Center for Social Development
GEORGE WARREN BROWN SCHOOL OF SOCIAL WORK
KU THE UNIVERSITY OF KANSAS School of Social Welfare

The Impact of Household Possessions on Youth's Academic Achievement in the Ghana YouthSave Experiment

A Propensity Score Analysis

Gina A. N. Chowa
University of North Carolina at Chapel Hill

Rainier D. Masa
University of North Carolina at Chapel Hill

Christopher J. Wretman
University of North Carolina at Chapel Hill

David Ansong
Washington University in St. Louis

This paper is part of the Assets and Education Research Symposium, sponsored by the University of Kansas School of Social Welfare and the Center for Social Development at the George Warren Brown School of Social Work, Washington University in St. Louis

2012

CSD Working Papers
No. 12-17

Acknowledgements

This publication is part of the Assets and Education Research Symposium held at the University of Kansas on March 28 and 29, 2012. The symposium is co-organized by the School of Social Welfare at the University of Kansas and the Center for Social Development at Washington University in St. Louis. Other supporters are CFED, New America Foundation, and the Office of the Provost at the University of Kansas.

The Impact of Household Possessions on Youth's Academic Achievement in the Ghana YouthSave Experiment: A Propensity Score Analysis

Households play an important role in youth's academic achievement. Household assets as part of youth's family background have been found to have a significant impact on youth's academic achievement. In this study, the impact of household possessions on youth's academic achievement in the Ghana YouthSave experiment is investigated. Findings support the hypothesized positive direction of the impact of household possessions on academic achievement of youth. Using propensity score optimal matching and matching estimators, results show youth from households that reported owning at least one of the five household items measured scored almost 1 unit higher on English than their peers from households that do not own any. However, results indicate ownership of household possessions do not have a statistically significant impact on Math scores of youth in the Ghana YouthSave experiment. Although the impact of ownership of household possessions on English scores is consistent across different tests used in this study, the impact of ownership of household possessions on Math scores is less conclusive. Policy implications are discussed.

Key words: *household assets, household possessions, academic achievement, Ghana, family background, propensity score analysis*

Introduction

UNICEF's 2011 *The State of the World's Children* highlighted the problems relating to adolescents and education. In particular, UNICEF called on nations to invest in the education of youth as a way to maintain the gains that have been achieved in child welfare. Academic achievement is an educational goal that ensures that every child does well in school both in cognitive and non-cognitive skills. Children's success in school, to a large extent, determines their success as adults—where they will go to college, what professions they will enter, and how much they will be paid. Increasingly researchers are concluding that it is not educational attainment, but rather what students actually know that is important for the economic growth of nations (see Fuchs & Wößmann, 2007; Hanushek & Wößmann, 2011 for reviews). Relatively small improvements in cognitive skill levels can, therefore, translate into substantial improvements in a population's future well-being (Hanushek and Kimko 2000; OECD 2010). The distinction between the quality versus quantity of education is important for policies that are developed to improve student achievement.

Ghana, like many other African nations, has adopted an education system that is designed to guarantee all children a minimum of nine years of basic education, i.e. six years of primary or

elementary education and three years of Junior High School (JHS) or middle school with a compulsory age range of 6-15 years (UNESCO, 2005). Ghana has consistently implemented policies to improve the quality, quantity, and accessibility of education. Examples of such policies are the Education Reform of 1987, which promised increased access to education at the basic level, the Free-Compulsory Universal Basic Education introduced in 1995, which promised to provide quality Education in teaching and learning, and the Capitation Grant of 2005/2006, which was implemented to cushion the burden of parents in meeting the cost of sending their children to school and to encourage parents especially in economically deprived areas to send their children to school. Despite all these initiatives, however, many children in Ghana fail to continue and complete their basic education program. For example in 2008, about a third (32.3%) of children who enrolled in JHS did not complete JHS final year (MESS, 2008).

Research has shown that a family's economic status—defined to include household income, years of education completion, and occupation—affects children's education completion (Bachman & Diprete, 2006), transition to higher education (Ellwood & Kane, 2000; Hertz, 2005; Sandefur, Eggerling-Boeck, & Park, 2005; Sandefeur, Meier, & Campbell, 2006), academic performance (Elliott et al., 2011; William Shanks et al., 2010), and educational aspirations and expectations (Elliot, Chowa, & Loke, 2011; Oyserman & Destin, 2010). These findings suggest that children from households that have lower incomes and less education, which typically are poor families, have disproportionately negative educational outcomes. However, research in this area has currently shifted from focusing only on income as a proxy for family's economic status to incorporating assets, as assets provide a more stable picture of family wealth status.

Evidence in developing countries of family socioeconomic status and academic achievement is mostly confined to cross-country studies. There are very few large-scale studies done within countries that investigate the relationship between family socioeconomic status and academic achievement. This study uses data from a large country-wide experiment in Ghana, YouthSave. This study seeks to answer the research question: What is the effect of family assets broadly and household possessions in particular on youth's academic achievement?

Family background and academic achievement

Families play an important role in children's academic achievement. The Coleman report's findings that school-level differences had little impact on variation among individual children in terms of their academic success, set the pace for added effort in investigating family background and its impact on academic success for children (Coleman, Campbell, Hobson, McPartland, & Mood; 1966). These findings were augmented by the Plowden Report (Peaker, 1971) in Great Britain which concluded that family background is more important than school factors in determining children's academic achievement. A shift in this debate was introduced when findings by Heyneman (1976) who replicated Coleman's study in Uganda suggested the opposite: that family background (parent's occupation, parent's education, and household possessions) is less important than school factors in

determining academic achievement. In a subsequent study Heyneman and Loxley (1983) generalized their findings to other developing countries and found that the portion of the variance attributable to family background was generally smaller compared to that of school characteristics, which was much larger. Additional studies have found that teacher training, textbooks, and libraries strongly determine achievement (Behrman & Birdsall, 1983; Lockheed, Vail, & Fuller, 1986). One of the main critiques of these studies is that the influence of schooling in developing countries has been overstated due to under-specification of student background factors where culturally relevant SES indicators are missing in the investigations; instead measures imported from developed countries are employed (Fuller & Clarke, 1994). For example, Goldsten (1995) states that because of the limited information on student's background and home amenities, studies limit the kinds of causal explanations that can be offered about SES and educational achievement. In contrast, a study by Lockheed, Fuller, and Nyirongo (1989) in Malawi included labor demands on children, basic attributes of a house, and mother tongue, to reflect a more culturally relevant measure of family background and found that these variables were more consistently related to academic achievement than were the more conventional variables of parental occupation and education.

The measurement of family background, which originally included only parent's education and occupation, has evolved to include family structure, parental involvement, educational resources in the home, economic characteristics of the home including wealth, and family's social and cultural capital. In developing countries, very little research has been done on family background in general and economic characteristics in particular. Direct measures of financial resources as a proxy for economic characteristics of the home are a challenge to collect in studies of educational achievement. Data in these studies are often obtained from students who may not have accurate information about their parent's financial resources.

These challenges in developing and collecting reliable measures of household wealth in studies of academic achievement have led researchers to use proxies for family wealth such as indices of home possessions and home structural characteristics. These are easy for students to report and can be easily verified. These indices are better approximations of long-term wealth, because they reflect earnings over a lifetime or the purchasing power of families, while income measures only reflect a particular point (Filmer & Pritchett, 1999; Lebowitz, 1974). Filmer and Pritchett developed an asset index which included household possessions and household structural characteristics and classified them into different wealth groups (poor, middle, rich) based on the asset index values. The advantage of an asset index is that it can be used to evaluate the distribution of educational outcomes across different socioeconomic status groups within countries (Filmer & Scott, 2008).

Studies investigating the impact of family structure on academic achievement show that family structure such as the number of children has a "resource dilution hypothesis" where the material resources and parental attention are diluted with additional children in the household (Bachman, 2002). However, Marks (2006), in a cross-country study testing the impact of family size on academic achievement, found that in almost all countries the effect of family size declined by

between a quarter and a half when taking into account a family's socioeconomic background (Marks, 2006). Marks concluded that much of the association between family size and educational outcomes is simply due to the correspondence between large families and lower socioeconomic status (Marks, 2006).

