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# Asset Ownership and Academic Achievement among Youth in Ghana

## Examining Associations Based on Asset Type and Academic Subject

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# Asset Ownership and Academic Achievement among Youth in Ghana: Examining Associations Based on Asset Type and Academic Subject

*Theoretical and empirical evidence suggest that asset ownership positively affects academic achievement. However, fewer studies, particularly in sub-Saharan Africa have investigated whether the effect of asset ownership differs based on the type of asset and academic subject. We examine the associations between asset type and academic achievement among Ghanaian junior high school students. Results suggest that the positive relationship between asset ownership and academic achievement depends on the type of asset and the academic subject. Homeownership is positively and significantly associated with math achievement. Mode of transportation (e.g., motorcycle, bicycle, cars, and trucks) ownership is positively and significantly associated with English achievement. The associations between other types of assets and math and English grades, although positive, are not statistically significant. Other significant predictors of academic achievement include male gender, commitment to school, academic expectations, and parent's employment type.*

*Our findings have important implications for programs and efforts to promote academic proficiency and progress for all youth. Allowing and helping families to own and accumulate assets may start to level the playing field for all youth so they can maximize their human capital potential.*

***Key words:*** *assets, academic achievement, junior high school, Ghana, livestock, transportation, homeownership, landownership, household possessions*

## Introduction

Academic achievement determines how far students will progress in their education, one of the most potent predictors of life course trajectory and determiners of long-term economic success and social mobility (Becker, 1975; Card, 1999; Kane, 2004; Pascarella & Terenzini, 1991, 2005). Students who do not get good grades or have inadequate educational preparation may have limited access to quality education or restrictions on what they can study. Academic achievement is not only necessary for educational progress but also a good indicator of human capital accumulation, which contributes to improvements in a variety of well-being outcomes.

Although academic achievement is influenced by a range of different factors, family economic resources have been shown to be a consistent predictor (Brooks-Gunn & Duncan, 1997; Coleman et al., 1966; Filmer & Pritchett, 2001; Rolleston, 2011). Families with adequate economic capital may be able to purchase or access resources such as books, additional training, and other educational tools that promote learning and maximize academic potential. In many studies, economic capital has been measured using household income. Although income is a valid indicator of household economic resources, its accuracy and researchers' ability to measure it reliably are limited, particularly in developing countries (Moser & Felton, 2007). For instance, many Ghanaian adults work in informal labor markets (Chowa et al., 2012; Ghana Statistical Service [GSS], 2008) where incomes are highly variable or seasonal. Taking a cross-sectional snapshot of income may produce an unreliable picture of household economic well-being.

Because of the limitations of income data, we use asset ownership as an indicator of a family's economic resources and a potential predictor of youth academic achievement. Asset ownership may

provide a better long-term gauge of economic capital because assets are accumulated over time and last longer. Also, a growing body of theoretical and empirical work has shown that asset ownership has independent effects on academic achievement apart from income (Conley, 1999; Elliott, Kim, Jung, & Zhan, 2010, 2011; Sherraden, 1991). A few studies in sub-Saharan Africa (SSA) have examined the influence of household asset ownership on academic outcomes (Curley, Ssewamala, & Han, 2010; Filmer & Pritchett, 1999, 2001).[1]

## Education in Ghana

Ghanaian youth believe that the benefits of education are numerous and substantial, including having a good career, achieving economic stability, and accessing more social and economic opportunities (Addai & Pokimica, 2010; Chant & Jones, 2005). However, access to education, academic standards, and academic achievement vary widely in the country, especially between urban and rural settings (GSS, 2008). Studies also show decreased educational access and academic achievement for girls and those with lower economic status (Palmer, 2005; Pryor & Ampiah, 2003; Tuwor & Sossou, 2008). Costs associated with schooling place a greater burden on economically poor households and have led some parents to question the value and benefits of education (Chant & Jones, 2005; Laird, 2002). This may contribute to reduced rates of education and less academic achievement among youth from lower income households.

## Asset Ownership in Ghana

Many developing countries have persistent asset-ownership inequality (Davies, Sandström, Shorrocks, & Wolff, 2009). In Ghana, urban residents are more likely than their rural counterparts to own different types of assets. Ownership of consumer durables is highest in Accra, followed by other urban areas (GSS, 2008). Radios, cellular phones, and televisions are the three most common types of consumer durables owned by Ghanaian households (Chowa et al., 2012). Car ownership is highest in Accra (10%), followed by other urban areas (4.1%) and all rural areas (1.4%). The quality of construction materials used in homes is also markedly different depending on where people live. In urban areas, 76% of families live in homes constructed with cement or sandcrete blocks, while 73% of rural families live in homes constructed mainly with mud (GSS, 2008).

Similarly, asset ownership varies by region (Chowa et al., 2012). Families from Volta, Brong Ahafo, Eastern, and Central regions are more likely to own land than families living in other regions. For instance, 48% of families from Brong Ahafo own land in contrast with only 19% of families from Ashanti. Homeownership also varies by region, with families from Volta, Northern, and Western regions more likely to own a home than families from other regions, such as Greater Accra, Eastern, and Ashanti regions. Livestock ownership is more prevalent in rural regions (e.g., Northern and Central regions) than in urban regions (e.g., Greater Accra). Although families living in Greater Accra, Eastern, and Ashanti regions are less likely to own land, house, or livestock, they are more likely to own transportation-related property, including bicycles, motorcycles, and other types of vehicles (e.g., cars and trucks) than families living in other parts of Ghana.

Asset inequality may perpetuate, contribute to, or worsen academic disparity in Ghana. Families with more assets may send their children to better schools and be able to access more resources that contribute to better learning and higher academic achievement, while families with few or no assets or limited financial resources may struggle to provide their children with the resources they need to attend or stay in school.

[1] For a review of evidence, see Chowa, G., Ansong, D., & Masa, R. (2010). Assets and child well-being in developing countries: A research review. *Children and Youth Services Review, 32*(11), 1508-1519.

## Assets and Education

Empirical evidence in developed and developing countries supports the positive association between asset ownership and education. (For a review of evidence see Chowa et al., 2010; Elliott, Destin, & Friedline, 2011; and Williams Shanks, Kim, Loke, & Destin, 2010). However, most studies in developing countries, particularly in SSA, focus on the relationship between asset ownership and other indicators of educational outcomes (e.g., school enrollment and attendance). Fewer studies examine the relationship between asset ownership and academic achievement, particularly scores or grades. Studies that investigate the effect of asset ownership on academic scores or grades suggest a positive impact. In Uganda, asset ownership measured by savings has a positive effect on not only children's school attendance but also examination scores (Curley et al., 2010; Ssewamala & Ismayilova, 2009). In Ghana, ownership of one of five home durable goods (e.g., electric iron, electric or gas stove, kerosene stove, refrigerator, and television) is associated with higher grades (Chowa, Masa, Wretman, & Ansong, 2013).

Overall, the current body of research suggests that asset ownership has a positive effect on education. Owning more assets is positively associated with higher school enrollment, attendance, and completion among youth in developing countries (Binder, 1998; Filmer & Pritchett, 1999, 2001; Montgomery & Hewett, 2005; Ota & Moffatt, 2007; Sawada & Lokshin, 2001). In a study conducted in 35 developing countries, researchers find that students from families in the top 20% of the asset index stayed in school longer than students whose families occupied the middle 40% or the bottom 40% of the asset index (Filmer & Pritchett, 2001). Students from low-asset families (i.e., those in the bottom 40% of the asset index) did not complete primary school (Filmer & Pritchett, 2001).

Assets that positively influence education outcomes in developing countries include land (Shafiq, 2007), farm equipment (Cockburn & Dostie, 2007), household durable goods (Filmer & Pritchett, 1999; Montgomery & Hewett, 2005; Ota & Moffat, 2007), modes of transportation (Filmer & Pritchett, 1999; Montgomery & Hewett, 2005), and higher quality home construction materials (Filmer & Pritchett, 1999, 2001; Montgomery & Hewett, 2005). However, some of these studies (Filmer & Pritchett, 1999, 2001; Montgomery & Hewett, 2005) created asset indices that combine different categories of assets (e.g., modes of transportation, home durable goods, and higher quality home building materials) and living conditions into one numerical score. Although this approach can be useful in aggregating multiple indicators, it does not allow researchers to examine variation in relationships between different types of assets and education.

