International Journal of Educational Development 106 (2024) 103021

Contents lists available at ScienceDirect

International Journal of Educational Development

journal homepage: www.elsevier.com/locate/ijedudev

Free secondary education policy and education attainment☆

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ARTICLE INFO

JEL classifications:
I25
I28
H40
O55

Keywords:
Human capital
Secondary education
Girls' education
Completion rates
Ghana
Africa

ABSTRACT

This paper investigates the impact of Ghana's Universal fee-free secondary education policy (FreeSHS) on educational attainment (completion rates). The policy was introduced in the school year 2017/2018, allowing every child to pursue secondary education irrespective of their background. We emphasize the educational outcomes of schoolgirls as they are shown to be at a greater disadvantage when accessing higher education in Ghana. Given the universality of the policy, we estimate a Difference-in-Differences model using variations in the treatment intensity across districts. The treatment and comparison groups are thus defined based on the differences in the uptake rate (changes in the uptake of education due to a price change). The paper draws from a comprehensive panel dataset capturing the demand and supply factors to education across 261 districts in Ghana. The empirical findings suggest that schoolgirls' completion rate increased by 14 percentage points in high uptake districts, whereas the reform impact is estimated at 14.9 percentage points overall (for boys and girls). In effect, the absorption of education costs by the state serves as a critical incentive for cost-constrained households and an efficient measure for correcting market failures related to access and completion of secondary education for girls.

1. Introduction

"To educate girls is to reduce poverty" – Kofi Annan.

A powerful message by former Secretary-General Kofi Annan (Secretary General, 2003, paragraph 2) that holds true in the literature. Girls' education has important implications for development and thus should be at the heart of education policies. Gender parity in primary education has been reached in more than two-thirds of countries in the world. However, girls are still disadvantaged, particularly in Sub-Saharan Africa (SSA), as they lag in secondary education enrolment (UNICEF, 2022; Asankha and Takashi, 2011). Whereas basic education has been universally free across the continent for some years (Adu-Ababio et al., 2018), the enrolment rate at the secondary level has generally remained low in SSA countries as fees are required for further education (Lewin, 2009).

In Ghana, the Gross Enrolment Ratio at the secondary level has been twice as low as at the primary (Iddrisu et al., 2016). Many pupils have been unable to enrol in Senior High Schools (SHS) due to financial constraints (Mohammed and Kuyini, 2021; Takyi et al., 2021). To combat the financial constraints and in line with SDG 4.1 (Target 4.1, indicator 4.1.2), which seeks to ensure that all girls and boys complete free, equitable and quality primary and secondary education (United Nations, n.d.), the government of Ghana introduced the Comprehensive Free Public Senior High School (FreeSHS) policy in the schoolyear of 2017/18. The policy made secondary education free for everyone (FreeSHS, n.d). This paper investigates the impact of the universal policy by addressing the question,

"To what extent does Ghana's FreeSHS policy impact the educational attainments of schoolgirls?".

Attainment, in this context, refers to the completion of secondary education. Given the contextual and persistent disparities in female secondary education in Ghana, the paper focuses on schoolgirls and contributes to the literature in two folds.

First, the relative novelty of fee-free secondary education policies in Africa provides a unique opportunity to contribute to an emerging field (Kakuba et al., 2021) and sets the scene to draw conclusions for other SSA countries. To date, 14 African countries have introduced fee-free

☆ The article reflects the personal opinions of the authors.

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https://doi.org/10.1016/j.ijedudev.2024.103021
Received 15 August 2023; Received in revised form 20 January 2024; Accepted 20 February 2024
Available online 28 February 2024

upper secondary education, and the impacts of these policies on learning outcomes are still being debated (Mohammed and Kuyini, 2021; Gruijters et al., 2023). Existing studies on fee-free secondary education have so far focused on outcomes such as enrolment, with, in part, a focus on gender differences (e.g., Asankha and Takashi, 2011; Kakuba et al., 2021) on grades (Chen et. al., 2013; Blimpo et al., 2019); or policy development perspectives (e.g., Fredriksen and Fossberg, 2014; Godda, 2018; Milligan, 2011). Regarding Ghana, research on the FreeSHS policy, though growing steadily, has taken a policy prescription and development perspective. Also, the methods applied to understanding the policy are primarily of a qualitative and descriptive nature (Tawiah and Addai-Mensah, 2019; Mohammed and Kuyini, 2021; Chanimbe and Dankwah, 2021). This paper takes the existing research a step further by providing quantitative evidence of the reform's impact. This paper is the first to comprehensively evaluate the FreeSHS policy's impact on education outcomes.

Secondly, focusing on the FreeSHS policy's impact on schoolgirls, this paper contributes to the gender dimension of access to education and underlines how removing cost barriers to education significantly enhances the chances of girls completing secondary education. Female education not only has individual benefits, but it also has observable positive externalities; hence, research should identify equity-enhancing mechanisms in education (Glick, 2008). This paper contributes to this call, highlighting the importance of investing in female education in developing countries.

The empirical analysis draws from districts and regional-level data on education from Ghana's Ministry of Education. The study employs a comprehensive panel dataset spanning the 2013/14–2019/20 school years to measure and evaluate the impact of the policy on educational outcomes for all students, emphasizing schoolgirls. As the FreeSHS policy reform is universal, we follow the literature on the causal evaluation of universal policies and apply a Difference-in-Differences strategy that utilizes the variation in the uptake of SHS education across districts. We thus exploit variations in the uptake of secondary education to determine treatment and comparison groups for the impact evaluation. The districts are sorted by their mean uptake rate – that is, the number of pupils enrolled under the FreeSHS policy divided by the population size (and, as an alternative, the teen population size of the corresponding district) – and then split at the median value (3.269 %) (see, Havnes and Mogstad, 2011; Brudevold-Newman, 2015). We also perform various sensitivity checks by altering the thresholds or by considering the treatment assignment at the region level. For robustness, we also consider a continuous treatment approach, leveraging the intensity of the uptake. Further, we adopt an alternative estimation method – entropy balancing – which ensures robust comparisons between similar districts across the treatment and control groups.

The empirical results suggest a positive impact of the FreeSHS on overall completion rates and, most importantly, completion rates of schoolgirls, who are at a greater disadvantage when it comes to access to higher education in Ghana. The absorption of education costs is confirmed to be an extra incentive for the inframarginal pupil to prefer secondary education and allows disadvantaged pupils to overcome credit constraints (see also Brudevold-Newman, 2015). Thus, as evidenced in this paper, the FreeSHS policy is a successful strategy for correcting market failures related to access and completion of secondary education in Ghana.

The paper is structured as follows. Section 2 describes the institutional context – Education in Ghana – and presents key elements of the Universal Free High School education policy. Section 3 sketches a theoretical framework and outlines the hypotheses to be tested. Section 4 presents the empirical framework, including the data sources and estimation approaches. Section 5 reports the empirical results, with discussion and conclusion remarks in Section 6.

2. Institutional context of education in Ghana

The current education system in Ghana is grouped under three blocks. The blocks include preschool, basic primary, secondary and tertiary education and follow a 2–6-3–3-4 structure (Adu-Gyamfi et al., 2016). The setting of the first cycle is two years of kindergarten. Basic primary education is six years of primary school and three years of Junior High School (JHS) (Ministry of Education Ghana, 2018; Takyi et al., 2021). Access to primary education in Ghana has reached a near-universal rate (World Bank, 2017). To qualify for SHS, pupils must take the Basic Education Certification Examination (BECE) at the end of JHS to get placed into a second cycle. The second cycle consists of three years of Senior High School (SHS) or Technical and Vocational Education (TVET) (Ministry of Education Ghana, 2018). Pupils' complete secondary education with the standardized West African Senior School Certificate Examination (WASSCE), allowing advancement into tertiary education (Senadza, 2012).

Ghana has undergone many educational reforms (see Adu-Gyamfi et al., 2016). A total of 9 reforms were made between independence and the 1980 s. By the 80 s, the education system was in a crisis following a persistent economic decline. Through the restructuring of pre-tertiary education, adopted in the 1986 reform program, and accelerating economic growth, the country's education system was able to recover (White and Masset, 2005), but several issues persist.

2.1. Education challenges in Ghana

There are spatial inequalities in the education landscape of Ghana. The country has 16 administrative regions, following an increase from 10 regions in 2018 (Ministry of Education Ghana, n.d; Ghana Education Service, 2020). The regions exhibit a notable north-south dichotomy (Abdulai et al., 2018) and a divide between urban and rural populations (Poku Boansi and Amoako, 2015). Of the people living in northern regions – Upper West, Northern, and Upper East – respectively, 70.9, 61.1, and 54.8 percent live below the national poverty line of 1314 GH¢. At the opposite end in the south, we find the Greater Accra, Ashanti, and Eastern regions, with a poverty incidence of only 2.5, 11.6, and 12.6

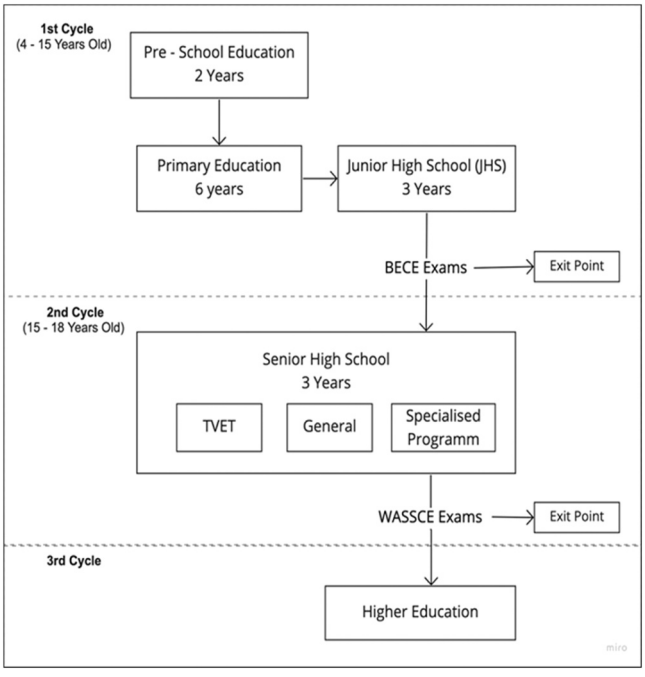

Fig. 1. Education System in Ghana (simplified). *Source: Authors' visualization based on* Ministry of Education Ghana, (2018); Takyi et al#, (2021); Senadza, (2012).

percent (Ghana Statistical Service, 2018).

Economic inequality along the spatial dimensions of poverty is a key challenge to access to education in Ghana. Compounded with an inefficient allocation of education resources (Osei Kwadwo and Konadu, 2020), the quality of schooling at all levels varies between rural-urban and south-north regions (Aryeetey and Kanbur, 2017).

Gender differences in access to education in Ghana also pose a significant challenge. Studies indicate that enrolment and retention of girls decrease with each educational level (Takyi et al., 2021). Out-of-school rates increase by educational level, with more girls (29 percent) out of school than boys (21 percent) in the upper secondary level (UNICEF, 2020). The Northern region has the highest out-of-school rate at the upper secondary level, with 31 percent (UNICEF, 2020). Explanations of the education gender gap in Ghana highlight individual household decisions (Orazem and King, 2007) that interact with socio-cultural (such as early marriage, opportunity cost of educating girls) and economic factors (Al-Samarrai and Peasgood, 1998; World Bank, 2017). Senadza (2012) attributes observed educational gender differences mainly to poverty. Adding a socio-cultural dimension, if a family has limited resources, they tend to spend more on boys' education than on girls' education, and this is reinforced by the belief that girls' labor around the house is more valuable (Senadza, 2012).

