduate program had the highest enrolment rates. Engineering and technology fields accounted for 32% of all undergraduate programs (MOE, 2018). On the other hand, the number of undergraduate program graduates has been increasing. In 2017/18, for example, 141,700 people graduated (MOE, 2018). However, there has been no evidence-based investigation into the employment status of graduates.

As the number of graduates' increases, the market capacity to absorb graduates is likely to decrease, particularly in countries like Ethiopia, where there is little demand for the skills fostered by some academic programs (Demissie et al., 2021; Kahsay, 2012). In Ethiopia, increased access to higher education may have contributed to an increase in the number of unemployed. As a result, with the annual graduation rate of both private and public universities hovering around 79%, graduate unemployment is likely

to rise (MOE, 2015). This may be determined by the interaction of various factors such as the individual (the graduate), universities, employers, and government rules and regulations (Demissie et al., 2021; Oluwajodu et al., 2015). Other authors have noted that the attitudes of employers have a significant impact on the rate of graduate employment (Bailly, 2008; Cai, 2012). As a result, the rise in graduate employability in Ethiopia could be attributed to the rapid development of higher education as well as a lack of curriculum aimed at improving students' entrepreneurial skills. To achieve that aim, trend analysis and forecasting the future of the country's higher education institutions and their match with the labour market are critical for the early identification of potential problems.

Graduates as consumable goods in the labor market: Theoretical framework

This study looks at the long-run efficiency of the country's higher education system, including trends and projections. Because the long-term aims of higher education are evaluative in nature, this study fits under Carol Weiss's Theory of Change, which was publicized in 1995 (Weiss, 1995; Msila & Setlhako, 2013). Weiss (1995) defines the theory of change as an approach established to aid in understanding and describing how change occurs and how interventions lead to desired results and goals. It also aids in comprehending and communicating how change occurs and how interventions result in desired outcomes and goals. It then maps backward to identify necessary preconditions (Demissie et al., 2021) and describes the process of change by detailing causal linkages in an initiative, that is, its shorter-term, intermediate-term, and long-term results.

Weiss (1995) also asserts that backwards mapping is used in the theory of change to produce a set of connected outcomes known as the pathway of change. This states, for example, that if inputs and activities yield outputs, this should result in outcomes that eventually contribute to the objective. In the larger context of the study, input refers to enrolment, activities refer to how HEIs run the undergraduate program, output refers to graduates, and result refers to graduates' employment. Because the current study asserts that the activity component of HEIs influences the outcome (the employability skills of graduates), this suggests that the institutions have more work to do on their internal systems, and the result must be a consumable element (Abas & Imam, 2016; Mainga et al., 2022; Borsi et al., 2022). This indicates that the skills of the HE graduates must be consumable goods in order for the government to fulfil its economic goals, with positive effects on GDP and employment rates, changes in nominal salaries, the consumer price index, capital stock, and other variables.

This theoretical paradigm emphasizes graduates' function as labour-market consumables and has substantial ramifications for HEIs, policymakers, and the economy. It emphasizes the critical importance of aligning higher education programs with changing labour market needs (Brown et al., 2003), since graduates' worth is determined by their relevance and application in the job market (Bridgstock, 2009). Thus, HEIs must constantly change curricula and teaching techniques to provide students with critical employability skills (Brown et al., 2003), necessitating a responsive strategy that incorporates employer feedback, industry insights, and market trends (Bridgstock, 2009). If this adjustment is not made, graduates will be ill-equipped for employment, potentially leading to underemployment or unemployment, with negative societal and economic implications (Purcell et al., 2007).

Moreover, perceiving graduates as consumable beings emphasizes the symbiotic relationship that exists between higher education, economic growth, and societal improvement. Policymakers and governments have an incentive to invest in education, recognizing graduates as economic contributors (Brennan & Shah, 2003). As a result, the framework advocates for increased funding for HEIs, research, infrastructure, and increased access to higher education. It emphasizes the importance of adequate procedures for measuring the effectiveness of educational spending, including graduate employability as well as larger economic indicators such as GDP growth, innovation, and competitiveness. Collaboration among education ministries, labour agencies, and relevant stakeholders is critical to ensuring that educational investments generate significant societal benefits (Brennan & Shah, 2003). In essence, the framework that views graduates as labour market consumables emphasizes the importance of constantly changing higher education to suit labour market demands, while simultaneously emphasizing the interdependence of education, economic advancement, and societal well-being.

