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MASTER'S THESIS

**Variability Among Determinants of Education Attainment:
The Effect of Natural Resources and Institutional Quality
in Sub-Saharan Africa**

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Master Thesis Proposal

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Proposed Topic:

Are determinants of demand in educational attainment homogenous? The effect of natural resource dependence and institutional quality on households in Sub-Sahara Africa

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Topic Characteristics:

It is a widely respected belief that education plays a critical role in development. It has also become common wisdom that in many countries abundant in natural resources such as oil, natural gas, and minerals, economic growth over the long term tends to be slower than in counties that are less resource abundant. Over time, cross-country empirical studies have shown firstly, economic growth varies directly with education. Secondly, that economic growth varies inversely with natural resource abundance and lack of institutional quality. And thirdly, measures of education are inversely correlated to natural resource abundance.

By comparing cross-sectional household survey data across 22 countries of Sub-Saharan Africa, the goal of this paper is to understand and determine household behavior and characteristics that predict demand for educational attainment. Are these determinants of demand heterogeneous across countries in SSA? What role does gender and wealth play? Are exogenous political and institutional characteristics of a country, such as resource wealth/dependence or institutional quality and corruption correlated with differences in educational demand determinants? What channels do they effect and why?

Working hypotheses:

- There is objective heterogeneity among countries in the determinants of education attainment
- Heterogeneity is linked to resource dependence/corruption measures
- Possible channels that effect education attainment that are impacted by resources/institutions are
 - Labor market
 - Supply of education at the macroeconomic/political level
 - Household demand for education

In resource rich countries, and countries with low institutional quality, I expect that Parents and households forego investment in their children's education because of lower perceived value of returns. In this case parental characteristics (wealth, education) more determine children's educational outcomes. In other words there is little intergeneration educational mobility.

In resource poor countries, or countries with higher institutional quality, there may be more equal opportunities and availability for children to attend school, thus the parental characteristics will have less an effect on their children's outcomes. The increased intergenerational mobility is an outcome three

possible channels: genetics, parental behavior, and environmental factors (Bauer and Riphahn, 2007). This paper will focus solely on environmental/HH factors but discuss the literature from the other two channels. A possible explanation for this increased mobility is that there should be higher demand and wages for skilled/educated labor coming from the manufacturing and tradables sector. Therefore parents are motivated to invest in children's education because of the perceived returns (Sachs and Warner, Birdsall, 2001).

Methodology:

- 1) Probit models across 22 Sub-Saharan African countries identifying the determinants of demand in primary school attainment for boys and girls across poorer and richer wealth cohorts - determines heterogeneity
- 2) Pooled dataset
- 3) Within pooled data, compare 'macro' cohorts of resource dependence and institutional quality
- 4) Marginal effects dydx estimation to compare intergenerational education mobility
- 5) If results warrant, deeper analysis of select countries with additional country-specific explanatory variables

Outline:

- 1) Introduction
 - a. Briefly summarize goal of paper and top line findings
 - b. Describe outline of paper
- 2) Background and Literature Review
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 - b. Education and Economic Growth
 - c. Natural Resources overview
 - d. Institutional quality overview
 - e. Reason for the paper, place in current literature
- 3) Hypothesis
 - a. Determinants for demand will be heterogeneous
 - i. Because of stark differences in countries, languages, religions, institutions etc
 - b. Heterogeneity is linked to resource dependence/institutional quality
 - i. Possible channels that effect education attainment that are impacted by resources/institutions are
 1. Labor market
 2. Supply of education at the macroeconomic/political level
 3. Household demand for education
- 4) Theoretical Discussion
 - a. Micro theory of human capital development/accumulation
 - i. Glewwe's model and education is an investment with direct and opportunity costs for schooling vs. the perceived future benefits and returns to education.
 - ii. Quantity vs. quality trade off (Becker, et al)
 - iii. Imperfect capital markets and the altruism of parents (Leibowitz, 1974). Opportunity cost of mother's time in the labor market and efficient household production (Tansel, 2000).
 - b. Intergenerational mobility
 - i. Education mobility
 - ii. Transmission channels: environment, biological, behavioral

- c. Why Africa/developing countries may be different
 - i. Opportunity costs are high in rural areas.
 - ii. Labor market
 - iii. Parents underestimate the returns to education
 - iv. Girls face compounded constraints however benefit from higher returns (Schultz)