While it is established that the education system in Ghana is not equitable and gender biased, there is also an alarmingly low transition rate. For instance, the transition from JHS to SHS was 51 % in 2011/12 and 68 % in 2016/17. Transition rates tend to be worse for the bottom quintile and those from rural areas, as they are approximately five to six times less likely to access SHS (World Bank, 2017). A common theme underlying the challenges to education access is poverty. Therefore, removing financial barriers to SHS education is expected to correlate positively with education outcomes.

2.2. The FreeSHS policy

The *FreeSHS* policy in Ghana takes root from an election campaign promise made by the President, Nana Akufo-Addo (Adarkwah, 2022). The main objective of the policy, as stated by the Ministry of Education (MoE), is to remove cost barriers to secondary education. With the beginning of the 2017/2018 academic year, every Ghanian pupil placed into a second cycle institution (public schools and TVET) by the Computerized School Selection and Placement System (CSSPS) is eligible to benefit from the policy (Abdul-Rahaman et al., 2018; Adarkwah, 2022; FreeSHS, n.d). This implies that a child enrolled in the second year of Senior High School in the academic year of 2017/2018 is not eligible for free education. Further, it also implies that those who re-enter and repeat a grade are excluded, as the funding duration for each pupil is only three years (FreeSHS, n.d).

'Free' additionally refers to further direct costs that may arise, including fees, textbooks, boarding, and meals (FreeSHS, n.d). To cover the expected increase in expenditure, the government has reassured that the policy cost will be covered partly by the country's profits from oil revenue (Mohammed and Kuyini, 2021).

The policy has not been without its share of controversy, with critics questioning its financing model amidst rising enrolment rates and concerns about deteriorating education quality (Adarkwah, 2022; Chanimbe and Dankwah, 2021; Mohammed and Kuyini, 2021). As a reaction to the explosion of enrolment rates, a double-track rotation system was introduced in the academic year of 2018/2019 to schools that suffered from overcrowding amidst the introduction of the policy. The pupils of high-demand schools are split into two groups, the green and gold track, and alternate in taking lessons (FreeSHS, n.d).

Despite these criticisms, public opinion on FreeSHS remains largely favourable. According to the Afrobarometer (2020), 23.5 percent agreed, and 63.1 percent strongly agreed that the FreeSHS had created opportunities for those who otherwise would not have been able to afford secondary education. However, beyond public sentiment, there is yet to be a systematic evaluation and quantitative evidence of the reform's impact on the educational attainment of beneficiaries. This paper contributes to filling this gap.

3. Analytical Framework

It is recognized that education positively affects economic growth, welfare, and individual incomes (Glick, 2008). Higher levels of education are regarded as key to forming critical human capital and are a motivation for individuals and countries to invest in education. Secondary education, in particular, is seen as the link to further economic growth for individuals and countries alike, because as people increase their skills and knowledge, they become more productive (Becker, 1993; Fredriksen and Fossberg, 2014).

In line with Glick (2008) and other studies on fee-free education (see, e.g., Asante, 2022; Hunt et al., 2008; Lincove, 2015), the analytical framework of this paper is based on the human capital theory. The theory posits that education can increase the productive capacity of individuals (Becker, 1993). However, households' choice to invest in their girl child's education is influenced by the demand and supply of education (Glick, 2008).

On the demand side, household poverty, socio-cultural factors that do not favour female education, and geographical inequalities impede household decisions to enrol females in secondary education. Coupled with supply-side challenges, including school quality factors (teachers, infrastructure, and logistics), there is limited incentive to complete the secondary education cycle even when females are enrolled. Parental decisions to invest in girls' education also tend to be less frequent in an environment that hinders girls' full potential.[1] Both demand and supply barriers can be mitigated by the FreeSHS policy, which aims not only to remove cost barriers but also to expand infrastructure following the expected increase in enrolment, improve quality and equity, and develop employability skills (FreeSHS, n.d).

Drawing on the human capital theory, we analyse the demand and supply of education and how introducing a universal fee-free component affects schoolgirls' enrolment at the entry-level and, ultimately, their education attainment. The human capital theory does not provide predictions on behaviour per se but serves as a framework guiding the interpretation of the literature on drivers of education investment, as a basis to hypothesize how the FreeSHS can facilitate access to education for human capital development. Plausible limitations, such as its linearity (see Marginson, 2019) in the complex context of SSA and Ghana, are complemented by findings on determinants of schooling in developing countries.

3.1. Demand for Education

There is a low demand for higher secondary education in Ghana. The Gross Enrolment Rate (GER) in higher secondary education in Ghana has increased from 36.5 percent in the schoolyear of 2010/11 to 50.1 percent in 2016/17, just before the implementation of FreeSHS (Ministry of Education Ghana, n.d). Despite the increase over the last years, the GER at SHS (2016/2017) is still comparably lower than the GER at primary (111 %) and JHS levels (87 %).

The human capital theory reflects that parents will invest in their child's education when the marginal cost equals the marginal benefits, thus reaching present and future maximum utility (Becker, 1993; Glick, 2008; Lincove, 2015). Consider a household where the present utility depends on present economic activities, and future utility depends on future (financial) support from their children. Whereas parents' future

[1] Reversely, however, improved conditions can foster demands for girls' education. For instance, according to recent evidence, improved sanitary and health conditions attract girls more than boys to go to school (Evans and Yuan, 2022).

utility will result from the benefits of having wealthier children, children's wealth is a function of present schooling and productive labour. Both activities, schooling and labour (family farming, household chores or other activities), can increase future benefits and earnings. However, children have time constraints and an increase in one activity, for instance, schooling, would lead to a reduction in the other, labour. Parents must decide how to allocate their children's time between schooling and work activities (Glick, 2008; Glick and Sahn, 2000). Therefore, they consider a certain trade-off between present costs and future benefits (Burgess, 2016).[2] Though the socio-economic benefits of education may outweigh the costs (Szirmai, 2005), Jensen (2010) highlights that underestimating the returns from secondary education and incomplete information leads to low demand for education. Poverty, geographical inequalities, and gender as socio-cultural issues contribute to the calculus of education investment trade-off. These demand factors are key in explaining unequal demand for schooling (Adu-Ababio et al., 2018; Kakuba et al., 2021; Takyi et al., 2021). The mechanisms through which these factors influence demand for education are elaborated in the following sections.

3.1.1. Unequal demand due to poverty

A comprehensive analysis of patterns in SSA concludes that household wealth is the single most significant determinant of access to education, even more important than gender and location (Lewin, 2009). Income inequality strongly correlates with school enrolment and is most relevant at the secondary education level (Szirmai, 2005). If all households had sufficient wealth and no liquidity constraints, they would always choose the same amount of education. However, poor households lacking financial resources would need to borrow money to finance their children's education. This is where one major limitation of the human capital theory comes in, as it assumes that perfect financial markets exist. For poor households, investing in human capital is often difficult to bear. The trade-off between immediate short-term costs needed to achieve long-term goals and overall current consumption is unfeasible (Adu-Ababio et al., 2018). However, by removing this assumption, as Checchi (2006) proposes, we are left with imperfect financial markets, a barrier to low-income families, hampering investment in children's education. With an increase in direct schooling costs,[3] a decrease in the demand for education, especially for people experiencing poverty, is expected.

In 2014, across all wealth quintiles, for every 100 children entering kindergarten, only 16 transitioned to SHS. Worse for children from the poorest quintile, only four out of 100 transitioned to SHS (World Bank, 2017). Having around 23.4 percent of people in Ghana living below the poverty line of 1314 GH¢ (Ghana Statistical Service, 2018) exemplifies why secondary education is less of a priority investment due to the financial constraint families face in affording secondary education.

3.1.2. Spatial variation in demands for education

Research has shown that geographical location can affect education (see Glick, 2008). Shabaya and Konadu-Agyemang (2004), among others, argue that a female pupil who lives in an urban area will last longer in the educational system.[4] In a comprehensive study on the rural-urban gap in pre-tertiary education in Ghana, Anlimachie and Avoada (2020) found distance to schools in rural settings among the most significant factors of low rural education access. Low availability, accessibility, and affordability cumulate in rural settings. Findings of girls residing in rural areas showed a reduced probability of attending school and thus having lower educational attainment (Sackey, 2007). Reluctance to send girls on long distances on their own negatively affects their education (Glick, 2008). Many prospective SHS pupils face the problem of commuting long distances to day SHS as there might not be enough schools in close proximity when transitioning from JHS to SHS (see Fig. 2). This leaves boarding schools as the only viable option; however, these are much more expensive (Adu-Ababio et al., 2018).

A north-south dichotomy visually emerges when looking at the density of all educational institutions in Ghana (Fig. 2). A comparison of demographic characteristics and availability of social facilities between three cities in the South (Accra, Sekondi-Takoradi, and Kumasi) with three cities in the North (Tamale, Wa, and Bolgatanga) revealed that across all levels of education, the north is at a disadvantage (Poku Boansi and Amoako, 2015). Fig. 2 illustrates the distribution of SHS across the country. Put next to primary and JHS exemplifies how sparse the availability of SHS gets as one moves from the south to the north. The Ministry of Finance Ghana (2017) alludes to the fact that the provision of public schools is currently unregulated, leading to a high concentration of schools in some areas while others are underserved.

3.1.3. Socio-cultural Limitations on Girls' Education

Two pupils, a boy and a girl, with comparable abilities facing identical schooling costs, should, in theory, choose the same length of schooling and attain higher secondary education. However, there are observable gaps between men and women in developing countries, favouring the former (Orazem and King, 2007). Adding assumptions about parental preferences for girls' education and socio-economic factors to the human capital investment framework explains the differential outcomes in schooling for girls.[5] Although based on the human capital theory, differences between girls' and boys' schooling can be explained, it is limited in that it only considers economic productivity. It disregards social and cultural factors, which are especially relevant for gender (Robeyns, 2006).

Broader findings in the SSA context have linked several factors to the likelihood of girls enrolling in (secondary) school. As an investigation in Guinea has shown, a negative factor in girls' educational attainment is, for example, the presence of siblings under five (Glick and Sahn, 2000). The World Bank (2017) similarly links gender inequality in access to and completion of education to socio-cultural factors, including, among other things, early marriage and high opportunity costs of education, especially secondary education. Studies in Ghana indicate that enrolment and retention of girls decrease with each educational level (Takyi et al., 2021). Predating the introduction of FreeSHS, Iddrisu et al. (2016) found that being female meant a lower probability of enrolling in secondary education. Commitments to household chores or family businesses decrease the likelihood of girls enrolling in education (Senadza, 2012). Outdated attitudes toward female education build barriers to enrolment and, consequently, girl child educational attainment at all levels (Shabaya and Konadu-Agyemang, 2004).

3.2. Supply side of education

Low enrolment rates are not always due to weak demand but can arise from supply constraints (Takyi et al., 2021). A key supply-side constraint is the quality of education. Analyses of the educational system in Ghana, along gender and spatial dimensions, found general patterns of supply-side inequality across a south-north divide in terms of

[2] Costs can include direct costs like school fees and indirect costs such as reduced consumption and income foregone or delayed entry into the labor force.