Research methods

This research took a purely quantitative approach. The researchers used rigorous data gathering techniques to entertain this approach. First and foremost, it is crucial to identify the data sources for education- and employment-related data. In this regard, the researchers learned that the Ministry of Education (MOE) and the Central Statistics Agency (CSA) are the principal governmental bodies that can offer the data. Once the relevant agencies identified, the next step is to access pertinent statistical records for each year from these organizations. These records were used to extract the data on higher education, enrolment, and unemployment. The data were compiled, preprocessed, and cleaned after the extraction to get rid of any discrepancies, errors, or missing values. The data set was prepared for time series analysis when all these operations were finished by the researchers.

The researchers examined Ethiopian employment trends using unemployment statistics. Because of their known association with job availability in an economy, unemployment trends are commonly utilized to examine changes in employment levels over time (Rothstein, 2011; Raphael & Stoll, 2010). Unemployment rates are also seen to be a good predictor of general employment fate (Raphael & Stoll, 2010). International organizations such as the OECD and ILO consider the unemployment rate to be an important short-term measure of labor force absorption (OECD, 2016; ILO, 2022). While unemployment statistics may lack insights into job quality, they still effectively depict employment direction due to their strong inverse relationship with job indicators (Rothstein, 2011). These arguments support our contention that unemployment data consistently reflects employment prospects through a credible metric.

To ensure the validity and reliability of this trend and forecast study, two reliable data sources were used. The Central Statistical Agency (CSA) and the Ministry of Education (MOE) were employed to get reliable data for these kinds of research. In line with this, the US Department of Education highlights the significance of leveraging high-quality data sources to develop accurate and relevant education research and policy. Additionally, the National Academies of Sciences et al. (2019) highlight the need for education researchers to use high-quality data sources and measurements to ensure the reliability and validity of their studies. This study, therefore, acquired information from sources that are in charge of offering a set of professionally collected data for researchers to perform their investigations. By doing this, the study maintains the validity and reliability of its findings and generates meaningful and insightful analyses that inform both practice and policy. Therefore, using these reliable and valid data sources has ensured that the trend and prediction analysis is trustworthy and has a solid foundation on which to draw conclusions.

This research employed time series models in forecasting enrolment, graduation, and employment in Ethiopia. Time series model is used to describe the trends and explain how past experiences influence future patterns, and accordingly forecast. This paper used autoregressive integrated moving average (ARIMA) (0, 1, 0) model to describe the series and forecast student enrolment count from 2004 to 2018 using the government's data. Autoregressive Integrated Moving Average (ARIMA) model projects a time series univariate variable based on order of the moving average, order of differencing and order of autoregressive scheme (Kavasseri & Seetharaman, 2009; Williams & Hoel, 2003).

On the other hand, the Holt-Winter model is used on time series secondary data from 2004 to 2018 to forecast graduation in Ethiopia. The Holt Winter forecasting model is an appropriate method for long-term projections utilizing time series data (Kumar & Jain, 2009). The Holt-Winter forecasting model not only entertains the exponentially smoothed component but also the trend component while projecting a time series variable. Finally, a simple model was used to predict future unemployment rates in Ethiopia.

The enrollment rates of regular undergraduate students fluctuate from one academic year to the next, as seen in Table 1. In 2004, 98,404 regular undergraduate students enrolled in government universities, and in 2018, 388,186 students were admitted. Furthermore, as shown in the table above, the graduation rates of regular undergraduate students varied significantly over time. For example, 7,006 regular undergraduate students graduated in 2004, while 62,199 regular undergraduate students graduated in 2018.

Table 2 shows that from 1999 to 2018, Ethiopia's unemployment rate averaged 19.54%, with a high of 26.90% in 1999 and a low of 16.80% in 2015.

Table 1. Summary statistics of higher education in Ethiopia.

