

Can Boarding Schools Increase the Quality of Education in Kenya?

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Abstract

Kenya's education system faces challenges rooted in inefficiencies, exacerbated by high poverty rates and the geographical constraints of barren lands. These circumstances disproportionately affect educational outcomes. Education, especially in developing countries, plays a pivotal role in driving economic growth. Ensuring the efficacy and efficiency of education systems is imperative to forge a pathway toward prosperity. Despite commendable efforts to expand education access, Kenya continues suffering from low academic achievement, limited functional literacy skills, high dropout rates, high repetition, and low educational attainment. The research highlights the multifaceted negative impact of poverty on education, encompassing health and nutrition issues, such as malnutrition and HIV, limited parental support, and cultural disparities leading to gender gaps. The findings indicate that implementing public boarding schools in these regions holds promise for improving educational outcomes and fostering accelerated economic growth. By addressing the prevailing challenges faced by students today, public boarding schools possess the potential to mitigate the adverse effects of poverty and empower them with opportunities for social mobility. Moreover, our cost-benefit analysis reveals that investing in public boarding schools will yield a positive return, further stimulating economic growth in Kenya.

Introduction

Education is a valuable tool for personal development as well as economic growth. Education is responsible for raising human capital and enhancing an individual's knowledge, skills, and abilities (Benos et al., 2014). These advanced skill sets contribute to a country's technological innovation and economic progress (Hanushek & Wößmann, 2010). That being said, effectively deploying resources to education is problematic because it requires careful attention to quantitative and qualitative factors. In the Republic of Kenya, for example, education spending as a percentage of GDP is significantly higher (19.6%, 2019) than in OECD countries (12.2%, 2019). However, Kenya's existing school system faces significant structural issues (Rehme, 2007). Kenya has achieved a commendable enrollment rate of 78%

(2009) in primary schools, reflecting its commitment to providing access to basic education for its population (World Bank, 2023). However, an alarming disparity emerges when we shift our focus to secondary school. With a mere 47% (2009) enrollment rate in secondary school, it becomes evident that a gap needs to be bridged. This stark contrast raises questions about the efficiency of the education system and highlights the need to address factors contributing to high dropout rates and low attainment. (World Bank). Therefore, evidence suggests that education policymakers in Kenya are likely not considering external factors still affecting their existing education system (Maiyo, 2015). This paper aims to better explain the disconnect between education outcomes and education spending in Kenya through the lens of non-school factors. Moreover, this paper hopes to mitigate the effects of non-school factors by proposing the adoption of Kenyan public boarding schools in semi-arid and arid areas.

Literature Review

Education is a human right and a crucial tool for enhancing stability, gender equality, and poverty reduction (WorldBank, 2022). It improves employment, income, and health (WorldBank,2022). Globally, each additional year of schooling results in a 6.5% increase in hourly wage (Fuente & Ciccone, 2003). The importance of education in economic growth has led policymakers to ensure that every child is in school. A report by the World Bank Independent Evaluation Group (2006) prioritized enhancing primary school enrollment rates within developing countries throughout the '90s and early 2000s (Hanushek & Wößmann, 2010).

The efforts to increase enrollment rates and ensure children attend school have been successful (Akmal & Pritchett, 2021). However, there needs to be more emphasis on ensuring that children acquire the necessary skills and knowledge during their time in school, as evidenced by students' proficiency in numeracy and literacy (Gruijters & Behrman, 2020). International assessments, such as PISA¹, developed by the OECD, reveal that less than 10% of students in developing countries achieve minimum literacy and numeracy levels (Hanushek & Wößmann, 2010). In their study, Hanushek and Wößmann (2007) examine the causal relationship between the quality of education, as measured by PISA International test

¹ Programme for International Student Assessment (PISA) is an international study. It aims to evaluate education systems worldwide by testing the skills and knowledge of 15-year-old students in participating countries/economies (OECD, 2023)

scores, and economic growth, as indicated by the average annual growth rate in GDP per capita. After accounting for the initial level of GDP per capita and years of schooling, they find that an increase in test scores by one standard deviation is associated with an average annual GDP per capita growth rate higher by two percentage points. Suggesting that education quality has a positive impact on economic growth.

Kenya has made considerable efforts to enhance its education sector, including the introduction of Free Primary Education in 2003. This policy initiative has yielded positive results, as primary school enrollment has grown substantially over the past decade, rising from 64% to 78% (World Bank, 2022). Despite this increase, Kenya's education system is deemed ineffective (Oketch, 2017). A nationwide survey comprising over 100,000 students aged between 3 and 16 in over 2,000 schools found that only 33% of the children in a class can read a paragraph at their level. Furthermore, a third cannot read a word, and 25% of grade 5 students cannot read a grade 2-level paragraph (Ngugi et al., 2015).

Several variables have been identified as contributors to students' academic underachievement. These factors encompass both school-based factors and non-school factors. Within the school environment, variables such as classroom size, teacher's education level, and the availability of textbooks have been associated with students' achievement outcomes. However, it is essential to recognize that various non-school factors influence educational outcomes. These factors include students' family background, household responsibilities, gender gaps, and additional indirect costs associated with schooling, such as transportation expenses (Ngugi et al., 2015).

Some countries have implemented boarding schools, specifically for underprivileged students, aiming to provide them with a safe learning environment and improve their education quality, as reflected in numeracy and literacy test scores (Curto & Fryer, 2011). Notably, the SEED Foundation has pioneered the establishment of the first and only public charter boarding schools for economically disadvantaged students in the United States. In their study, Curto and Fryer (2014) revealed a positive impact on students' academic performance and future earnings in SEED schools. The findings showed an annual increase of 0.211 standard deviations in reading achievement and a 0.229 standard deviation in mathematics achievement.

In our research, we further examine the underlying factors and variables that hinder the quality of primary education in Kenya. Simultaneously, we will investigate the potential benefits and cost-effectiveness of public charter boarding school initiatives. By examining these aspects, we seek to determine the viability of public boarding school initiatives as policy recommendations for the Kenyan government in enhancing educational outcomes.