Assets and Education

Research in developing countries has shown that assets are associated with positive educational outcomes. An experimental study conducted in Uganda, for instance, found a positive relationship between asset ownership, particularly youth savings, and higher academic grades and test scores (Curley, Ssewamala, & Han, 2010). Orphans with savings account scored higher on the Primary Leaving Examination Scores than their peers without savings accounts (Curley et al., 2010). Aside from examination scores, empirical evidence also suggests positive relationships between assets and other educational outcomes, including school enrollment (Filmer & Pritchett, 2001), higher school attendance (Kruger, Soares, & Berthelon, 2007), higher educational attainment (Filmer & Pritchett, 1999; Montgomery, Grant, Mensch, & Roushdy, 2005), and low school drop-out rates (; Curley et al., 2010; Filmer & Pritchett, 1999). However, Chowa, Ansong, and Masa (2010) found mixed results on the relationship between assets and educational outcomes in developing countries. In their research review, Chowa et al. (2010) found that not all types of assets positively influence children's educational outcomes. For instance, assets that require substantial amounts of time to maintain such as a large number of livestock or permanent crops are associated with negative education outcomes such as low school attendance rates (Admassie, 2002; Cockburn & Dostie, 2007).

Findings in developing countries are consistent with results found in more developed economies. Elliott (2009), for instance, found a positive association between household assets and children's math achievement. A research review conducted by Elliott and colleagues (2011) suggested that the type of asset, as well as the child's age and race, differentially affects academic achievement. Assets, particularly more liquid assets, have a stronger predictive effect on college attendance than early net worth (Huang, Guo, Kim, & Sherraden, 2010). This finding holds true even when academic achievement is controlled for (Elliott et al., 2011). Similarly, a research review conducted by Williams Shanks and colleagues (2010) suggests that assets play an influential role in children's education outcomes independent of the effects of household income and parent's education.

Household economic stability and children's academic achievement

The connections between educational achievement and household wealth (sometimes measured by household possessions) are built upon an ecological systems approach. Applying ecological theory to well-being, low education achievement can be understood as a contributing factor to the intergenerational poverty cycle in developing countries (Shapiro & Tambashe, 2001). Conversely, high education achievement is one pathway to achieve intergenerational social mobility. Intergenerational social mobility refers to the relationship between the socioeconomic status of

parents and the status their children will attain as adults (OECD, 2010). Intergenerational mobility is influenced by a host of factors that determine economic success including inheritability traits and social and family environments in which individuals are situated. Among environmental factors are policies that shape access to human capital formation such as public support for early childhood, primary, secondary, and tertiary education, as well as redistributive policies that may raise financial barriers to accessing education.

Economic resources such as income and assets, which are indicators of parent and household socioeconomic status, influence youth's academic achievement. Household income and wealth have been shown to be associated with improvements in children's education in developing countries, including Sub-Saharan Africa (Filmer & Pritchett, 1999, 2001; Glick & Sahn, 2000, 2009; Lincove, 2009; Zhao & Glewwe, 2010). Decline in income has been shown to negatively affect school enrollment of children in developing countries (Grimm, 2010).Research has also shown that changes in youth's levels of educational aspiration or expectation are influenced by household socioeconomic status (Hossler, Schmit, & Vesper, 1999; Reynolds & Pemberton, 2001; Valadez, 1998). One way asset ownership, particularly liquid assets, influence youth academic achievement is through a family's ability to purchase school materials (for example, text books and other needed supplies) that can facilitate learning both in and outside of the classrooms. For instance, research has shown positive association between household computer ownership and children's academic performance (Schmitt & Wadsworth, 2006) and school enrollment (Fairlie, 2005).

Saving for education is considered to be another pathway that can explain how a family's socioeconomic status can influence academic achievement. Research has shown that having a savings account among youth from lower SES is associated with higher levels of educational aspiration and expectation (Elliot, 2009; Elliott, Sherraden, Johnson, & Guo, 2010; Ssewamala & Ismayilova, 2009), as youth have begun to realize whether or not their families can afford to support their education. Using possible selves (Markus & Nurius, 1986), researchers have suggested that a cognitive shift takes place in youth's minds through their aspirations and expectations; they begin to perform better in school because they realize that going further in school is possible (Elliot, Chowa, & Loke, 2011; Oyserman & Destin, 2010). In other words, possible selves function as incentives for behavior by providing images of the future self in desired or undesired end-states (Markus & Nurius, 1986; Oyserman & Fryberg, 2006).

Educational achievement is also seen by some researchers as a dimension of well-being in its own right, contributing to a person's functioning and capacity to flourish (Sen, 1999). School, poverty, family, assets, and other variables are not considered in isolation. Indeed, researchers labor over the connections between educational achievement and long-term well-being. Educational achievement amongst adolescents is widely seen as being a primary pathway to well-being. Education is a strong predictor of earnings, health status, and, in some cases, participation in political processes. Evidence has shown that doing well in school leads to higher social and economic well-being throughout one's life no matter the person or place. Given these links between education and other dimensions

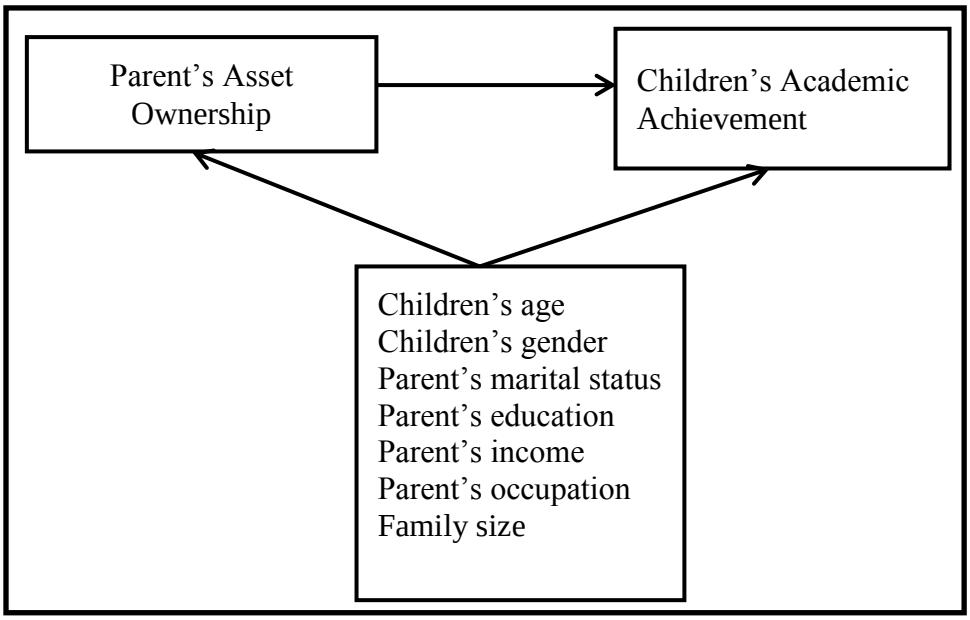
of well-being, such as income and political participation, the degree to which family background and other pre-determined personal characteristics determine a person's educational outcomes needs to be investigated.

Investigating the impact of household possessions on academic achievement: A conceptual framework

The key question is why assets, particularly liquid assets, have such a powerful impact on academic achievement. Arguably the most widely used perspective on this question is a sociological one. According to Teachman (1987), parents use material and non-material resources to create a conducive atmosphere at home that fosters academic skills. Parents allocate resources to children that may influence their education attainment and achievement. Teachman (1987) further states that educational resources were more likely to be available in the homes where parents were not only educated but also financially stable.

Coleman (1990, 1998) has offered three capitals that influence a child's education: financial, human and social capital. These are interrelated and a child requires all three to achieve in optimal growth. Parents who are educated (human capital) are assumed to hold stable jobs (financial capital) and are more inclined to be communicative with their children in terms of their children's education (social capital). Although this framework is helpful for developed countries, it does not hold very well in developing countries where parents do not necessarily have to attain a college degree to provide educational resources and pay for tuition. In developing countries like Ghana, a household's wealth may be more significant than other household characteristics in predicting how well children do in school. Consequently, researchers have employed culturally relevant proxies for household wealth such as household possessions. We suggest that households with more possessions will have a higher purchasing power to respond to children's educational resource needs than households with fewer possessions. This is because households with possessions such as radios or televisions can quickly sell these for cash if there is a need to purchase educational resources. Also, household possessions, as discussed earlier, provide a more stable picture of the economic health of a household. Therefore, as depicted in Figure 1, households with more possessions will have higher academically achieving children than households with fewer or no household possessions. However, because size of household, gender and age of child, occupation, and education of parent may influence children's academic achievement, these are used as covariates in the model to account for their influence on household possessions.