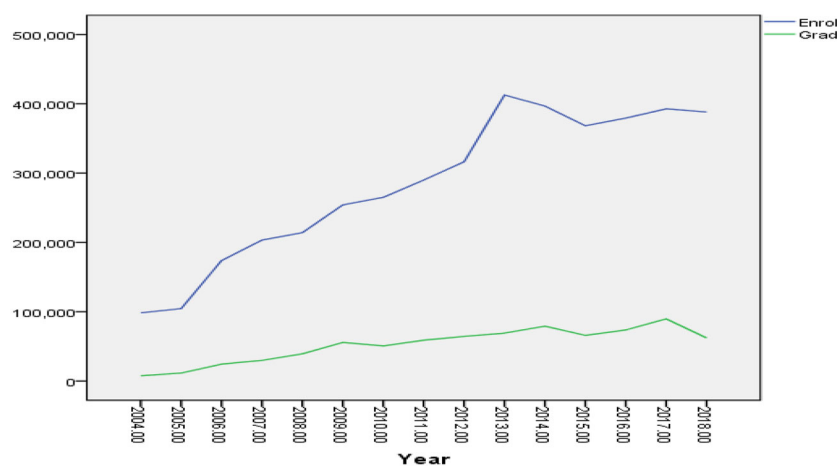
Year	Enrolment		Graduation	
	N ^o	Annual change in %	N ^o	Annual change in %
2004	98,404		7600	
2005	104501	6	11535	52
2006	173,901	66	24458	112
2007	203,399	17	29845	22
2008	214,199	5	39,304	32
2009	254192	19	55770	42
2010	265050	4	50672	-9
2011	290005	9	58953	16
2012	316,432	9	64,469	9
2013	412752	30	69137	7
2014	396,725	-4	79231	15
2015	368,314	-7	65,897	-17
2016	379,389	3	73,689	12
2017	392,788	4	89,754	22
2018	388,186	-1	62,199	-31

Source: (MOE 1997, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015a, 2015b, 2017, 2018).

Table 2. Summary statistics of Ethiopia unemployment rate (1999–2018).

Year	Unemployment (%)
1999	26.90
2000	26.40
2004	22.90
2005	20.60
2008	20.40
2010	18.90
2011	18.00
2012	17.50
2014	17.4
2015	16.8
2016	16.9
2018	19.1

Source: (CSA, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019).

**Figure 1.** Higher Education Enrolment and Graduation (2004–2018).

Results: Trend and forecast analyses

Secondary data were analyzed in this part to indicate the trend in Ethiopian higher education enrolment, graduation, and employment.

Trends: Enrolment and graduation

Figure 1 depicts the enrolment and graduation rates of undergraduate students in Ethiopian government universities over the last 15 years.

In Ethiopian government universities, both enrolment and graduation rates of regular undergraduate students have increased, as shown in Figure 1. Enrolment and graduation rates, on the other hand, were not proportional. Enrolment was soaring, and graduation rates were gradually increasing. Surprisingly, the enrolment rates in 2007, 2013, and 2016 differed significantly. These shifts could be attributed to the emergence of second, third, and fourth generation universities.

Forecasting: Enrolment and graduation

Figure 2 presents the forecast on higher education undergraduate enrolment graduation rates based on trends of the past 15 years.

The projection shows that the enrolment rate of undergraduate students will continue to climb over the next ten years, as illustrated in Figure 2 and Table 3. The reasons for the increased enrolment of undergraduate students could be linked to population growth and institutional intake capacity. Graduation rates for undergraduates, on the other hand, are predicted to decline within the same time span. Because of government and institutional responses to quality education, undergraduate graduation rates may be dropping (MOE 2015b). Table 3, which is a summary of estimates on undergraduate enrolment and graduation, also supports the above-mentioned result.

Employment trends

Figure 3 displayed undergraduate employment trends of the past 20 years.

In Ethiopian government universities, both enrolment and graduation rates of regular undergraduate students have been increasing, as shown in Figure 1. Enrolment and graduation rates, on the other hand, were not proportional. Enrolment was rapidly increasing, but graduation rates were increasing steadily. Surprisingly, there were considerable fluctuations in enrolment rates in 2007, 2013, and 2016.