Research and Methodology

This study aims to conduct a comprehensive meta-analysis of existing literature research to investigate potential solutions for improving the educational quality in primary schools in Kenya. The research will involve analyzing data, regressions, and findings from various studies to assess the effectiveness of different approaches in improving the quality of education. Specifically, the study will focus on evaluating the impact of two groups of measurements: school-based factors and non-school factors, on economic growth. Furthermore, the research will assess the effectiveness of boarding school programs, focusing on the SEED² program in the United States, through a comprehensive cost-benefit analysis of public boarding school implementation. This research aims to provide comprehensive recommendations for policymakers in Kenya that could inform insights into the potential viability of boarding schools to address out-of-school factors to enhance overall educational equality.

Discussion

Education and Economic Growth

Education fundamentally influences economic development and labor productivity (Mankiw et al., 1992). Moreover, higher education gives individuals the tools to adapt during volatile economic periods and rapidly changing times (Kucharčíková, 2014). Across the board, each additional year of schooling is associated with a 6.5% increase in annual wages (Fuente & Ciccone, 2002) and other indirect benefits such as increased social mobility social

² The SEED schools are the only urban public boarding schools for the poor in the United States. They combine a “No Excuses” charter model with a 5-day-a-week boarding program (Curto & Fryer, 2011).

mobility³ (Haveman & Smeeding, 2006). This influx of well-paid and educated workers should drive consumption and stimulate the economy. For example, empirical investigations from Barro (1997) and Mankiw et al. (1992) estimate the impact of education on economic growth with cross-country growth regressions. These regressions examine the relationship between a country's average annual growth in gross domestic product (GDP) per capita over time as a function of schooling, measured by enrollment rate. Their findings reveal a significant (0.67, $p < 0.1$) and positive relationship between quantitative measures of schooling and economic growth.

Effective primary education, in particular, is an essential foundation for development. Psacharopoulos (1994) presents compelling evidence that primary schooling yields higher returns than secondary and tertiary education. Underscoring the crucial role of primary education in driving economic growth and fostering individual prosperity. Moreover, studies indicate that primary education offers an average rate of return estimated at 11%, surpassing the 7% rate of return associated with secondary education (Montenegro & Patrinos, 2021). These findings highlight the economic benefits of investments in primary education and emphasize its potential for creating positive outcomes for individuals and societies.

Issues Faced in Kenya

Kenya has demonstrated considerable commitment to promoting equitable education and realizing the Universal Primary Education (UPE)⁴ goal. In 2003, the country implemented free primary education⁵ (FPE) to alleviate the financial burden of school fees, particularly for those living in poverty. The primary objective of this policy was to enhance access to education and remove barriers that hindered educational opportunities. Furthermore, the government has allocated a substantial budget to support the education sector (Ngugi et al., 2015). In 2004, Kenya dedicated 6.8% of its GDP to education, surpassing the regional average of 3.1% in sub-Saharan Africa (World Bank, 2022). The substantial investments in education and the introduction of FPE in Kenya led to a notable quantitative expansion in enrollment rates, which increased from 5.9 million in 2003 to 8.6 million in 2009 (Owuor et

³Refers to change in a person's socio-economic situation, either in relation to their parents or throughout their lifetime (OECD, 2023)

⁴ Universal Primary Education (UPE): refers to the enrolment of all school-age children in primary school, i.e. 100% net enrolment. (*Universal Primary Education (UPE)* | *Unesco IIEP Learning Portal*, n.d.)

⁵ “FPE is the provision of primary education to all children of school going age (6-15 years) and adults (above 16 years) who never had the opportunity (ROK 2003b)” (Ogola, 2010, page 2).

al., 2018). However, despite these commendable strides, educational outcomes, including cognitive skills dropout and repetition rates, continue to pose challenges in Kenya (Maiyo, 2015). Uwezo's sixth learning assessment report for Kenya⁶ (2016) revealed concerning statistics, showing that only 47.1% of third-grade students demonstrated proficiency in grade 2 mathematics, 39.9% showed competence in grade 2 English, and only 46.1% were able to perform grade 2 tasks in Kiswahili.

On average, 1 out of 10 Kenyan primary school children completed Class 8 without acquiring the expected competencies of a child in Class 2. A consequence of the low achievement in Kenya's education system is the high rate of grade repetition among students. On average, the repetition rate in primary school stands at 15.4% (Maiyo, 2015). This repetition hampers the individual student's progress and reflects a system struggling to provide adequate education that meets students' needs. However, the impact of low achievement and repetition goes beyond academic setbacks. It has a profound effect on student's motivation and engagement with education. When students continually experience challenges and are unable to meet expected competencies, they may lose hope and give up on their educational journey. 2011 out of the 137 million children who started first grade, an estimated 34 million were likely to leave school before reaching the final grade, resulting in an early school dropout rate of 25% (Njueh & Minja, 2020).

The cycle of low achievement, repetition, and dropout negatively affects students and the country's development. Therefore, it is crucial to identify and address the barriers and inefficiencies that hinder educational outcomes in Kenya. In light of these realities, it becomes imperative to identify and address the barriers and inefficiencies that hinder educational outcomes in Kenya. The persistence of inefficiencies in their education system necessitates further understanding of the underlying causes and reasonings behind the low educational outcomes

⁶ Uwezo is a household-based initiative that aims to improve competencies in literacy and numeracy among children aged 6/76 years old in Kenya, Tanzania and Uganda. The Uwezo Annual Learning Assessment surveys began in Kenya in 2009, helping to summarize what pupils know, and do against the relevant year level achievement standard for different learning areas/subjects, in order to report on achievement and progress. (UNESCO, 2016),

Quantity and Quality in Developing Countries

The intricate relationship between quantitative measures and economic growth has positioned policymakers to rely heavily on these metrics when formulating legislation. In policy deliberation, quantitative metrics, such as years of school attainment or enrollment rates, have become customary and expedient. The widespread availability and straightforward measurement of these indicators make them indispensable tools for policymakers seeking to gauge the effectiveness of educational interventions and their potential impact on economic development (Hanushek & Wößmann, 2010).

