Gendered geographical inequalities in junior high school enrollment

Do infrastructure, human, and financial resources matter?

David Ansong and Chesworth Brittney Renwick
School of Social Work, University of North Carolina, Chapel Hill, North Carolina, USA
Moses Okumu
Factor-Inwentash Faculty of Social Work, University of Toronto, Toronto, Canada
Eric Ansong
University of East London, London, UK, and
Cedrick Joseph Wabwire
Faculty of Social Sciences, Uganda Christian University, Mukono, Uganda

Abstract

Purpose – The purpose of this paper is to examine the spatial patterns of gender inequality in junior high school enrollment and the educational resource investments associated with the spatial trends.

Design/methodology/approach – The paper uses data on 170 districts in Ghana and hot spot analysis based on the Getis-Ord Gi statistic, linear regression, and geographically weighted regression to assess spatial variability in gender parity in junior high school enrollment and its association with resource allocation.

Findings – The results reveal rural-urban and north-south variability in gender parity. Results show that educational resources contribute to gender parity. At the national level, educational expenditure, and the number of classrooms, teachers, and available writing places have the strongest positive associations with girls' enrollment. These relationships are spatially moderated, such that predominantly rural and Northern districts experience the most substantial benefits of educational investments.

Practical implications – The findings show that strategic allocation of infrastructure, financial, and human resources through local governments holds promise for a more impactful and sustainable educational development of all children, regardless of gender. Besides seeking solutions that address the lack of resources at the national level, there is a need for locally tailored efforts to remove the barriers to equitable distribution of educational resources across gender and socioeconomic groups.

Originality/value – This paper's use of advanced spatial analysis techniques allows for in-depth examination of gender parity and investments in educational resources, and highlights the spatial nuances in how such investments predict gender disparities in junior high school enrollment. The findings speak to the need for targeted and localized efforts to address gender and geographical disparities in educational opportunities.

Keywords Ghana, Economic resources, Sub-Saharan Africa, Gender parity, Geographical disparities, School enrolment, Geographical inequalities

Paper type Research paper

1. Introduction

Education fosters economic growth for individuals, families, communities, and nations, yet, many young people lack the opportunity to access basic education. In this paper, we examine how the allocation of three types of educational resources (infrastructural resources, human resources, and financial resources) helps shape gender parity in school enrollment. Globally, about 63.2 million lower secondary school-age children were not enrolled in school (out-of-school) in 2012 (UNICEF, 2015). The out-of-school rate is particularly high in developing regions such as Sub-Saharan Africa, where 30 million children are currently not enrolled in school (UNESCO Institute for Statistics and UNICEF, 2015).

Journal of Economic Studies
Vol. 45 No. 2, 2018
pp. 1-15

0144-3585
DOI 10.1108/JES-10-2016-0211

The current study focuses on the case of Ghana, where the estimated net enrollment rate for lower secondary was 55 percent in 2015 (World Bank, 2018).

Globally, the rate of out-of-school children has reduced due to concerted efforts by governments and the international community toward meeting the Millenium Development Goals (i.e. MDG 2)[1]. For instance, between the period of 2000 and 2012 alone, the out-of-school rates for children at both the primary and lower secondary levels decreased by 50 percent. However, this reduction has not been equal for both genders, and across geographic regions. In 2015, the UNESCO Institute for Statistics and the United Nations Children's Fund (UNICEF) estimated that more than half of the 58 million out-of-school children worldwide were girls. While Ghana has made significant progress in promoting access to education, gender disparities in educational opportunities remain visible, particularly at the secondary and tertiary education levels (Senadza, 2012). At the junior high school level, the gender parity index (GPI), which represents the ratio of girls' gross enrollment to boys' gross enrollment, has improved from 0.88 in 2004 to 0.96 in 2014. Notwithstanding the 9 percentage-point improvements in GPI over ten years, the current 0.96 ratio means that only 96 girls are enrolled in school for every 100 boys enrolled. Therefore, it is expected that the relatively lower rate of girl child enrollment at the junior high level will continue to be manifested at the senior high school level and subsequently tertiary level of education.

In Ghana and many other developing countries such as Zambia, Cameroon, and Rwanda, where educational resources are limited, and the rural-to-urban-poverty ratio is about 3:1, geographical regions with greater economic stability tend to receive a higher priority in educational investment. For example, in 2008, among primary school-age children in Ghana, 40 percent of the poorest children were not enrolled in school compared to 12.1 percent of the richest children (UNESCO, 2012a). Similarly, 29.5 percent of children in rural areas were out of school compared to 18.4 percent of children in urban areas (UNESCO, 2012a). Despite the increases in school enrollment, at both the urban and rural areas, the GPI of 0.91 for deprived districts still lags behind the national average of 0.96 (Kumi-Yeboah, 2015). Thus, there are many girls without access to education, many of whom live in deprived areas.

In fact, available evidence suggests that geographical disparities exacerbate these gender differences, with rural and poorer geographic areas demonstrating even higher incidences of gender inequality in school enrollment (Senadza, 2012). The geographically moderated gender gaps in education are more pronounced in developing countries than developed countries (Jayachandran, 2015). For instance, in Ghana, research shows that girls from geographically deprived areas have a disproportionally higher risk of dropping out of junior high school than boys (Atuahene and Owusu-Ansah, 2013).

Although prior studies have examined the gender disparities in educational access, several important questions remain unanswered. For instance, despite indications of variability in the balance of parity between girls' and boys' enrollment (Senadza, 2012), the literature is scant on the variations in rural areas. Also, the extent to which factors that account for these differences vary spatially is not clear. The current study uses advanced data analytic approaches to explore the role of educational resources on gender parity as suggested by Senadza's (2012) broader study of the spatio-gender dynamics of educational attainment in Ghana. First, the present study uses the Getis-Ord Gi technique to identify the spatial clusters in the gender disparities in junior high school enrollment. Second, this study examines the extent to which the allocation of educational resource investments (infrastructural resources, human resources, and financial resources) relate to gender differences in school enrollment. Third, the present study uses geographically weighted regression to assess the extent to which the relationship between gender parity and educational investments and resources vary from one geographical area to another.