[3] For an overview of the average cost of education in Ghana, see Table A.1 in Appendix.

[4] Despite introducing universal fee-free secondary education, the probability of enrolling in secondary education in Uganda was reduced by the greater distance to the nearest school, especially in rural compared to urban areas (Kakuba et al., 2021).

[5] For instance, a labor market discriminating against female wages would result in lower future benefits for the parents. Hence, the future utility of a household resulting from boys' remittances is higher than if the household has invested in a girl's education.

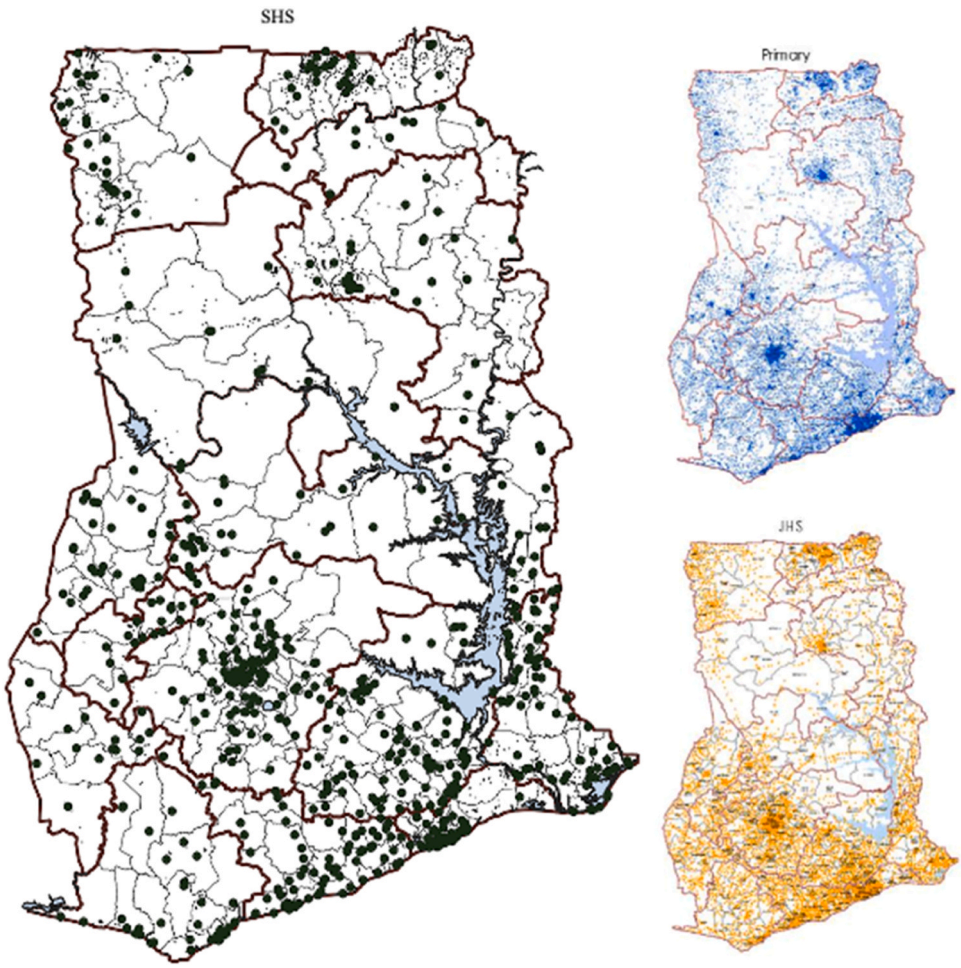

Fig. 2. Geolocation of Primary, Junior High Schools (JHS) and Senior High Schools (SHS) in Ghana (2019/20). *Visualization SHS: author; Source for SHS:* Ghana Education Service (2020)*; Source and visualization Primary and JHS:* Ghana Statistical Service (2021).

quality, favouring the south as the economically stronger region (Senadza, 2012).

Removing demand barriers is only one part of the picture. Hence, what happens between initial enrolment and completion of SHS needs to be accounted for. Prior research has shown that the cost of schooling impacts the demand for and attainment of girl child education and school *quality* (Glick, 2008; Hanushek et al., 2008). School quality is defined as the expected gain in achievement a pupil can realize for an additional year of schooling. The quality of a school and the resulting academic performance of a pupil can impact future labour market advantages and may influence the decision to drop out of school among different individuals. A pupil enrolled in a school of poor quality might choose to drop out as the gains in achievement are low, and an additional year of schooling would not result in increased future benefits. This sentiment is reflected in Ghana, where pupils reported that going to school is a waste of time in light of insufficient teacher numbers and teacher absenteeism (Ananga, 2011).

School quality factors (infrastructure, teachers, logistics) may be similar for girls and boys, but empirical evidence shows that some factors have a bigger impact on girls (Glick, 2008). Improved sanitary conditions, for instance, attract girls more than boys to go to school (Evans and Yuan, 2022). Shabaya and Konadu-Agyemang (2004) have also shown in the Ghanaian context that poor educational infrastructure and logistics were among the barriers to female retention at higher educational levels. The increase in opportunities for secondary education, especially in developing countries, could still be jeopardized by the low quality of education (Glewwe and Kremer, 2006). Consequently, attaining education is not entirely about barriers to enrolment but also about drivers behind retention and dropping out (Hunt et al., 2008).

3.3. How does FreeSHS Intervene?

3.3.1. Effects on enrolment

A cost intervention at higher levels of education yields higher returns of schooling, thus increasing schooling (Glick, 2008). The existing literature has already investigated the impact of cost intervention at higher levels of education on enrolment and, consequently, educational attainment of girls and boys but not on a universal fee-free policy. A microsimulation of FreeSHS on household poverty and inequality predicts that in the short term, overall household poverty will be reduced (Adu-Ababio et al., 2018). Using macro-level panel data of several SSA countries between 2003 and 2018 revealed strong empirical evidence that cost-eliminating interventions increase upper secondary enrolment, especially amidst high poverty rates (Asante, 2022). Evans and Yuan's (2022) extensive systematic literature review summarizes that reducing the direct costs of schooling is the most effective way to bring girls into schools. Remarkably, girl-targeted and non-gendered interventions performed similarly on average in increasing girls' participation.

Further, findings from a girl-targeted Randomized Control Trial in Ghana by Duflo et al. (2021) indicate that fee-free secondary education increased the enrolment of girls. Contrasting, Asante (2022) finds that cost elimination had a greater positive impact on male enrolment than on females. While these studies provide important insights, they are mostly small-scale or targeted interventions and are not universal, as is

the case with FreeSHS.

In line with previous findings on fee-reducing policies in SSA and the theoretical considerations, an increase in enrolment rates following FreeSHS is expected. The reform can remove financial barriers and hence increase demand. As FreeSHS is a universal policy, girls and boys alike benefit from the government intervention, making it a non-gendered intervention. However, policies like these still affect girls differently than boys (Glick and Sahn, 2000). FreeSHS can remove not only economic barriers but also intervene in socio-cultural obstacles by changing the perceived costs of sending the girl child to school, hence creating an equal demand. It is consequently expected that *girls' enrolment rates will increase following the introduction of FreeSHS because the policy removes economic barriers and socio-cultural obstacles to education.*

3.3.2. Effects on attainment

Following the definition of educational attainment provided by the UNESCO Institute for Statistics (2016), educational attainment refers to the highest grade completed within an individual's highest level of education. Applied to FreeSHS and the country case, Ghana, it means completing the third and last year of Senior High School (SHS 3). This allows for a more nuanced view of the policy, which goes beyond initial enrolment rates to investigate whether schoolgirls survive within the three-year school cycle.

Enrolling girls in schools is the first step in attaining higher secondary education. It is not sufficient to only consider early-stage outcomes such as enrolment as it does not capture, for instance, whether the child completes a particular cycle of education (Szirmai, 2005; Orazem and King, 2007). Hunt (2008) indicates that the cost of schooling impacts access and retention. The FreeSHS promises to remove cost barriers, expand infrastructure, improve quality and equity, and develop employability skills (FreeSHS, n.d.). As the policy addresses education demand and supply issues, it is expected that the *FreeSHS would positively impact schoolgirls' completion rates because the policy removes cost barriers and improves the quality of education.* This expectation stands at the core of our empirical estimations as we assess the impact of the reform primarily on the completion rates of schoolgirls.

4. Empirical framework

The empirical analysis of this paper draws from district and regional-level data on education from Ghana's Ministry of Education, both in terms of inputs (e.g., students' teacher ratios) and outputs (e.g., enrolment and completion rates). Given the universality of the reform, we exploit the variation in treatment intensity by considering the difference in the uptake of secondary education, which results from the change in price-free access for all among districts with high and low coverage rates.

4.1. Data sources & description

Primary data for this research come from the publicly available Educational Management System (EMIS), an education census dataset by the Ministry of Education of Ghana.[6] Alternative data sources, such as EdStats by the World Bank, have significant gaps as they ended in 2019 and only provide macro-level data. Another option could have been to use the Ghana Living Standards Survey at the individual and household levels. However, no Living Standards or Household survey covers the cohort of pupils benefiting from FreeSHS that would have allowed a comparison. The EMIS provides granular information regarding educational inputs and outputs at the districts and regional levels for Ghana.

Our unit of analysis is the districts. Ansong et al. (2015) claim that (primary) education research has focused solely on outcomes at the individual pupil level but ignored district and regional levels. They argue that to make important contributions, research should be situated in the larger context, specifically, the level at which policy decisions are made. The districts (261 consisting of 6 metropolitan, 117 municipal and 138 district assemblies) are embedded in the administrative regions of Ghana that increased from ten to sixteen in December 2018 (Ghana Education Service, 2020). For the regional analysis, we reverted the new regions to the old regional structure to deal with the changing regional landscape and ensure that the variables were comparable over time. This was possible since most of the data is based on headcounts. Rates and ratios (e.g., GER) were then recalculated with the reverted regions.

The analysis covers the schoolyears 2013/14–2019/20. Data was only available until this point, even though another cohort has undergone three years of SHS and graduated in 2020/21 under the policy. The dataset starts in 2005/06; however, the availability of key variables, especially completion rate, varies between the years. This is aggravated by the fact that SHS switched between three years to four years and back to three in 2013/14, where it stayed that way. Further, estimations of the variables like repeaters were not included due to the reliability of this data (Ministry of Education Ghana, 2018). Considering all of the above reduces the time frame to seven years (2013/14 – 2019/20), ensuring compatibility between variables across all years.

4.2. Variables of interest

The main outcome variable of interest is SHS completion rates at the district level. The completion rate (in percent) is defined as the ratio of enrolment into SHS3 (regardless of age) and the population of the statutory age of 18 years old. It is important to note that how the completion rate is calculated in EMIS is a proxy measure for SHS completion. According to UNESCOs (2009) educational indicators, it could also be referred to as the Gross intake ratio in the last grade of upper secondary (GIRLG). WASSCE test takers and pass rates cannot be considered an appropriate substitute for more accurate completion rates since pupils can take the test multiple times, even after finishing SHS3 (Duflo et al., 2021).