5) Methodology

- a. Countries and data
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 - ii. Descriptive statistics
 - iii. Dependent variable
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- a. Finding 1: Determinants of Primary school edu are not homogenous
- b. Finding 2: Determinants of secondary school edu are relatively homogenous
- c. Finding 3: Intergenerational education mobility increases as institutional quality increases
- d. Finding 4: Household Wealth & Institutional Quality
- e. Finding 5: Mineral and Fuel dependence affects secondary education mobility
- f. Endogeneity and other estimation issues

7) Conclusions

- a. Further areas of research

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Demographic and Health Surveys, USAID

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Master's Thesis:

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ABSTRACT:

This thesis exploits survey data from 21 Sub-Saharan African countries. After constructing a dataset of over 100,000 households to analyze the variability in traditional determinants of schooling attainment across exogenous domains, results indicate strong heterogeneity across countries in the effects of household composition and parental background. Additionally, findings suggest that 1) marginal effects of parental education are on average three times smaller for secondary compared to primary school attainment, 2) countries with lower corruption are correlated with higher levels of educational mobility, 3) dependence on natural resource revenue is associated with increased educational mobility. And finally 4) household wealth becomes a stronger determinant in countries with better institutions. Exogenous factors appears to have a large correlative impact on schooling outcomes, such as individuals belonging to the richest households have almost ten times the chances of completing primary schooling over the poorest quintile in less corrupt states compared to only a marginal advantage in highly corrupt states.

DECLARATION:

I hereby declare that this thesis is my own work, based on the sources and literature listed in the appended bibliography. The thesis as submitted is 140,534 keystrokes long (including spaces), i.e. 56 manuscript pages.

Tobin Hanspal

Signature:

Date: In Prague, May 18th, 2012

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I would like to express my sincere gratitude to my thesis supervisor, Michal Bauer, for his expert assistance on the submitted work.

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I. Introduction:

Relatively small and simple investments in education have the ability to transform lives. On their education portal the World Bank states that schooling can be one of the “strongest instruments for reducing poverty and improving health” (World Bank, 2012). This view is almost universally accepted by economists, international organizations, and policy makers and has been supported by a plethora of peer-reviewed research evidence. Yet across Sub-Saharan Africa we still see large gaps in school enrollments and education attainment. While some countries in the region have attained close to universal primary schooling in recent years, many still lag far behind. Malawi and Sao Tome and Principe are examples of countries where net enrollments of primary schooling reach levels close to 97% however enrollments for primary schooling in Mali and Burkina Faso are closer to 60%. Niger faces enrollment rates even below those (WDI, 2011). In addition, many students do not complete primary school and even fewer make it on to enroll in secondary school. Across more than 20 Sub-Saharan African countries, less than 40% of the sample over the age of 15 had completed at least primary school and only about 10 % had completed at least secondary school.¹

Many argue that the optimal solution to increasing rates of education across the developing world is a supply side problem. Governments (with the help of foreign aid and NGOs) must improve the access individuals have to schools while improving the quality of the education itself. On the other hand, others place the importance on the demand side: improving access and quality will have no effect unless individuals and families naturally increase their demand for better and more schooling institutions. This may arise based on shifts in perceptions about the role of education in their own personal lives such as higher wages in a formal market for educated labor. What is interesting about both views, as Esther Duflo and Abhijit Banerjee point out, is the fact that the parents of the children who should be attending school play a large, unprecedented role in whether or not the child enrolls, attends, and learns in school. The head of the household (and spouse) exerts a certain level of authority over the children and other household members. They have the ability and responsibility to decide how income is spent and

¹ Author’s calculations discussed at length in the methodology and findings sections (V, and VI) data source: DHS.

on what. Who goes to school, and who stays at home to help with household chores, agricultural or other employment, and raising young children within the household.²

Parental decision making on their children's education plays an important role in the determinants of successful education attainment. Without being able to physically observe parental decision making (or explicitly ask it in a survey questionnaire), this may be best represented by parental background variables such as income or wealth and level of education. These among other determinants of child education attainment have been well documented in the literature. However, there seems to be a lack of large scale initiatives to survey the determinants of education across Sub-Saharan African countries. In addition, there may be a number of channels that augment the decision making of parents on their children at the household level. A few of these many factors, as proposed in this paper, consist of exogenous political economy, macroeconomic-level phenomenon such as the level of institutional quality and a country's dependence on natural resource wealth.