Hanushek and Wößmann (2007) argue that relying solely on quantitative measures is insufficient to understand educational outcomes fully. They emphasize the importance of considering additional factors, such as family background, peer influence, and community dynamics, which also play a role in educational attainment. To support their argument, the authors conducted a study investigating the relationship between years of schooling (using the average years of schooling of a population between 15-60) and economic growth (using real GDP per capita between 1960-2000). Their findings indicate that years of school are statistically significantly (0.369, $t=3.23$) linked to a higher growth rate. However, years of schooling were sensitive to specific modeling⁷ approaches employed in their study, suggesting the need for a more comprehensive analysis.

Interestingly, when introducing educational quality, measured by PISA international math and science test score averages, into the model, a previously observed significant association between schooling years and economic growth became statistically insignificant (0.026, $t=0.34$) (Hanushek & Wößmann, 2010). Furthermore, the study revealed a robust, positive, and statistically significant impact of quality (1.980, $t=9.12$) on economic growth. This finding implies that knowledge acquisition, as reflected by cognitive skills, plays a vital role in driving economic growth, surpassing the influence of years of schooling alone. An increase of one standard deviation at the country level in test performance corresponds to approximately a one percentage point increase in annual growth. Furthermore, the inclusion of the quality variable in the model increased the adjusted R^2 from 0.25 to 0.75, indicating that the level of knowledge acquired primarily determines educational outcomes.

⁷ Modeling approaches - Hanushek, E.A., & Wößmann, L. (2007). The Role of Education Quality in Economic Growth. World Bank Policy Research Working Paper(4122) - page 24

Broadening the Spectrum Exploring the Factors Affecting Educational Quality- School-Based Factors

Through the research, two distinct categories were found to impact the overall quality of education: school-based factors and non-school factors. School-based factors involve using educational institutions' physical, human, and financial resources to enhance academic performance (Nambuya, 2013). These factors include aspects such as the pupil-teacher ratio, availability of teaching materials, and teachers' remuneration (Lee & Barrow, 2000). On the other hand, non-school factors refer to external influences that extend beyond the school environment's control but influence students' educational achievements (Nambuya, 2013). Examples of non-school factors include socioeconomic status, gender dynamics, and literacy rates among parents. A deeper understanding of the complex factors contributing to the overall quality of education can be obtained by conducting a thorough analysis of these two categories.

While certain school-based factors, such as the educational level of teachers (2.7568, $t=5.27$), are significant in student achievement (Harris & Sass, 2011). A study by Michaelowa (2021) highlights the prominent role of non-school⁸ factors⁹ in primary school achievement¹⁰. The findings reveal that non-school factors account for 81% of the variance within the tested model. Furthermore, supporting studies indicate that most school-based factors have a negligible effect on education quality (Hanushek et al., 2005; Lee & Barrow, 2000; Asbury & Woodson, 2012). For instance, reducing class sizes and allocating additional resources have shown limited empirical evidence supporting their effectiveness in improving education quality (Hanushek et al., 2005).

In line with these findings, the research will explore the influential external factors that extend beyond the school's control but impact education quality. More specifically, the study will focus on identifying and examining the factors most prevalent in Kenya.

⁸ Students' individual characteristics and socioeconomic characteristics of their families (Michaelowa, 2001)

⁹ School, classroom and teacher characteristics (Michaelowa, 2001)

¹⁰ Measured by the number of correct answers on the PASEC tests in French and mathematics at the end of the fifth grade (Michaelowa, 2001)

factors Affecting Educational Quality- Non School Factors

Poverty

Poverty¹¹ casts a pervasive shadow over the educational landscape in Kenya, profoundly influencing students' academic achievement and hindering their chances of success. Marinara and Mwabu (2007) revealed a significant negative impact of high poverty rates (-0.1997 , $p < 0.01$) on educational achievement¹². For impoverished parents, providing the necessities such as clothing, transportation, daily meals, suitable study spaces, and educational materials becomes an uphill battle (Mutwota, 2013). Approximately 36.1% of Kenyans lived below the international poverty line in 2016 (World Bank, 2020). Regions characterized by higher poverty rates, such as North Eastern Kenya, with a poverty headcount of 73.9%, exhibit the lowest education outcomes, scoring 6.64% lower than the national average on KCPE exams¹³ (Julius & Bawane, 2011).

Moreover, these poverty-stricken areas also display the lowest literacy rates, with only 18.7% of adults able to read a basic sentence (Julius & Bawane, 2011). The impact of poverty on educational outcomes is further underscored by the fact that children from impoverished and illiterate households receive less support at home, spending less time with their parents reviewing school work and engaging in cognitively enriching activities such as reading. Research conducted by Michaelowa (2001) provides supporting evidence for the significant positive impact of two factors on academic performance: parental literacy skills and access to books at home. The study demonstrates that children whose parents possess literacy skill¹⁴ and have access to books at home achieve higher scores on the PASEC¹⁵ test ($p < 0.05$). Studies show Literate parents are more likely to enroll their daughters in school, while regions with higher proportions of illiterate adults tend to experience wider gender gaps in education (Anderson, 1988).

¹¹ "People living below a poverty line don't have enough to meet their basic needs. Countries typically define national poverty lines, and we use the lines of a group of the poorest countries to define the international extreme poverty line of \$1.90 per day" (WorldBank, 2017)

¹² "Academic achievement represents performance outcomes that indicate the extent to which a person has accomplished specific goals that were the focus of activities in instructional environments".(Oxford, 2023)

¹³ The Kenya Certificate of Primary Education examination (KCPE) is designed as a primary school leaving examination. It is an entry examination that enables candidates to progress to Secondary education or training in tertiary institutions (KNEC, n.d.).