The following control variables are included based on the literature review and theoretical framework. On the demand side, we include variables capturing local economic development – namely *nightlight intensity* (see, e.g., Henderson et al., 2012; Hodler and Raschky, 2014; Alesina et al., 2016; Bruederle and Hodler, 2018; Bargain et al., 2023) – socio-cultural factors (captured by district fixed effects), a proxy for geographical inequality (percentage of rural schools in the region). We account for quality factors on the supply side by controlling for the pupil-teacher ratio at SHS1, the percentage of schools with toilets, sitting and writing places per pupil ratio, books per pupil ratio, and the percentage of female teachers. In some specifications, we also use the district-year or region-year fixed effects in addition to other variables to capture other unobservable trends that occurred at the district or regions-levels.

4.3. Identification strategy

The empirical strategy follows two studies, one by Havnes and Mogstad (2011) on universal childcare and one by Brudevold-Newman (2015) on fee reduction in secondary schools in Kenya. Similarly, the methodological approach's main concern is the policy's universality. In a case like this, the authors propose to apply a Difference-in-Differences strategy that makes use of the fact that the policy coverage was higher in some areas than others. Both studies exploit the fact that the coverage and intensity of their policies varied between regions. However, unlike Brudevold-Newman (2015) we consider changes in the post-policy uptake, as opposed to a pre-policy identification strategy (transition rate). Whereas Havnes and Mogstad (2011) identification strategy is based on the increase in child coverage rate (supply-driven).

[6] Publicly available until approximately February 2022. The data used in this paper is available upon request.

4.3.1. Treatment and comparison groups

The main approach to finding the appropriate treatment and comparison groups is based on the mean FreeSHS uptake rate per district. The uptake rate is defined as the number of pupils enrolled under the FreeSHS policy since 2017/18, divided by the population of the corresponding district. The districts are sorted by the mean uptake rate between the schoolyears 2017/18 and 2019/20 and then separated at the median (3.269 %) (see Havnes and Mogstad 2011 and Brudevold-Newman 2015). The districts above the median form the treatment group, and those below the comparison group. The districts with high uptake (treatment group) of FreeSHS beneficiaries are compared to the districts with lower uptake rates (comparison group) for the schoolyear 2019/20.

In the baseline estimates, the districts located in the Northern regions are underrepresented in the treatment group. Table 1 shows that 85.71 % of the districts in the Northern region are in the comparison group, implicating a lower uptake rate. Similarly, 80.33 % of the districts in the Greater Accra region and 75.63 % of districts in the Western region are in the comparison group (see also Table A.6 in the Appendix).

Regarding the Northern Region having the lowest uptake of the FreeSHS policy, there are underlying systemic barriers to SHS education in districts other than fees. There have been conscious political endeavours to improve access to education. For instance, the Education Act of 1961 furthered the offer of free education in northern Ghana, which aimed to reverse centuries of discrimination by region (Tsikata and Seini, 2004). Yet, these efforts have not reflected in the level of access to education compared to other regions. Although we account for such regional disparities, in-depth analyses of their sources are beyond the scope of this paper.

As the capital and wealthiest region, the districts in the Greater Accra region are among the lowest FreeSHS uptake rates, with only 20 % in the treatment group from the baseline estimates. While surprising, such stylized facts might be explained by the proportion of private schools. In 2021, out of 100 SHS in the region, more than half (55) were private schools. Similar reasoning could be applied to the districts in the Western region, located in the wealthier south of Ghana, in addition to a resource curse. The Western region is endowed with most of Ghana's resources, such as gold, bauxite, manganese, diamonds, and oil and gas resources natural resources (Ackah et al., 2019). This gives the region significant economic importance that can be detrimental to the demand for secondary education as a trade-off between utility from present economic activities and the future benefits of secondary education (Burgess, 2016).

Several robustness checks are conducted using different thresholds to test the sensitivity of the results to the cut-off points, the measurement of the reform uptake, or the definition of treatment and control groups (see Havnes and Mogstad, 2011). For instance, an alternative way of capturing the uptake rate is through the official school-aged teen population (15–19 years old) with data from the national census. The uptake rate is thus measured by the share of beneficiaries in the total teen population per district. Alternative approaches also include considering the 25th percentile and defining treatment with uptakes at regional levels (see more in the results section).

Table 1
Share of districts in treatment and comparison groups (%).

Region	% Comparison Districts	% Treatment Districts
Ashanti	31.4	68.6
Brong Ahafo	47.8	52.2
Central	30.38	69.62
Eastern	36.78	63.22
Greater Accra	80.33	19.67
Northern	85.71	14.29
Upper East	37.65	62.35
Upper West	36.9	63.1
Volta	36.22	63.78
Western	75.63	24.38

4.3.2. Difference-in-differences estimation model

The analogous Difference-in-Differences regressor of the main model is expressed in Eq. (1). Y_{st} reflects the outcome Y for the districts s at time t. $Treated_s$ is a dummy that takes the value of 1 for treatment districts and 0 for comparison districts. $Time_t$ is also a dummy of 1 for the years in which FreeSHS was in effect and 0 otherwise. $X'_{st}\zeta$ is a set of variables. District fixed effects are reflected in η_s; they aim to capture time-invariant characteristics of the districts, such as background conditions, initial size, administrative status, and initial institutional quality, most of which are unobservable. Time-fixed effects are reflected in t_t and implicitly capture factors that are common to all districts, such as macroeconomic shocks, broad climate conditions, or applied policies (other than FreeSHS). The errors ϵ_{st} are clustered at the district level (or regional level in some specifications for robustness checks).

$$Y_{st} = \beta_0 + \beta_1(Treated_s * Time_t) + X'_{st}\zeta + \eta_s + t_t + \epsilon_{st} \quad (1)$$

Concluding from the regressor and estimator, the main analysis uses a binary Difference-in-Differences model compared to the continuous models of Brudevold-Newman (2015). A binary approach is nonetheless still valid, as in Havnes and Mogstad (2011). The estimated effect of the FreeSHS policy on the outcome variables (Y_{st}), is the interaction coefficient β_1.

4.3.3. Trends in the pre-reform era

The Difference-in-Differences strategy has two main assumptions. First, it assumes that many observables, but also unobservable characteristics of units and individuals, are constant over time. Observed characteristics can, for instance, be the fathers' level of education (Gertler et al., 2016). In this paper, we control for unobservable by adding district and time fixed-effects (as in Havnes and Mogstad, 2011) as well as region-year fixed effects to capture varying trends through time and space, in addition to the control variables. The second and most important assumption is equal trends, meaning that, even without FreeSHS, the treatment and comparison group completion rate would have decreased and increased in parallel for the school year 2019/20. Although the policy was introduced in 2017/18, the first cohort that graduates under the policy is three years later. It is fundamentally impossible to show that, without FreeSHS, both groups (treatment and control) would have moved in tandem. Still, the assumption can be tested by looking at pre-policy introduction trends (Gertler et al., 2016).

Fig. 3 already visually hints towards an equal trend of completion pre-FreeSHS, both for total and for girls. The completion rate moves almost in parallel before the policy introduction in the school year 2017/18. Following FreeSHS, however, the slope of the completion rate of the treatment group increases. Considering the identification strategy and theoretical framework based on income shocks, it is not unexpected to see a faster increase in completion rates in the treatment group even before the first FreeSHS cohort reaches the last year of SHS. The positive income shock could, for instance, benefit older siblings who have already been enrolled and thus facilitate their completion rate despite not benefiting directly from the reform. Finally, with the first cohort reaching SHS3, the graph drastically shifts upwards in the treatment group, while the comparison group has a lower increase in completion rates. This shows that treatment (high-uptake) and comparison (low-uptake) districts differ in changes in completion rates.

In addition, Table 2 suggests that, upon accounting for unobservable characteristics and clustering the standard errors (as we do in the empirical estimations), there are no major statistically significant differences in key variables, both dependent and controls, in the pre-reform period. Schools in the high-uptake (treated) and low-uptake (comparison) districts share, for the most part, similar characteristics. The mean percentage of public toilets, sitting and writing places per pupil, and

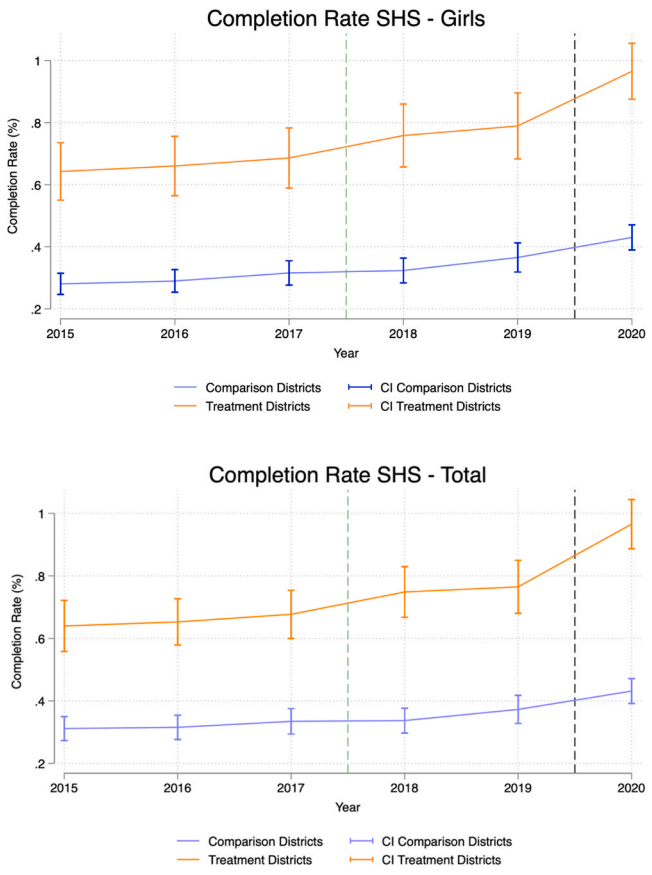

Fig. 3. Secondary High School completion rates through time. *Notes:* The treatment group is above the median of the FreeSHS uptake rate and vice versa. The light blue dotted line indicates the introduction of FreeSHS in the school year 2017/18. The black dotted line indicates the first cohort of beneficiaries that completed SHS. CI indicates the confidence interval.

books per pupil is similar across both groups.

In addition, we follow Havnes and Mogstad's (2011) analysis to test potential bias in our estimation *vis-à-vis* the selected control variables. We proceed by having each control variable substitute the main dependent variable in the model of Eq. (1), as they potentially may have also been influenced by the reform itself. Table A.2 in the Appendix shows that all results are statistically insignificant at 5 %. The pupil-teacher ratio and percentage of female teachers are statistically significant at 10, but we consider these outcomes negligible and not a threat to our model. Further, in the results tables, we also vary the inclusion of the controls to test the robustness of the results to such parameters.

5. Results

5.1. Trends in enrolment rates

Fig. 4 displays the number of girls enrolled in all grades of public SHS per school year. The pre-FreeSHS years (black vertical line) show that overall enrolment of girls in SHS has improved. From numbers as low as 318,902 girls in SHS nationally in 2013/14–393,990 in 2016/17. The trend line (green dashes) between 2013/14 and 2016/17 exemplifies this steady increase. If this trend had continued in a similar manner and in the absence of FreeSHS, there wouldn't have been a vast gap between actual enrolment and predicted enrolment, particularly for the school year 2019/20. The increased enrolment suggests that the cost of schooling, direct and indirect, constituted a significant household burden.