Empirical evidence also suggests that asset ownership has mixed effects on education. Assets that require substantial amounts of time to maintain may be negatively associated with school attendance and completion. For instance, ownership of agricultural crops decreases school attendance, reflecting the amount of time needed to plant, maintain, and harvest the crops (Cockburn & Dostie, 2007). However, ownership of farm equipment (e.g., plows and sickles) increases school attendance, reflecting a lower demand for labor. In another study, assets in the form of agricultural crops have mixed effects on schooling and labor demand, depending on the level of crop losses (Dillon, 2013). Large crop losses increase the likelihood that children will be withdrawn from school to engage in farm work. However, small crop losses do not have significant effects on schooling and labor demand. Children who miss even a few weeks of school may face difficulties trying to catch up with school work and may fail academic subjects and have to repeat grade levels. Also, youth who combine work and school may not get the full benefit of their education because they have less time to do homework or study for exams, or they may be exhausted and unable to pay attention in class.

## Research Question

Our primary research question is whether the relationship between asset ownership and youth academic achievement varies depending on the type of asset owned. Although evidence suggests that asset ownership in general influences academic outcomes, fewer studies explore the relationship between academic outcomes and different types of assets, particularly in developing countries. This study examines the relationship between asset ownership and academic grades and aims to address gaps in knowledge by examining the association between five types of assets—house, land, mode of transportation, livestock, and household possessions (i.e., home durable goods or appliances)—and math and English grades of Ghanaian youth. To our knowledge, this is the first study in Ghana and perhaps in SSA to concurrently examine the relationships between these five types of assets and math and English grades of youth.

Many studies create indices to aggregate observed measures of a household's asset ownership (Filmer & Scott, 2012). Although an index is helpful because it combines numerous items and different categories of assets (e.g., household durable goods, household building materials, and livestock) and reduces items to a one-dimensional score, an index may not give an accurate or detailed picture of the relationship between different types of assets and academic outcomes. For instance, by aggregating livestock, mode of transportation, and household durable goods into one score, we cannot see how each affects academic outcomes. In this paper, we classify asset ownership into five distinct categories and individually examine whether and how each predicts youth academic achievement.

# Methods

## Data

YouthSave is a five-year, longitudinal study that investigates the use of savings accounts as a tool for youth development and financial inclusion in four developing countries. Savings accounts are offered by local financial institutions, and local researchers are assessing their performance and participants' developmental outcomes. Although YouthSave is being implemented in four countries, the data in this study are taken from the Ghana Experiment, a cluster randomized study of 6,252 youth in 100 schools randomly selected from eight of Ghana's 10 regions. Fifty schools were assigned to the treatment condition, and another 50 schools were assigned to the control condition. Sixty students were selected randomly from each school with oversampling to take attrition into account. The baseline sample consists of 6,252 youth and 3,083 parents.

Baseline data were collected in May and June 2011, and follow-up data collection is scheduled for 2014. Data include youth's educational, health, psychosocial, and financial outcomes and youth and parental demographics and socioeconomic characteristics, including ownership of different assets.

## Measures

*Outcome variables*

Outcome variables are students' summed examination and continuous assessment scores in math and English collected from school records. The continuous assessment score is the total of all quiz and assignment grades given during the academic term, and students take the examination at the end of the term. Because different schools use different proportions of the continuous assessment and examination scores to calculate final grades, we normalized the scores across all schools so that continuous assessment and examination scores each account for 50% of the total grade for the term for each course. Both measures were interval-level variables with values ranging from 0 to 100. A high value indicates high achievement in the subject.

*Variables of interest*

Five different types of assets are included in the study: house, land, mode of transportation, household possessions, and livestock. All asset items were reported by youth. Two measures of asset ownership are dichotomous (i.e., house and land) and three measures are continuous (i.e., mode of transportation, household possessions, and livestock).

House or homeownership refers to whether a youth's family owns a home (coded as 1 for yes or 0 for no). Land refers to whether a youth's family owns a piece of land (coded as 1 for yes and 0 for no).

Mode of transportation refers to ownership of a canoe or boat, bicycle, motorcycle, or other vehicles (e.g., cars and trucks). Household possessions refer to ownership of nine home durable goods: box irons, cellular phones, electric irons, electric or gas stoves, kerosene stoves, land phones, radios, refrigerators, and televisions. We created indices for transportation-related assets and household goods using the method recommended by Filmer and Pritchett (1999, 2001) and Moser and Felton (2007). Our index follows the basic form $A_i = (b_1a_{1i}) + (b_2a_{2i}) + \cdots + (b_ka_{ki})$, where $A_i$ is the transportation asset or household possession index for household "*i*", $(a_{1i}, a_{2i}, \ldots, a_{ki})$ are the *k* indicators of transportation-related assets or household possession, and $(b_1, b_2, \ldots, b_k)$ are weights used to aggregate the items into an index. We conducted principal component analysis to determine the weight for each mode of transportation and household good.

Livestock refers to ownership of six types of animals: chickens, cows, donkeys, goats, pigs, and sheep. We created an index of livestock ownership with the same procedures we used to create mode of transportation and household possession indices.

*Independent variables*

Independent variables include youth demographic controls (i.e., gender and age), parent and household socioeconomic variables (i.e., marital status, employment type, education level, household monthly income, and number of economic dependents), and student trait variables (i.e., academic self-efficacy, commitment to school, planned effort, future orientation, and academic expectations).

Gender is a dichotomous variable coded as 1 for male or 0 for female. Age of youth is the youth's age when baseline data were collected in 2011. Parent's educational level is a dichotomous variable coded as 1 for primary education or higher or 0 for no formal education. Marital status is a dichotomous variable coded as 1 for married or 0 for not married. Employment status is a dichotomous variable coded as 1 for formally employed (i.e., receiving regular wages or salaries as an employee) or 0 for not formally employed (i.e., receiving irregular wages or salaries from engagement in the "informal" sector of the economy). Household income is a continuous variable defined as the household's total monthly income from full- or part-time work, rental properties, and pension or remittances. The number of economic dependents is a continuous variable measured as the number of individuals 14 years old and younger who rely on the head of household for food, shelter, clothing, and other basic needs.

All student traits variables are continuous and measured using preexisting scales. For each multi-item predictor, we calculated a composite score by summing the score of all items in the scale. We measured academic self-efficacy using an eight-item, 10-point, Likert-type scale ranging from 0 (*cannot do at all*) to 10 (*highly certain can do*) adapted from Muris (2001). We asked youth how well they can get teachers to help them, how well they can study, how well they can pay attention in class, and how well they can succeed in doing school activities. A high value indicates a high level of academic self-efficacy.

We measured commitment to school using a nine-item, 10-point, Likert-type scale that ranges from 0 (*strongly disagree*) to 10 (*strongly agree*) adapted from the Rochester Youth Development Study (Thornberry, Lizotte, Krohn, Farnworth, & Jang, 1991). We asked youth to describe their attitudes toward school, doing homework, and getting good grades. A high value indicates high level of commitment to school.

We measured planned effort by asking youth how many hours per week on average that they spend on school work outside of school. A high value indicates a higher level of planned effort. We measured academic expectations by asking youth what grades they expect to get in their math and English classes. Both measures of academic expectations are interval-level variables with values ranging from 0 to 100 and were adapted from Destin and Oyserman (2009).

Finally, we used two dimensions of future orientation: orientation toward success and uncertainty of the future. Orientation toward success was measured using a 6-item, 10-point, Likert-type scale ranging from 0 (*strongly disagree*) to 10 (*strongly agree*). We asked youth how positive and successful their future selves would be. A high value on this scale indicates higher level of future orientation. We measured uncertainty of the future using a 5-item, 10-point, Likert-type scale ranging from 0 (*strongly disagree*) to 10 (*strongly agree*). We asked youth how unprepared and uncertain they are of their future. A lower value on this scale indicates higher level of future orientation. Both measures of future orientation were adapted from the School Success Profile Survey (Bowen, Rose, & Bowen, 2005).

**Samples**

This study uses two samples from YouthSave Ghana Experiment baseline survey data to determine whether results are consistent across different samples or are sample specific. We present sample-size estimates under a variety of assumptions about the characteristics of the YouthSave Ghana population.