This modeling approach addresses the conceptual issues around the non-stationarity of correlates of educational outcomes.

Findings from our study can help decision makers develop better policy responses to the gender disparity challenges and help educational stakeholders to develop tailored interventions appropriate for different contexts. For practice and research purposes, it is equally essential to understand how resource distribution are associated with gender differences in varied geographical contexts because the primary predictive factors at the national level are often different than those at the local level (Camfed Ghana, 2012). Thus, it is imperative that we continue to pursue a greater understanding of the infrastructure, human, and financial resource barriers as well as the facilitators of girls' educational opportunities and outcomes in Ghana and other developing countries across the world.

2. Barriers to education

Despite significant improvement in enhancing educational opportunities for the girl child, the gender gap in enrollment persists in some communities because of the many barriers that continue to hinder girls from obtaining basic education. A 2012 UNESCO report indicated that majority of countries in Sub-Saharan Africa failed to achieve gender parity in school enrollment as required by MDG 2. Hence, addressing the gender parity in basic education enrollment remains a major hurdle in the attainment of educational equality (Sustainable Development Goals (SDG 4))[2] in most Sub-Saharan African countries.

This study uses conflict theory with emphasis on resource allocation as the theoretical lens to assess the gendered educational inequalities in Ghana. Conflict theory asserts that social space is an arena where individuals and groups compete with one another in accessing limited and valued resources. However, since societies are stratified, dominant groups have greater access to available resources (Semel, 2010). The propositions are that in areas where educational resources are limited, those with more power and privilege tend to have greater access to these resources compared to those with less power and privilege. In most resource-constrained areas, children, especially girls who live in rural areas, with higher poverty rates are more likely to have lower school enrollment rates compared to boys or more economically advantaged children who have greater access to educational resources. Consequently, girls, especially those from economically disadvantaged backgrounds, are disadvantaged; they have limited access to educational opportunities and are at risk of growing into adults with fewer skills to offer in an increasingly competitive job market.

In many ways, the dynamics around the allocation of scarce resources that drive conflict at the intrahousehold level play out similarly at the community and national levels. In most resource-limited countries, large cities and urban centers tend to have the political and economic advantage and thus have a greater share of limited available resources. As Gardent and Reeves (2009) aptly described, "resource allocation issues can be particularly challenging for rural communities, where resources are not enough to meet all needs, and fewer alternatives exist to resolve conflicts between competing needs" (p. 166). More central governments in developing countries are adopting a decentralized system of governance to minimize resource allocation "conflicts" and optimize opportunities for direct allocation of resources to social programs such as education at the local communities (Shuqair and Abdel-Aziz, 2015).

In Ghana's case, starting in the 1990s, a constitutional mandate (1992 Constitution, Article 241) and legislative support (Local Government Act of 1993) ushered in a decentralized system of governance where administrative responsibilities shifted to Metropolitan, Municipal, and District Assemblies (MMDAs). Currently, the MMDAs and District Directorates of Education have the responsibility for the allocation of resources for school buildings, furniture, and other infrastructural needs based on each district's priorities (Ansong et al., 2015; Maikish and Gershberg, 2008). The capitation grant scheme,

a per capita allocation of financial resources for district assemblies to pay for school fees, is one of the major strategic social interventions implemented to achieve the MDG of eliminating gender disparity in primary and junior secondary education (MDG 3). This crucial allocation of financial resources to basic schools is administered at the district level. However, the question of how the distribution of resources at the district level might be linked to improved educational outcomes such as gender parity in school enrollment is still unknown.

In this study, we focus on three key categories of resources (infrastructure, human, and financial) based on a framework of resource typology used in a forerunner study by Shuqair and Abdel-Aziz (2015) to examine resource allocation at the district level in Ghana. Our focus on resource allocation typologies does not discount the role that household factors such as family structure, income, employment, and traditional cultural values and norms play in driving gendered parity in education (Afridi et al., 2016; Atuahene and Owusu-Ansah, 2013; Dolan et al., 2014; Mabefam and Ohene-Konadu, 2013; UNESCO, 2012a).

Rather the current study builds on the work around education financing that demonstrate that educational expenditures, distribution, and availability of well-trained teachers, and small class sizes are associated with children's educational outcomes (Ansong et al., 2015; Bressoux et al., 2009; UNESCO, 2012a). Although a significant amount of development and education resources are funneled through the District Assemblies, much remains to be learned about how the unequal distribution of education resources at the district level relate to disparities in educational outcomes. Relatively fewer empirical studies in Sub-Saharan Africa have focused on the association between resource distribution at the district level and gender parity from a spatial perspective.

In light of the urgency to eliminate gender disparities in education as stipulated in the SDG (SDG 4), this study seeks to examine the extent to which gender differences in junior high school enrollment is spatially moderated. The study also examines how the allocation of different educational resources (i.e. infrastructural, human, and financial resources) relate differentially to gender parity in various geographical areas.

3. Methods

3.1 Data and measures

This study used data from three sources. The first is Ghana's 2010 National Population and Housing Census data collected by the Ghana Statistical Service and aggregated at the district level. The census enumerators used structured questionnaires to gather data on household characteristics including demographics, social, and economic characteristics. Additional data for the study were obtained from Ghana's 2012 district assembly composite budget and the 2012 round of the annual basic school census administered by Ghana's Ministry of Education.