Most importantly, the boxplot in Fig. 5 displays how Gender Parity Index (GPI) in public SHS changed over the years. A GPI of 1 denotes gender parity; a value below 1 shows disparity favouring boys and vice versa for girls. Previous Figures already hinted towards positive trends for girls. Correspondingly, we find an increase in the GPI across all regions. Even in the Northern region, however it is still outside the lower adjacent values. Although the Northern region has shown a considerable increase from a GPI of 0.631 in 2013/14–0.799 in 2019/20, it is still falling far behind other regions in the country. Most importantly, the range of GPI across regions (indicated as the box and whiskers) decreased since 2017/18, meaning that most regions share a similar GPI. The lower adjacent value has moved substantially closer to 1 and consequently closer to gender parity since 2017/18. The Eastern region in 2019/20 is an "outlier" with a GPI of 1.05, and this may be explained by the nature of economic activities (fishing and mining) that attract boys more than girls.

5.2. Baseline estimates: impact of FreeSHS on education attainment

Differencing out high-uptake districts with low-uptake districts comes with a cautionary note, which aligns with Brudevold-Newman's (2015) interpretation issues. The analysis only indicates the differential effect of FreeSHS for high-uptake districts (treatment) relative to low-uptake districts (comparison), yet FreeSHS is a universal policy and consequently impacts low-supply shock districts. As such, the results are expected to underestimate the total impact of the reform.

Table 2
Summary statistics by treatment and comparison districts in the pre-reform era.

	Treatment Districts			Comparison Districts			Pairwise t-test	
	N	CL	Mean	N	CL	Mean	CL	Mean difference
Outcome Variable								
Completion rate girls	480	96	0.707 (1.055)	486	98	0.315 (0.390)	194	0.392
Completion rate total	480	96	0.697 (0.837)	486	98	0.334 (0.408)	194	0.362
Control variables								
Pupil-trained teacher ratio SH1	454	96	7.060 (4.271)	418	96	8.031 (6.456)	192	-0.971
Percentage female teachers	454	96	0.203 (0.159)	420	96	0.169 (0.220)	192	0.034
Percentage toilets	453	96	0.907 (0.205)	413	95	0.895 (0.311)	191	0.012
Sitting places per pupil	452	96	0.933 (0.580)	414	95	0.953 (0.703)	191	-0.020
Writing places per pupil	452	96	0.877 (0.561)	414	95	0.908 (0.659)	191	-0.031
Books per pupil	439	94	0.578 (0.500)	340	86	0.526 (0.652)	180	0.052
Percentage of rural schools	359	94	0.606 (0.418)	295	91	0.757 (0.531)	185	-0.151
Nightlight (Local Development)	450	95	1.022 (7.775)	442	97	1.192 (8.062)	192	-0.171

Notes: This table shows the mean, clusters (CL) and SD for key variables for the pre-reform period, computed with standard errors clustered at the district levels. Standard errors are in parentheses. Significance levels (of mean difference): ***p < 0.01, ** p < 0.05, * p < 0.1

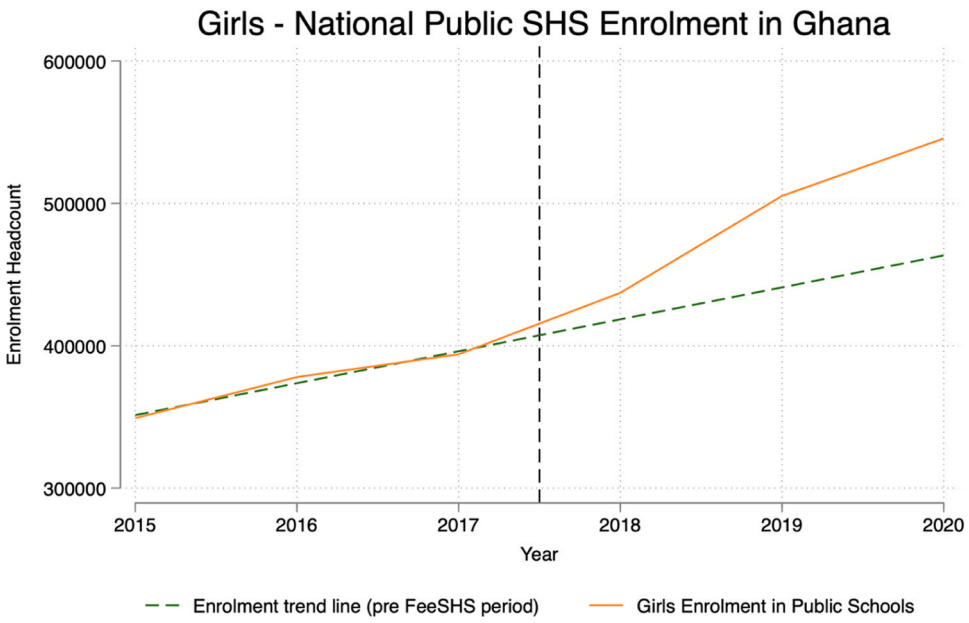

Fig. 4. Trendline and actual enrolment of girls in public SHS.

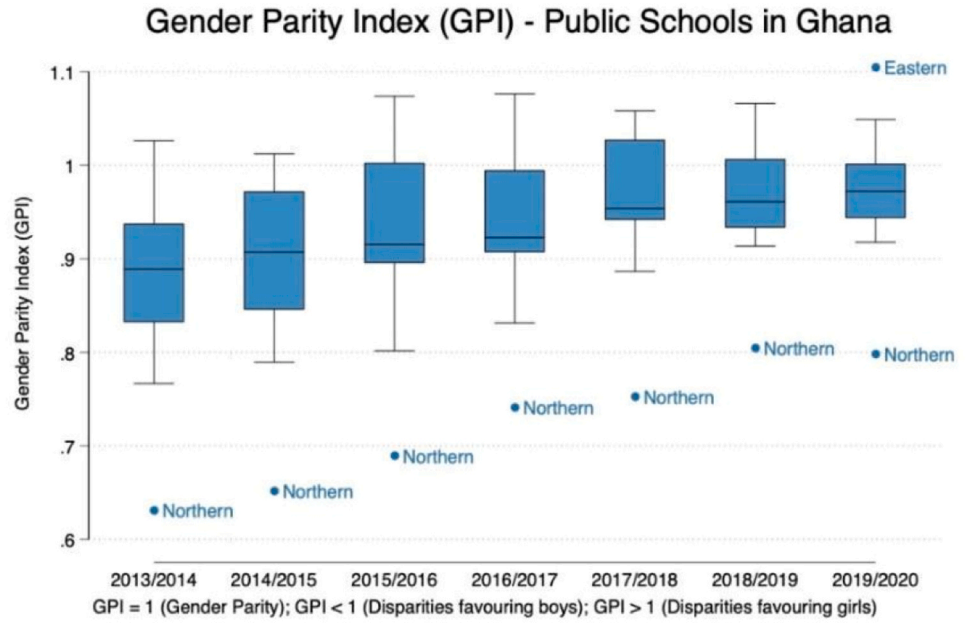

Fig. 5. Gender parity index in public SHS by region.

The baseline estimates in Table 3 suggest that FreeSHS positively impacted the overall completion rate and the completion rate of schoolgirls in treatment districts. As Havnes and Mogstad (2011) suggested, estimates with and without control variables and district-fixed effects are reported to reduce concerns of selection bias. The results for the general completion rate and completion rate of schoolgirls show that the estimates in column (1) are similar across the specifications, and they are all significant at the 1 percent level.

In Panel A, column 1.1 suggests that the completion rate for girls in the high-uptake districts increased by 14.0 percentage points relative to the low-uptake districts. The 95 percent upper bound (confidence interval) even reaches a maximum of 23.0 percentage point increase in girls' completion rate. The different specifications in Panel A range between a 12.6 and 15.4 percentage point increase in completion rates in the high-uptake regions relative to the low-uptake regions. Table A.3 in the Appendix includes the results of the control variables. They have no statistically significant impact on the completion rate. Comparing the impact of girls' educational attainment with the general measure, which includes boys, indicated that FreeSHS has a larger isolated impact on boys' educational attainment. Total mean completion rates rose by 14.9 percentage points in the baseline model in high-uptake districts relative to low-uptake districts. A gender gap in SHS completion favouring boys hence persists. FreeSHS alone does not erase the social/cultural constraints to education but contributes to reducing them. Since we only have a short-term impact, this might change in the long run.

5.3. Robustness checks

5.3.1. Sensitivity to treatment thresholds

The main identification strategy orders and divides the districts at

Table 3
Baseline Estimates – Impact of FreeSHS on Completion Rates in Ghana.

	Completion Rate - Girls			Completion Rate – Total		
	(1.1)	(1.2)	(1.3)	(2.1)	(2.2)	(2.3)
Panel A: Baseline Estimate						
ATET	0.140***	0.126***	0.154***	0.149***	0.139***	0.160***
	(0.046)	(0.035)	(0.046)	(0.043)	(0.034)	(0.043)
Constant	0.499***	0.459***	0.475***	0.503***	0.475***	0.479***
	(0.084)	(0.012)	(0.087)	(0.080)	(0.012)	(0.082)
N Observations	793	1216	793	793	1216	793
Districts	194	250	194	194	250	194
R2	0.928	0.922	0.922	0.908	0.903	0.903
R2 adjusted	0.902	0.901	0.895	0.876	0.877	0.870
Controls	Yes	No	Yes	Yes	No	Yes
District FE	Yes	Yes	No	Yes	Yes	No
Year FE	Yes	Yes	No	Yes	Yes	No
Mean	0.707			0.697		

Notes: The list of controls is in Table 2. Means refer to pre-FreeSHS means in the treatment districts and regions. ATET is defined as the percentage point increase in the completion rate (of girls) in the high-uptake districts relative to the low-uptake districts and based on Eq. (1). Standard errors are clustered at the district level and in parentheses. Significance levels: ***p < 0.01, ** p < 0.05, * p < 0.1

the median defined by the uptake rate. We consider some threshold alternatives to test the sensitivity of the results to this threshold. First, and like Havnes and Mogstad (2011), districts are split at the 25th and 75th percentile of the uptake ratio. Districts below the 25th percentile form the comparison group, those above the 75th percentile, the treatment group, and those in-between are excluded. For this robustness check, we focus on the completion rate for girls as the outcome variable.[7] The results are reported in Panel B of Table 4. They indicate a 22.4 percentage point increase in the completion rate of girls in the high-uptake districts relative to the low-uptake districts, thus a much larger magnitude of the impact when considering the upper and lower thresholds of the policy's uptake rate.

5.3.2. Sensitivity to the policy uptake measurement approach

The main treatment identification strategy divides the FreeSHS beneficiaries by the district population. This approach to measuring the uptake might under or over-estimate the supply shock in the event of large gaps in the demographic composition of certain districts (that is, the share of teens in the age of attending SHS in the total population). Therefore, an alternative uptake measurement approach considers the teenaged population per district, such that the uptake rate is the number of pupils that enrolled under the FreeSHS policy divided by the teenaged (15−19) population of the corresponding district. The results are reported in Panel C of Table 4. There is a 12.5 percentage point increase in the completion rate of girls in the high-uptake districts relative to the low-uptake districts.