Figure 1: Conceptual model of impacts of household possessions on children's academic achievement



Project setting: Education in Ghana

Ghana is a very diverse country in west-central Africa of over 22 million people. In recent decades it has made enormous strides in improving the standard of living for its people, become something of a model for many neighboring countries. Key reforms and policies have resulted in higher education enrollment, lower birth rates, higher life expectancies, and lower infant mortality rates (Ghana, 2008). Economically speaking, the country's GDP continues to grow at a healthy pace while key indicators such as electricity production and water treatment have risen as well (Ghana Statistical Services, 2011). Despite these improvements, many hardships remain, especially for children (Laird, 2002). Moreover, the recent global economic downturn has significantly hurt Ghana's economy, reduced available funds, and somewhat clouded a once sunny economic outlook (Addai & Pokimica, 2010). Still, Ghana's future should be viewed as promising. As one of the most developing of the sub-Saharan African countries, it is seen as a proving ground for research and intervention. Leaders both in Ghana and otherwise have called on the country to maintain its decades-long momentum of progress (Addai & Pokimica, 2010).

There is consensus amongst Ghanaians that education is a crucial component in the future of the country and its people (Addai & Pokimica, 2010). A 2003 study of 10-19 year olds identified educational attainment as the most important factor in getting a "good career" (Chant & Jones, 2005). Other surveys of Ghanaians have found that students believe the benefits of education to be numerous and substantial. Key benefits cited include the ability to be mobile in one's career and place of residence, having financial assets as insurance against hard times, and the numerous

opportunities that education creates. Overall, there is awareness amongst students in Ghana that education can influence a positive future (Addai & Pokimica, 2010). On a policy level, Ghana has made spending on education a high priority and has surpassed most other sub-Saharan African countries in education spending (Adesina, 2009; Akyeampong, Djangmah, Oduro, Seidu, & Hunt, 2007).

Despite these positives, there are still many ongoing issues with education in Ghana. Recent research has shed light on ambiguous and ineffective policies that have led to little or no positive outcomes (Osei, Owusu, Asem, & Afutu-Kotey, 2009). There is also fear that gains in educational achievement amongst Ghanaians have slowed or even become stagnant. Based on data from the Ghana Education Services (GES), 91.6% of students scored below average in Math and 91.4% of youth had a below average score in English (UNICEF, 2011; Nyarko, 2008). According to the 2008 Ghana Living Standards Survey, 31% of Ghanaians have never been to school. The survey found that educational access, standards, and achievement varied widely in the country, especially in regard to urban and rural settings. Numerous other studies have brought attention to these education gaps, particularly the gaps seen in education for the poor and girls (Palmer, 2005; Pryor & Ampiah, 2003; Sutherland-Addy, 2002; Tuwor & Sossou, 2008). It is also troubling that some parents in Ghana and other developing countries question the value and benefits of school for their children considering the additional costs and resources necessary (Buchmann, 2000; Chant & Jones, 2005; Chowa, Ansong, & Masa, 2010; Laird, 2002). There is often a lack of parental and community involvement in schools, which has been identified as a primary barrier to the further improvement of Ghana's schools (Nyarko, 2007).

Methods

Data and sample

This study used baseline data from the Ghana YouthSave Experiment. YouthSave is a five year research project that investigates the potential of savings accounts as a tool for youth development and financial inclusion in developing countries, by co-creating tailored, sustainable savings products with local financial institutions and assessing their performance and development outcomes with local researchers. This research is in four countries; however, the data in this study are taken from the Ghana experiment.

The Ghana experiment is a cluster randomized study. One hundred schools were randomly selected from eight of Ghana's ten regions. Fifty schools were assigned to the treatment condition and another 50 schools were assigned to the control condition. Sixty students were randomly selected from each school with oversampling to take attrition into account. The baseline sample consists of 6,252 youth.

YouthSave is a longitudinal study. The baseline data were collected in May and June 2011. Follow-up data collection is scheduled for 2014. Data are collected on youth's educational, health, psychosocial, and financial outcomes. Youth and parental demographics and socioeconomic characteristics, including ownership of different assets, are also collected. This study used a subset of the YouthSave baseline data. Because household asset-ownership is predicted by characteristics of adult household members, we only included youth whose parents were interviewed at baseline. Thus, although 6,252 youth are part of the experiment, the study sample is 4,576 pairs of youth and their parents or guardian. However, the sample size was further reduced to 2,366 pairs of youth and their parents or guardian because we only included youth with the same breakdown of the percentages of continuous assessment versus exam scores. In the sample used in this study, continuous assessment is 30 % of the final grade of the academic year.

Measures

Dependent variables. The two dependent variables are youth's Math and English continuous assessment scores. This is an average score of all the quizzes and tests that students took during the academic term in those subjects. We use the continuous assessment score because research suggests it is a better indicator of academic performance (Amuah, 1996). In this study, the highest possible score for the subjects is 30 points.

Covariates of ownership of household items in SSA. Based on theory and prior research, predictors of family or household asset ownership, including household items, in SSA include head of household's age, gender, marital status, education, and employment or occupation status. Other important predictors include household income and number of economic dependents (of all ages) in the household. In SSA, women own fewer assets than men (Deere & Doss, 2006; LeBeau, Iipinge, & Conteh, 2004). Further, women's ability to accumulate assets is governed by norms that historically have favored men (Fafchamps & Quisumbing, 2005). In developing countries, education affects asset ownership by improving a household's ability to efficiently adjust "production" decisions during periods of change (Schultz, 1989). Further, marital status also affects asset accumulation (Grinstein-Weiss et al., 2011; Wilmoth & Koso, 2002). The pooled resources of a married couple may provide a cushion that allows them to buffer crises and accumulate assets over time. Finally, as proposed by neoclassical economic theories (Friedman, 1957; Modigliani & Ando, 1957), differences in ownership of household items are attributed to variation in age and number of economic dependents in the household.

Gender was a dichotomous variable that we coded as 1 for male and 0 for female. Education was also a dichotomous variable that we coded as 1 for primary education or higher and 0 for no formal education. Marital status was a dichotomous variable that we coded as 1 for married and 0 for not married. Age was a continuous variable measured in years. Employment status was a dichotomous variable that we coded as 1 for formally employed and 0 for not formally employed. Household income was a continuous variable defined as the household's total monthly income from full- or

part-time job, properties, pension or remittances, and other sources. The number of economic dependents was also a continuous variable measured as the number of individuals, regardless of age, who rely on the head of household for food, shelter, clothing, or other basic needs.

Household possession (variable of interest). A variable for ownership of household items was coded as 1 if a youth reported that his or her family own at least one household item and 0 if a youth reported that his or her household do not own any household items (i.e., assigned to the comparison group). In our study, household items refer to the ownership of televisions, refrigerators, electric irons, electric or gas stoves, and kerosene stoves a family or household owns.

Data analysis

Drawing causal inferences in observational studies or studies without randomization is challenging, particularly because observational studies often violate the ignorable treatment assignment assumption (Rosenbaum & Rubin, 1983). This assumption states that, conditional on a given set of covariates, the assignment of study participants to either the treatment or control group is independent of the outcome of non-treatment and the outcome of treatment. Unlike in observational studies, the researcher who conducts a randomized experiment can be reasonably confident that the ignorable treatment assignment assumption holds because randomization balances the observed and unobserved data between treatment and control participant and makes treatment assignment independent of the outcomes under the two conditions (Rosenbaum, 2002; Rosenbaum & Rubin; Rubin, 2008). Thus, when treatment assignment is non-ignorable, evaluation of treatment effects using nonrandomized or non-experimental approaches is misguided because the treated and comparison groups are prone to numerous selection biases. Groups may be imbalanced on observed and unobserved covariates. Thus, a key issue in observational studies is selection bias.

The problem of selection bias has led researchers to develop more rigorous and efficient analytical methods that can help evaluate treatment effects in studies based on observational data (e.g. Heckman, 1978, 1979; Rosenbaum & Rubin, 1983). These methods are known collectively as propensity score analysis. Although different methods are based on various sets of assumptions, propensity score analysis aims to accomplish data balancing when treatment assignment is non-ignorable; reduces multidimensional covariates to a one-dimensional score called a propensity score; and allows a more rigorous evaluation of treatment effects (Guo & Fraser, 2010). Because of selection effects in observational data, propensity score analysis is a more rigorous statistical strategy to estimate treatment effects than a conventional regression or regression-type model (Berk, 2004).

This study uses propensity score analysis to correct for the effects of selection bias based on available covariates, and provide a more rigorous estimation of the treatment effects, i.e., to test a potential causal relationship, conditional on observed covariates, between household possessions and youth academic performance. Specifically, this study employs propensity score optimal matching

(Hansen, 2007; Haviland, Nagin, & Rosenbaum, 2007; Rosenbaum, 2002), and matching estimators (Abadie & Imbens, 2002, 2006) to estimate the hypothesized causal relationship.