The outcome variable, GPI, was gathered in 2012 as part of the basic school census and is defined as the ratio of girls' gross junior high school enrollment rate to boys' gross junior high school enrollment. When the GPI value is less than 1, there is inequality in favor of males, and when it is greater than 1, the inequality favors females. A value of 1 denotes gender equality.

Six indicators of educational resources, all expressed as per capita figures to take into account the population size of the districts, were examined: one financial resource indicator (educational expenditure per capita), one human resource indicator (number of teachers per capita), and four indicators of infrastructural resources (classrooms per capita, school seating places per capita, school writing places per capita, and number of public schools per capita).

Education expenditure per capita was obtained from the district assembly composite budget, a continuous variable measured as the amount of US dollars each district spends on education per person. Each district prioritizes its education expenditure on a wide range of needs including construction, renovation, and rehabilitation of school building, district education offices, and teacher housing; scholarships and bursaries to needy

students but brilliant students; school feeding programs; support for science, technology, and mathematics education workshops for girls; official celebrations and awards (best student and teacher awards); mock examination fees; and monitoring and evaluation activities. Teacher per capita is a continuous variable defined as the total number of teachers per person in a district. Classroom per capita is another continuous variable expressed as the total number of classrooms per person. School furniture per capita is a continuous variable operationalized as the number of school desks per person. The number of public schools per capita is a count of junior high schools in each district per person. All infrastructural resource data are from the 2012 edition of the annual basic school census data.

3.2 Analysis strategy

3.2.1 Multiple imputations. Two variables had missing data: GPI (0.59 percent) and education expenditure per capita (2.35 percent). We followed Little and Rubin's (2002) recommendation to use multiple imputations when variables have less than 20 percent missing data. Multivariate imputation methods were used to create 20 imputed data sets, thus reducing the potential for bias in the parameter estimates of statistical models (Saunders et al., 2006). All variables used in the statistical models were included in the imputation model.

3.2.2 Spatial analysis. The Local Moran's I tool in ArcGIS 10.2.1 (ESRI, 2014) was used to analyze the spatial patterns in the GPI values. This analytic technique generates a z-score to assess whether the gender parity pattern expressed is clustered, dispersed, or random. If the z-score is statistically significant, then a positive Moran's I value would suggest the existence of spatial clustering and a negative value would suggest spatial dispersion. The local Moran statistic was specified as follows:

$$I = \frac{n}{S_0} \frac{\sum_{i=1}^{n}\sum_{j=1}^{n} w_{ij}(x_i - \bar{x})(x_j - \bar{x})}{\sum_{i=1}^{n}(x_i - \bar{x})^2} \quad (1)$$

where I denotes the Moran's I index; x_i, x_j are the values of GPI in spatial unit i and j; x is the mean of the variable for all districts; n represents the spatial weight between the ith and jth observations; and S_0 accounts for the sum of all w_{ij}.

To complement and validate the Moran's I spatial analysis, we used the Getis-Ord Gi* statistic tool in ArcGIS to conduct hot spots analysis to uncover and map out statistically significant spatial patterns in the distribution of the GPI. This analysis examines whether certain areas of the country have statistically significantly high or low gender parity values. We conceptualized the spatial relationship with the contiguity constraints option in ArcMap to reflect the possibility of neighboring districts affecting each other.

3.2.3 Linear regression. The study used linear regression with robust standard errors to address the question of how three key types of education resources are associated with gender parity in junior high school enrollment. We modeled the "main effects" of educational expenditure, the number of teachers, classrooms, and schools as well as available seating and writing places, and the type of district (ordinary, municipal, or metropolitan district). Bivariate tests showed that all six educational resource indicators were significantly associated with GPI at the 0.05 significance level. We also interacted district type with expenditure and schools to account for situations where the extent of the relationship between expenditure and schools and GPI depends on the kind of district. Further justification for the interaction term is based on results of bivariate ANOVA tests that confirmed that out of the six independent variables, expenditure ($F = 4.18$, $p<0.05$) and schools ($F = 8.02$, $p<0.001$) varied statistically significantly by district type.

3.2.4 Geographically weighted regression. We used the GWR4 software (Fotheringham et al., 2002) to conduct geographically weighted regression to examine whether the relationships between the three categories of educational resources and gender parity vary by locality. Because the outcome variable is a continuous variable, we fitted and specified a Gaussian model as follows:

$$Y_i = b_0(u_i, v_i) + \sum_k b_k(u_i, v_i) x_{ik} + e_i \quad (2)$$

where (u_i, v_i) represents the coordinates (latitude and longitude) of the ith point in space, $\beta_0(u_i, v_i)$ is the intercept for location i, and $\beta_k(u_i, v_i)$ represents vector of the local parameter estimate for predictor x_k at location i, and ε_i denotes the random normally distributed error term at point i. The recommended difference criterion value of W|2| was used as the cutoff to identify relationships that varied spatially. The local coefficients generated from the geographically weighted regression were mapped out using ArcGIS 10.2.1 (ESRI, 2014).

4. Results

4.1 Sample description

Table I presents the summary statistics of the 170 districts included in the study. The GPI values ranged from 0.62 to 1.24. One-sixth of the districts had GPI values greater than 1, meaning 15 percent of the districts had gender disparities in favor of females. There was an average of 67 teachers per 1,000 people (average number of teachers per capita ¼ 0.067, SD ¼ 0.014), 29 classrooms per 1,000 people (average number of teachers per capita ¼ 0.029, SD ¼ 0.006), and 9 junior high schools per 1,000 people (average number of schools per capita ¼ 0.009, SD ¼ 0.002). The ordinary districts and municipal districts (M ¼ 0.006, SD ¼ 0.001) had statistically significantly more schools per capita than the metropolitan districts (M ¼ 0.006, SD ¼ 0.001): F ¼ 8.02, p<0.001. On average, the number of available seating (M ¼ 0.856, SD ¼ 0.205) and writing places (M ¼ 0.842, SD ¼ 0.201) were less than 1, which means some students had to share school furniture. It is worth pointing out that there were more available seating places per capita in ordinary districts than in the municipal and