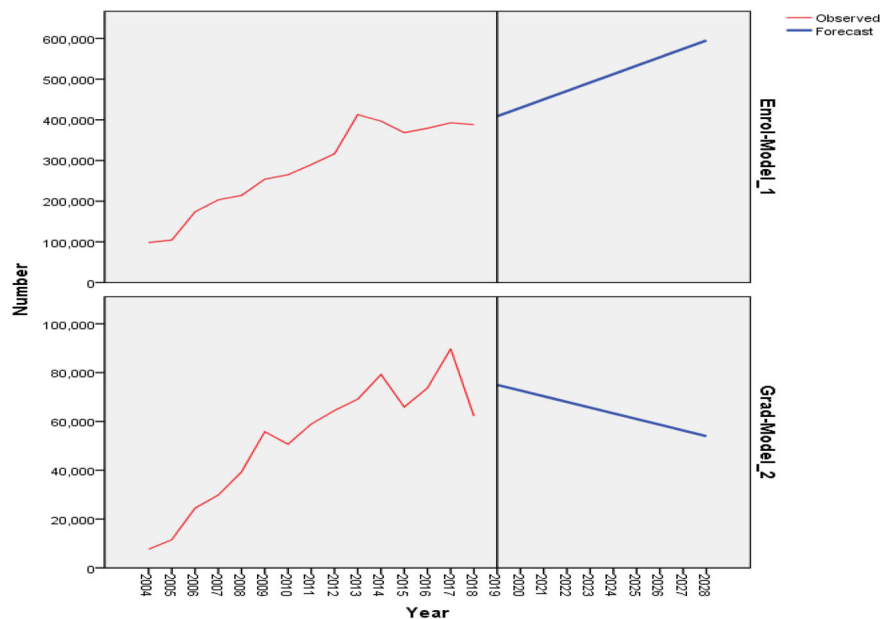


Figure 2. Forecasts on Higher Education Enrolment and Graduation (2019–2028).

Table 3. Summary of a forecast of Ethiopian Enrolment and Graduation (2019–2025).

Model		2019	2020	2021	2022	2023	2024	2025
Enrol-Model	Forecast	408884.71	429583.43	450282.14	470980.86	491679.57	512378.29	533077.00
	UCL	478620.50	528204.72	571068.07	610452.43	647613.53	683195.38	717580.55
	LCL	339148.93	330962.13	329496.22	331509.28	335745.61	341561.19	348573.45
Grad-Model	Forecast	74985.54	72651.20	70316.87	67982.53	65648.20	63313.86	60979.53
	UCL	95253.27	95655.40	98523.46	103608.89	110473.08	118765.74	128250.31
	LCL	54717.81	49647.01	42110.28	32356.18	20823.32	7861.99	−6291.25

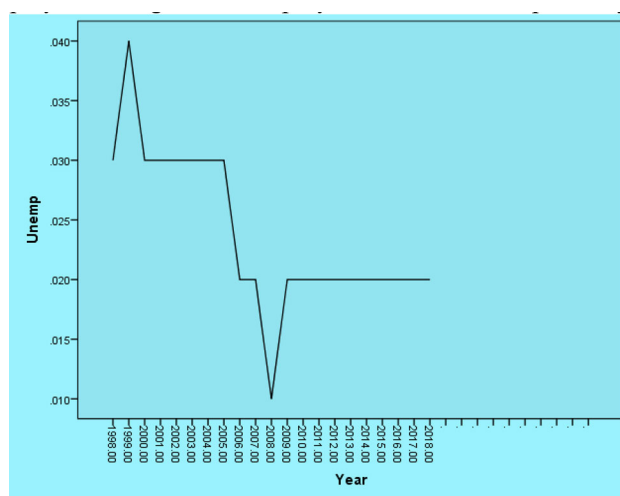


Figure 3. Unemployment trends (1999–2018).