Sample 1 consists of youth whose parents were interviewed in the baseline survey. Although 6,252 youth were included in the baseline survey, only 4,576 adult caregivers also were interviewed. Although we made attempts to contact at least one parent or guardian of each youth, we were unable to interview 1,676 parents or guardians at baseline. Common reasons for survey nonresponse include not being home at the time of the interview appointment and not responding to calls to make interview appointments. We made several attempts to reach parents through repeated telephone calls and visits to their homes.

Of the 4,576 adult caregivers interviewed at baseline, only 3,083 were biological parents of the youth. Because research suggests that youth academic achievement is influenced by *parental* socioeconomic status, we included only youth whose parents were interviewed at baseline. Thus, Sample 1 includes 3,083 pairs of youth and their parents. Missing data on outcome and predictor variables reduced the final sample size to 2,825 pairs of youth and parents. Bivariate comparisons using t, $\chi 2$, and Wilcoxon rank-sum tests show that members of Sample 1 differ significantly ($p < .05$) from youth and their parents who were excluded because of missing variables on three covariates (i.e., academic self-efficacy, expectations of math grades, and expectations of English grades). Youth did not differ significantly on any of the five asset-ownership variables or either outcome variable.

Sample 2 comprises all youth ($N = 6,252$) in the baseline data. Unlike Sample 1, no parental socioeconomic covariates are included. Missing data on outcome and predictor variables reduced the final size of Sample 2 to 5,684 youth. Bivariate comparisons using t, $\chi 2$, and Wilcoxon rank-sum

tests show that members of Sample 2 differ significantly ($p < .05$) from youth excluded because of missing variables on two key explanatory variables (i.e., livestock and mode of transportation ownership) and two control variables (i.e., commitment to school and academic self-efficacy). On average, youth excluded because of missing variables have lower scores on livestock and mode of transportation asset indices and lower academic self-efficacy and commitment to school than youth in Sample 2. Youth did not differ significantly on math or English scores.

### Analysis plan

Our analysis plan included several steps, each undertaken separately for each sample. First, we performed principal component analysis to determine the weights for each of the separate multi-item asset indices (i.e., livestock, household possessions, and mode of transportation). Details about this topic and method can be found in Filmer and Pritchett (1999, 2001), Filmer and Scott (2012), and Moser and Felton (2007), and equations used to create asset indices are illustrated above on page 7. Second, we conducted diagnostic tests and residual analyses. Results suggest that household monthly incomes are highly skewed and not normally distributed. To reduce the influence of extreme observations on regression coefficient estimates, we transformed household monthly income using inverse hyperbolic sine transformation to handle observed zero values (Burbidge, Magee, & Robb, 1988). Third, we examined the relationship between asset ownership and academic achievement using multivariate linear regression. Because of the hierarchical nature of our data (i.e., students were nested within schools), we adjusted for the effect of clustered data by using robust standard errors. Robust standard errors are appropriate because our models may have violated the assumption of linear regression regarding independence of observations. In our data, youth are independent across schools but not necessarily within schools.

For both samples, we examined models in which youth demographic variables (i.e., gender and age) and academic traits (i.e., self-efficacy, commitment to school, planned effort, academic expectations, and future orientation) were included as covariates. For Sample 1, we included household and parental socioeconomic variables as additional covariates to check the robustness of our findings and assess sensitivity of the results to variation of model specification. Because we do not have data on household and parental socioeconomic status for all youth in Sample 2, we included only student academic traits and youth demographics in the model. All analyses were conducted using STATA Release 12 (StataCorp, 2011).

## Results

### Descriptive statistics

Table 1 presents descriptive statistics for youth and their parents in the YouthSave Ghana Experiment baseline data. In Sample 1 ($N$ = 2,825), there are equal percentages of boys and girls, and the average age of youth is 15 years. The average math and English scores are nearly 53 of 100 points. Youth report high levels of commitment to school, academic self-efficacy, and future orientation and spend an average of nearly eight hours per week doing school work outside school. Youth also expect above-average grades in math (67 points) and English (68 points). Among parents in Sample 1, 74% completed some formal education, only 12% work as regular employees in the formal sector, and 78% are married. Average monthly income is USD 132, and the average number of dependents ages 14 years and younger is nearly three per household. Regarding ownership of assets, 51% of families own a house, and 38% own land. Youth and their families in sample 1 scored an average of 4.45, 0.60, and 2.37 on livestock, mode of transportation, and household possession indices, respectively. Higher scores suggest that a family owns more of that type of asset.

Characteristics of youth in Sample 2 (*N* = 5,684) are similar to those of youth in Sample 1. Average math and English grades of youth in Sample 2 are slightly higher than grades of youth in Sample 1. Fifty-one percent of the sample are girls. As in Sample 1, youth report high levels of commitment to school, academic self-efficacy, and future orientation and spend an average of nearly eight hours per week doing school work outside school. Youth also expect above-average grades in math (67 points) and English (68 points). Regarding ownership of different assets, 52% of families own a home, 37% own land. Scores on the livestock, mode of transportation, and household possession indices are consistent with the scores for Sample 1.

Table 1. Descriptive Statistics for YouthSave Ghana Experiment Baseline Participants

| | % or *M (SD)* | |
|---|---|---|
| Variables | Youth and parents sample (Sample 1) (*N* = 2,825) | Youth-only sample (Sample 2) (*N* = 5,684) |
| Outcome variables | | |
| Math score | 52.63 (17.35) | 52.94 (17.45) |
| English score | 52.98 (17.56) | 53.14 (17.60) |
| Youth demographics | | |
| Gender (girls) | 50% | 49% |
| Age in 2011 | 15.14 (1.92) | 15.34 (2.00) |
| Youth academic traits | | |
| Academic self-efficacy | 61.09 (9.85) | 60.87 (9.98) |
| Commitment to school | 77.76 (9.31) | 77.43 (9.29) |
| Planned effort | 7.62 (4.82) | 7.61 (4.90) |
| Orientation toward success | 52.19 (6.91) | 52.15 (7.00) |
| Uncertainty of future | 5.77 (7.27) | 5.97 (7.44) |
| Grade expectation (math) | 66.80 (16.20) | 66.53 (16.10) |
| Grade expectation (English) | 67.68 (16.25) | 67.15 (16.01) |
| Parent and household covariates | | |
| Education level (no formal education) | 74% | - |
| Employment type (informal) | 12% | - |
| Marital status (not married) | 78% | - |
| Household monthly income in USD[a] | 132.12 (205.07) | - |
| Number of economic dependents | 2.71 (1.84) | - |
| Asset-ownership variables (variables of interest) | | |
| Own land (does not own land) | 38% | 37% |
| Own home (does not own house) | 51% | 52% |
| Own livestock | 4.45 (6.07) | 4.42 (6.22) |
| Own mode of transportation | 0.60 (0.88) | 0.62 (0.91) |
| Own household possessions | 2.37 (1.58) | 2.41 (1.62) |

Note: % = percentage distribution for categorical variables; M (SD) = mean (standard deviation) for continuous variables. Reference group is shown in parentheses for a categorical variable.
[a]Exchange rate used is GHS 1 = USD 0.66, approximately the rate when the baseline survey was conducted. Income was transformed using inverse hyperbolic sine transformation.

## Multivariate results

Tables 2 through 7 present results of regression analysis of the relationships between ownership of different types of assets and Ghanaian youth's academic achievement. In each set of analyses, we controlled for youth and parent/household characteristics using two sample sizes. The second (math) and third (English) columns in each table include a model with only youth covariates using Sample 1 (*N* = 2,825). The fourth (math) and fifth (English) columns in each table represent models

with youth and parent/household covariates using Sample 1 ($N$ = 2,825). The sixth (math) and seventh (English) columns in each table present results based on models with only youth covariates using Sample 2 ($N$ = 5,684). Using different samples and model specifications allows us to check robustness of findings.

*Land ownership*

Table 2 presents results of regression analysis of land ownership and math and English grades. In Model 1 (Sample 1 with youth covariates only), land ownership is positively associated with math grade. Youth whose families own a piece of land scored 1.53 points higher in math than youth whose families do not own land. However, the association is not statistically significant ($p > .05$). When we add parent/household covariates for Model 2, the association between landownership and math grade remains positive. Youth whose families own a piece of land scored 1.62 points higher in math than youth whose families do not own land. However, the effect of landownership on math grades not statistically significant ($p > .05$).