Research framework. To draw valid causal inference and guide data analysis, this study employs the Neyman-Rubin counterfactual framework of causality (Neyman, 1923; Rubin, 1974, 1986). Under this framework, a counterfactual is a potential outcome that would have happened in the absence of the cause (Shadish, Cook, & Campbell, 2002). Thus, for a participant in the treatment condition, a counterfactual is the potential outcome under the condition of control; for a participant in the control condition, a counterfactual is the potential outcome under the condition of treatment. Because the counterfactual is not observed in real data, the Neyman-Rubin framework holds that the researcher can assess the counterfactual by evaluating the difference in mean outcomes between the two groups or "averaging out" the outcome values of all individuals in the same condition (Guo & Fraser, 2010). More formally, let $E(Y_0|W = 0)$ denote the mean outcome of individuals in the comparison group, and $E(Y_1|W = 1)$ denote the mean outcome of the individuals in the treatment group. Because both outcomes are observable and we are using data from a sample that represents the population of interest, we can define the treatment effect as a mean difference: $\hat{\tau} = E(\hat{y}_1|w = 1) - E(\hat{y}_0|w = 0)$, where $\hat{\tau}$ denotes treatment effect. In the current study, the dilemma of not observing the Math and English continuous assessment scores of youth from families who own household possessions in the condition of not owning any household possessions is resolved by examining the average scores among the sample youth in the comparison group, i.e., those youth from families who do not own any household possessions. Similarly, if the comparison of the two mean outcomes leads to $\hat{\tau} = E(\hat{y}_1|w = 1) - E(\hat{y}_0|w = 0) > 0,$ or the mean outcome of all sample youth from household possession-owning families is higher than the mean outcome of all sample youth from households without any household possessions, then the researcher can infer that ownership of household possessions contributes to higher youth continuous assessment scores. Thus, the Neyman-Rubin framework offers a valuable way to evaluate the counterfactuals and guide causal inferences.

Propensity score optimal matching. The first propensity score model we used is propensity score optimal matching. Optimal matching is used over greedy matching because of limitations inherent in greedy matching (e.g., requirement of a sizable common support region and dilemma between incomplete and inaccurate matching) (Guo & Fraser, 2010). Using network flow theory (Hansen & Klopfer, 2006), optimal matching optimizes or minimizes the total distance for a given data set and pre-specified structure. Unlike greedy matching, optimal matching identifies matched sets in such a way that the matching process optimizes the total distance, and decisions made later takes into account decisions made earlier in the matching process (Rosenbaum, 2002). In the current study, we used propensity-score optimal pair matching (i.e., each treated participants matches to a single control) and full matching (each treated participant matches to one or more controls, and similarly each control participant matches to one or more treated participants) to balance data.

The first step in optimal matching, like in greedy matching, is to conduct a logistic regression to estimate propensity scores. We used generalized boosted regression (GBR) to estimate propensity scores. Unlike logistic regression, GBR, through its use of the regression tree method, does not require specification of the functional forms of predictor variables. GBR and the regression tree method handle continuous, nominal, ordinal, and missing independent variables, and they capture nonlinear and interaction effects (McCaffrey, Ridgeway, & Morral, 2004). Because GBR appears promising in solving variable specification problems, GBR is more robust than logistic regression when estimating propensity scores. After optimal full matching, we performed the Hodges-Lehmann aligned rank test to estimate the average treatment effect (ATE) (Hodges & Lehmann, 1962). After obtaining a matched sample using optimal pair matching, we conducted a regression of difference scores with covariance control to estimate ATE (Rubin, 1979; Rosenbaum, 2002). In addition, we used imbalance indexes (Guo, 2008; Haviland et al., 2007) to check covariate imbalance before and after optimal matching. We conducted chi-square tests and independent sample *t*-tests to check the significance level of any covariate imbalance before matching.

Sensitivity analysis. Because each propensity score model requires different assumptions, and findings are sensitive to different data situations, the robustness of results should be tested. We conducted an additional statistical method as sensitivity analysis strategy to warrant that the final findings are robust and consistent with estimates from different statistical procedures. We used matching estimators to cross-validate the findings of optimal matching. We used matching estimators because this type of propensity score analysis allows estimation of different types of treatment effects that optimal matching cannot estimate. In addition, because matching estimators evaluate a potential outcome for each study unit, matching estimators allow us to estimate average treatment effects for user-defined subsets of study units and then test hypotheses related to differential treatment exposure (Guo & Fraser, 2010). In other words, we selected matching estimators to conduct efficacy subset (or dosage) analysis (ESA).

Matching estimators. Matching estimators, like optimal matching, match a treated case to a control (or vice versa) based on observed covariates. However, unlike optimal matching, matching estimators do not use logistic regression or GBR to predict propensity scores. Instead, matching estimators use a vector norm to calculate distances on the observed covariates between a treated case and each of its potential control cases (Abadie & Imbens, 2002, 2006). The vector norm is used to choose the outcome—which serves as the counterfactual for the treated case—of a control case whose distance on covariates is the shortest vis-à-vis other control cases. Matching estimators also offer several advantages than other propensity score models: 1) matching estimators allow estimation of effects for both the sample and population (including ATE, ATT and ATC); 2) matching estimators permit a direct ESA to test hypotheses regarding treatment effects by dosage or exposure level, and 3) matching estimators allow individual observations to be used as a match more than once (Abadie et al., 2004; Abadie & Imbens, 2006).

To assess the effect of ownership of household items on academic performance using matching estimators, we included the same covariates used in optimal matching. We used the bias-corrected matching to remove bias caused by the three continuous-level covariates: income, age, and number of dependents. When continuous covariates are present, it is impossible to conduct exact matching, and the estimator will have a bias term that corresponds to matching discrepancies (Abadie & Imbens, 2002). In this study, we used the same set of matching variables as the independent variables for the regression adjustment in the bias correction process. Following the recommendation of Abadie et al. (2004), we chose four matches per observation in the analysis. Further, in order to perform ESA, we constructed an index of household items. We used the approach recommended by Filmer and Scott (2008) and Filmer and Pritchett (2001) to create the household item index. Using the equation, $A_i = (b_1 a_{1i}) + (b_2 a_{2i}) + \ldots (b_k a_{ki})$, where A_i is the household item index for household "i", (a_{1i}, a_{2i}, …, a_{ki}) are the k indicators of household items, and (b_1, b_2, …, b_k) are weights used to aggregate the indicators into an index. We conducted principal component analysis to determine the weight for each of the five household items. Based on the values of the household item index, we divided the sample into three subsets based on treatment dosage. We then conducted ESA on each of the subsets. We defined dosage as the total index value of household items owned by a family or household. Based on this definition, we defined three subsets: 1) low household item ownership ("low asset"), that is, households at or below the median index value for households who reported owning at least one household item; 2) high household item ownership ("high asset"), that is households above the median index value for households who reported owning at least one household item; and 3) no household item ownership ("no asset) or the control group, that is, households who do not own any of the five household items. The dosage for the comparison group is zero.

Results

Table 1 presents descriptive statistics for the sample as well as the results of imbalance checks conducted before and after matching. The average Math continuous assessment score of youth is20.58 (SD=4.52), while the average English continuous assessment score is 20.33 (SD=4.49). Seventy-eight percent of the sample were in the group that had one or more household possessions. Participants from families with household possessions were, on average, one year younger than the comparison group. Almost 70% of the samples were female. Seventy-four percent of parents or guardians were married, and 70% had at least some primary education. Only 12% were formally employed. The average monthly income was 200 GHC or approximately 107 USD. Participants from families with household possessions, on average, have higher monthly income than the comparison group. The average number of economic dependents was five. Household possession and comparison participants, on average, have roughly the same number of economic dependents.

Table 1. Sample Description and Imbalance Check Before and After Matching

Covariates	Overall Sample Before Matching (n = 2,366)		ASDCM After Optimal Matching (d_{xm})	
	% or Mean[a] (SD)	ASDCM (d_x)	Pair Matching (n = 1,032)	Full Matching (n = 2,366)
Number of participants with household possessions	1,850			
Number of participants without household possessions	516			
Gender of Parents		0.022	0.050	0.076
Male	31.6			
Female	68.4			
Education of Parents		0.366	0.036	0.027
No formal education	30.2***			
Primary or higher	69.8***			
Marital Status of Parents		0.109	0.026	0.070
Not married	25.9*			
Married	74.1*			
Age of Parents		0.103	0.044	0.051
Household possessions	45.9*(12.79)			
No household possessions	47.3*(14.15)			
Employment Status of Parents		0.225	0.034	0.012
Formally employed	11.6***			
Informally employed	88.4***			
Household Monthly Income (in GHC)[b]		0.252	0.011	0.060
Household possessions	214.37*** (320.77)			
No household possessions	149.52*** (171.72)			
Number of Economic Dependents		0.008	0.074	0.038
Household possessions	4.87 (3.16)			
No household possessions	4.85 (2.62)			
Dependent Variables				
Math score	20.58 (4.52)			
English score	20.33 (4.49)			

Note. ASDCM = absolute standardized difference in covariate means.