¹⁴ Dummy variable, 2=if both parents are literate, 1=one parent is literate, 0=both or illiterate (Michaelowa, 2001)

¹⁵ "The Program for the Analysis of Educational Systems of CONFEMEN (PASEC) exists since 1991, it implements evaluations aimed at reporting on the performance of the education systems of the member countries of CONFEMEN, in sub-Saharan Africa in the Middle East, Lebanon and since 2011 in Southeast Asia".

Malnourishment

Children living in poverty are more susceptible to malnourishment, detrimental to their educational outcomes (Chimombo, 2005). A report by the World Food Programme¹⁶ highlights that approximately one-third of children in arid and semi-arid areas in Kenya suffer from growth stunting caused by malnutrition and vitamin/mineral deficiencies. These deficiencies impair children's cognitive development, resulting in difficulties concentrating, learning, and retaining information, ultimately impacting their academic performance and overall performance and achievement (Gomez-Neto., et al., 1997). Additionally, Michaelowa (2001) found that regular meals increase test scores¹⁷ by 0.009 ($p < 0.05$), emphasizing the importance of nutrition on academic performance.

Child Labour

Parents living in poverty face the opportunity cost of prioritizing immediate household income and their child's future income when deciding whether to send their children to school, even when there may be free education and accessible schools (Lloyd & Blanc, 1996). Unfortunately, child labor is prevalent in regions with high poverty levels, with 8.5% of children in Kenya, equivalent to 1.3 million, engaging in such labor (Chibebe & Zaman, 2021 Kenya National Bureau of Statistics (KNBS)). These children are involved in various labor-intensive activities such as working on family farms, harvesting crops, and fishing (Chimombo, 2005). Moreover, the severity of child labor in Kenya is alarming, involving hazardous work in the agricultural sector, child mining, and commercial sexual exploitation, often linked to human trafficking (Bureau of International Labor Affairs, 2021).

¹⁶ “The World Food Programme (WFP) is the leading humanitarian organization saving lives and changing lives, delivering food assistance in emergencies and working with communities to improve nutrition and build resilience.” (*Mission | World Food Programme*, n.d.)

¹⁷ Refers to the PASEC tests for fifth graders in Sub Saharan Africa

Arid and Semi-arid

Arid and semi-arid ¹⁸ conditions characterize the most impoverished regions of Kenya. These areas, covering more than 80% of the country's land, are challenged by frequent droughts that result in crop failure, livestock death, food insecurity, and water scarcity, perpetuating the cycle of poverty (Wanjuhi, 2014). Additionally, approximately 80% of the population comprises nomadic pastoralists who rely heavily on livestock for their livelihood. This nomadic lifestyle often entails long and unsafe journeys in search of pasture and water, hindering children's access to formal education within a structured school setting and safe learning environment (Okinawa, 2015). Arid and semi-arid regions are characterized by poor infrastructure, having inadequate roads (Okilwa, 2015). Students from these areas often cannot afford transportation and must walk extensive distances to reach school (Kitavi & Westhuizen, 1997). As a result, these students often arrive at school exhausted and lacking motivation to learn (Kitavi & Westhuizen, 1997). The long commute contributes to issues such as lateness, absenteeism, and eventual dropout (Jagaro, 2010). Interestingly, the impact of distance to school is more pronounced among girls. A study by Jagaro (2010) revealed a shorter distance of one kilometer to school led to a significant improvement in performance for girls (0.643, $p < 0.05$), whereas this effect was not observed among boys. Additionally, Jagaro's (2010) study found a one percent reduction in lateness corresponded to a 0.463% improvement in performance ($p < 0.05$).

Gender Gap

Gender gaps are prevalent within arid and semi-arid regions and can be attributed to the socioeconomic status (SES) and cultural attitudes in these areas. Recent studies demonstrate a disparity in primary school completion rates, with girls at 68%, compared to boys at 82% (Hockett, 2021). Additionally, girls' performance in the national KCPE exam (2008) was 3.6% lower than that of boys (Ruto et al., 2009).

Within many cultures, parents facing financial constraints, coupled with the belief that education holds little value for daughters, expected them to assume traditional gender roles upon marriage. Consequently, parents opt not to send their girls to school because they

¹⁸ Arid regions by definition receive little precipitation—less than 10 inches of rain per year. Semi-arid regions receive 10 to 20 inches of rain per year.

perceive that any advantages resulting from education would primarily benefit the son-in-law's family rather than their own, contributing to this disadvantageous situation (Lockheed Jamison et al., 1980). Practices such as early marriage and female genital mutilation (FGM) further hinder girls' educational opportunities, leading to early pregnancies and school discontinuation (Okwila, 2015; Mensch & Lloyd, 1998). Additionally, the lack of access to basic sanitary supplies during menstruation often leads to frequent school absences for adolescent girls from poor households (Hockett, 2021). Furthermore, gender norms exacerbate the disadvantages faced by girls. Societal expectations of girls to manage household tasks, such as caring for younger siblings, meal preparation, cleaning, laundry, and fetching water, further impede their academic progress. Research by Mariara and Mwabu (2007) supports this notion, revealing that the distance to a water source significantly impacts girls' academic performance (-0.01666 , $p < 0.05$), while the effect is not statistically significant for boys (-0.0069 , $p < 0.88$). These gendered responsibilities highlight the unequal distribution of household chores, leaving girls with limited time to review school work when they return home.

HIV/AIDS Pandemic

HIV/AIDS poses a barrier to educational achievements and contributes to high dropout rates among students (Morara & Chemwei, 2013). In 2017, Kenya was ranked third among Eastern-African countries regarding the estimated number of new HIV infections among adults aged 15 and older (Waruru, 2021). This situation affects children whose parents are infected with HIV, as they confront the challenging realities of irregular school attendance and eventually drop out to assume caregiving responsibilities for their parents (Morara & Chemwei, 2013). Furthermore, losing parents to HIV/AIDS places these children into orphanhood, compounding their disadvantages as they navigate life without parental support and guidance. Mishra et al. (2007) revealed a substantial decrease in school attendance among orphans and children with HIV-positive parents. These children were found to be 53% ($p=0.03$) and 37% ($p=0.039$) less likely to attend school, respectively, compared to children with HIV-negative parents.