When we use a different sample that consists of youth only (i.e., Model 3), landownership remains a positive predictor of math grades but not statistically significant. Although landownership is not a statistically significant predictor, male gender and academic expectation of math grade are consistent significant predictors ($p < .05$). Academic expectation positively influences math grade.

Consistent with math grade, landownership is positively associated with English grade. Youth whose families own land scored between 0.68 to 1.12 points higher in English than youth whose families do not own land. However, the effect of landownership on English grades is not statistically significant ($p > .05$). Among other predictors, only academic expectation is consistently associated with English grades. Academic expectation positively influences English grade. Male gender and commitment to school are significant predictors only in the youth-only sample (Model 3). Commitment to school approaches statistical significance ($p < .10$) in Models 1 and 2. None of the parental covariates is significantly associated with academic outcomes.

Table 2. Regression Analysis of Land Ownership, Youth and Parent Characteristics, and Academic Achievement Outcomes

| | Youth and parents sample (Sample 1) ($N$ = 2,825) | | | | Youth-only sample (Sample 2) ($N$ = 5,684) | |
|---|---|---|---|---|---|---|
| | Model 1[b] | | Model 2[c] | | Model 3[b] | |
| Variables | Math β(Robust SE) | English β(Robust SE) | Math β(Robust SE) | English β(Robust SE) | Math β(Robust SE) | English β(Robust SE) |
| Variable of interest | | | | | | |
| Land ownership (own land = 0) | 1.53 (1.02) | 1.09 (0.96) | 1.62 (1.02) | 1.12 (0.95) | 1.48 (0.94) | 0.68 (0.90) |
| Youth covariates | | | | | | |
| Gender (girls = 0) | 1.98 (0.86)* | 1.10 (0.88) | 1.95 (0.86)* | 1.10 (0.88) | 2.13 (0.71)** | 1.46 (0.71)* |
| Age in 2011 | -0.22 (0.28) | -0.46 (0.30) | -0.27 (0.27) | -0.49 (0.29)† | -0.26 (0.25) | -0.41 (0.27) |
| Academic self-efficacy | -0.05 (0.07) | -0.08 (0.07) | -0.04 (0.07) | -0.08 (0.07) | -0.02 (0.06) | -0.03 (0.07) |
| Commitment to school | 0.11 (0.07) | 0.11 (0.06)† | 0.11 (0.07) | 0.11 (0.06)† | 0.09 (0.05)† | 0.10 (0.05)* |
| Planned effort | -0.01 (0.10) | -0.15 (0.09)† | -0.02 (0.10) | -0.15 (0.09)† | -0.02 (0.08) | -0.10 (0.06) |
| Orientation toward success | -0.03 (0.06) | 0.02 (0.06) | -0.03 (0.06) | 0.03 (0.06) | -0.05 (0.06) | -0.03 (0.06) |
| Uncertainty of future | 0.01 (0.09) | 0.01 (0.09) | 0.02 (0.09) | 0.01 (0.09) | 0.01 (0.08) | -0.01 (0.07) |
| Grade expectation (math) | 0.12 (0.03)*** | - | 0.12 (0.03)*** | - | 0.13 (0.03)*** | - |
| Grade expectation (English) | - | 0.24 (0.03)*** | - | 0.24 (0.03)*** | - | 0.22 (0.03)*** |
| Parent and household covariates | | | | | | |
| Education level (no formal education = 0) | | | -1.18 (1.20) | -1.41 (1.08) | | |
| Employment type (informal = 0) | | | 2.23 (1.18)† | 1.00 (1.19) | | |
| Marital status (not married = 0) | | | -0.49 (0.90) | -0.64 (0.88) | | |
| Household monthly income in USD[a] | | | -0.33 (0.39) | -0.19 (0.38) | | |
| Number of economic dependents | | | 0.08 (0.19) | 0.20 (0.20) | | |
| Constant | 42.33 (7.80)*** | 39.10*** | 45.76 (8.38)*** | 41.15 (7.83)*** | 43.40 (6.19)*** | 39.55 (6.31)*** |
| $F$ value | 3.97*** | 11.36*** | 4.16*** | 8.79*** | 5.15*** | 11.80*** |
| $R^2$ | .0226 | .0571 | .0268 | .0593 | .0248 | .0512 |

†$p \leq .10$, *$p \leq .05$, **$p \leq .01$, ***$p \leq .001$, two-tailed test

[a]Exchange rate used is GHS 1 = USD 0.66, approximately the rate when the baseline survey was conducted. Income was transformed using inverse hyperbolic sine transformation.

[b] Model with youth covariates only

[c] Model with youth and parent/household covariates

*Homeownership*

Table 3 presents results of regression analysis of homeownership and math and English grades. In Model 4 (Sample 1 with youth covariates only), homeownership is positively and significantly associated with math grade. Youth whose families own a house scored 2.94 points higher in math than youth from families that do not own a house. When we add parent/household covariates in the model (Model 5), the effect of homeownership on math grade remains statistically significant ($p < .05$). Youth whose families own a house scored 2.94 points higher in math than youth whose families do not own a house.

When we use a different sample consisting of youth only (i.e., Model 6), homeownership remains a positive predictor of math grade, but only approaches statistical significance ($p < .10$). These results suggest that the effect may be robust. Other consistent significant predictors of math grade include male gender and academic expectation of math grades. Academic expectation positively influences math grades. Commitment to school approaches statistical significance ($p < .10$) in all three models. Parent's employment is also a statistically significant predictor of math achievement. Youth whose parents work in the formal sector scored 2.38 points higher in math than youth whose parents work in informal labor sector.

Homeownership also is positively associated with English grade. In Model 4 (Sample 1 with youth covariates only), youth whose families own a house scored 1.68 points higher in English than youth whose families do not own a house. When we add parent/household covariates to the model (Model 5), the effect of homeownership on English grade remains positive. Youth whose families own a house scored 1.62 points higher in English than youth whose families do not own a house. When we use a different sample consisting of youth only (Model 6), homeownership remains a positive predictor of English grade. However, none of the positive associations are statistically significant. Planned effort approaches statistical significance in all three models. Commitment to school is a statistically significant predictor in Model 6 ($p < .05$) and approaches statistical significance in Models 4 and 5 ($p < .10$). No parent/household covariate is a statistically significant predictor of English grade.

Table 3. Regression Analysis of Homeownership, Youth and Parent Characteristics, and Academic Achievement Outcomes

| | Youth and parents sample (Sample 1) ($N$ = 2,825) | | | | Youth-only sample (Sample 2) ($N$ = 5,684) | |
|---|---|---|---|---|---|---|
| | Model 4[b] | | Model 5[c] | | Model 6[b] | |
| Variables | Math β(Robust SE) | English β(Robust SE) | Math β(Robust SE) | English β(Robust SE) | Math β(Robust SE) | English β(Robust SE) |
| Variable of interest | | | | | | |
| Homeownership (own house = 0) | 2.94 (1.18)* | 1.68 (1.19) | 2.94 (1.15)* | 1.62 (1.15) | 2.17 (1.14)† | 1.40 (1.15) |
| Youth covariates | | | | | | |
| Gender (girls = 0) | 2.02 (0.86)* | 1.13 (0.88) | 2.00 (0.86)* | 1.14 (0.88) | 2.17 (0.72)** | 1.47 (0.72)* |
| Age in 2011 | -0.26 (0.28) | -0.47 (0.29) | -0.30 (0.27) | -0.50 (0.29† | -0.27 (0.25) | -0.42 (0.27) |
| Academic self-efficacy | -0.05 (0.07) | -0.09 (0.07) | -0.05 (0.07) | -0.09 (0.07) | -0.03 (0.07) | -0.03 (0.07) |
| Commitment to school | 0.12 (0.07)† | 0.12 (0.06)† | 0.12 (0.07)† | 0.12 (0.06)† | 0.10 (0.06)† | 0.10 (0.05)* |
| Planned effort | -0.01 (0.10) | -0.15 (0.09)† | -0.02 (0.10) | -0.15 (0.08)† | -0.02 (0.08) | -0.10 (0.06)† |
| Orientation toward success | -0.03 (0.06) | 0.03 (0.06) | -0.03 (0.06) | 0.03 (0.06) | -0.04 (0.06) | -0.02 (0.06) |
| Uncertainty of future | 0.02 (0.09) | 0.01 (0.09) | 0.02 (0.09) | 0.01 (0.09) | 0.01 (0.08) | -0.01 (0.06) |
| Grade expectation (math) | 0.12 (0.03)*** | - | 0.12 (0.03)*** | - | 0.13 (0.03)*** | - |
| Grade expectation (English) | - | 0.24 (0.03)*** | - | 0.24 (0.03)*** | - | 0.22 (0.03)*** |
| Parent and household covariates | | | | | | |
| Education level (no formal education = 0) | | | -1.57 (1.17) | -1.27 (1.04) | | |
| Employment type (informal = 0) | | | 2.38 (1.16)* | 1.07 (1.17) | | |
| Marital status (not married = 0) | | | -0.72 (0.88) | -0.75 (0.87) | | |
| Household monthly income in USD[a] | | | -0.03 (0.39) | -0.17 (0.38) | | |
| Number of economic dependents | | | 0.05 (0.18) | 0.18 (0.19) | | |
| Constant | 41.41 (7.81)*** | 38.50 (7.35)*** | 44.73 (8.33)*** | 40.48 (7.83)*** | 42.51 (6.20)*** | 39.08 (6.33)*** |
| $F$ value | 4.90*** | 11.39*** | 5.03*** | 8.56*** | 5.33*** | 12.56*** |
| $R^2$ | .0279 | .0584 | .0317 | .0604 | .0269 | .0525 |