In addition, we consider an alternative treatment measurement approach by computing the policy uptake at the regional level (instead of the district level). We use the mean uptake ratio of Ghana's regions, that is, the number of pupils enrolled under the FreeSHS policy in each region divided by the population of the corresponding regions. Regions are also split into treatment and comparison groups based on the median value of the new uptake measure. By defining the treatment at the regional level, districts that have been in the comparison group in the baseline estimates could now be part of the treatment group (and vice versa), although we expect this shift to be rather limited. The results are reported on Panel C of Table 4 and suggest that the reform has a greater overall impact (an increase of 14.9 percentage points) on the completion rate of girls in districts in regions with high uptakes.

5.3.3. Sensitivity to unit of analysis

Lastly, in Panel D, we move the entire analysis to the regional level by considering the region-level treatment definition, thus, the average completion rates of girls in a given region as the outcome, and control variables also at the regional levels. The results point to a 12.9 percentage point increase in the completion rate of girls in the high-uptake regions relative to the low-uptake regions.

5.3.4. Other sensitivity checks

Panel E (Table 5) reports the coefficient estimates from other sensitivity checks. First, we capture regional and district-level trends by adding region × year and district × year fixed effects. These are expected to capture unobservable changes through time, either at the district or regional levels, which are not accounted for in the baseline estimates. The coefficient estimates are statistically significant. The district-level trend even suggests a greater impact of the reform on the completion rate of girls (15.5 percentage points) than the baseline estimates without such trends.

5.3.5. Placebo tests

Panel F of Table 5 reports placebo test results. These tests address the concerns that the positive impact of FreeSHS on SHS completion rates might reflect a time trend between treatment and comparison regions rather than a real policy impact. While the balance table and balance Fig. 3 hint at a parallel trend, the tests further check whether the assumption of common time trends between districts in the absence of FreeSHS holds (see Havnes and Mogstad, 2011). We estimate the model using a time dummy for the schoolyears of 2016/17 and 2015/16. By pretending that FreeSHS was introduced at a different time before the actual introduction, we can confirm the assumption of a common time trend in the absence of the policy if the results are insignificant. The ATET coefficients from both placebo test results in Panel F are statistically insignificant. This confirms that different time trends between districts do not influence the resulting impact.

5.3.6. Continuous treatment and entropy balancing

We adopted two alternative estimation methods. First, we consider a continuous instead of binary treatment approach. The continuous treatment is the policy intake intensity in treated districts. The resulting outcome reported in Panel G (Table 5) further confirms that the FreeSHS positively impacts completion rate outcomes, especially for girls.

In addition, we adopted the entropy balancing technique proposed by Hainmueller (2012) for binary treatment. The primary challenge to causal analysis is the selection bias. While we test the sensitivity of our results by varying the uptake threshold, the calculation methods, and the treatment layer (i.e., region-level instead of district-level treatment) while controlling for various district (or region) characteristics, fixed-effects and specific trends, the entropy balancing ensures that we

[7] Results for the whole sample, i.e., with total completion rate, are reported in Appendix, Table A.4 and Table A.5.

Table 4
Sensitivity checks: Alternative treatment thresholds and policy uptake.

Dependent variable: Completion rate of girls								
	Treatment (25th/75th)		Uptake rate with teenaged population		Treatment Threshold at the Regional level		Region-Level Treatment & Outcomes	
	(1.1)	(1.2)	(2.1)	(2.2)	(2.3)	(2.4)	(3.1)	(3.2)
Panel B: Sensitivity to Treatment Thresholds								
ATET	0.204***	0.224***						
	(0.058)	(0.083)						
Panel C: Sensitivity to the policy uptake measurement approach								
			0.125***	0.135***				
ATET			(0.035)	(0.046)				
					0.149***	0.180***		
					(0.034)	(0.044)		
Panel D: Sensitivity to Unit of Analysis								
ATET							0.129**	0.110**
							(0.041)	(0.041)
Constant	0.503***	0.593***	0.459***	0.497***	0.472***	0.541***	0.441***	0.544*
	(0.018)	(0.100)	(0.012)	(0.084)	(0.012)	(0.081)	(0.009)	(0.291)
N Obs.	611	377	1216	793	1217	777	60	60
Districts	130	98	250	194	249	188	10	10
R2	0.943	0.946	0.922	0.928	0.923	0.929	0.958	0.964
R2 adjusted	0.927	0.923	0.901	0.902	0.903	0.904	0.943	0.942
Controls	No	Yes	No	Yes	No	Yes	No	Yes
District FE	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE							Yes	Yes
Mean	0.895		0.718		0.603		0.596	

Notes: Means refer to pre-FreeSHS means in the treatment districts and regions. ATET is defined as the percentage point increase in the completion rate of girls in the high-uptake districts/regions relative to the low-uptake districts/regions. Panel B columns (1.1) and (1.2) estimations include district and time fixed-effects, and errors are clustered at the district level. Treated districts are over the 75th percentile, and comparison districts are below the 25th percentile of the uptake ratio, while in-between thresholds are excluded. The treatment level in panel C column (2.1) and (2.2) is defined by the uptake rate of the teenaged population per district (number of pupils that enrolled under the FreeSHS policy divided by the teenaged (15−19) population of the corresponding district), whereas the treatment in panel C column (2.3) and (2.4) is based on the mean FreeSHS uptake rate per region (number of pupils that enrolled under the FreeSHS policy), divided by the population of the corresponding region and split into above or below the median value. Standard errors in Panels B and C are clustered at the district level. Standard errors from results in Panel D columns (3.1) and (3.2) are clustered at the regional level. Control variables are listed in Table 2. The same controls are used for regional-level estimates in Panel D. Standard errors are in parentheses. Statistical significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 5
Sensitivity checks: Placebo and other checks.

Dependent variable: Completion Rate of Girls				
	Trend: Region × Year	Trend: District x Year	Placebo: Policy introduced in 2016/2017	Placebo: Policy introduced in 2015/2016
	(1)	(2)	(3)	(4)
Panel E: Other sensitivity checks				
ATET	0.131***	0.155***		
	(0.045)	(0.047)		
Panel F: Placebo Checks				
			0.032	
ATET			(0.027)	
				0.024
				(0.040)
Constant	39.892**	0.045	0.493***	0.497***
	(17.482)	(0.133)	(0.075)	(0.075)
N Obs.	793	793	645	645
Districts	194	194	174	174
R2	0.929	0.422	0.944	0.944
R2 adjusted	0.904	0.404	0.921	0.921
Controls	Yes	Yes	Yes	Yes
District FE	Yes	No	Yes	Yes
Year FE	Yes	No	Yes	Yes
Region FE	No	Yes	No	No
District x Year	No	Yes	No	No
Region × Year	Yes	No	No	No
Mean	0.707	0.707	0.663	0.643

Notes: Means refer to pre-FreeSHS means in the treatment districts and regions. ATET is defined as the percentage point increase in the completion rate of girls in the high-uptake districts/regions relative to the low-uptake districts/regions. Standard errors are in parentheses. Control variables are listed in Table 2. Statistical significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

compare districts that are closer to each other based on a high covariate balance between treatment and comparison group (Neuenkirch and Neumeier, 2016). This robustness test addresses the concern that the uptake rate and, consequently, selection into treatment and comparison groups might be endogenous (see, e.g., Apeti and Edoh, 2023). Panel H of Table 6 reports the results based on entropy balancing. The results indicate a statistically significant increase in the completion rate of girls in the high-uptake district, although of a lower magnitude than

previously reported. Notwithstanding, the results from these estimation approaches are robust and in line with previous conclusions that the FreeSHS policy positively impacts the educational attainment of school girls.

6. Discussion and concluding remarks

This paper answered the question, *"To what extent does Ghana's FreeSHS policy impact the educational attainments of schoolgirls?* The study revealed that Ghana's FreeSHS policy positively impacts overall completion rates and especially for girls in high-uptake districts (treatment) relative to those in the low-uptake districts (comparison).

The findings from this paper should be considered with cognizance of its limitations. Given that FreeSHS is a universal policy and the methodological approach chosen, we are not able to fully assess the impact of the policy in the comparison districts, despite robustness checks (see Sections 5.3.1 and 5.3.3). Henceforth, it is emphasised that the results for the high-uptake groups are relative to the low-uptake group. For the country as a whole, this means that the impact may be lower than the results obtained, especially given the high regional disparities (see Section 3.2). Some regions, for instance, the northern region and western region, had among the lowest uptake rates for the FreeSHS. There are underlying systemic barriers to SHS education in these regions other than fees. Lessons from Uganda have shown that, despite introducing universal fee-free secondary education, the probability of enrolling in secondary education was reduced by the greater distance to the nearest school, especially in rural compared to urban areas (Kakuba et al., 2021).

The main concerns of the methodological approach are the universality of the policy and the identification of the appropriate treatment and comparison groups. Other appropriate strategies could have included the ratio of students completing SHS to the total number of students enrolled in SHS, or transition rates as suggested by Brudevold-Newman (2015). However, the identification strategy of this paper was limited by the availability of data. Additional limitations have to be considered. For example, the paper does not account for the double track rotation system and more nuanced impacts on the type of schools, for instance, boarding vs. day schools or mixed versus girls' schools. Also, aggregate data and analysis of completion rates cannot capture time-varying individual, family, and school-level factors that would, for instance, influence decisions to drop out.

Despite the limitations, the results are in line and provide corroborative evidence supporting the conclusions of Chen et. al., (2013) and Duflo et al. (2021) regarding the positive impact of secondary school scholarships on educational attainment.

Table 6
Sensitivity checks completion rate: Continuous Treatment.

	Completion Rate - Girls		Completion Rate – Total	
	(1.1)	(1.2)	(2.1)	(2.2)
Panel G: Continuous Treatment				
ATET	0.022***	0.026***	0.024***	0.027***
	(0.006)	(0.008)	(0.005)	(0.007)
Constant	0.459***	0.495***	0.475***	0.500***
	(0.012)	(0.084)	(0.012)	(0.081)
N Observations	1216	793	1216	793
Districts	250	194	250	194
R2	0.9236	0.9302	0.9054	0.9117
R2 adjusted	0.9033	0.9055	0.8803	0.8805
Controls	No	Yes	No	Yes
District FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Mean	0.6872		0.6868	

Notes: Means refer to pre-FreeSHS means in the treatment districts and regions. ATET is defined as the percentage point increase in the completion rate of girls in the high-uptake districts/regions relative to the low-uptake districts/regions. Standard errors are in parentheses. Control variables are listed in Table 2. Statistical significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 7
Sensitivity checks completion rate: Entropy balancing.

	Completion Rate - Girls		Completion Rate – Total	
	(1.1)	(1.2)	(2.1)	(2.2)
Panel H: Entropy balancing				
ATET	0.097**	0.094**	0.113***	0.110***
	(0.041)	(0.041)	(0.037)	(0.037)
Constant	0.808***	40.795	0.871***	36.826
	(0.177)	(26.905)	(0.176)	(25.756)
N Observations	645	645	645	645
R2 adjusted	0.965	0.965	0.947	0.947
Controls	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Region x Year FE	No	Yes	Yes	Yes

Notes:. ATET is defined as the percentage point increase in the completion rate of girls in the high-uptake districts/regions relative to the low-uptake districts/regions. Standard errors are in parentheses. Control variables are listed in Table 2. Statistical significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

The policy is having a positive impact on the educational attainment of both girls and boys, but this is not yet translating into full gender parity in completion rates. The short-term impact suggests that the policy alone does not erase all gendered constraints (for example social and cultural) to education but it has thus far contributed to reducing them. The results (see Fig. 5) further suggest that the FreeSHS has increased gender parity in enrolment across all regions, with girls enrolling at rates equal to or exceeding those of boys. While we do not claim a causal relationship between the policy and enrolment, these observations have important implications for efforts toward reducing gender inequality in Ghana.