[a] Each entry is a percentage of participants in the categorical variable or the mean of the continuous covariate by group. Standard deviations are presented in parentheses.

[b] GHC = Ghanaian Cedi

*p <.05, **p < .01, ***p < .001.

Optimal matching

As Table 1 also shows, the overall sample before matching is not balanced on five covariates. The original sample, for instance, includes more individuals who are formally employed, and the difference is statistically significant ($p < .001$). If these differences are not taken into account in causal inference about the effect of ownership of household items on youth' academic performance, the findings may be biased. The sample sizes after optimal pair and optimal full matching are also presented in Table 1. After optimal pair matching, the matched sample includes 516 pairs of youth from households with household possessions and paired (or matching) youth from households with no household possessions. Because there are more participants with household possessions than without, optimal pair matching loses 1,334 participants with household possessions but retains all 516 comparison participants (or those without household possessions). Optimal full matching, however, is estimated to retain all 2,366 with household possessions and 516 participants with no household possessions. Optimal matching also provides the total distance between treated and non-treated participants over all matched sets. Total distance, which is the sum of differences on propensity scores between treated and comparison participants over all matched sets (Guo & Fraser, 2010), can be used to determine which type of optimal matching produces the smallest distance (or closest match) for the given data set. Full matching (total distance = 7, 980) has a higher total distance than pair matching (total distance = 919). However, optimal full matching does not lose any cases, particularly treated participants.

As Table 1 illustrates, we can determine how well optimal matching has reduced bias by comparing between the absolute standardized difference in covariate mean (ASDCM) before and after matching (i.e., a comparison between and d_{xm}). ASDCM before matching generally has higher values than the index after optimal matching. For instance, the d_x of education level of parents or guardian before optimal matching is 0.37. This means that the participants with household possessions and comparison groups are 37% of a standard deviation apart on education level. After optimal pair and optimal full matching, the d_{xm} of education becomes 0.036 and 0.027, respectively. The values of most covariates, except gender and number of dependents, decrease from the d_x to d_{xm}, suggesting that optimal matching improves balance. Optimal pair matching improves data balance on three covariates, compared with optimal full matching. Optimal full matching improves data balance on two covariates, compared with optimal pair matching.

Table 2 presents results of the post-matching analysis using the Hodges-Lehmann test after full matching, using regression of difference scores after pair matching, and matching estimators. As the table shows, youth from families with household possessions had higher Math (except the regression of difference scores) and English continuous assessment scores than youth from families without any household possessions. However, the treatment differences for Math are not statistically significant ($p > 0.05$). On the other hand, the treatment differences for English, except for the regression of difference scores, are statistically significant at a 0.05 level. On average, youth from families that own household possession scored almost one point higher on English than youth from

families that do not own any household possessions. The study also detected an effect size of 0.12 for English, which is a small effect size in terms of Cohen's (1988) criteria. The Hodges-Lehmann test was also used to gauge the statistical significance of the ATE on both academic outcomes. Further, in a regression of difference scores, the intercept indicates the ATE. The estimated intercepts or ATEs, as shown in Table 1, is -0.31 for Math and 0.36 for English. Thus, using pair matching and regression adjustment, we found that, on average, youth from families that own household possessions scored 0.36 points higher on English but 0.31 points lower on Math than youth from families that do not own any of the five household possessions. Although both findings are not statistically significant ($p > 0.05$), the ATE of ownership of household possessions on English approaches statistical significance ($p = 0.10$).

Table 2. Household Possessions and Estimated Average Treatment Effects using Hodges-Lehmann Aligned Rank Test after Optimal Full Matching, Regression of Difference Scores after Optimal Pair Matching, and Matching Estimators, on Youth Continuous Assessment Scores

	Estimated Average Treatment Effects	
Test Statistic	Math Score	English Score
Hodges-Lehmann Aligned Rank Test	0.32	0.56*
Regression of Difference Scores	-0.31	0.36
Matching Estimators	0.02	0.57*

*$p < .05$, **$p < .01$, ***$p < .001$, one-tailed test.

Matching estimators

The first sensitivity analysis supports some of the findings based on optimal matching. Table 3 shows the estimated effects of ownership of household possessions on youth's Math and English continuous assessment scores. A specific sample effect is the same as its corresponding population effect in magnitude. For instance, both sample average treatment effect (SATE) and population average treatment effect (PATE) for English scores is 0.57. The two effects differ from each other only on the standard error. Results also indicate that, on average, youth from families that own household possessions scored 0.02 units higher on Math and 0.57 units higher on English than youth from families that do not own any of the five household possessions. However, only the treatment effects for English are statistically significant. With regard to the sub-population of treated participants (SATT and PATT), the treatment effect on Math and English scores was slightly larger at 0.03 and 0.62 units, respectively, compared with SATE. However, only the treatment effects for the treated for English are statistically significant. Further, had all participants with no household possessions (i.e., comparison group) owned household possessions and all participants with household possessions not owned any household possessions, then on average, youth from families that do not own any of the five household possessions would score 0.003 units higher in Math and 0.38 units higher in English than their counterparts. However, none of the treatment effects for those with no household possessions are statistically significant. In this study, the sample average treatment effect for the treated (SATT) and sample average treatment effects for the control (SATC) for both academic scores are not equal. These differences are attributable to either additional

selection bias not accounted for in the study or to study data that violated assumptions of matching estimators (Guo & Fraser, 2010). Nonetheless, the results support the hypothesized positive direction of the effects of household item ownership on youth's academic performance.

Table 3. Estimated Treatment Effects of Household Possessions on Math and English Continuous Assessment Scores Using Bias-Corrected Matching

	Math Score		English Score	
Treatment Effects	Coefficient (SE)	95% C.I.	Coefficient (SE)	95% C.I.
Sample average treatment effect (SATE)	0.02(.2504)	[-0.47, 0.51]	0.57(.2569)*	[0.07, 1.07]
Population average treatment effect (PATE)	0.02(.2514)	[-0.47, 0.52]	0.57(.2570)*	[0.07, 1.07]
Sample average treatment effect for the treated (SATT)	0.03(.2639)	[-0.49, 0.55]	0.62(.2705)*	[0.09, 1.15]
Population average treatment effect for the treated (PATT)	0.03(.2650)	[-049, 0.55]	0.62(.2701)*	[0.09, 1.15]
Sample average treatment effect for the controls (SATC)	0.003(.2543)	[-0.50, 0.50]	0.38(.2614)	[-0.13, 0.90]
Population average treatment effect for the controls (PATC)	0.003(.2588)	[-0.50,0.51]	0.38(.2679)	[-0.14, 0.91]

Note: Matching variables: age, gender, marital status, education level, employment status, household monthly income, and number of economic dependents.
*$p < .05$, **$p < .01$, ***$p < .001$, one-tailed test.

Population effects indicate whether the tested impact of household possessions on academic achievement will be effective in a second sample taken from the same population. Taking SATT ($p < 0.05$) and PATT ($p < 0.05$) on Math scores as examples, the study indicates that the treatment effect for the treated group is statistically significant in the sample at the level of 0.05. If we take a second sample from the population, we are likely to observe the same level of treatment effect for the treated, and the effect should remain statistically significant at a level of 0.05 (Guo & Fraser, 2010). Finally, as Table 3 presents, our results show that four treatment effects of ownership of household possessions (SATE, PATE, SATT, and PATT) on English scores are statistically significant ($p < .05$). Further, the 95% confidence intervals of all four statistically significant effects do not contain a zero or negative values. These results suggest that, conditioned on the available data, ownership of household possession contributed to higher English scores. However, results of other treatment effects, particularly for Math scores are not statistically significant and less conclusive.

Table 4 shows the results of the efficacy subset analysis (ESA) or treatment effects by dosage using matching estimators, as well as the sample size of each subset: 1,129 youth are from households above the 50% median index value or "high asset," while 721 youth are from households at or below the 50% median index value or "low asset." With regard to ESA, the subsets we used allowed

us to make three comparisons for each academic outcome: the "low asset" versus the "no asset," the "high asset" versus the "no asset," and the "low asset" versus the "high asset." Our general hypothesis is that household possessions produce higher scores for youth whose families own any of the five household possessions, and youth whose families own more household possessions will show greater academic performance. Except for the difference in Math score between "low asset" and "no asset" and English score between "high asset" and "low asset", ESA supports the hypothesized positive direction of household item ownership on both Math and English scores. However, only two comparisons are statistically significant at a 0.05 level. The "low asset" and "high asset" groups exhibited higher scores on English, compared with the "no asset group" ($p < 0.05$). For instance, youth in the "low asset" group scored nearly one point higher on English, than youth in the "no asset" group. Youth in the "high asset" group also scored nearly one point higher on English, than youth in the "no asset" group. However, results indicate no statistically significant differences on English scores between youth in the "low asset" and "high asset" groups.