The analysis of non-school factors reveals various elements that impact students' academic achievement and overall well-being. One such factor is poverty in certain regions, which coincides with lower academic achievement. This connection indicates that poverty

hampers educational success. In addition to poverty, other factors such as geographical location, gender gaps, and the resulting challenges further contribute to obstacles faced by students. These challenges include inadequate housing facilities, limited access to a nutritious diet, and the burden of family responsibilities (Okilwa, 2015; Chimombo, 2005). The cumulative influence of these factors highlights the importance of implementing intervention strategies to mitigate their impact and promote equal opportunities for all children to thrive academically and holistically. In light of these insights, a proposed intervention strategy involved establishing boarding schools for primary-aged children. Boarding schools offer a unique opportunity to address and counteract the adverse effects of these factors by providing students with a supportive and structured educational environment (Curto & Fryer, 2014).

Background - Boarding Schools

The impact of the aforementioned non-school factors and the unique circumstances faced by students in Kenya have profound adverse effects on their educational outcomes Oloo (2003); Mackenzie (1997); Mensch and Lloyd (1997); Kitavi and Westhuizen (1997). In light of these challenges, it becomes evident that investments in education reform alone may yield limited results unless the fundamental needs of children are effectively addressed, including providing them with a sense of security, stability, and positive role models (Duncan & Magnuson, 2005). A comprehensive approach that combines academic support with measures to improve students' well-being and create a conducive learning environment is necessary for fostering educational success and empowering students to overcome the obstacles they face. In the case of the benefits of boarding schools for students in arid and semi-arid areas of Kenya, we present a policy recommendation in favor of their efficacy and the positive impact they might have on the lives of these young individuals.

A boarding school is an educational institution that offers a unique model by providing academic instruction and a residential living environment for students. Students who attend boarding schools reside on campus, typically away from their homes, and live in dormitories or designated boarding houses under the supervision of housemasters or resident advisors (Boarding school- *Cambridge Dictionary*, n.d.).

In addition to academic classes, boarding schools often offer a wide range of extracurricular activities, including sports, arts, culture, and music programs. These activities are designed to foster personal growth, character development, and social interaction among students (*Benefits of Boarding Schools Boarding-Schools-Benefits Benefits of Boarding Schools: What Experts Say*, n.d.). Boarding schools prioritize creating a structured and supportive student environment (Curto & Fryer, 2014). They often have specific rules and regulations regarding behavior, study hours, and campus life to ensure discipline, focus, and a sense of community. They also provide essential amenities such as meals, laundry facilities, and common areas for socializing and relaxation. The faculty and staff at boarding schools play a crucial role in students' lives, serving not only as educators but also as mentors and support systems. They provide guidance and academic assistance (Curto & Fryer, 2014).

Overall, boarding schools offer a comprehensive educational experience that extends beyond academics. By combining residence and education, these institutions aim to provide a structured, nurturing, and well-rounded environment that promotes personal growth, academic achievement, and the development of lifelong skills.

Schools for Educational Evolution and Development (SEED) have emerged as a compelling case study for understanding the transformative power of public boarding schools in the context of education for economically disadvantaged students. By examining the implementation and outcomes of SEED schools, we gain valuable insights into the effectiveness of their unique educational approach. These schools, designed to address the multifaceted needs of underprivileged students, prioritize academic excellence, personal growth, and holistic development. By studying SEED schools, we aim to uncover the impact and potential of boarding school education in empowering underprivileged students to reach their full potential.

School for Educational Evolution and Development (SEED)

The establishment of Schools for Educational Evolution and Development (SEED) as the first public charter boarding school in Washington, D.C., in 1988 marked a pivotal milestone in pursuing educational excellence for disadvantaged students. The student population is exclusively made up of students from diverse racial and ethnic backgrounds, with 98% African-American and 2% Hispanic (Bass, 2014). The founders, Rajiv Vinnakota and Erica Adler, recognized the numerous challenges hindering academic instruction, including unstable home environments, health issues, and truancy. Adler emphasized the importance of meeting students' basic needs, such as nutritious meals, a good night's sleep, personal hygiene, clean clothes, a hot shower, and the ability to do homework, to foster academic success (Bass, 2014). SEED schools cater to students from grades 6 through 12, employing a "no excuse" school model that cultivates a culture of achievement while maintaining a paternalistic approach. The SEED schools nurture the development of essential life skills and prioritize students' overall well-being through a diverse array of programs that promote academic excellence, and enhance mental and physical wellness, social engagement, and enrichment opportunities. This environment fosters a collective dedication and commitment among students, staff, and parents to prioritize and actively pursue comprehensive personal and academic success.

The inaugural graduating class of SEED in 2004 achieved a remarkable milestone, while every student successfully gained admission to renowned universities such as Columbia, Cornell, Georgetown, Princeton, Stanford, and various other prestigious universities (Bacon, 2004). This accomplishment underscores the belief that, given the necessary tools, any student can pursue higher education (Wingert, 2004). Moreover, SEED graduates demonstrate higher college graduation rates, three times more likely to complete their college education than their non-SEED peers (Curto & Fryer, 2014). These findings

emphasize the long-term success students from SEED schools achieve, both in their pursuit of higher education and in various aspects of their lives. Academically, students who enroll in SEED demonstrate an increased annual achievement of 0.211 standard deviation in reading and 0.229 standard deviation in Mathematics (Curto & Fryer, 2014). Beyond academic achievements, attending SEED schools for one year is associated with a 3.8% boost in annual earnings Chetty, Friedman, and Rockoff (2012). Additionally, research by Auld and Sudhu (2005), Elias (2005), and Kaestner (2009) suggests a decrease of 4.4% - 6.6% in the likelihood of experiencing health disabilities.