†$p \leq .10$, *$p \leq .05$, **$p \leq .01$, ***$p \leq .001$, two-tailed test

[a]Exchange rate used is GHS 1 = USD 0.66, approximately the rate when the baseline survey was conducted. Income was transformed using inverse hyperbolic sine transformation.

[b]Model with youth covariates only

[c]Model with youth and parent/household covariates

*Livestock ownership*

Table 4 presents results of regression analysis of livestock ownership and math and English grades. In Model 7 (Sample 1 with youth covariates only), livestock ownership is positively associated with math grade. Other things being equal, every one-point increase on the livestock ownership index increases math grade by 0.14. However, the association is not statistically significant. When parent/household covariates are added to the model (Model 8), the effect remains positive and approaches statistical significance ($p < .10$).

When we use the youth-only sample (Model 9), livestock ownership remains a positive predictor of math grade and approaches statistical significance ($p < .10$). Other things being equal, every one-point increase on the livestock ownership index increases math grade by 0.12. Consistent with other model results, male gender and academic expectation of math grade are significant predictors of math grade. Parent's employment is also a statistically significant predictor of math achievement. Youth whose parents work in the formal sector scored 2.33 points higher in math than youth whose parents work in informal labor sector.

The effect of livestock ownership on English achievement is positive, albeit not statistically significant. Youth whose families own livestock scored between 0.03 to 0.07 points higher in English than youth whose families do not own land. Although the main variable of interest in these models does not have a statistically significant association with English score, academic expectation of English grade is a statistically significant predictor in all three models. Academic expectation is positively associated with English grade. No parent/household covariate is a statistically significant predictor of English achievement.

Table 4. Regression Analysis of Livestock Ownership, Youth and Parent Characteristics, and Academic Achievement Outcomes

| | Youth and parents sample (Sample 1) ($N$ = 2,825) | | | | Youth-only sample (Sample 2) ($N$ = 5,684) | |
|---|---|---|---|---|---|---|
| | Model 7[b] | | Model 8[c] | | Model 9[b] | |
| Variables | Math β(Robust SE) | English β(Robust SE) | Math β(Robust SE) | English β(Robust SE) | Math β(Robust SE) | English β(Robust SE) |
| Variable of interest | | | | | | |
| Livestock index | 0.14 (0.09) | 0.03 (0.08) | 0.14 (0.08)† | 0.03 (0.08) | 0.12 (0.07)† | 0.07 (0.07) |
| Youth covariates | | | | | | |
| Gender (girls = 0) | 2.01 (0.87)* | 1.15 (0.88) | 1.99 (0.87)* | 1.15 (0.89) | 2.11 (0.70)** | 1.44 (0.70)* |
| Age in 2011 | -0.23 (0.28) | -0.44 (0.30) | -0.28 (0.27) | -0.48 (0.29) | -0.26 (0.25) | -0.41 (0.37) |
| Academic self-efficacy | -0.05 (0.07) | -0.09 (0.07) | -0.04 (0.07) | -0.09 (0.07) | -0.03 (0.07) | -0.03 (0.07) |
| Commitment to school | 0.11 (0.07) | 0.11 (0.06)† | 0.11 (0.07) | 0.11 (0.06)† | 0.10 (0.06)† | 0.10 (0.05)* |
| Planned effort | -0.01 (0.10) | -0.15 (0.09)† | -0.02 (0.10) | -0.15 (0.09)† | -0.02 (0.08) | -0.10 (0.06) |
| Orientation toward success | -0.02 (0.06) | 0.03 (0.06) | -0.01 (0.06) | 0.03 (0.06) | -0.03 (0.06) | -0.02 (0.06) |
| Uncertainty of future | 0.02 (0.09) | 0.01 (0.09) | 0.02 (0.09) | 0.02 (0.09) | 0.01 (0.08) | -0.01 (0.07) |
| Grade expectation (math) | 0.12 (0.03)*** | - | 0.12 (0.03)*** | - | 0.13 (0.03)*** | - |
| Grade expectation (English) | - | 0.24 (0.03)*** | - | 0.24 (0.03)*** | | 0.22 (0.03)*** |
| Parent and household covariates | | | | | | |
| Education level (no formal education = 0) | | | -1.67 (1.16) | -1.39 (1.05) | | |
| Employment type (informal = 0) | | | 2.33 (1.16)* | 0.97 (1.19) | | |
| Marital status (not married = 0) | | | -0.56 (0.92) | -0.60 (0.90) | | |
| Household monthly income in USD[a] | | | -0.32 (0.39) | -0.18 (0.38) | | |
| Number of economic dependents | | | 0.06 (0.19) | 0.20 (0.19) | | |
| Constant | 41.77 (7.80)*** | 38.68 (7.36)*** | 45.09 (8.34)*** | 40.58 (7.85)*** | 42.76 (6.22)*** | 39.25 (6.36)*** |
| $F$ value | 3.70*** | 10.31*** | 3.80*** | 7.86*** | 5.14*** | 11.93*** |
| $R^2$ | .0232 | .0563 | .0272 | .0584 | .0250 | .0515 |

†$p \leq .10$, *$p \leq .05$, **$p \leq .01$, ***$p \leq .001$, two-tailed test

[a]Exchange rate used is GHS 1 = USD 0.66, approximately the rate when the baseline survey was conducted. Income was transformed using inverse hyperbolic sine transformation.

[b]Model with youth covariates only

[c]Model with youth and parent/household covariates

*Transportation*

Table 5 presents results of regression analysis of mode of transportation ownership and math and English grades. In Model 10 (Sample 1 with youth covariates only), mode of transportation ownership is positively associated with math grade. Other things being equal, each one-point increase on the mode of transportation asset index increases math grade by 1.28 points. When we add parent/household covariates to the model (Model 11), the effect of mode of transportation ownership on math grade remains positive. The effect of mode of transportation ownership on math grade in Models 10 and 11 approaches statistical significance ($p < .10$).

When we use a different sample consisting of youth only (Model 12), mode of transportation ownership remains a positive predictor of math grade and approaches statistical significance ($p < .10$). Other things being equal, each one-point increase on the mode of transportation asset index increases math grade by 1.13 points. Other consistent significant predictors ($p < .05$) of math grade in all three models include male gender and academic expectation of math grade. Parental employment type approaches statistical significance ($p < .10$).

Mode of transportation ownership is positively and significantly associated with English achievement in all three models. In Model 10, each one-point increase on the mode of transportation ownership index increases English grade by 1.49 points. When we add parent/household covariates to the model (Model 11), the effect of mode of transportation ownership on English grade remains positive and statistically significant ($p < .05$). When we use a different sample consisting of youth only (Model 12), mode of transportation ownership remains a statistically significant and positive predictor of English grade. In Model 12, each one-point increase on the mode of transportation ownership index increases English grade by 1.29 points. Consistent with other models, English grade expectation is a consistent, significant predictor. Age of youth, planned effort demonstrates statistical significance in all three models ($p < .10$). Commitment to school is a statistically significant predictor in Model 12 and approaches statistical significance in Models 10 and 11. Consistent with the results of analyses that use other asset indicators, no parent/household covariate is a statistically significant predictor of English grade.