Table 4. Efficacy Subset Analysis Using Matching Estimators: Estimated Average Treatment Effects for the Treated by Dosage

Outcome Variable	Hypothetical Sign	Math Score Coefficient(SE)	English Score Coefficient(SE)
"Low Asset" versus "No Asset"	+	-0.26 (0.29)	0.66 (0.28)*
"High Asset" versus "No Asset"	+	0.21 (0.29)	0.60 (0.31)*
"High Asset" versus "Low Asset"	+	0.21 (0.23)	-0.19 (0.23)
No. of "no asset" participants	516		
No. of "low asset" participants	721		
No. of "high asset" participants	1,129		

*$p < .05$, **$p < .01$, ***$p < .001$, two-tailed test.

Discussion

This study aims to determine the effects of asset ownership, in general, and household possessions, in particular, on the academic achievement of Ghanaian youth participating in the YouthSave project. The results of the analysis supports the hypothesis that household possessions have a positive impact of on one measure of academic achievement. The Hodges-Lehmann test indicates a statistically significant positive impact of ownership of household possessions on English continuous assessment scores. Results of the matching estimators support the findings of the Hodges-Lehmann test. Both propensity score models suggest youth from families with household possessions scored nearly one point higher on English than youth from families without any household possessions. However, the effect of ownership of household possessions on Math scores is not statistically significant. Nonetheless, results of the Hodges-Lehmann test and matching estimators support the hypothesized positive impact of household possessions on youth academic performance.

The consistent positive direction of treatment effects and statistically significant results based on two propensity score models that took into account all observations suggest that the effect of household possessions on English performance is robust. However, the effect of household possessions on Math performance is less conclusive. Unlike results in developed countries which indicate that there is a positive association between household assets and math than there is with reading achievement achievement (Elliott, Destin & Friedline, 2011), we find the opposite in this study. This could be attributed to the fact that in Ghana students do not start learning English officially in school until later years of elementary school. Only children whose parents have resources such as TV could have access to other forms of using English outside school. This also means that English books would have to be purchased outside the requirements of the school curriculum and only families who have disposable income can afford to buy these books. This is a luxury for poor families who do not have money to spare from what they may consider basic and fundamental needs.

When comparing the effects of household possessions on academic achievement by different asset-ownership levels, results indicate that those in the low or high asset threshold scored higher on English, compared with youth from families without any of the five household possessions. These results are statistically significant ($p < 0.05$). However, only high asset group scored higher on Math, compared with youth from families without any of the five household possessions. The low asset group scored lower on Math, compared with the no asset group. However, all ESA results for Math scores were not statistically significant. Although both asset groups performed better on English scores than the no asset group, comparison between low asset and no asset youth produced slightly higher English continuous assessment scores than the comparison between high asset and no asset youth. For instance, low asset youth scored 0.66 units higher on English than no asset youth. When high asset youth were compared with the no asset youth, high asset youth scored 0.60 units higher on English than no asset youth. The difference is 0.06 units. However, when the low and high asset groups were compared with each other, results show no statistically significant difference between the two groups. Although the result is not statistically significant, the direction of the finding is contrary to our hypothesis, that is, youth from families with higher levels of asset ownership have higher English scores than their peers from families with lower levels of asset ownership. In our sample, youth with more assets scored lower on English scores, compared with low asset youth. Nonetheless, the statistically insignificant finding between "low-asset" and "high-asset" families is consistent with Sherraden's (1991) theory that even small number (or amount) of assets can positively influence the well-being of families, including academic outcomes of youth. In other words, the results of this study suggest that household item ownership, regardless of number, may influence the academic performance, particularly in English, of youth in the household.

The ideal study would be a randomized experiment in which both observed and unobserved predictors are balanced. As Donald Rubin (2008) has aptly pointed out, for objective causal inference, design trumps analysis. However, in the instances when a randomized trial is infeasible or unethical, a data set that includes detailed individual- and contextual-level predictors of asset-

ownership is desired. However, such a wide array of characteristics was not available in the data set used in the current study. Nonetheless, the propensity score model used in this study includes all available variables theorized to predict ownership of assets among households in Sub-Saharan Africa. In developing the model to estimate the propensity score, we tested other specifications and inclusion of additional predictors. Those other specifications were found to be inferior to the final model presented. Further, because propensity score analysis fails to balance study conditions that are due to unmeasured or unobserved variables, the study findings do not indicate a clear causal relationship between the household possessions and youth academic performance. Nonetheless, the analytic methods used in this study were carefully chosen to address limitations of conventional covariance control approach, and therefore, provide more rigorous evidence to support the conclusion that there is a likely net association between ownership of household possessions and academic outcomes of youth, particularly English continuous assessment scores.

Limitations

The current study has noteworthy limitations. Although this study used propensity score analysis in an attempt to control statistically for the effects of parental socioeconomic status and several other influential variables that could influence the outcomes, this methodology cannot conclusively rule out unmeasured or unobserved variables that may be central to the "treatment" effects. In other words, propensity score models fail to correct for selection bias that results from the presence of unobserved variables. If the matching process omits important covariates that predict ownership of household possessions, the study findings may be prone to error. In addition, propensity score matching does not handle a covariate that is related to treatment assignment but not to outcome (Rubin 1997). Unfortunately, no desirable solution is currently available to address this limitation (Guo and Fraser 2010).

Another limitation pertains to the nature of the design of the study. The data is cross-sectional although the research design of the actual study is longitudinal. Differences in Math and English scores based on incremental or even declining household possession would give a fuller picture of how household possessions impact academic performance. This will be possible to investigate after the second round of data is collected in 2014. The limited number of household possessions included in the analysis is also a limitation. Adding one or more household possessions may affect the findings of our result. Thus, future research should include a more comprehensive list of household possessions, including household items that have been shown to affect academic performance of youth.

Policy implications

The development of any nation or community depends largely on the quality of education of such a nation. It is generally believed that the basis for any true development must commence with the development of human resources (Akanle, 2007). Hence formal education remains the vehicle for

social-economic development and social mobilization in any society. Poor education outcomes can have detrimental effects on a country's economic and social development. At the individual level, low learning achievement not only limits one's progression further in school but also negatively affects an individual's future income and productivity (Hanushek & Pace, 1995). Nevertheless, the recognition of the problem of poor learning outcomes has not translated into the development of more effective actions to improve education quality and policies that will improve the chances of children in poor families to do well in school.

Most programs undertaken to improve educational efficiency in developing countries focus on changing the educational system itself (Harbison & Hanushek, 1993). This has also been true in Ghana where policy planners generally recommend revising the curriculum, increasing the number of schools, and distributing educational materials more widely and equitably. This course of action overlooks the role of family and personal factors in shaping the academic trajectories of school children. Of particular importance is that some of these non-educational influences may also be changed through reasonable governmental policies.

Although Ghana has introduced free education for the primary and JHS, poor families still struggle with additional costs of sending children to "free" schools which include transportation, text books, and uniforms (UNESCO, 2005), child labor which disproportionately affects children from poor families (Chowa et al., 2010), and low parental involvement in school particularly for poor families (Nsiah, 2011). Poor communities in Ghana have the highest levels of academic underachievement. Policies that address increasing the capacity of poor families to increase academic achievement would begin to address some of the underlying challenges. Policies should include asset and cash transfers for very poor families towards educational resources similar to cash transfer policies for health care access and education that are being implemented in some developing countries. Another strategy would be to increase both liquid and illiquid assets for families to increase their economic well-being. This would increase the purchasing power of poor families to address the educational needs of their children. This would include savings for the families and savings for their children's education.

Conclusion

This study finds that household wealth (measured as household possessions) has an impact on youth's academic achievement. This study further presents evidence of the importance of the influence of family background on children's academic performance. Policies need to target children from poor families to provide the important resources that are missing in their home environment. These policies may include both long- and short-term interventions. Long-term interventions or policies may include opportunities to build wealth for poor families to enable these families to provide the necessary resources to respond to their children's educational needs. In the short-term the government will do well to expand the current cash transfers program that gives direct cash to extremely poor households to help meet basic needs that enhance educational success. While the

capitation grant program has made good progress in providing tuition-free basic education, there are still other school-related costs that parents have to bear. Households that cannot make ends meet may be unable to afford these school-related expenses, thereby depriving children of important resources for positive educational experience. Targeted programs to assist such households to meet their children's school needs would go a long way to help basic school students have better educational experience and outcomes.

Overall, more research needs to be done comparing the impact of family background and school resources on academic achievement. The next study will investigate these constructs in unison.