Variables	Overall sample Mean (SD)	Ordinary district Mean(SD)	Municipal district Mean(SD)	Metropolitan districts Mean(SD)	F statistic for group differences
Gender parity index (n ¼ 169)	0.919 (0.087)	0.918 (0.094)	0.929 (0.059)	0.905 (0.029)	0.29
Infrastructural resource					
Schools (n ¼ 170)	0.009 (0.002)	0.009 (0.002)	0.009 (0.002)	0.006 (0.001)	8.02***
Classroom (n ¼ 170)	0.029 (0.006)	0.029 (0.006)	0.029 (0.005)	0.026 (0.005)	1.03
Seating places (n ¼ 170)	0.856 (0.205)	0.864 (0.210)	0.832 (0.195)	0.848 (0.087)	0.30
Writing places (n ¼ 170)	0.842 (0.201)	0.846 (0.205)	0.824 (0.199)	0.863 (0.098)	0.18
Human resource					
Teachers (n ¼ 170)	0.067 (0.015)	0.065 (0.016)	0.067 (0.012)	0.063 (0.008)	0.32
Financial resource					
Education expenditure (n ¼ 157)	13.055 (20.791) N ¼ 170	13.178 (20.044) (n ¼ 133)	14.674 (25.812) (n ¼ 30)	3.215 (2.764) (n ¼ 6)	4.18*

Table I.
Summary statistics

Notes: All variables are expressed as per capita. *p<0.05; ***p<0.001

metropolitan areas, although the difference was not statistically significant (F ¼ 0.30, p ¼ 0.744). Regarding educational expenditure, the typical district invested $13.06 (SD ¼ 20.79) per person. On a per capita basis, ordinary districts (M ¼ 13.178, SD ¼ 20.044) and municipal districts (M ¼ 14.674, SD ¼ 25.812) spent more per student than metropolitan districts (M ¼ 3.215, SD ¼ 2.764) and the difference was statistically significant (F ¼ 4.18, p0.05). Majority of the districts were classified as ordinary districts (n ¼ 133, 78.70 percent), followed by municipal districts (n ¼ 30; 17.75 percent). Only six districts (3.55 percent) were metropolitan districts.

4.2 Spatial distribution of gender parity

Figure 1 illustrates the spatial distribution of the country's GPI. In general, there are more districts in the North with GPI values greater than 1 compared to other parts of the country. The Northern region of the country, which is predominantly rural, has the most districts with the highest and lowest gender parity values. This suggests that rural districts are not necessarily more susceptible to lower gender parity values than urban areas.

The statistically significant positive Global Moran's I statistic (Moran's Index ¼ 0.531, z-score ¼ 13.665, p0.001) suggests that the distribution of high GPI values and low GPI values in the data set is spatially clustered. In other words, there are clusters of districts with high GPI and clusters of districts with low GPI values. The illustration in Figure 2 confirms that traces of spatial clustering exist, particularly in the Northern sector, where the cold and hot spots are confined. The dominance of the yellow shades in the Southern sector of the map is evidence that the districts of the South, which are comparatively less rural, do not have clusters of extremely low nor high GPI values.

4.3 Educational resources and gender parity at the national level

The results from the linear regression with robust standard errors show the extent to which educational resources are associated with GPI at the national level. The global results show that nationally, two out of the four infrastructural resources were statistically positively associated with gender parity. For every 1 percent increase in the number of classrooms per capita, the predicted GPI is expected to increase marginally by 1.566 percentage points (i.e. b ¼ 1.565,

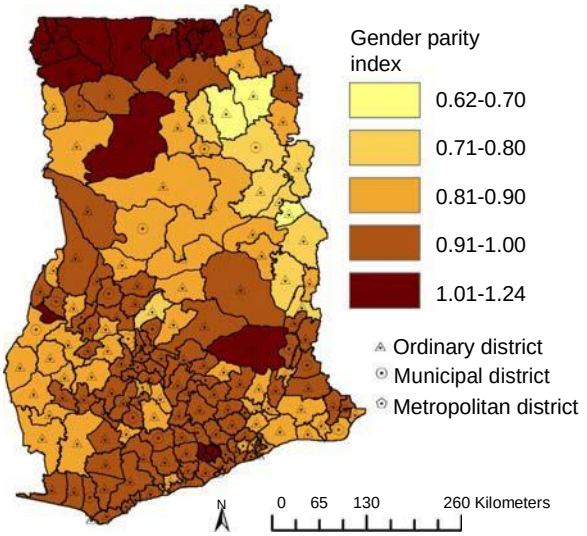


Figure 1.
Spatial distribution of gender parity index for junior high school enrollment at the district level

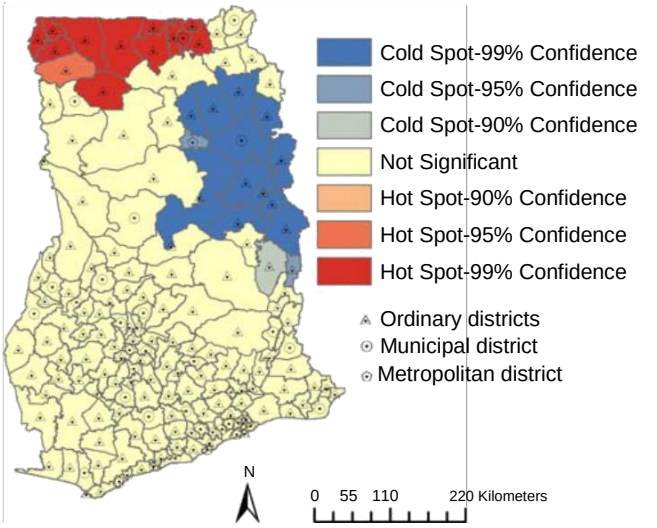


Figure 2.
Statistically significant clusters of high and low gender parity values for junior high school enrollment