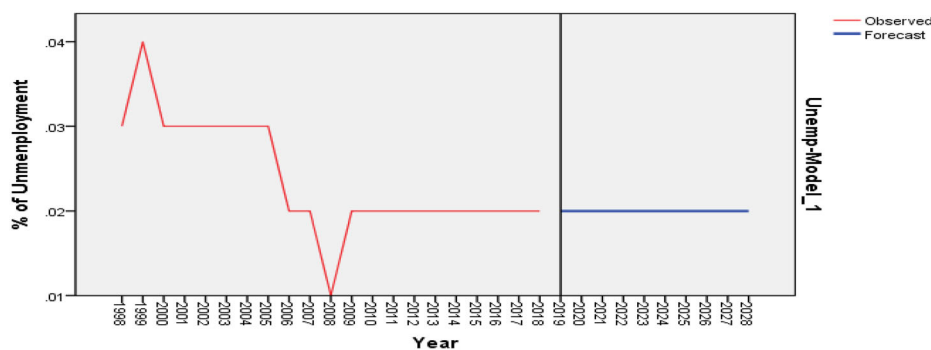


Figure 4. Time series of unemployment (1998–2028).

Table 4. Time series forecasting of unemployment in 10 years in Ethiopia.

Model	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Forecast	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02
UCL	.03	.03	.03	.03	.03	.04	.04	.04	.04	.04
LCL	.01	.01	.01	.01	.01	.00	.00	.00	.00	.00

One of the reasons for these shifts could be the emergence of second, third, and fourth generation institutions.

Forecasting employment

The time series forecasting of employment in Ethiopia is depicted in Figure 4.

Figure 4 shows a time series of graduate unemployment rates, which shows that the rates will remain stable for the next 10 years (2019–2028). Table 4 also backs up the findings in the previous figure (Figure 4 and Table 4). Consistent economic growth could be one of the causes of high rates. The current political instability and economic climate are thought to be influential factors in the rising rate of graduate unemployment in the coming decade.

Discussion of findings

This study sought to evaluate past trends and forecast future developments in Ethiopia's higher education industry graduates' employability. The main objective of the study, which focused on student

enrolment, graduation rates, and career prospects, was to establish a solid understanding of the sector's dynamics in accordance with the precepts of the Theory of Change.

The investigation discovered notable patterns after analysing these trends. Regular undergraduate enrolment and graduation rates at Ethiopian government universities have increased over time. However, growth rates were not uniform. While enrolment increased rapidly, graduation rates increased more gradually. Surprisingly, distinct changes in enrolment rates were discovered in select years, namely 2007, 2013, and 2016. These shifts could be linked to the creation of second-, third-, and fourth-generation educational institutions, which brought new dynamics to the higher education environment.

Anticipating future trends needs a comprehensive examination of economic conditions, educational system effectiveness, and labour market dynamics. Governments can then develop proactive steps to address changing requirements. Ethiopia's higher education evolution is inextricably linked to the country's socio-political and economic development. The growing population has significantly altered this trend, influencing enrolment rates directly. Varghese (2016) and Yizengaw (2004)'s findings, which stressed the need for university expansion and increased enrolment as a result of the population growth, validated this association. A further factor in the increase in enrolment in higher education is undoubtedly the growth of colleges around the country, particularly second- and third-generation universities (Borsi et al., 2022).

The Ethiopian higher education landscape has been substantially changed by broad reforms in a variety of sectors. These reforms included the implementation of cost-sharing in higher education, changes in funding mechanisms, decentralization of institutional authority, the formation of the Council of Universities, the establishment of regulatory bodies, and governmental transformations (Varghese, 2016). The findings show that while the graduation rate is predicted to go down, the enrollment rate is predicted to stay the same. It is clear that the government's decision to prioritize excellent education above equal access has been a major contributor to the drop in graduation rates (MOE, 2015b, Ministry of Education (MoE), 2018).

Graduate employability has showed a modest rising trajectory over the last two decades (1999–2018), fuelled by a variety of drivers. The probable impact of the Ethio-Eritrean War on the nation's graduate employment rate is one example. Graduate employment outcomes improved after 2005, most likely as a result of government efforts aimed at improving political stability following elections. The assertion is supported by a recent research by Demeke (2022), which recognises the role of political stability on the 2009 decline in the unemployment rate. Due to Ethiopia's accessible labour market and close proximity to Europe, remittances and private investments from countries including China, India, Turkey, Sweden, and the United Kingdom were drawn there in 2008 and 2009. This tendency has been substantiated by research showing that economic expansion, particularly in sectors like textiles and leather, has considerably impacted job outcomes (Zewdu, 2014).