References

Abadie, A., Drukker, D., & Herr, J. L., & Imbens, G. W. (2004). Implementing matching estimators for average treatment effects in Stata. *Stata Journal*, *4*, 290-311.

Abadie, A., & Imbens, G. W. (2002). *Simple and bias-corrected matching estimators for average treatment effects* (NBER Technical Working Paper 283). Cambridge, MA: National Bureau of Economic Research.

Abadie, A., & Imbens, G. W. (2006). Large sample properties of matching estimators for average treatment effects. *Econometrica*, *74*, 235-267.

Addai, I., & Pokimica, J. (2010). Ethnicity and economic well-being: The case of Ghana. *Social Indicators Research, 99*(3), 487-510.

Adesina, J. O. (2009). Social policy in sub-Saharan Africa: A glance in the rear-view mirror. *International Journal of Social Welfare, 18*, S37-S51.

Admassie, A. (2002). The implication of asset ownership on child work in rural Ethiopia. *Ethiopian Journal of Economics*, *11*(2), 25-58.

Akyeampong, K., Djangmah, J., Oduro, A., Seidu, A., & Hunt, F. (2007). *Access to basic education in Ghana: The evidence and the issues* (CREATE Country Analytic Report). Brighton, UK: University of Sussex.

Amuah, I. R. (1996, December). Portfolio assessment: New trends in the evaluation of Ghanaian Junior Secondary School student's musical achievement. *The African Music Educator, 8*, 14-20.

Bachman, J. G. (1970). *The impact of family background and intelligence on tenth-grade boys.* Ann Arbor, MI: Institute for Social Research, University of Michigan.

Behrman, J. R., & Birdsall, N. (1983). The quality of schooling: Quantity alone is misleading. *American Economic Review, 73*(5), 928-946.

Berk, R. A. (2004). *Regression analysis: A constructive critique*. Thousand Oaks, CA: Sage Publications.

Buchmann, C. (2000). Family structure, parental perceptions, and child labor in Kenya: What factors determine who is enrolled in school? *Social Forces, 78*(4), 1349-1378.

Buchmann, C., & Diprete, T. A. (2006). The growing female advantage in college completion: The role of family background and academic achievement. *American Sociological Review, 71*(4), 515-541.

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.

Cockburn, J., & Dostie, B. (2007). Child work and schooling: The role of household asset profiles and poverty in rural Ethiopia. *Journal of African Economies*, *16*(4), 519-563.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum.

Coleman, (1990). *Foundations of social theory.* Cambridge, MA: Harvard University Press.

Coleman, J. S. (1998). Social capital in the creation of human capital. *American Journal of Sociology, 94*, S95-S120.

Coleman, J. S., Campbell, E. Q., Hobson, C. F., McPartland, J., & Mood, A. M. (1966). *Equality of educational opportunity.* Washington, DC: Government Printing Office.

Curley, J., Ssewamala, F., & Han, C. K. (2010). Assets and educational outcomes: Child Development Accounts (CDAs) for orphaned children in Uganda. *Children and Youth Services Review, 32,* 1585-1590.

Deere, C. D., & Doss, C.R. (2006). The gender asset gap: What do we know and why does it matter? *Feminist Economics, 12*(1-2), 1-50.

Elliott III, W. (2009). Children's college aspirations and expectations: The potential role of Children's Development Accounts (CDAs). *Children and Youth Services Review, 31*, 274-283.

Elliott, W., Chowa, G., & Loke, V. (2011). Toward a children's savings and college-bound identity intervention for raising college attendance rates: A multilevel propensity score analysis. *Sociology Mind*, *1(*4). doi: 10.4236/sm.2011.14025

Elliott III, W., Destin, M., & Friedline, T. (2011). Taking stock of ten years of research on the relationship between assets and children's educational outcomes: Implications for theory, policy, and intervention. *Children and Youth Services Review, 33*, 2312-2328.

Elliott III, W., Sherraden, M., Johnson, L., & Guo, B. (2010). Young children's perceptions of college and saving: Potential role of Child Development Accounts. *Children & Youth Services Review, 32*(11), 1577-1584.

Ellwood, D., & Kane T. J. (2000). Who is getting a college education? In S. Danzinger & J. Waldfogel (Eds.), *Securing the future.* New York: Russell Sage

Fafchamps, M., & Quisumbing, A.R. (2005). Assets at marriage in rural Ethiopia. *Journal of Development Economics, 77*(1), 1-25.

Fairlie, R.W. (2005). The effects of home computers on school enrollment. *Economics of Education Review, 24*(5), 553-547.

Filmer, D., & Pritchett, L. (1999). The effect of household wealth on educational attainment: Evidence from 35 countries. *Population and Development Review*, *25*(1), 85-120.

Filmer, D., & Pritchett, L. (2001). Estimating wealth effects without expenditure data — or tears: An application to educational enrollment in states of India. *Demography*, *38*(1), 115-132.

Filmer, D., & Scott, K. (2008). *Assessing asset indices* (World Bank Policy Research Working Paper No. 4605). Washington, DC: World Bank.

Friedman, M. (1957). *A theory of the consumption function*. Princeton, NJ: Princeton University Press.

Fuchs, T., & Wößmann, L. (2007). What accounts for international differences in student performance? A re-examination using PISA data. *Empirical Economics, 32*(2/3), 433-464.

Fuller, B., & Clarke, P. (1994). Raising school effects while ignoring culture? Local conditions and the influence of classroom tools, rules and pedagogy. *Review of Educational Research, 64,* 119-157.

Ghana 2008: Results from the demographic and health survey. (2010). *Studies in Family Planning, 41*(4), 307-312.

Ghana Statistical Services (GSS) (2011). *Ghana's economic performance 2010*. Retrieved from http://www.statsghana.gov.gh/docfiles/news/gh_eco_performance_2010_in_figures.pdf

Glick, P., & Sahn, D.E. (2000). Schooling of girls and boys in a West African country: The Effects of parental education, income, and household structure. *Economics of Education Review, 19*(1), 63-87.

Glick, P., & Sahn, D.E. (2009). Cognitive skills among children in Senegal: Disentangling the roles of schooling and family background. *Economics of Education Review, 28*(2), 178-188.

Grimm, M. (2011). Does household income matter for children's schooling? Evidence for rural Sub-Saharan Africa. *Economics of Education Review, 30*(4), 740-754.

Grinstein-Weiss, M., Charles, P., Guo, S., Manturuk, K., & Key, C. (2011). The effect of marital status on home ownership among low-income households. *Social Service Review, 85*, 475-503.

Guo, S., & Fraser, M. W. (2010). *Propensity score analysis: Statistical methods and applications*. Thousand Oaks, CA: Sage Publications.

Hansen, B. B. (2007). Optmatch: Flexible, optimal matching for observational studies. *R News, 7*, 19-24.

Hansen, B. B., & Klopfer, S. O. (2006). Optimal full matching and related designs via network flows. *Journal of Computational and Graphical Statistics, 15*, 1-19.

Hanushek, E. A., & Kimko, D. D. (2000). Schooling, labor-force quality, and the growth of nations. *American Economic Review, 90*(5), 1184-1208.

Hanushek, E. A., & Wößmann, L. (2011). The economics of international differences in educational achievement. In E. A. Hanushek, S. Machin, & L. Wößmann (Eds.), *Handbook of the Economics of Education, Vol. 3* (pp. 89-200). North Holland: Elsevier.

Haviland, A., Nagin, D. S., & Rosenbaum, P. R. (2007). Combining propensity score matching and group-based trajectory analysis in an observational study. *Psychological Methods, 12,* 247-267.

Heckman, J. J. (1978). Dummy endogenous variables in a simultaneous equations system. *Econometrica, 46,* 931-960.

Heckman, J. J. (1979). Sample selection bias as a specification error. *Econometrica, 47,* 153-161

Hertz, T. (2005) Atrrition and Age-Biased-Corrected estimates of the trend in intergenerational persistence of family income. Unpublished, American University.

Heyneman, S. P. (1976). Influences on academic achievement: A comparison of results from Uganda and more industrialized societies. *Sociology of Education, 49,* 200-211.

Heyneman, S. P. & Loxley, W. A. (1983). The effect of primary-school quality on academic achievement across twenty-nine high-and low-income countries. *American Journal of Sociology, 88*(6), 1162-1194.

Hodges, J., & Lehmann, E. (1962). Rank methods for combination of independent experiments in the analysis of variance. *Annals of Mathematical Statistics, 33*, 482-497.

Hossler, D., Schmit, J., & Vesper, N. (1999). *Going to college: How social, economic and educational factors influence the decisions student make*. Baltimore, MD: Johns Hopkins University.