Benefits of boarding school

First and foremost, a crucial aspect of boarding schools lies in the provision of basic necessities that many underprivileged students lack in their daily lives. Clean clothes, hot showers with running water, and a comfortable bed are not just simple luxuries but essential for their well-being (Brown, 2009). By ensuring access to these fundamental amenities, boarding schools create an environment that fosters dignity, self-respect, and a profound sense of belonging. Students are no longer burdened by the worry of inadequate living conditions, but instead, they can focus their energy and attention on their studies and personal growth (Jagero, 2010). Additionally, Boarding schools offer a meticulously designed schedule that instills discipline and keeps students engaged in productive learning activities. By adhering to a set wake-up time and organized meal times, these schools ensure that students receive regular and nutritious meals- a critical factor in addressing the issue of malnutrition and hunger that often plagues students attending day schools (Curto & Fryer, 2014). This commitment to well-balanced meals improves overall health and enhances their cognitive abilities, enabling them to maximize their learning potential (Mutwota, 2013).

In addition to meeting the basic needs and providing a structured routine, boarding schools eliminate the strenuous and often dangerous journeys underprivileged students face in arid and semi-arid areas to reach their day school. By residing within the school premises, students are freed from the time-consuming and energy-draining commutes, allowing them to invest their resources in academic pursuits and extracurricular activities that foster their overall development (Slaughter & Epps, 1987). Additionally, the boarding school

environment offers a safe and secure haven, shielding students from the negative influences of their neighborhood and providing them with a supportive community (Curto & Fryer, 2014).

One of the advantages of boarding schools is the presence of dedicated and qualified teachers who prioritize their students' academic progress and well-being. With smaller classes, these educators can provide individualized attention and personalized support, identifying and addressing the specific needs of each student. Boarding schools also offer valuable mentorship opportunities through increased faculty engagement, fostering social capital, and building strong student-teacher relationships (Curto & Fryer, 2014). Research by Gichana (2021) indicates that more than 50 percent of learners in boarding schools receive improved supervisory support and access to well-equipped study rooms and benefit from substantially increased study time during weekdays and weekends. Furthermore, studies conducted by Zachariah and Joshua (2016) demonstrate that boarding schools outperform day schools regarding study time allocation and academic performance.

In addition to the presence of dedicated teachers and ample study resources, boarding schools also incorporate mandatory quiet time dedicated to studying and completing assignments. This aspect creates a conducive learning environment for students (Bass, 2014). By establishing designated periods of focused study, boarding schools promote discipline, concentration, and academic productivity among students (Bass, 2014).

Moreover, boarding schools offer a unique avenue for students to gain access to social, cultural, and educational capital that may be otherwise unavailable to them before (Bass, 2014). Being part of a boarding community exposes students to diverse social interactions, cultural activities, and educational opportunities that broaden their horizons and expand their knowledge beyond what they would typically encounter in their immediate surroundings. This exposure to different perspectives, experiences, and resources helps enrich their educational experience and enhance their social and cultural capital, equipping them with valuable skills and tools for their future endeavors (Bass, 2014). Boarding schools offer a variety of extracurricular activities and resources that foster the development of well-rounded individuals. These structured activities, ranging from sports to arts and music, allow students to explore their talents and interests. By engaging in these activities, students develop their

creative and physical abilities and learn valuable life skills such as teamwork, leadership and management.

Boarding schools play a pivotal role in transforming the lives of underprivileged students. By addressing the fundamental needs of students, providing a supportive and nurturing environment, and offering opportunities for academic and personal growth, these institutions can serve as a beacon of hope. They can break the poverty cycle within those areas and open doors to a brighter future.

Boarding schools enhance educational outcomes and empower students through the provision of addressing their basic needs, such as nutritious meals, providing a structured routine, eliminating long commutes, offering dedicated teachers, and providing access to enriching extracurricular activities. These institutions create an environment where students can thrive academically and socially. The transformative power of boarding schools provides underprivileged students with equal opportunities for success, empowering them to break free from the cycle of poverty and achieve their full potential.

In this context, providing students with stable environments is an imperative factor contributing to enhanced academic achievement within boarding schools.

Things to consider

While boarding schools can provide many advantages, it is essential to consider potential drawbacks and challenges associated with this educational model. The separation from parents at a young age can result in emotional distress and homesickness, affecting students' overall well-being (Bass, 2014). A study on Scottish boarding school students revealed that approximately 70% of them reported experiencing homesickness during their first year (Fisher et al., 1986). This may impact their ability to concentrate and cope with academic tasks, ultimately damaging their academic performance (Fisher et al., 1985). Moreover, the effects of missing out on raising their children are considered irreversible (Gichana, 2021). It is argued that boarding school experiences cannot replicate the nurturing care and proper upbringing provided by parents, potentially leading to emotional detachment, defensive behavior, and the development of "Boarding school syndrome" (Partridge, 2011, p. 2). Critics argue that boarding schools may contribute to a sense of detachment from the

students' families and communities, potentially leading to a loss of cultural identity (Gichana, 2021). Furthermore, critics note that boarding schools can place unnecessary pressure on even the best students, making them less ideal for academically weaker students (Partridge, 2011).

Cost Benefit Analysis

An assessment will be conducted to determine the economic profitability of implementing the proposed policy in Kenya. A thorough cost-benefit analysis is necessary to assess the project's net present value. Since there is a need for more existing literature on public boarding in Kenya, the study conducted by Curto and Fryer (2011) will serve as a reference for estimating the costs and benefits associated with future earnings resulting from the implementation of this proposal.

The estimated annual cost per pupil in the SEED program amounts to 39,275 USD, as Curto and Fryer (2011) reported. By applying the Purchasing Power Parity¹⁹ (PPP) conversion factor of 42.93 (World Bank, 2022), the estimated cost per student attending boarding school in Kenya is approximately 896 USD annually. Considering that students will attend boarding school for 8 years, the present value of the total cost can be calculated using the factor²⁰ of 7.05% (World Bank, 2023). Consequently, the estimated present value of the total cost over the 8-year period amounts to 5,333.97 USD.