Table 5. Regression Analysis of Ownership of Transportation Asset, Youth and Parent Characteristics, and Academic Achievement Outcomes

| | Youth and parents sample (Sample 1) ($N$ = 2,825) | | | | Youth-only sample (Sample 2) ($N$ = 5,684) | |
|---|---|---|---|---|---|---|
| | Model 10[b] | | Model 11[c] | | Model 12[b] | |
| Variables | Math β(Robust SE) | English β(Robust SE) | Math β(Robust SE) | English β(Robust SE) | Math β(Robust SE) | English β(Robust SE) |
| Variable of interest | | | | | | |
| Mode of transportation index | 1.28 (0.68)† | 1.49 (0.60)* | 1.22 (0.64)† | 1.44 (0.57)* | 1.13 (0.60)† | 1.29 (0.54)* |
| Youth covariates | | | | | | |
| Gender (girls = 0) | 1.88 (0.87)* | 0.94 (0.88) | 1.87 (0.87)* | 0.96 (0.88) | 2.05 (0.72)** | 1.30 (0.72)† |
| Age in 2011 | -0.25 (0.28) | -0.50 (0.29)† | -0.29 (0.27) | -0.53 (0.29)† | -0.28 (0.25) | -0.45 (0.27)† |
| Academic self-efficacy | -0.05 (0.07) | -0.09 (0.07) | -0.05 (0.07) | -0.09 (0.07) | -0.03 (0.07) | -0.04 (0.07) |
| Commitment to school | 0.12 (0.07) | 0.12 (0.06)† | 0.12 (0.07)† | 0.12 (0.06)† | 0.10 (0.06)† | 0.11 (0.05)* |
| Planned effort | -0.02 (0.10) | -0.15 (0.09)† | -0.02 (0.10) | -0.15 (0.08)† | -0.03 (0.08) | -0.11 (0.06)† |
| Orientation toward success | -0.02 (0.06) | 0.03 (0.06) | -0.02 (0.06) | 0.03 (0.07) | -0.04 (0.06) | -0.02 (0.06) |
| Uncertainty of future | 0.03 (0.09) | 0.02 (0.09) | 0.03 (0.09) | 0.02 (0.09) | 0.02 (0.08) | 0.00 (0.07) |
| Grade expectation (math) | 0.12 (0.03)*** | - | 0.11 (0.03)** | - | 0.12 (0.03)*** | - |
| Grade expectation (English) | - | 0.24 (0.03)*** | - | 0.24 (0.03)*** | - | 0.22 (0.03)*** |
| Parent and household covariates | | | | | | |
| Education level (no formal education = 0) | | | -1.56 (1.14) | -1.07 (1.04) | | |
| Employment type (informal = 0) | | | 2.10 (1.15)† | 0.90 (1.15) | | |
| Marital status (not married = 0) | | | -0.72 (0.89) | -0.95 (0.86) | | |
| Household monthly income in USD[a] | | | -0.29 (0.39) | -0.16 (0.38) | | |
| Number of economic dependents | | | 0.03 (0.18) | 0.13 (0.19) | | |
| Constant | 41.96 (7.80)*** | 38.92 (7.34)*** | 45.31 (8.34)*** | 41.05 (7.82)*** | 43.20 (6.20)*** | 39.69 (6.32)*** |
| $F$ value | 3.78 | 11.73 | 3.44*** | 8.18*** | 5.11*** | 12.51*** |
| $R^2$ | .0249 | .0616 | .0284 | .0632 | .0265 | .0553 |

†$p \leq .10$, *$p \leq .05$, **$p \leq .01$, ***$p \leq .001$, two-tailed test

[a]Exchange rate used is GHS 1 = USD 0.66, approximately the rate when the baseline survey was conducted. Income was transformed using inverse hyperbolic sine transformation.

[b]Model with youth covariates only

[c]Model with youth and parent/household covariates

*Household possessions*

Table 6 presents results of regression analysis of household possession ownership and math and English grades. Unlike the positive associations between other types of assets and academic achievement, results show that ownership of household possessions is negatively associated with math grade. This negative direction is observed in all three models (i.e., Models 13–15) with different samples and model specifications. However, the negative association between ownership of household durable goods and math achievement is not statistically significant in all three models. Similarly, household possession ownership is not a statistically significant predictor of English achievement, but the direction of the effect is less conclusive.

Results of analyses using the youth and parent sample (Models 13 and 14) show that ownership of household possessions is negatively associated—albeit not statistically significant—with English achievement, while results using the youth-only sample (Model 15) indicate that household possession ownership has a positive influence on English achievement.

Although household possession ownership of does not have a statistically significant association with math and English scores, other youth covariates are consistently and statistically significant predictors of academic achievement ($p < .05$). Male gender and grade expectations are significant predictors. Consistent with other findings, boys have higher math grades than girls, scoring two points higher in math. Although boys score higher in English than girls, the relationship is only statistically significant in Model 15. Grade expectations are positively associated with math and English grades. Commitment to school is a statistically significant predictor of English grade in Model 15 and approaches statistical significance in Models 13 and 14. Commitment to school positively influences English grade. On the other hand, planned effort negatively predicts English grade, and the relationship approaches statistical significance ($p < .10$) in all three models. Only one parental covariate (i.e., type of employment) demonstrates statistical significance. Youth whose parents are regular employees in the formal sector scored 2.21 points higher in math than youth whose parents are engaged in the informal sector.

Table 6. Regression Analysis of Ownership of Household Possessions (Home Durable Goods), Youth and Parent Characteristics, and Academic Achievement Outcomes

| | Youth and parents sample (Sample 1) ($N$ = 2,825) | | | | Youth-only sample (Sample 2) ($N$ = 5,684) | |
|---|---|---|---|---|---|---|
| | Model 13[b] | | Model 14[c] | | Model 15[b] | |
| Variables | Math β(Robust SE) | English β(Robust SE) | Math β(Robust SE) | English β(Robust SE) | Math β(Robust SE) | English β(Robust SE) |
| Variable of interest | | | | | | |
| Household possession index | -0.22 (0.43) | -0.15 (0.40) | -0.18 (0.44) | -0.09 (0.41) | -0.04 (0.34) | 0.05 (0.40) |
| Youth covariates | | | | | | |
| Gender (girls = 0) | 2.04 (0.86)* | 1.15 (0.88) | 2.02 (0.87)* | 1.15 (0.88) | 2.22 (0.72)** | 1.51 (0.72)* |
| Age in 2011 | -0.20 (0.28) | -0.44 (0.30) | -0.24 (0.27) | -0.47 (0.29) | -0.24 (0.25) | -0.40 (0.27) |
| Academic self-efficacy | -0.05 (0.07) | -0.09 (0.07) | -0.04 (0.07) | -0.09 (0.07) | -0.03 (0.07) | -0.03 (0.07) |
| Commitment to school | 0.12 (0.07) | 0.11 (0.06)† | 0.12 (0.07)† | 0.11 (0.06)† | 0.10 (0.06)† | 0.10 (0.05)* |
| Planned effort | -0.01 (0.10) | -0.15 (0.08)† | -0.02 (0.10) | -0.15 (0.08)† | -0.02 (0.07) | -0.11 (0.06)† |
| Orientation toward success | -0.02 (0.06) | 0.03 (0.06) | -0.02 (0.06) | 0.03 (0.06) | -0.04 (0.06) | -0.02 (0.06) |
| Uncertainty of future | 0.02 (0.09) | 0.01 (0.09) | 0.03 (0.09) | 0.02 (0.09) | 0.02 (0.08) | -0.00 (0.07) |
| Grade expectation (math) | 0.12 (0.03)*** | - | 0.12 (0.03)*** | - | 0.13 (0.03)*** | - |
| Grade expectation (English) | - | 0.24 (0.03)*** | - | 0.24 (0.03)*** | - | 0.22 (0.03)*** |
| Parent and household covariates | | | | | | |
| Education level (no formal education = 0) | | | -1.77 (1.19) | -1.38 (1.07) | | |
| Employment type (informal = 0) | | | 2.21 (1.15)† | 0.97 (1.19) | | |
| Marital status (not married = 0) | | | -0.33 (0.88) | -0.54 (0.86) | | |
| Household monthly income in USD[a] | | | -0.30 (0.40) | -0.17 (0.38) | | |
| Number of economic dependents | | | 0.09 (0.19) | 0.21 (0.20) | | |
| Constant | 42.20 (7.68)*** | 38.98 (7.37)*** | 45.08 (8.26)*** | 40.64 (7.84)*** | 42.97 (6.06)*** | 39.22 (6.22)*** |
| $F$ value | 3.33** | 10.62*** | 3.64*** | 8.58*** | 4.69*** | 11.60*** |
| $R^2$ | .0212 | .0564 | .0251 | .0584 | .0231 | .0509 |

†$p \leq .10$, *$p \leq .05$, **$p \leq .01$, ***$p \leq .001$, two-tailed test

[a]Exchange rate used is GHS 1 = USD 0.66, approximately the rate when the baseline survey was conducted. Income was transformed using inverse hyperbolic sine transformation.