Huang, J., Guo, B., Kim, Y., & Sherraden, M. (2010). Parental income, assets, and borrowing constraints and children's post-secondary education. *Children and Youth Services Review, 32*, 585-594.

Jones, G. A., & Chant, S. (2005). Youth gender and livelihoods in West Africa: Perspectives from Ghana and the Gambia. *Children's Geographies, 3*(2), 185-199.

Kruger, D., Soares, R. R., & Berthelon, M. (2007). *Household choices of child labor and schooling: A simple model with application to Brazil*. Bonn, Germany: Institute for the Study of Labor IZA Discussion Paper No. 2776.

Laird, S. E. (2002). The 1998 Children's Act: Problems of enforcement in Ghana. *British Journal of Social Work*, *32*(7), 893-905.

LeBeau, D., Iipinge, E., & Conteh, M. (2004). *Women's property rights and inheritance rights in Namibia*. Windhoek, Namibia: Pollination Publishers.

Leibowitz, A. (1974). Home investments in children. *Journal of Political Economic, 82*(2), S111-S131.

Lincove, J.A. (2009). Determinants of schooling for boys and girls in Nigeria under a policy of free primary education. *Economics of Education Review, 28*(4), 474-484.

Lockheed, M. E., Vail, S., & Fuller, B. (1986). How textbooks affect achievement in developing countries: Evidence from Thailand. *Educational Evaluation and Policy Analysis, 8,* 379-392.

Lockheed, M. E., & Fuller, B., & Nyirongo, R. (1989). Family background and student achievement. *Sociology of Education, 64(4),* 239-256.

Marks, G. (2006). Family size, family type and student achievement: Cross-national differences and the role of socioeconomic and school factors. *Journal of Comparative Family Studies*, *37*(1), 1-27.

Markus, H., & Nurius, P. (1986). Possible selves. *American Psychologist, 41*, 954-969.

McCaffrey, D. F., Ridgeway, G., & Morral, A. R. (2004). Propensity score estimation with boosted regression for evaluating causal effects in observational studies. *Psychological Methods, 9*, 403-425.

MESS (2008). Preliminary education sector performance report, 2008. Ministry of Education, Science, and Sports. Retrieved March 8, 2012 from http://www.gnecc.org/downloads/Preliminary%20Education%20Sector%20Performance%20Report%202008.pdf

Modigliani, F., & Ando, A. K. (1957). Tests of the life cycle hypothesis of savings. *Bulletin of the Oxford Institute of Statistics, 19*(2), 99-124.

Montgomery, M., Grant, M., Mensch, B., & Roushdy, R. (2005). *Children's schooling in developing-country slums: A comparison of Egypt and India* (Economics Departmental Working Paper No. 05-07). Stony Brook, NY: Stony Brook University.

Neyman, J. S. (1923). Statistical problems in agricultural experiments. *Journal of the Royal Statistical Society, Series B, 2*, 107-180.

Nsiah, G. K. B. (2011). Case studies in U.S. distance education: Implications for Ghana's under-served high schools. *Creative Education, 2*(4), 346-353.

Nyarko, K. (2008). *Parental Involvement: A sine qua non in adolescents' educational achievement* (Doctoral dissertation). Retrieved from http://edoc.ub.uni-muenchen.de/8384/1/Nyarko_Kingsley.pdf

OECD (2010). *Economic policy reforms 2010: Going for growth.* Retrieved March 6, 2012, from http://www.oecd.org/document/51/0,3343,en_2649_34325_44566259_1_1_1_1,00.html

Oyserman, D., & Destin, M. (2010). Identity-based motivation: Implication for intervention. *The Counseling Psychologist, 38*(7), 1001-1043.

Oyserman, D., & Fryberg, S. (2006). The possible selves of diverse adolescents: Content and function across gender, race, and national origin. In C. Dunkel & J. Kerpelman (Eds.), *Possible selves: Theory, research and applications* (pp. 17-39). Hauppauge, NY: Nova Science Publishers.

Osei, R. D., Owusu, G. A., Asem, F. E., & Afutu-Kotey, R. L. (2009). *Effects of capitation grant on education outcomes in Ghana* (GDN Working Paper No. 20). New Delhi: Global Development Network.

Palmer, R. (2005) *Beyond the basics: Post-basic education and training and poverty reduction in Ghana* (Post-Basic Education and Training Working Paper Series No. 4). Edinburgh: Centre of African Studies, University of Edinburgh.

Peaker, G. (1971). *The Plowden children four years later.* London: National Foundation for Educational Research.

Pryor, J., & Ampiah, J. G. (2003). *Understandings of education in an African village: The impact of information and communication technologies* (Report of DFID Research Project Ed2000-88). Sussex, UK: Centre for International Education, University of Sussex Institute of Education.

Reynolds, J. R., & Pemberton, J. (2001). Rising college expectations among youth in the United States: A comparison of the 1979 and 1997 NLSY. *The Journal of Human Resources, 36*(4), 703-726.

Rosenbaum, P. R. (2002). *Observational studies* (2nd ed). New York, NY: Springer.

Rosenbaum, P. R. (2005). Sensitivity analysis in observational studies. In B. S. Everitt & D. C. Howell (Eds.), *Encyclopedia of statistics in behavioral science* (pp. 1809-1814). New York, NY: Wiley.

Rosenbaum, P. R., & Rubin, D. B. (1983). The central role of the propensity score in observational studies for causal effects. *Biometrika, 70*(1), 41-55.

Rubin, D. B. (1974). Estimating causal effects of treatments in randomized and nonrandomized studies. *Journal of Educational Psychology, 66*, 688-701.

Rubin, D. B. (1986). Which ifs have causal answers? *Journal of the American Statistical Association, 81*, 961-962.

Rubin, D. B. (1979). Using multivariate matched sampling and regression adjustment to control bias in observational studies. *Journal of the American Statistical Association, 74*, 318-328.

Rubin, D. (2008). For objective, causal inference, design trumps analysis. *Annals of Applied Statistics,* 2, 808-40.

Sandefur, G. D., Eggerling-Boeck, J., & Park, H. (2005). Off to a good start? Post-secondary education and early adult life. In R. A. Settersten, F. F. Furthenberg, & R. G. Rumaut (Eds.), *On the frontier to adulthood* (pp. 292-320). Chicago and London: University of Chicago Press.

Sandefur G. D., Meier A. M., & Campbell M. C. (2006) Family resources, social capital and college attendance. *Social Science Research,* 35(2), 525-553

Schmitt, J., & Wadsworth, J. (2006). Is there an impact of household computer ownership on children's education attainment in Britain? *Economics of Education Review, 25*(6), 659-673.

Schultz, P. T. (1989). *Benefits of educating women*. Washington, DC: World Bank, Population and Human Resources Department, Education and Employment Division.

Sen, A. (1999). *Development as freedom*. New York, NY: Alfred A. Knopf.

Shadish, W. R., Cook, T. D., & Campbell, D. T. (2002). *Experimental and quasi-experimental designs for generalized causal inference*. Boston: Houghton Mifflin.

Shapiro, D., & Tambashe, B. O. (2001). Gender, poverty, family structure, and investments in children's education in Kinshasa, Congo. *Economics of Education Review, 20*(4), 359-375.

Sutherland-Addy, E. (2002). *Impact Assessment Study of the Girls' Education Programme in Ghana.* Retrieved from http://www.unicef.org/evaldatabase/files/GHA_2002_022.pdf

Ssewamala, F. M., & Ismayilova, L. (2009). Integrating children savings account in the care and support of orphaned adolescents in rural Uganda. *Social Service Review, 83*(3), 453-472.

Teachman, J. (1987). Family background, educational resources, and educational attainment. *American Sociological Review*, *53*, 548–557.

Tuwor, T., & Sossou, M. (2008). Gender discrimination and education in West Africa: Strategies for maintaining girls in school. *International Journal of Inclusive Education, 12*(4), 363-379.

UNESCO (2005). Children out of school: Measuring exclusion from primary education. Montreal: UNESCO Institute for Statistics.

United Nations Children's Fund (UNICEF) (2011). *State of the world's children 2011*. New York, NY: UNICEF.

Valadez, J. R. (1998). Applying to college: Race, class, and gender differences. *Professional School Counseling, 1*(5), 14-20.

Williams Shanks, T. R., Kim, Y., Loke, V., & Destin, M. (2010). Assets and child well-being in developed countries. *Children and Youth Services Review, 32,* 1488-1496.

Wilmoth, J., & Koso, G. (2002). Does marital history matter? Marital status and wealth outcomes among preretirement adults. *Journal of Marriage and Family, 64*(1), 254–68.

Zhao, M., & Glewwe, P. (2010). What determines basic school attainment in developing countries? Evidence from rural China. *Economics of Education Review, 29*(3), 451-460.