SE ¼ 1.501, p<0.01). Unlike the number of available seating (b ¼ 0.007, SE ¼ 0.012, p ¼ 0.561), available writing places (b ¼ 0.118, SE ¼ 0.014, p<0.001) were positively associated with gender parity. Thus, a one-unit increase in the number of writing places per capita is associated with a 0.118 percentage point increase in the predicted gender parity. The regression of GPI on human capital (teachers per capita) revealed a statistically significant positive relationship (b ¼ 0.479, SE ¼ 0.126, p<0.001). Thus, when the number of teachers per capita goes up by one point, the predicted gender parity goes up by 0.479 percentage points. The global results also reveal that GPI goes up by 0.01 percentage points for every additional $1 invested in education. Overall, the predicted GPI is 0.042 points more in municipal districts (b ¼ 0.042, SE ¼ 0.021, p<0.05) and 0.119 points more in metropolitan districts (b ¼ 0.119, SE ¼ 0.0.18, p<0.001) than ordinary districts. The significant interaction term means that in municipal districts, the predicted GPI decreases by 0.011 percentage points with each $1 increase in the education expenditure. Likewise, in metropolitan districts, the predicted GPI goes down by 0.014 percentage points for every $1 invested increase in education.

4.4 Association of educational resources and gender parity at the local level

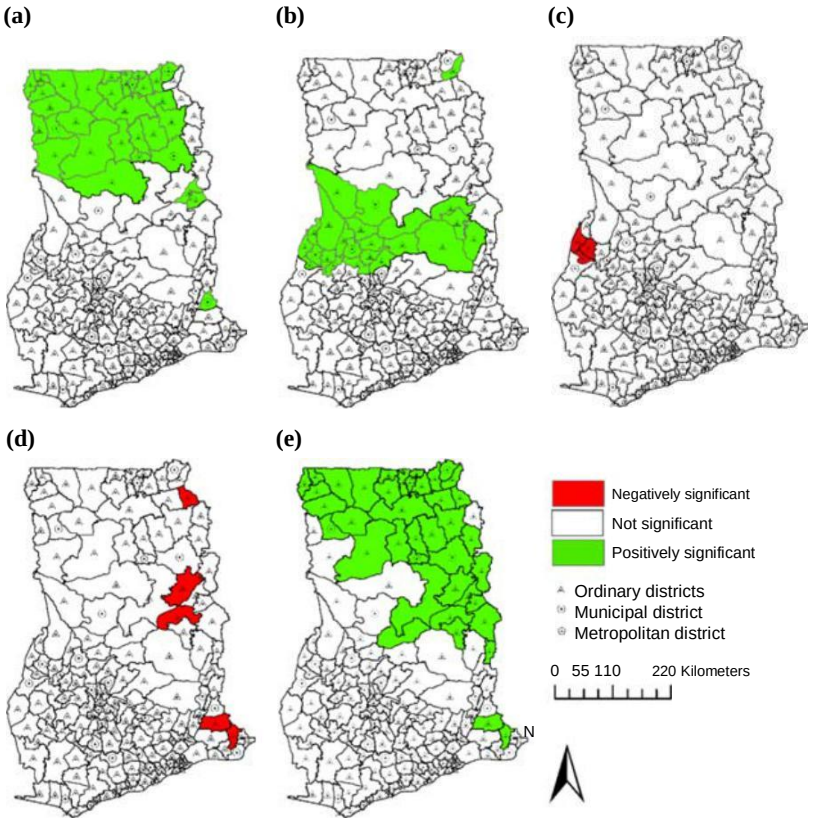
Because of the evidence of spatial autocorrelation from the Moran's I test, geographically weighted regression was used to assess how all six education resources and GPI vary spatially. Results of the geographically weighted regression are shown in Table II. All educational resource variables, except teachers per capita, had negative difference criterion values (i.e. −0.715 to −5.915), which indicate that the associations between GPI and schools, classrooms, seating and writing places, and educational expenditure vary geographically. The F values are also greater than two, further confirming significant spatial variability in the regression coefficients.

The maps in Figure 3 confirm that geographical trends exist in the relationships between the five measures of educational resource investments and gender parity. The local results shown in Panels (a), (b), and (e) of Figure 3 point to statistically significant positive connections between gender parity and the measures of educational expenditure, the number of classrooms, and availability of writing places. Most of these significant positive relationships are observed in the Northern and middle sectors of the country. Only classroom per capita and available seating places have negative associations with gender parity, although these negative relationships are confined to a handful of ordinary districts.

Table II. Results of models assessing global and the local regression correlates of gender parity

	Global results	Local results						
		Geographical variability tests		Geographically varying (local) coefficients				
Variables[a]	b (SE)	F	Difference of criterion	Mean of b	SD of b	Lower quartile	Median	Upper quartile
Intercept	0.724 (0.013)***	8.250	−5.353	0.910	0.011	0.912	0.917	0.920
Infrastructural resource								
Schools	−1.115 (1.501)	4.031	−2.518	−0.010	0.012	−0.018	−0.010	−0.003
Classroom	1.565 (0.576)**	4.643	−3.012	0.016	0.009	0.009	0.014	0.023
Seating places	0.007 (0.012)	5.084	−3.292	−0.001	0.015	−0.006	−0.004	−0.002
Writing places	0.119 (0.015)***	2.959	−0.959	0.019	0.011	0.018	0.020	0.021
Human resource								
Teachers	0.479 (0.126)***	0.715	2.228	0.009	0.004	0.009	0.009	0.010
Financial resource								
Education expenditure	0.01 (0.001)***	7.783	−5.915	0.010	0.017	0.002	0.003	0.004
District type[b]								
Municipal	0.042 (0.021)*							
Metropolitan	0.119 (0.018)***							
Interactions								
School × District type[b]								
Municipal	−0.778 (2.130)							
Metropolitan	−17.768 (2.385)***							
Education expenditure × District type[b]								
Municipal	−0.0115 (0.002)***							
Metropolitan	−0.014 (0.002)***							
Model fit								
AIC	−7676.829	−369.831						
Adjusted R^2	0.117	0.216						