According to Curto and Fryer (2011), each additional year of attending the SEED school is associated with a 3.8% increase in earnings. Considering that the rate of return on primary education in Sub-Saharan Africa surpasses the global average²¹ (Psacharopoulos & Patrinos, 2010), it can be inferred that the annual increase in wages for each year of attending the boarding school will likely exceed that of the SEED school. Therefore, the 3.8% estimate can be considered a conservative approximation when evaluating the benefits. As a result, the

¹⁹ PPPs are the rates of currency conversion that equalize the purchasing power of different currencies by eliminating the differences in price levels between countries. In their simplest form, PPPs are simply price relatives that show the ratio of the prices in national currencies of the same good or service in different countries (*Purchasing Power Parities - Frequently Asked Questions (FAQs)*, n.d.)

²⁰ The discount factor used is the average real interest rate in Kenya between the years 2000-2021 (*Real Interest Rate (%) - Kenya | Data*, n.d.)

²¹ "The rate of return to education is particularly high when the supply of educated labor is rather scarce. Even though enrolment has greatly increased in sub-Saharan Africa over the last decades, the region has not yet been able to catch up in terms of average years of schooling. This could explain why the rate of return to education is markedly higher in this region than in any other region of the world"

lower bound increase in earnings after 8 years of attending the boarding school is estimated at 35%.

Utilizing the country's GDP per capita (PPP), which amounts to 5,236.6 USD according to the World Bank (2023), the average annual income is calculated to estimate the present value of an individual's lifetime earnings without attending boarding school.

To calculate the present value of an individual's lifetime earnings, assuming a 40-year working period (with retirement at age 60) and an annual salary growth rate of 2%, the estimated amount is 88,687.91 USD. In contrast, if the proposed policy is implemented, individuals attending the boarding school can expect an average annual salary of approximately 7,069.41 USD. Applying the same calculation as above, the present value of their lifetime earnings amounts to 119,728.67 USD.

Based on these figures, it can be determined that attending boarding school adds a value of 31,040.76 USD to an individual's lifetime earnings. When comparing this figure to the previously calculated total cost (5,333.97 USD), the net present benefit of the proposed policy is determined to be 25,804.16 USD. Indicating a positive net benefit resulting from the implementation of the proposed policy.

Furthermore, the implementation of this policy is accompanied by additional social benefits. Research by Curto and Fryer (2011) indicates that each additional year of attending SEED is associated with a 1.0%–1.3% decrease in the likelihood of participating in property or violent crimes and a 4.4%–6.6% decrease in the probability of experiencing health disabilities. These benefits are expected to extend to individuals who successfully complete the boarding school program. While assigning a precise monetary value to these probabilities presents challenges, policymakers in Kenya should consider them when conducting the cost-benefit analysis²².

²² (See appendix for calculations)

Proposal

In light of the out-of-school factors found in our meta-analysis that hinder educational success in Kenya, we propose a 5-day boarding school program similar to SEED in the United States.

Based on our meta-analysis revealing various extrinsic factors affecting educational achievement in Kenya, we advocate for implementing a five-day boarding school program modeled after the successful SEED program in the United States.

Our proposal differentiates itself from the SEED model by embracing a similar approach to implementing public boarding schools in Kenya while incorporating distinct elements. While SEED predominantly concentrates on high school-level students, our proposal targets explicitly the primary school level. This strategic focus is based on recognizing that the returns on primary education surpass those of other educational stages ((Montenegro & Patrinos, 2021). Furthermore, studies have consistently underscored the paramount significance of the primary education cycle compared to other learning phases (Ngugi et al., 2015). This period represents a critical juncture in an individual's growth and development (Ngugi et al., 2015).

Moreover, we will extend this policy's implementation to encompass the Semi-arid and Arid regions of Kenya, in contrast to the SEED locations predominantly situated in urban areas. Our research findings indicate that these regions experience elevated levels of poverty, harsh climatic conditions, and a nomadic way of life, all of which contribute to significant challenges in achieving desirable education outcomes (Okinawa, 2015). Consequently, these areas exhibit the lowest educational outcomes and literacy rates within Kenya ((Julius & Bawane, 2011). Considering these factors, we believe that children from these regions would reap the most benefits from establishing public boarding schools.

Conclusion

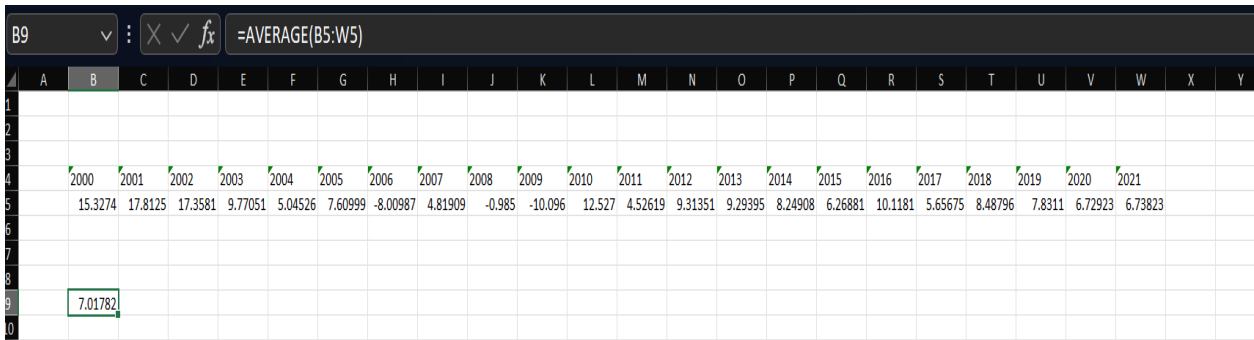
Education is pivotal in driving economic growth, especially in developing countries. Throughout the years, Kenya has implemented various policies to promote equitable education and achieve the goal of Universal Primary Education (UPE). However, examining the educational outcomes shows that the education system lacks efficiency, thereby hindering economic growth and prosperity. Our meta-analysis reveals that factors beyond the school environment, such as family background, gender disparities, and health status, pose significant challenges to enhancing educational achievement among primary school students, particularly in arid and semi-arid regions. By analyzing public boarding school models like SEED schools in the United States, we find that these schools' components, such as a conducive learning environment, regular meals, and consistent attendance, can mitigate these challenges, thus improving primary educational achievement in Kenya. Furthermore, by conducting a cost-benefit analysis, we show that the benefits of implementing public boarding schools outweigh the associated costs. This, in turn, will improve educational outcomes, contributing to the nation's overall economic growth and prosperity.