Although girls' schooling tends to be more responsive to improvements in quality (Glick, 2008), reports of inadequate infrastructure (Adarkwah, 2022) and overcrowding (necessitating the double-track rotation system) hint towards an unchanged and even declining quality of schooling, at least for the period covered in this research (Dwomoh et al., 2022). Though the FreeSHS policy has a sufficient impact on driving education completion in our findings, it risks losing its effectiveness beyond education attainment if measures are not taken.

First, increased SHS completion rates should not be mistaken for education quality. While the quality of schooling was not independently tested as a significant driver of completion rates in our study, it remains critical and must be enhanced to improve labour market competitiveness and long-term gains beyond secondary education completion.

Secondly, the results show an increase in enrolment and completion rates following the policy, leading to a larger pool of highly educated youth. To fully realize the potential benefits of the policy's investment, the government must implement complementary policies that ensure that labour market and tertiary education opportunities are sufficient to match the new demand. If these complementary policies are not put in place, future benefits as an incentive (demand) to secondary education will decline over time, consequently leading to decreased preference for secondary education.

Lastly, Previous authors have argued that universal policies like FreeSHS can be regressive (Lewin, 2009; Gruijters et al., 2023). Ghana already spends more than the UNESCO standard of investing 4–6 percent of GDP to ensure quality education. Therefore, exploring ways to optimize expenditure efficiency is crucial. It will be prudent to identify the education bottlenecks in the system and reallocate expenditure to ensure efficiency (Osei Kwadwo and Konadu, 2020). In this regard, making the FreeSHS a targeted intervention other than universal may be an option. Targeting thus could include deprived districts or families with little resources. This could yield savings and generate requisite resources for education investment in districts that need it most. However, taking away the universality of the policy will most likely be politically

unpopular, given that public opinion generally favours the policy (Afrobarometer, 2020). The alternative is that additional funding sources should be pursued and invested in addressing the identified education sector gaps in deprived districts while the FreeSHS remains universal.

This paper sets the scene to understand the impact of Africa's relatively novel fee-free secondary education policies. Focusing on the FreeSHS in Ghana and its impact on girls' educational attainment paves the way for future research on the broader impact of such education policies. More disaggregated data is recommended to explore the micro-level (individual and household) mechanisms behind FreeSHS and educational attainment. Finally, while we find evidence of the positive impact of the FreeSHS policy, it is worthwhile for future studies to explore its long-term sustainability.

Declaration of Competing Interest

The authors declare that they have no known competing interests.

Appendix

Table A.1
Average household expenditure (GH¢) in education by level (2016/17)

Spending categories (Direct Costs)	Primary	JHS	SHS
School and registration fees	195.32	265.15	1139.17
Contribution to PTA	10.91	14.85	27.45
Uniform and sports clothes	33.99	38.05	33.32
Books and school supplies	68.59	105.38	137.81
Transportation to and from school	28.07	38.85	86.56
Food, board, and lodging	252.06	344.35	400.92
Expenses on extra classes	38.86	62.98	67.25
In-kind expenses	6.74	5.99	13.28
Other (cannot breakdown)	35.88	50.01	293.19
Total	670.42	925.61	**2198.95**

Note: This table displays the average household expenditure on pupils attending school in 2016/2017 by the level of education. Data Source: (Ghana Statistical Service, 2019).

Table A.2
Estimations with control variables as dependent variables

	Coefficient Estimates	SE	Mean
Pupil-teacher ratio at SHS1	0.815*	0.470	7.559
Female teachers (%)	-0.010*	0.006	0.187
Schools with Toilets (%)	-0.036	0.029	0.906
Sitting places per pupil	0.032	0.055	0.947
Writing places per pupil	-0.063	0.047	0.895
Books per pupil	-0.073	0.060	0.548
Rural Schools (%)	0.012	0.045	0.666
Nightlight	-0.018	0.108	1.079

Note: This table reports the coefficient estimates from the main equation using the control variables as dependent. Means: means of control variables in the pre-reform era. We hereby test whether the reforms could have impacted those control variables. SHS1 refers to first year of senior high school. Significance levels: ***p < 0.01, ** p < 0.05, * p < 0.1.

Table A.3
Baseline Estimates including control variables – Impact of FreeSHS on Completion Rates in Ghana

	Completion Rate - Girls			Completion Rate – Total		
	(1.1)	(1.2)	(1.3)	(2.1)	(2.2)	(2.3)
Panel A: Baseline Estimate						
ATET	0.140***	0.126***	0.154***	0.149***	0.139***	0.160***
	(0.046)	(0.035)	(0.046)	(0.043)	(0.034)	(0.043)
Pupil-trained teacher ratio SH1	-0.002		0.0002	-0.002		-0.001
	(−0.92)		(0.17)	(−1.18)		(−0.48)
Percentage female teachers	0.144		0.318	0.225		0.359
	(0.42)		(0.88)	(0.66)		(1.02)
Percentage toilets	0.0003		-0.031	0.011		-0.014
	(0.01)		(−1.02)	(0.40)		(−0.51)
Sitting places per pupil	-0.006		-0.007	-0.008		-0.008
	(−0.34)		(−0.44)	(−0.34)		(−0.36)
Writing places per pupil	-0.006		-0.015	-0.013		-0.022
	(−0.32)		(−0.74)	(−0.58)		(−0.92)
Books per pupil	-0.012		0.058*	-0.014		0.045
	(−0.41)		(2.41)	(−0.47)		(1.92)
Percentage of rural schools	-0.004		0.013	-0.011		0.004
	(−0.15)		(0.47)	(−0.40)		(0.15)
Nightlight (Local Development)	0.001		0.035	0.003		0.030
	(0.04)		(1.29)	(0.16)		(1.32)
Constant	0.499***	0.459***	0.475***	0.503***	0.475***	0.479***
	(0.084)	(0.012)	(0.087)	(0.080)	(0.012)	(0.082)
N Observations	793	1216	793	793	1216	793
Districts	194	250	194	194	250	194
R2	0.928	0.922	0.922	0.908	0.903	0.903

(*continued on next page*)

Table A.3 (*continued*)

	Completion Rate - Girls			Completion Rate – Total		
	(1.1)	(1.2)	(1.3)	(2.1)	(2.2)	(2.3)
R2 adjusted	0.902	0.901	0.895	0.876	0.877	0.870
Controls	Yes	No	Yes	Yes	No	Yes
District FE	Yes	Yes	No	Yes	Yes	No
Year FE	Yes	Yes	No	Yes	Yes	No
Mean	0.707			0.697		

Means refer to pre-FreeSHS means in the treatment districts and regions. ATET is defined as the percentage point increase in the completion rate (of girls) in the high-uptake districts relative to the low-uptake districts and based on Eq. (1). Standard errors are clustered at the district level and in parentheses. Significance levels: ***p < 0.01, ** p < 0.05, * p < 0.1.

Table A.4
Sensitivity Checks: Alternative Treatment thresholds and policy uptake

Dependent variable: Competition rate - total								
	Treatment (25th/75th)		Uptake rate with teenaged population		Treatment Threshold at the Regional level		Region-Level Treatment & Outcomes	
	(1.1)	(1.2)	(2.1)	(2.2)	(2.3)	(2.4)	(3.1)	(3.2)
Panel B: Sensitivity to Treatment Thresholds								
	0.217***	0.228***						
	(0.055)	(0.077)						
Panel C: Sensitivity to the policy uptake measurement approach								
			0.135***	0.140***				
			(0.034)	(0.043)				
					0.152***	0.171***		
					(0.033)	(0.042)		
Panel D: Sensitivity to Unit of Analysis								
							0.146***	0.125***
							(0.038)	(0.035)
Constant	0.506***	0.561***	0.475***	0.501***	0.488***	0.549***	0.461***	0.578*
	(0.020)	(0.097)	(0.012)	(0.080)	(0.012)	(0.076)	(0.009)	(0.267)
N Obs.	611	377	1216	793	1217	777	60	60
Districts	130	98	250	194	249	188	10	10
R2	0.926	0.930	0.903	0.908	0.905	0.908	0.946	0.956
R2 adjusted	0.905	0.900	0.877	0.875	0.880	0.876	0.928	0.928
Controls	No	Yes	No	Yes	No	Yes	No	Yes
District FE	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	No	No	No	No	No	No	Yes	Yes
Mean	0.861		0.709		0.595		0.588	

Notes: Means refer to pre-FreeSHS means in the treatment districts and regions. ATET is defined as the percentage point increase in the completion rate of girls in the high-uptake districts/regions relative to the low-uptake districts/regions. Panel B columns (1.1) and (1.2) estimations include district and time-fixed effects, and errors are clustered at the district level. Treated districts are over the 75th percentile, and comparison districts are below the 25th percentile of the uptake ratio, while in-between thresholds are excluded. The treatment level in panel C columns (2.1) and (2.2) is defined by the uptake rate of the teenaged population per district (number of pupils that enrolled under the FreeSHS policy divided by the teenaged (15−19) population of the corresponding district), whereas the treatment in panel C column (2.3) and (2.4) is based on the mean FreeSHS uptake rate per region (number of pupils that enrolled under the FreeSHS policy), divided by the population of the corresponding region and split into above or below the median value. Standard errors in Panels B and C are clustered at the district level. Standard errors from results in Panel D columns (3.1) and (3.2) are clustered at the regional level. Control variables are listed in Table 2. The same controls are used for regional-level estimates in Panel D. Standard errors are in parentheses. Statistical significance: *** p < 0.01, ** p < 0.05, * p < 0.1.