Notes: [a]Variable expressed per capita for each district; [b]reference group is "ordinary district". *po0.05; **po0.01; ***po0.001



Notes: (a) Local coefficients for relationship between education expenditure per capita and GPI; (b) local coefficients for relationship between number of classrooms per capita and GPI; (c) local coefficients for relationship between number of schools per student and GPI; (d) local coefficients for relationship between number of available seating places and GPI; (e) local coefficients for relationship between number of available writing places and GPI

Figure 3.
Mapping of local regression results

5. Discussion

This study examined the spatial patterns in the gender parity in junior high school enrollment and the six indicators of educational resources, namely schools, classrooms, seating and writing places, teachers, and educational expenditure. Overall, the evidence from the data shows that gender parity varies spatially, and the nature of the relationships between gender parity and the educational resources depends on the locality. A synthesis of the global and local results revealed that except for the number of schools and availability of seating places, all the indicators of educational resources are positively associated with gender parity both at the national and local level, particularly in the Northern part of Ghana. Our study findings are consistent with the findings of Shuqair and Abdel-Aziz (2015), which suggest that strategic allocation of infrastructure, financial, and human resources through local governments hold promise for a more impactful and sustainable development. In patriarchal societies of Sub-Saharan Africa, gender equality can best be achieved when adequate investments are channeled into children and women's education, thus providing opportunities for many to benefit (Duflo, 2012).

The finding that investments in more schools and seating places at the national and district levels are not statistically associated with gender parity in school enrollment is consistent with our earlier acknowledgment that family structure, income, employment, and traditional cultural values and norms may drive gendered parity in education (Afridi et al., 2016; Atuahene and Owusu-Ansah, 2013; Dolan et al., 2014; Mabefam and Ohene-Konadu, 2013; UNESCO, 2012a). Thus, the provision of more schools and seating places may be necessary, but not sufficient to ensure that boys and girls are afforded the same opportunities to attend school. As illustrated in Figure 1, districts in the Northeast, which, are mostly deprived districts, had some of the lowest GPI values. Sometimes, children in economically deprived communities are involved in domestic work or provide labor for family businesses, which contributes to their absenteeism (UNESCO, 2012a). These findings are suggestive of the kinds of interventions and policies that may hold promise for addressing gender disparities in educational outcomes. Historically, a multi-level approach to educational investment (from the household to the community, district, and the national level) has utility in education. For example, UNICEF has adopted this multi-level approach in the implementation of its Girls' Education Projects, an approach that is partly credited with the significant reduction in the gender disparity at the primary school level in countries such as Ghana and Nigeria (UNESCO, 2012b; UNICEF, 2007).

As our spatial results reveal, the geographical location of a district moderates the relationship between GPI and financial, infrastructural, and human resource investments. With a few exceptions, the educational investments were more predictive of GPI in the Northern regions, and poorer, and rural areas of Ghana, compared to the less rural and more economically advantaged geographic regions (see Figures 2 and 3). Our findings are consistent with Senadza's (2012) assumption that investment in educational resources may hold promise for advancing educational opportunities for young girls is deprived communities. The Northern districts, which are predominantly rural, may be experiencing the strongest benefits of educational investments. This finding is consistent with the view that community development programs in Sub-Saharan Africa have had a significant impact on a range of development priorities including, school outcomes (Bonye et al., 2013). Our finding further validates prior evidence on the centrality of education investments in achieving gender parity in education, particularly in rural districts (Quang, 2008). In Ghana, education expenditures such as government subsidies to schools through the Capitation Grant Scheme have been instrumental in improving educational outcomes at the primary and junior high school level.

However, similar to the mixed results from prior studies (Cuesta et al., 2015), the data presented in this study suggest not all forms of educational investments have a positive association with gender parity. We did not find an association between the number of classrooms and gender parity at the national level, but a further investigation from a spatial perspective revealed that the relationship is significant in selected localities of the country. In the literature, the impact of classroom furniture on learning and enrollment in developing countries such as Ghana, Nigeria, Vietnam, Jamaica, and Pakistan have been mixed (Glewwe et al., 1995; Hungi, 2008; Khan and Kiefer, 2007). Considering the mixed findings from the extant literature, our finding that available writing space, but not seating space, is a positive predictor of gender parity in school enrollment at the local level suggests that, perhaps, the mixed results in prior studies can be explained by the spatial variability in prediction. Thus, the significant relationship at the local level has implications for future research on gender disparities in school outcomes. Stakeholders studying ways to improve gender equality in education should consider geographical and contextual differences. When the study population or area is heterogeneous, researchers should consider employing spatial modeling techniques such as hot spots analysis and geographically weighted regression that can unearth geographic differences that may exist.

The local results also offer insights into the extent to which education policies and interventions ought to be tailored differently for diverse geographical contexts. The clear evidence of spatial variability in gender parity and its correlates means a national-level response to gender disparities in school enrollment may be more effective if supplemented with localized programs. For instance, local and community policy enforcements can ensure that all children, including girls, are sent to school by their parents. The spatial variability finding lends support to the gradual shift away from a centralized management structure to a more devolved school management system in developing countries. Developing countries that already have a decentralized system of government, such as Ghana, may be able to capitalize on the decentralized development approach to better address local educational needs.