Appendix

Cost Benefit Analysis

The annual cost per student in the public boarding school in Kenya, was calculated by talking to annual cost estimated for the SEED school, amounting to o 39,275 USD (Curto & Fryer, 2011) and dividing it by the Purchasing Power Parity (PPP) conversion factor of 42.93 (2022) (World Bank, 2023). This total amount yielded 896 USD, annually

To understand the present value of the total cost, we have to discount the future costs for all the 8 years. To do so we used a discount factor of 7.02%, which we estimated by taking the average real interest rate in Kenya between the years 2000-2021 (World Bank, 2023), with the assumption that the average will not change in the upcoming years. The calculation was done using Excel, see screenshot below



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y
1																									
2																									
3																									
4		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021		
5		15.3274	17.8125	17.3581	9.77051	5.04526	7.60999	-8.00987	4.81909	-0.985	-10.096	12.527	4.52619	9.31351	9.29395	8.24908	6.26881	10.1181	5.65675	8.48796	7.8311	6.72923	6.73823		
6																									
7																									
8																									
9		7.01782																							
10																									

To calculate the present value of the total costs we used Caculate.net (n.d). See screenshot below for the inputs used. The total cost we got was 5,346.14 USD

Present Value of Periodical Deposits

Number of Periods (N)	8
Interest Rate (I/Y)	7.02 %
Periodic Deposit (PMT)	\$896 /period
PMT made at the ☐ beginning ☒ end of each compound period	
Calculate	

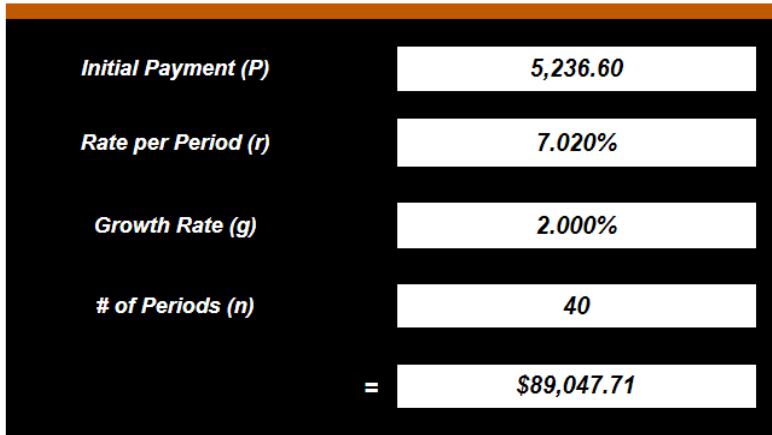
Results	
Present Value: \$5,346.14	
FV (Future Value)	\$9,199.41
Total Principal	\$7,168.00
Total Interest	\$2,031.41

To estimate the lower bound increase in earnings after 8 years of attending the boarding school, we used the annual increase found by Curto and Fryer (2011) and grew it by 8 years, resulting in an estimated 35% increase. The calculation is shown below:

$$(1+0.038)^8=0.35$$

We then proceeded with calculating the estimate present value of an individual's lifetime earnings without attending boarding school, by using Kenya's **GDP per capita (PPP)** as an estimate of the average annual income, which amounts to 5,236.6 USD (World Bank, 2023)

To calculate the present value we used Finance Formulas (n.d), below is the screenshot of the input



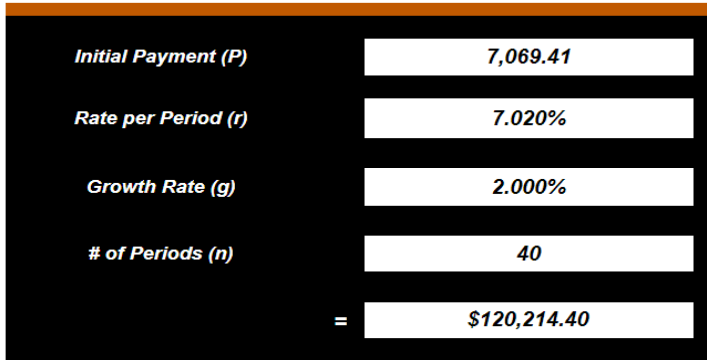
<i>Initial Payment (P)</i>	5,236.60
<i>Rate per Period (r)</i>	7.020%
<i>Growth Rate (g)</i>	2.000%
<i># of Periods (n)</i>	40
=	\$89,047.71

$$= \frac{\$5,236.60}{0.07020 - 0.02000} \times \left[1 - \left(\frac{1 + 0.02000}{1 + 0.07020} \right)^{40} \right]$$

To calculate the estimate present value of an individual's lifetime earnings with attending boarding school, we first gre the estimated annual income by 35%, the calculation is shown below

$$5,236.6 \cdot (1+0.35) = 7,069.41$$

We then used the same website mentioned above to receive the present value of one's lifetime earnings. See screenshot below for the input used.



Initial Payment (P)	7,069.41
Rate per Period (r)	7.020%
Growth Rate (g)	2.000%
# of Periods (n)	40
=	\$120,214.40

$$= \frac{7,069.41}{0.07020 - 0.02000}$$

$$\times \left[1 - \left(\frac{1 + 0.02000}{1 + 0.07020} \right)^{40} \right]$$

By subtracting the present value of an individual's lifetime earnings from attending boarding school and an individual's lifetime earnings who does not attend the boarding school we reached a total amount of 31,116.69 USD. See calculation below

$$120,214.40 - 89,047.71 = 31,116.69$$

We then proceeded with calculating the net present benefit of the boarding schools by subtracting the total cost from the total benefit. This amount totaled to 25,820.55 USD. See calculation below:

$$31,116.69 - 5,346.14 = 25,820.55$$

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