Table A.5
Sensitivity checks: alternative treatment thresholds and policy uptake

Dependant variable: Competition rate – total				
	Trend: Region × Year (1)	Trend: District x Year (2)	Placebo: Policy introduced in 2016/2017 (3)	Placebo: Policy introduced in 2015/2016 (4)
Panel E: Other sensitivity checks				
	0.142***	0.163***		
	(0.042)	(0.042)		
Panel F: Placebo Checks				
			0.027	
			(0.026)	
				0.024
				(0.041)
Constant	32.214*	0.191*	0.511***	0.514***
	(17.173)	(0.110)	(0.074)	(0.074)
Observations	793	793	645	645
Districts	194	194	174	174
R2	0.910	0.439	0.925	0.925
R2 adjusted	0.878	0.420	0.895	0.895
Controls	Yes	Yes	Yes	Yes
District FE	Yes	No	Yes	Yes
Year FE	Yes	No	Yes	Yes
Region FE	No	Yes	No	No
District x Year	No	Yes	No	No
Region × Year	Yes	No	No	No
Mean	0.697	0.697	0.656	0.640

Notes: Means refer to pre-FreeSHS means in the treatment districts and regions. ATET is defined as the percentage point increase in the completion rate of girls in the high-uptake districts/regions relative to the low-uptake districts/regions. Standard errors are in parentheses. Control variables are listed in Table 2. Statistical significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.6
Policy uptake score by district in baseline estimates

District COMPARISON GROUP	Region	Policy Uptake Score
Kpone Katamanso	Greater Accra	0.293
Wasa Amenfi Central	Western	0.481
Ga East Municipal	Greater Accra	0.500
Awutu Senya East	Central	0.537
Adentan Municipal	Greater Accra	0.581
North Gonja	Northern	0.599
Central Gonja	Northern	0.640
Garu	Upper East	0.651
Ga West Municipal	Greater Accra	0.698
Krachi Nchumuru	Volta	0.786
Wasa Amenfi East	Western	0.835
Ashaiman Municipal	Greater Accra	0.842
Wa West	Upper West	0.890
Wassa East	Western	0.913
Upper Denkyira West	Central	0.933
Suame	Ashanti	0.951
Ga Central Municipal	Greater Accra	0.961
Aowin	Western	1.005
Nanumba North	Northern	1.009
Kpandai	Northern	1.038
Ablekuma North	Greater Accra	1.081
Wa East	Upper West	1.084
Ablekuma Central	Greater Accra	1.092
Bodi	Western	1.115
Mion	Northern	1.116
Ningo Prampram	Greater Accra	1.126
Gomoa East	Central	1.173
Adaklu	Volta	1.232
Effia-Kwesimintsim	Western	1.254
Amansie South	Ashanti	1.259
Bia West	Western	1.266
Mamprugu Moaduri	Northern	1.308
Nkwanta North	Volta	1.316
Nanumba South	Northern	1.324
Assin Fosu	Central	1.342
Tema West	Greater Accra	1.360
Sene East	Brong Ahafo	1.360
Kwahu Afram Plains South	Eastern	1.365
Banda	Brong Ahafo	1.388
Pru East	Brong Ahafo	1.399
Krowor	Greater Accra	1.399
Afigya-Kwabere	Ashanti	1.437
Bosome Freho	Ashanti	1.444
Sissala West	Upper West	1.448
Kwahu Afram Plains North	Eastern	1.481
Kintampo South	Brong Ahafo	1.482
Sene West	Brong Ahafo	1.504
Tatale Sanguli	Northern	1.543
Ga North	Greater Accra	1.546
Binduri	Upper East	1.591
Chereponi	Northern	1.597
Gushiegu	Northern	1.628
Juaboso	Western	1.647
Sawla-Tuna-Kalba	Northern	1.652
Karaga	Northern	1.699
Prestea Huni Valley	Western	1.704
Ledzokuku	Greater Accra	1.716
Ga South Municipal	Greater Accra	1.742
Bolgatanga Municipal	Upper East	1.742
Shama	Western	1.810
Gomoa Central	Central	1.823
Twifo Ati-Morkwa	Central	1.841
Ayensuano	Eastern	1.867
Saboba	Northern	1.890
Efutu Municipal	Central	1.925
Obuasi East	Ashanti	1.945
Accra Metropolitan	Greater Accra	1.952
Atwima-Kwanwoma	Ashanti	1.995
Kintampo North Municipal	Brong Ahafo	2.027
Bibiani-Anhwiaso-Bekwai	Western	2.035

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Table A.6 (*continued*)

District	Region	Policy Uptake Score
COMPARISON GROUP		
Tolon	Northern	2.100
Wasa Amenfi West	Western	2.126
Sefwi Akontombra	Western	2.132
Ablekuma West	Greater Accra	2.173
Amansie Central	Ashanti	2.182
Adansi Asokwa	Ashanti	2.198
Asunafo North Municipal	Brong Ahafo	2.199
Techiman Municipal	Brong Ahafo	2.202
Ketu South	Volta	2.221
Akatsi South	Volta	2.229
Akatsi North	Volta	2.234
Mpohor	Western	2.253
Ahafo Ano South East	Ashanti	2.263
Bole	Northern	2.269
Dormaa West	Brong Ahafo	2.279
Amansie West	Ashanti	2.284
East Mamprusi	Northern	2.290
Tarkwa-Nsuaem Municipal	Western	2.296
Kwahu West Municipal	Eastern	2.345
Krachi East	Volta	2.365
Bawku West	Upper East	2.465
Atebubu-Amantin	Brong Ahafo	2.491
Atiwa East	Eastern	2.520
West Mamprusi	Northern	2.531
Okaikwai North	Greater Accra	2.573
Pru West	Brong Ahafo	2.606
Akyemansa	Eastern	2.641
Atiwa West	Eastern	2.641
Nsawam Adoagyiri	Eastern	2.663
Jomoro	Western	2.694
La Nkwantanang Madina Municipal	Greater Accra	2.705
Ejura Sekyidomase	Ashanti	2.712
Awutu-Senya	Central	2.716
Upper Manya Krobo	Eastern	2.748
Jaman South	Brong Ahafo	2.816
Zabzugu	Northern	2.856
Kumbungu	Northern	2.858
Birim North	Eastern	2.890
Yilo Krobo	Eastern	2.908
Akrofuom	Ashanti	2.948
Yendi Municipal	Northern	2.992
Nkoranza South	Brong Ahafo	3.005
Asunafo South	Brong Ahafo	3.023
Sefwi-Wiawso	Western	3.026
Talensi	Upper East	3.034
Daffiama-Bussie-Issa	Upper West	3.060
Asokwa	Ashanti	3.070
Sagnerigu	Northern	3.137
Ada West	Greater Accra	3.145
Adansi South	Ashanti	3.149
Tempane	Upper East	3.151
Nkwanta South	Volta	3.182
Oforikrom	Ashanti	3.217
Ada East	Greater Accra	3.219
Ahafo Ano South West	Ashanti	3.249
Agotime Ziope	Volta	3.261
TREATMENT GROUP		
Nkoranza North	Brong Ahafo	3.269
Upper West Akim	Eastern	3.299
Asutifi North	Brong Ahafo	3.368
Upper Denkyira East Municipal	Central	3.491
Suaman	Western	3.496
East Gonja	Northern	3.512
Afadzato South	Volta	3.529
Wa Municipal	Upper West	3.577
Biakoye	Volta	3.584
Tamale Metropolitan	Northern	3.590
Atwima Mponua	Ashanti	3.595
Shai-Osudoku	Greater Accra	3.640
Twifo Hemang-Lower Denkyira	Central	3.643
Ellembele	Western	3.659
Achiase	Eastern	3.707
Sunyani East	Brong Ahafo	3.791
Jirapa	Upper West	3.814
Kwaebibirem	Eastern	3.815

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Table A.6 (*continued*)

District COMPARISON GROUP	Region	Policy Uptake Score
Ahanta West	Western	3.847
Ayawaso North	Greater Accra	3.884
Tain	Brong Ahafo	3.889
Dormaa Central Municipal	Brong Ahafo	3.907
Bawku	Upper East	3.911
Wenchi Municipal	Brong Ahafo	3.922
Nandom	Upper West	3.961
Nzema East Municipal	Western	3.972
Dormaa East	Brong Ahafo	3.999
Asene Manso	Eastern	4.005
North Tongu	Volta	4.021
Bongo	Upper East	4.103
Bunkpurugu-Nakpanduri	Northern	4.104
Tema Metropolitan	Greater Accra	4.108
Fanteakwa North	Eastern	4.110
Sissala East	Upper West	4.152
Krachi West	Volta	4.160
Lambussie-Karni	Upper West	4.186
Asikuma-Odoben-Brakwa	Central	4.208
Nadowli-Kaleo	Upper West	4.223
West Akim Municipal	Eastern	4.252
Central Tongu	Volta	4.255
Nabdam	Upper East	4.263
Komenda-Edina-Eguafo-Abirem Municipal	Central	4.288
Obuasi	Ashanti	4.348
Jaman North	Brong Ahafo	4.417
Sunyani West	Brong Ahafo	4.430
Asante-Akim South	Ashanti	4.467
Ketu North	Volta	4.474
Bosomtwe	Ashanti	4.726
Offinso North	Ashanti	4.738
Kadjebi	Volta	4.816
Anloga	Volta	4.817
Asokore Mampong Municipal	Ashanti	4.871
South Tongu	Volta	4.902
Atwima Nwabiagya North	Ashanti	4.969
Assin South	Central	4.974
Kwabre East	Ashanti	4.997
Denkyembour	Eastern	5.040
Agona West Municipal	Central	5.066
West Gonja	Northern	5.105
Afigya Kwabre North	Ashanti	5.115
Atwima Nwabiagya South	Ashanti	5.129
Tano North	Brong Ahafo	5.241
Berekum East	Brong Ahafo	5.252
Kassena-Nankana West	Upper East	5.292
Techiman North	Brong Ahafo	5.309
Jasikan	Volta	5.367
Ajumako-Enyan-Essiam	Central	5.428
Asutifi South	Brong Ahafo	5.498
Old Tafo	Ashanti	5.571
Tano South	Brong Ahafo	5.618
Berekum West	Brong Ahafo	5.647
Kwadaso	Ashanti	5.671
Assin North Municipal	Central	5.671
Hohoe Municipal	Volta	5.746
Kassena-Nankana Municipal	Upper East	5.788
Suhum Municipal	Eastern	5.834
Lawra	Upper West	5.849
Mfantseman Municipal	Central	5.855
Gomoa West	Central	5.982
Offinso South	Ashanti	6.005
Abura-Asebu-Kwamankese	Central	6.023
Ahafo Ano North	Ashanti	6.064
Ekumfi	Central	6.160
Savelugu	Northern	6.237
Juaben	Ashanti	6.260
Ho Municipal	Volta	6.427
Ejisu	Ashanti	6.453
La Dade-Kotopon Municipal	Greater Accra	6.516
Builsa South	Upper East	6.614
Abuakwa North	Eastern	6.707
Sekyere Central	Ashanti	6.956
Asante-Akim Central Municipal	Ashanti	7.032
Akwapim South	Eastern	7.612

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Table A.6 (*continued*)

District COMPARISON GROUP	Region	Policy Uptake Score
New Juaben South	Eastern	7.876
Kpando	Volta	7.897
Birim South	Eastern	7.946
South Dayi	Volta	8.097
Okere	Eastern	8.174
Lower Manya Krobo	Eastern	8.186
Fanteakwa South	Eastern	8.277
Bekwai Municipal	Ashanti	8.353
Mampong Municipal	Ashanti	8.456
Kwahu South	Eastern	8.618
Builsa North	Upper East	8.992
North Dayi	Volta	9.178
Ho West	Volta	9.279
Agona East	Central	9.350
Sekyere East	Ashanti	9.362
Asante-Akim North	Ashanti	9.443
Abuakwa South	Eastern	9.519
Birim Central Municipal	Eastern	9.607
Asuogyaman	Eastern	9.641
Kumasi Metropolitan	Ashanti	9.798
Sekondi-Takoradi Metropolitan	Western	9.909
Adansi North	Ashanti	9.951
Korle Klottey	Greater Accra	10.253
Kwahu East	Eastern	10.357
Bolgatanga East	Upper East	11.609
Sekyere Kumawu	Ashanti	11.672
Cape Coast Metropolitan	Central	12.035
Keta	Volta	12.612
New Juaben North	Eastern	12.751
Sekyere South	Ashanti	13.366
Akwapim North	Eastern	22.223

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