This paper attempts to link the effect of these political economy characteristics to the supply and demand side perspective of household decision making on education. While this study does not develop a causal relationship, it attempts to shed light on how determinants of education may have heterogeneous effects in light of distinct macroeconomic environments. To the author's knowledge, such a study, encompassing a large number of Sub-Saharan African countries is yet to be published. Through an empirical analysis of high quality survey data, I aim to answer the following questions: do the determinants of educational attainment differ across Sub-Saharan African countries? And what effect can political economy characteristics have on the decision making process for education demand at the household level? I propose that the determinants of demand in education will be heterogeneous because of stark cultural and institutional differences across countries. Additionally, heterogeneity may be linked to resource dependence and institutional quality by affecting the supply and quality of education, and the household demand for education. I hypothesize that in countries with high levels of resource dependence and low levels of institutional quality, there is lower educational mobility from parent to child, and that levels of parental educational and wealth strongly predict the educational prospects of their children.

² This section is based on Chapter 4 of Poor Economics by Banerjee and Duflo. It provides a good summary and introduction to the topic.

I present several core findings that, to the author's knowledge, have been previously under discussed in published literature on human capital and in Sub-Sahara Africa. Firstly, the determinants of primary schooling attainment are quite heterogeneous across countries coupled with the fact that determinants for secondary schooling are relatively homogenous. Secondly, intergenerational education mobility appears to increase across groupings of countries as their level of institutional quality increases. Additionally, the role of household wealth has the opposite influence as institutional quality increases. Finally, mineral and fuel dependence appears to affect parental educational mobility of children's secondary education attainment. In general the study finds that these exogenous characteristics appear to be highly correlated with schooling outcomes. Each of these findings are discussed in relation to specific hypothesis in further detail in later sections of the paper.

The paper proceeds as follows: first I discuss the literature and provide a detailed background of the issues involved. Section III describes the hypotheses, after which in Section IV, I discuss three distinct areas of theory that provide a framework for the paper. The following section (Section V) describes the methodology, model specification, and the empirical predictions. Section VI reviews the findings from the empirical results and relevant discussion topics. Finally, Section VII concludes by summarizing the findings, discussing the limitations of the study, and proposing important areas for further research.

II. Background and Literature Review:

It is a widely respected belief that education plays a critical role in development, at both the macro and micro-economic level. There has been an extensive body of literature determining strong correlations between measures of education and components of development such as economic growth, increased productivity, reduced gender and income inequality, and higher levels of democracy (Barro, 1999; Barro 2001). And at the individual level, many empirical studies have demonstrated the link between education and quality of life indicators such as income, health, fertility, etc (World Bank, 2012; Zhao and Glewwe, 2010).

There has been extensive literature focusing on human capital outcomes and accumulation. This has most typically been measured by completed years of schooling or highest grade reached. It has been shown over time in various studies that parental education has a

powerful influence on indicators of human capital (Behrman, 1997; Strauss and Thomas, 1995). In Cote d'Ivoire and Ghana, Aysit Tansel (1997) finds that the effect of father's education is greater than the mother's for both boys and girls. This is in contrast to conventional wisdom of high-income countries where generally the mother's level of education is found to be more important (Mare, 1996; Behrman, 1997). Zhao and Glewwe's (2010) study of rural china present findings consistent with this conventional wisdom and also find that the education level of the mother and her attitudes toward children's education have strong effects on the child's attainment levels.

Within this literature education attainment studies have shown empirical proof of key determinants of human capital accumulation such as gender, health, household income and wealth, community resources, and household composition (Appleton, 2000; Tansel, 1997, 2002; Glick and Sahn, 2000; Lillard and Willis, 1993, 2002). Al-Samarrai and Peasgood (1997) in their analysis from Tanzania show significant household differences between the way in which household characteristics affect outcomes for boys and girls. Appleton (2000) reiterates this by finding similar results across Sub-Saharan African countries, however he adds that the gender differences are not as defined for health outcomes compared to education (Appleton, 2000). Many researchers now distinguish their samples by gender to understand determinants with different effects on boys and girls. Zhao and Glewwe (2010) find in rural china that income and nutrition levels have positive effects on completed years of schooling. Many researchers have also shown the importance of health on education through a multitude of interventions.³

Researchers have identified strong positive wealth effects in determining education attainment and enrollment such as Filmer and Pritchett (2001; 1999) where they show for example, that in India a wealthy child is 31% more likely to be enrolled in school than a child from a poor household (Filmer and Pritchett 2001). Researchers have also found that the composition of the family members within a household can have a significant influence on the education success of a child (Dumas and Lambert, 2007; Glick and Sahn, 2000). For example, elder children are less likely to be enrolled in school because they are more likely to be responsible for household tasks and chores, in addition to a variety of cultural and traditional reasons (Dumas and Lambert, 2007). Studies have also shown not surprisingly, that children of rural based households often attain less years of schooling than their urban counterparts