The discrepancy between higher education system efficacy (enrolment and graduation) and graduates' career prospects is a significant problem in this study. This imbalance is expected to persist, owing in part to on-going political upheaval affecting employment rates. Uncertain political environments impede graduate employability and discourage investment due to excessive unemployment, inequality, and corruption, impacting economic growth and job creation (Lyons, 2009; Kassa, 2012; Azeng, 2015; Yimer, et al., 2022; Herut & Dube, 2022; Herut et al., 2022). As a result, developing internal processes and programs at Ethiopian colleges is critical for increasing graduation rates and removing hurdles. Furthermore, assessing curriculum, instructional methodologies, and support systems is critical for increasing efficacy. Also emphasized was the importance of consistent, labour market-aligned expansion, which calls for thorough workforce planning and integrated university development. The mismatch between employment rates and graduation rates underlines the compatibility of education with the job market. This study calls for the collaboration of academic institutions, businesses, and policymakers, as well as the modification of curricula and the closing of skill gaps. Additionally, it emphasized the importance of strong ties between university and industry, political stability, economic growth, strategic investments, impact analyses, and balanced policies (ILO, 2022; Herut et al., 2022). These actions are essential to strengthening Ethiopia's higher education system and the growth of the job market.

Limitations and recommendations

Future proactive activities should be founded on a thorough understanding of the relationship between higher education and employment trends, taking into account economic shifts, educational reforms, and labor market dynamics. Policymakers must balance quality education with equitable access, supporting individual growth and socioeconomic advancement, in order to preserve good graduate employment trends while addressing graduation rate problems. For effective higher education systems, the interplay between enrolment, graduation, and employment rates is critical. The report advises significant adjustments in the country's higher education institutions to boost graduate employability, necessitating close monitoring and control of this interplay. Higher education should be aligned with the labor market through the development of competence-based systems and proactive economic measures.

Methodologically, the study used ARIMA, Holt Winter, and simple models to describe enrollment, graduation, and employment patterns. While ARIMA may lack precision in specific ranges and fail to account for parameter estimation error, its competitive accuracy and continual evaluation encourage its adoption. For lengthier projections, the Holt-Winters approach should follow the seasonal cycle of the data. Future study should focus on natural computing-based models and particle swarming techniques to optimization. The study's findings about Ethiopian higher education are not universally applicable due to its dependence on secondary sources. More research is needed to overcome methodological shortcomings and expand beyond the scope of this study. Scholars who are interested in addressing these limitations and contributing to policy-level initiatives in higher education are urged to do so.

Conclusions

This study looked into the trends in higher education enrolment, graduation, and employment in Ethiopia, uncovering fascinating patterns and insights. The study emphasized Ethiopian government universities' extraordinary growth in regular undergraduate enrolment and graduation rates; however the rates of growth were not regularly aligned. The establishment of subsequent-generation educational institutions was related to notable swings in enrolment rates during specific years. This also implies that the interaction between population expansion, changing educational regulations, and the establishment of colleges around the country emerged as important variables influencing higher education enrolment.

The findings highlighted the critical importance of reforms in changing Ethiopia's higher education landscape, including cost-sharing schemes, financial systems, institutional authority, and political changes. Notably, the desire of quality education over equitable access appeared as a driver in the expected drop in graduation rates. On the employment front, an upward trend in graduate employability has been recorded over the last two decades, although its steadiness is predicted to be influenced by factors such as geopolitical events, post-election measures promoting political stability, and external investments. These findings highlight Ethiopia's dynamic higher education system, which is inextricably linked to economic situations, political dynamics, and educational policy. Finally, the study underscored the importance of promoting progress in Ethiopia's education system and labor market. Effective higher education planning, greater ties between academics and business, political stability, economic growth, strategic investments, impact evaluations, and well-balanced policies are among them.

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Data availability statement

The dataset of this article is available with the corresponding author and it will be presented whenever requested.

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