There are a couple of data-specific limitations in our study. First, data on newly created districts do not exist, and so we were unable to examine the GPI values for junior high enrollment in these districts. Second, the non-experimental nature of our data limits our ability to make causal inferences in the relationships examined in this study. Despite these limitations, this study offers a valuable contribution to the knowledge base on the extent of spatial variability in gender parity and the critical educational resource investments associated with the spatial trends. Since these data were collected from a range of geographical locations in Ghana, our findings are mainly generalizable in Ghana. Beyond Ghana, our findings have the potential to speak to the connection between educational resources and female access to educational opportunities across developing countries with similar geographically heterogeneous settings. Also, our use of advanced spatial analysis techniques allowed us to conduct a more in-depth examination of gender parity and educational resources at district levels, as opposed to merely examining district averages across the country. Further studies within the SSA region may have to examine the geospatial differences in GPI to spearhead any evidence-based policy framework.

6. Conclusion

In communities with limited resources, school-aged children from rural areas are at a greater risk of not receiving an education due to limited resources within their communities, compared to school-aged children in urban areas who have access to more resources (Senadza, 2012). It is imperative that, in addition to seeking solutions that address the availability of limited resources at the country level, we also remove the barriers to equitable distribution of educational resources across gender and socioeconomic groups. From the conflict theory perspective, the conflict produced by inequality can only be defeated through a fundamental change in existing societal relationships and structures (Sears, 2008). A targeted approach to eliminating educational inequalities may be the way forward. Further research in this area can promote awareness about the unequal distribution of resources across Ghana and other developing countries, which can subsequently equip policymakers to implement changes at the policy level. It is through such policy-level changes that we can empower marginalized groups in developing countries to ensure that girls and children in rural, poorer areas may achieve equal opportunity in school enrollment and retention.

Notes

1. MDG 2 was the second Millennium Development Goal aimed at ensuring that children universally will be able to complete primary education by 2015.
2. It is the fourth target of the Sustainable Development Goal (SDG), aimed at ensuring inclusive and quality education for all by 2030.

References

Afridi, F., Mukhopadhyay, A. and Sahoo, A. (2016), "Female labor force participation and child education in India: evidence from the National Rural Employment Guarantee Scheme", IZA Journal of Labor & Development, Vol. 5 No. 7, pp. 1-27.

Ansong, D., Ansong, E., Ampomah, A.O. and Afranie, S. (2015), "A spatio-temporal analysis of academic performance at the Basic Education Certificate Examination in Ghana", Applied Geography, Vol. 65, pp. 1-12.

Atuahene, F. and Owusu-Ansah, A. (2013), "A descriptive assessment of higher education access, participation, equity, and disparity in Ghana", Sage Open, Vol. 3 No. 3, pp. 1-16.

Bonye, S.Z., Aasoglenang, T.A. and Owusu-Sekyere, E. (2013), "Community development in Ghana: theory and practice", European Scientific Journal, Vol. 9 No. 17, pp. 79-101.

Bressoux, P., Kramarz, F. and Prost, C. (2009), "Teachers' training, class size and students' outcomes: learning from administrative forecasting mistakes", The Economic Journal, Vol. 119 No. 536, pp. 540-561.

Camfed Ghana (2012), "What works in girls' education in Ghana: a critical review of the Ghanaian and international literature", Ghana Education Service, Accra, available at: https://camfed.org/media/uploads/files/What_Works_in_Girls_Education_in_Ghana_-_A_Critical_Review_Precis.pdf (accessed October 23, 2016).

Cuesta, A., Glewwe, P. and Krause, B. (2015), "School infrastructure and educational outcomes: a literature review, with special reference to Latin America", available at: www.cid.harvard.edu/Economia/Forthcoming%20papers/Cuesta,%20Glewwe%20and%20Krause%20-%20Economia.pdf (accessed October 23, 2016).

Dolan, C.S., Ryus, C.R., Dopson, S., Montgomery, P. and Scott, L. (2014), "A blind spot in girls' education: menarche and its webs of exclusion in Ghana", Journal of International Development, Vol. 26 No. 5, pp. 643-657.

Duflo, E. (2012), "Women empowerment and economic development", Journal of Economic Literature, Vol. 50 No. 4, pp. 1051-1079.

ESRI (2014), "ArcGIS Desktop: Release 10.2.1", Environmental Systems Research Institute Redlands, CA.

Fotheringham, S.A., Brunsdon, C. and Charlton, M. (2002), Geographically Weighted Regression: The Analysis of Spatially Varying Relationships, Wiley, West Sussex.

Gardent, P.B. and Reeves, S.A. (2009), "Ethics conflict in rural communities: allocation of scarce resources", in Nelson, W.A. (Ed.), Handbook for Rural Health Care Ethics: A Practical Guide for Professional, University Press of New England, Lebanon, NH, pp. 164-185.

Glewwe, P., Grosh, M., Jacoby, H. and Lockheed, M. (1995), "An eclectic approach to estimating the determinants of achievement in Jamaican primary education", World Bank Economic Review, Vol. 9 No. 2, pp. 231-258.

Hungi, N. (2008), "Examining differences in mathematics and reading achievement among grade 5 pupils in Vietnam", Studies in Educational Evaluation, Vol. 34 No. 3, pp. 155-164.

Jayachandran, S. (2015), "The roots of gender inequality in developing countries", Annual Review of Economics, Vol. 7 No. 1, pp. 63-88.

Khan, S.R. and Kiefer, D. (2007), "Educational production functions for rural Pakistan: a comparative institutional analysis", Education Economics, Vol. 15 No. 3, pp. 327-342.

Kumi-Yeboah, A. (2015), "Voices of educational experience and challenges: young adolescent girls in Ghana", in Stacki, S.L. and Baily, S. (Eds), Educating Adolescent Girls around the Globe: Challenges and Opportunities, Routledge, New York, NY, pp. 238-258.