[b]Model with youth covariates only

[c]Model with youth and parent/household covariates

Table 7. Regression Analysis of All Asset Variables, Youth and Parent Characteristics, and Academic Achievement Outcomes

| | Youth and parents sample (Sample 1) ($N$ = 2,825) | | | | Youth-only sample (Sample 2) ($N$ = 5,684) | |
|---|---|---|---|---|---|---|
| | Model 16[b] | | Model 17[c] | | Model 18[b] | |
| Variables | Math β(Robust SE) | English β(Robust SE) | Math β(Robust SE) | English β(Robust SE) | Math β(Robust SE) | English β(Robust SE) |
| Asset Variables | | | | | | |
| Land ownership | 0.80 (0.85) | 0.72 (0.80) | 0.92 (0.85) | 0.79 (0.80) | 0.91 (0.77) | 0.27 (0.72) |
| Home ownership | 2.35 (1.03)* | 1.15 (1.04) | 2.40 (1.03)* | 1.16 (1.03) | 1.54 (0.96)† | 0.83 (0.98) |
| Livestock index | 0.05 (0.07) | -0.05 (0.07) | 0.06 (0.07) | -0.05 (0.07) | 0.05 (0.05) | 0.01 (0.05) |
| Mode of transportation index | 1.04 (0.67) | 1.57 (0.57)** | 1.00 (0.63) | 1.52 (0.55)** | 0.94 (0.56)† | 1.28 (0.49)** |
| Household possession index | -0.47 (0.46) | -0.43 (0.43) | -0.44 (0.47) | -0.39 (0.45) | -0.28 (0.36) | -0.22 (0.35) |
| Youth covariates | | | | | | |
| Gender (girls = 0) | 1.79 (0.83)* | 0.88 (0.85) | 1.77 (0.83)* | 0.89 (0.86) | 1.90 (0.83)** | 1.23 (0.66)† |
| Age in 2011 | -0.34 (0.27) | -0.54 (0.29)† | -0.37 (0.27) | -0.56 (0.28)* | -0.33 (0.24) | -0.47 (0.26)† |
| Academic self-efficacy | -0.05 (0.07) | -0.09 (0.07) | -0.04 (0.07) | -0.09 (0.07) | -0.03 (0.06) | -0.03 (0.07) |
| Commitment to school | 0.12 (0.07)† | 0.12 (0.06)† | 0.12 (0.07)† | 0.12 (0.06)† | 0.10 (0.05)† | 0.10 (0.05)* |
| Planned effort | -0.00 (0.10) | -0.14 (0.08)† | -0.00 (0.10) | -0.14 (0.08)† | -0.02 (0.07) | -0.10 (0.06)† |
| Orientation toward success | -0.03 (0.06) | 0.02 (0.06) | -0.03 (0.06) | 0.02 (0.06) | -0.04 (0.06) | -0.02 (0.06) |
| Uncertainty of future | 0.01 (0.09) | 0.01 (0.09) | 0.01 (0.09) | 0.01 (0.09) | 0.01 (0.08) | 0.01 (0.07) |
| Grade expectation (math) | 0.12 (0.03)*** | - | 0.12 (0.03)*** | - | 0.13 (0.03)*** | - |
| Grade expectation (English) | - | 0.24 (0.03)*** | - | 0.24 (0.03)*** | - | 0.22 (0.03)*** |
| Parent and household covariates | | | | | | |
| Education level (no formal education = 0) | | | -1.08 (1.09) | -0.82 (1.00) | | |
| Employment type (informal = 0) | | | 2.64 (1.13)* | 1.13 (1.17) | | |
| Marital status (not married = 0) | | | -0.89 (0.88) | -0.96 (0.87) | | |
| Household monthly income in USD[a] | | | -0.31 (0.39) | -0.16 (0.38) | | |
| Number of economic dependents | | | -0.03 (0.18) | 0.11 (0.18) | | |
| Constant | 43.06 (7.67)*** | 39.98 (7.32)*** | 46.31 (8.25)*** | 41.85 (7.80)*** | 43.84 (6.03)*** | 40.14 (6.16)*** |
| $F$ value | 3.74*** | 9.83*** | 4.22*** | 8.11*** | 3.93*** | 9.59*** |
| $R^2$ | .0324 | .0644 | .0361 | .0657 | .0305 | .0562 |

†$p \leq .10$, *$p \leq .05$, **$p \leq .01$, ***$p \leq .001$, two-tailed test

[a]Exchange rate used is GHS 1 = USD 0.66, approximately the rate when the baseline survey was conducted. Income was transformed using inverse hyperbolic sine transformation.

[b]Model with youth covariates only

[c]Model with youth and parent/household covariates

*Final model*

Table 7 presents results of the final three models in which all five asset variables are included simultaneously in the regression model. Consistent with the results of other models, four asset variables (i.e., livestock, mode of transportation, house, and land) are positively associated with math grade. However, only the effect of homeownership on math grade in Models 16 and 17 is statistically significant. Youth whose families own a home scored at least two points higher in math than youth whose families do not own a home. In Model 18 (i.e., youth-only sample), the effect of homeownership and mode of transportation ownership on math grade approaches statistical significance ($p < .10$). Male gender and academic expectation of math grade are consistent significant predictors of math grade in all three models. Commitment to school positively influences math grade, and the relationship approaches statistical significance. When we add parental/household covariates, parental employment type becomes a significant predictor. Youth whose parents are regular employees in the formal sector scored 2.64 points higher in math than youth whose parents are engaged in the informal sector.

Three asset variables (i.e., house, land, and mode of transportation) are positively associated with English grade. Consistent with the results of other models, ownership of household possessions is negatively associated with English score. The direction of the effect of livestock ownership is less conclusive. In the youth and parents sample (Models 16 and 17), livestock ownership is negatively associated with English score. In the youth-only sample (Model 18), livestock ownership is positively associated with English score. However, only the effect of mode of transport ownership is statistically significant ($p < .01$). Other things being equal, each one-point increase on the mode of transportation asset index increases math grade by more than one point. Consistent with math score, academic expectation of English grade is consistently and positively associated with English score ($p < .001$). Age has a negative effect on English score, and the relationship is statistically significant in Model 17 (i.e., model with youth and parental/household covariates) and approaches statistical significance in Models 16 and 18 (i.e., models with youth covariates only). Planned effort also has a negative effect on English score, and the relationship approaches statistical significance in all three models ($p < .10$). Commitment to school positively influences English grade, and the relationship approaches statistical significance in Models 16 and 17 (i.e., models using youth and parents sample) and statistically significant in Model 18 (i.e., model using youth-only sample). No parental/household covariate is significantly associated with English score.