Little, R.J.A. and Rubin, D.B. (2002), Statistical Analysis with Missing Data, 2nd ed., John Wiley &Sons, New York, NY.

Mabefam, M.G. and Ohene-Konadu, K. (2013), "Access to and dropout of girls from school: a quantitative analysis of the effects of marriage arrangements on girl-child education in Bolni", Journal of Social Sciences, Vol. 9 No. 3, pp. 119-126.

Maikish, A. and Gershberg, A. (2008), "Overcoming inequality: why governance matters (paper commissioned for the EFA global monitoring report 2009)", United Nations Educational Scientific and Cultural Organization, Paris.

Quang, D.M. (2008), "Human capital, poverty, and income distribution in developing countries", Journal of Economic Studies, Vol. 35 No. 4, pp. 294-303.

Saunders, J., Marrow-Howell, N., Spitznagel, E., Doré, P., Proctor, E.K. and Pescario, R. (2006), "Imputing missing data: a comparison of methods for social work researchers", Social Work Research, Vol. 30 No. 1, pp. 19-31.

Sears, A. (2008), A Good Book, In Theory: A Guide to Theoretical Thinking, Higher Education University of Toronto Press, North York.

Semel, S.F. (2010), Foundations of Education: The Essential Texts, Routledge, New York, NY.

Senadza, B. (2012), "Education inequality in Ghana: gender and spatial dimensions", Journal of Economic Studies, Vol. 39 No. 6, pp. 724-739.

Shuqair, H.I. and Abdel-Aziz, D.M. (2015), "Efficient and strategic resource allocation for sustainable development in Jordan", Journal of Architectural Engineering Technology, Vol. 4 No. 1, p. 138, doi: 10.4172/2168-9717.1000138.

UNESCO (2012a), "All children in school by 2015: global initiative on out-of-school children: Ghana country study", The government of Ghana, Accra, available at: www.uis.unesco.org/Library/Documents/out-of-school-children-ghana-country-study-2012-en.pdf (accessed October 1, 2016).

UNESCO (2012b), "World Atlas of gender equality in education", UNESCO, Paris.

UNESCO Institute for Statistics (UIS) and UNICEF (2015), "Fixing the broken promise of education for all: findings from the global initiative on out-of-school children", UNESCO Institute for Statistics, Montreal.

UNICEF (2007), "Girls' education: information sheet", Nigeria Country Programme, Lagos, available at: www.unicef.org/wcaro/WCARO_Nigeria_Factsheets_GirlsEducation.pdf (accessed October 11, 2016).

UNICEF (2015), "The investment case for education and equity", UNICEF, New York, NY.

Further reading

Dave, M. (2013), "When the lights go on: household electrification and educational outcomes in rural India", master's thesis, Georgetown University, Washington, DC, available at: https://repository.library.georgetown.edu/bitstream/handle/10822/558641/Dave_georgetown_0076M_12200.pdf?sequence¼1 (accessed October 23, 2016).

Eccles, J.S. and Davis-Kean, P.E. (2005), "Influences of parents' education on their children's educational attainments: the role of parent and child perceptions", London Review of Education, Vol. 3 No. 3, pp. 191-204.

Greene, W.H. (2012), Econometric Analysis, 3rd ed., Prentice Hall, Upper Saddle River, NJ.

Levine, R., Lloyd, C.B., Greene, M. and Grown, C. (2009), "Girls count: a global investment and action agenda", Center for Global Development, Washington, DC.

Li, H. and Huang, L. (2009), "Health, education and economic growth in China: empirical findings and implication", China Economic Review, Vol. 20 No. 3, pp. 374-387.

Lloyd, C.B. and Young, J. (2009), "New lessons: the power of educating adolescent girls", The Population Council, New York City, NY, available at: www.popcouncil.org/uploads/pdfs/2009PGY_NewLessons.pdf (accessed June 14, 2016).

Robbins, S.P., Chatterjee, P. and Canda, E.R. (2012), Contemporary Human Behavior Theory: A Critical Perspective for Social Work, 3rd ed., Allyn & Bacon, Boston, MA.

UIS and UNICEF (2012), "Finishing school. A right for children's development: a joint effort", available at: www.uis.unesco.org/Education/Documents/oosci-lacexecutive-summary-2012-en. pdf (accessed October 2, 2016).

UNDP (2014), "UNDP gender equality strategy 2014-2017", United National Development Programme, New York, NY.

UNICEF (2012), "Global initiative on out of school children: Ghana country study", UNICEF, Accra, available at: www.unicef.org/education/files/Final_OOSC_Flyer.pdf (accessed October 10, 2016).

World Bank (2018), "Education statistics: all indicators", World Bank, Washington, DC.

About the authors

David Ansong (MSW, PhD) is an Assistant Professor at the University of North Carolina at Chapel Hill. His research interest is in economic and educational disparities, with a particular focus on the impact of economic security interventions on educational outcomes.

Chesworth Brittney Renwick (MSW) is a PhD Student at the University of North Carolina at Chapel Hill. Her research interests focus on gender inequalities.

Moses Okumu (MSW) is a PhD Student at the Factor-Inwentash Faculty of Social Work, University of Toronto. His research interests include global health, international development, and vulnerable populations. Moses Okumu is the corresponding author and can be contacted at: Moses.okumu@mail.utoronto.ca

Eric Ansong (MISW) is a Doctoral Candidate in Development Studies and a Visiting Lecturer at the University of East London's School of Law and Social Sciences. His research focuses on social justice, human capital development, and maternal and child health-seeking behaviors.

Cedrick Joseph Wabwire (BA) is a Master's Student in Research and Public Policy at Uganda Christian University. His research focuses on civic engagement, financial capabilities, and youth development.