We also compare the relative strength of the five asset variables. In Models 16 and 17, homeownership has the largest standardized coefficient (0.07) on math score, and livestock ownership has the smallest standardized coefficient (0.02 in absolute value). In Model 18, mode of transportation ownership has the largest standardized coefficient (0.05), followed by homeownership (0.04), and livestock ownership's standardized coefficient remains the smallest (0.02). With regard to English score, mode of transportation ownership has the largest standardized coefficient (0.07–0.08) in all three final models. Consistent with math score, livestock ownership has the smallest standardized coefficient (0.002–0.02) in all three models. When we compare the relative strength of all predictors, academic expectation of grades has the largest standardized coefficient. In all three final models, a one standard deviation increase in academic expectation of math grade leads to a 0.11 standard deviation increase in math score, with other variables held constant. Further, a one standard deviation increase in academic expectation of English grade leads to a 0.20 standard deviation increase in English grade in Model 18 and a 0.23 standard deviation increase in Models 16 and 17.

Finally, we test whether or not the five asset variables contribute information about youth's academic achievement that is not provided by youth and parental/household covariates. We test $H_0$ : $\beta_{homeownership} = \beta_{landownership} = \beta_{livestock} = \beta_{transport} = \beta_{householdpossessions} = 0$ against $H_1$ : at least one of the asset variables' effects is not zero, using a likelihood ratio test with $\alpha = .05$. When we compare the full model (i.e., a model with all predictors) and reduced model (i.e., a model without the five asset variables), results of likelihood ratio tests in all three final models (Models 16 to 18) are statistically significant ($p < .001$), which suggest the model with all five asset variables fits significantly better than the model without asset variables. The results also suggest that asset ownership is an important predictor of math and English grades because the five asset predictors contribute information about changes in math and English scores beyond what youth and parental/household covariates provide.

**Discussion**

This study examines the relationships between asset ownership and academic achievement of youth in Ghana, and results suggest that asset ownership overall is positively associated with academic achievement. However, findings also show that the positive relationship between asset ownership and academic achievement depends on the type of asset and the academic subject. Homeownership is positively and significantly associated with math achievement. Mode of transportation (e.g., motorcycle, bicycle, cars, and trucks) ownership is positively and significantly associated with English achievement. These findings are consistent across different sample and model specification, which suggests that the observed association may be robust. Although the relationships between other types of asset variables and academic achievement (e.g., land ownership and math and English grades, homeownership and English grades, mode of transportation ownership and math grades, and livestock ownership and math grades) are not statistically significant, the positive direction of the relationships is important, particularly from a policy or program perspective. At the very least, with the exception of household possession ownership, asset ownership does not contribute to lower academic performance of youth.

By examining the relationships between different types of assets and math and English achievement separately, we are able to demonstrate that—although asset ownership in general influences academic achievement positively—there are variations in direction and magnitude of effect by type of asset. Owning a greater variety of assets seems to positively influence math achievement but not English achievement among Ghanaian youth. We find that ownership of land, a home, a mode of transportation, or livestock positively influence math grades, but only homeownership, landownership or mode of transportation ownership positively predicts English achievement. Alternatively, only household possession ownership has a negative effect on math achievement, but two types of assets (i.e., household possessions and livestock) negatively influence English achievement. In addition, the coefficient size of the association between asset ownership and math score is generally higher than the coefficient size of the association between asset ownership and English score. For instance, homeownership is associated with a nearly three-point increase in math but only a 1.5-point increase in English, which suggests that asset ownership predicts a greater positive effect on math scores. Nevertheless, asset ownership remains a positive predictor of both measures of academic achievement.

Consistent with Sherraden's (1991) propositions, we may be able to explain the positive association between asset ownership and youth's academic achievement by examining (a) the direct financial effect of asset ownership on a household's ability to purchase school-related materials and (b) the indirect effect of asset ownership on attitudes and behaviors. Household asset ownership may

increase youth's and parents' ability to purchase books, uniforms, and school supplies; pay fees for school and extracurricular activities; and attend school beyond free and compulsory education. Although the assets included in our study are not "liquid," these assets may provide families with adequate cash flow to purchase or have access to school-related materials that make it easier for the youth to learn and perform better in school. For instance, families who own land can lease it or plant crops to generate income. Houses or rooms within the home can be rented. Livestock can be sold for cash or used to generate income (e.g., selling of their milk). Motorcycles, boats, and bicycles can be sold or leased or used to transport people for a fee. Mode of transportation also can reduce the time it takes youth to travel from home to school, which allows them to arrive on time or less tired from walking long distances.

Asset ownership also may indirectly affect school-related attitudes and behaviors, which may contribute to higher academic achievement. For instance, youth who believe that their families have enough economic resources to pay for school may be able to better prepare for final exams, focus on getting higher grades to advance to the next grade level, and plan for schooling beyond the free and compulsory education. This may lead to increased academic efforts, expectations, and achievement. The indirect attitudinal and behavioral effects of asset ownership could be as important as its monetary or financial impact in predicting higher academic achievement.

Our findings are consistent with research in the US that shows a more consistent positive and significant association between asset ownership and math scores than asset ownership and English scores (Orr, 2003; Phillips, Brooks-Gunn, Duncan, Klebanov, & Crane, 1998; Zhan, 2006). (For a review of evidence see Elliott et al., 2011 and Williams Shanks et al., 2010.) Our findings also are consistent with research conducted in the US that shows that the relationship between asset ownership and academic achievement varies by type of asset (Elliott et al., 2011). However, most studies in the US use net worth and liquid assets (e.g., savings) as measures of asset ownership, which rely on readily available and more reliable sources. Obtaining similar reliable measures of asset ownership in Ghana is more challenging. Price data and market values can be difficult to obtain in many developing countries, particularly in economies characterized by high levels of informal activities (e.g., bartering). We used the same procedure put in place by international organizations (e.g., the World Bank and United Nations Development Program) to collect information about household asset ownership in developing countries by asking youth to report assets their families own. When asking people what they own from a list of assets, there is often more likelihood of recall.

Our findings suggest that male gender, commitment to school, and academic expectations are consistent and significant predictors of academic achievement. Higher academic expectations and commitment to school may help students develop positive feelings about, greater motivation for, and interest in school subjects, which may result in higher academic achievement (Bandura, 1997; Gonida & Leondari, 2011). Results also suggest that Ghanaian girls remain at an academic disadvantage, possibly because of differences in expectations in Ghana. Some parents continue to have higher expectations of boys' academic achievement than girls' because of cultural and customary influences. Boys often are expected to become self-sufficient breadwinners and household heads. In some cases, teachers buy into the normalcy of gender differences, which may be reflected in how they question or praise boys and girls in the classroom (Kyei, Apam, & Nokoe, 2011). In addition, classroom dynamics (e.g., seating assignments or bullying and harassment), may hamper girls' active participation and engagement in the classroom (Dunne & Leach, 2005; Mensch & Lloyd, 1998).

### Limitations

The study has limitations. First, we used cross-sectional data, which cannot definitively establish the direction of the relationship, causality, or variation of academic achievement over time. Once follow-up data are collected, we will address issues of reverse causality and potential confounding that may undermine the results of our current study.

Second, we investigated the effects of a limited number of assets (e.g., land, home, household possessions, livestock, and mode of transportation). Although the types of assets used in the study are appropriate for Ghana, we may have omitted other types of assets that influence youth academic achievement. Future studies should examine the role of other types of assets, including liquid assets (e.g., savings) on Ghanaian youth's academic outcomes. A growing body of literature has shown that savings have a more direct and stronger influence on academic achievement than other types of assets (e.g., Elliott, Jung, & Friedline, 2011; Elliot et al., 2010). Further, some of the asset indicators used in the study are not informative enough to differentiate assets based on quality or size. For instance, because we are unable to differentiate land ownership by size or homeownership by quality of construction materials, we are unable to examine whether the effects of these types of assets vary depending on these specific characteristics.

Third, although we included predictors that have been shown to influence academic achievement, our models generated low $R^2$, which implies that other important predictors of youth academic achievement in Ghana were omitted.

## Conclusions

Our study presents evidence that the effect of asset ownership on academic achievement of Ghanaian youth depends on the type of asset and academic subject. In general, asset ownership has a positive effect on academic achievement. Multiple assets (e.g., land, house, livestock, and mode of transportation) positively influence math grades, but only homeownership, landownership, and mode of transportation ownership have positive effects on English grades. Because academic achievement may determine other educational outcomes (e.g., school completion, transition to higher levels of education, and how much youth will pay for higher education and what courses they can take), our findings have important implications for programs and efforts to promote academic proficiency and progress for all youth. Our findings suggest that allowing and helping families to own and accumulate assets may start to level the playing field for all youth so they can maximize their human capital potential.

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