³ See recent work by Abjhit Banerjee, Esther Duflo, Michael Kremer, and in general JPAL.org

(Gardner, 1998) likely due to the increased opportunity costs with attending schools in less densely populated regions. Another reason why rural children accumulate less years of education is because there may be less demand for education goods. In a rural society, labor prospects likely involve sustenance farming or agricultural work. Although researchers have shown that education correlates with increases in agricultural productivity (Psacharopoulos and Patrinos, 2004; Appleton, 2000), this phenomenon may not be a rational decision in the mindset of individuals. An individual may be expected to follow in the employment footsteps of his parents, thus the perceived returns to education may be limited (Hout, 1989).

Other researchers have shown correlations and have often attempted a causal interpretation linking levels of education to be important indicators of fertility rates in women and time preferences in adults (Bauer and Chytlova, 2009). These findings in summation indicate the obvious: that education plays a crucial role in the fundamental livelihood of individuals across many domains.

At the macroeconomic level, seminal studies have shown that economic growth is positively related to the average schooling attainment of its citizens, as is the quality of the education (Barro 2001), suggesting that workers with higher educational backgrounds are needed to complement new technologies crucial for long term economic growth (Barro, 2001). Economists and development organizations have stressed the importance of access to schooling as represented by the United Nation's Millennium Development Goals which include the achievement of universal primary education by 2015. Given the important role of education across the world, the topic itself has spurred many critical debates. The supply-side versus demand-side argument over education for development stems from the quest to find the most cost-effective way to attain a certain aggregate level or number of years of educational attainment. While some argue that improvements to access and quality of schooling institutions is necessary to improve human capital outcomes (Hansuchek, 1995), which in turn should help developing countries reach middle income status, others argue that altering the supply-side may have no effect on individual's demand for education and schooling (Kremer, 1995). While interventions have addressed both of these aspects (among many others), increasing educational outcomes continues to remain an important facet and goal of development economists.

Related to the pursuit of economic growth it has become common wisdom that in many countries abundant in natural resources such as oil, natural gas, and minerals, economic growth over the long term tends to be slower than in countries that are less resource abundant. It is generally accepted that institutional quality plays a large role in allowing resource rich countries to break the trap of the resource curse, and it has also been hypothesized that secondary education can be a decisive factor (Auty, 2001; Sachs and Warner, 1997; Glyfason, 2000). Over time, cross-country empirical studies have shown firstly, economic growth varies directly with education. Secondly, that economic growth varies inversely with natural resource abundance. And thirdly, measures of education are inversely related to natural resource abundance (Glyfason, 2000). Conversely, a more recent study by Stijns, using a slightly different classification of resource abundance determined that resource wealth and rents are in fact correlated with an increase of human capital accumulation (Stijns, 2009), where accumulation is defined by a number of largely accepted human capital measurements including average years of education.

A hypothetical link has been determined between natural resource rich countries and the incentive and investment in education. This is in part supported by evidence that in resource poor countries, there is a higher demand and higher wages for skilled and educated labor. Therefore parents invest in children's education because of the perceived returns. In resource rich countries, traditional trade and manufacturing sectors may be eroded by an emphasis on resource commodities which in turn, results in less demand for educated labor. States with high levels of resource dependence face the “crowding-out” of growth in the manufacturing sector, coupled with a lack of democracy (Ross, 2001). In these situations, the potential returns in terms of wages and employment opportunities and perceived benefit for educated workers is reduced. Families therefore invest less in education. Children and families may forgo education and presumably become employed in basic services and nontradables where education does not result in higher wages (Birdsall, 2001; Sachs and Warner, 1997). From a top-down perspective, governments of resource abundant countries may perhaps try to redirect resource rents to policy programs, such as the expansion of education. However in effect, its quality is reduced, as is its demand (Birdsall, 2001). Finally, it has been hypothesized that in resource abundant countries, the rentier effect permeates more than just economic and public policy making. The rentier mentality creates a shift in the general attitude towards work, achievement, and compensation.

For even the general public, monetary rewards becomes a given, “an isolated fact” (Beblawi and Luciania, 1997). Education and investments in human capital become divorced from reward and incentive in education diminishes. In other words, natural resource abundance creates a false sense of confidence and that “easy riches lead to sloth” (Sachs and Warner, 1997). These citizens in resource abundant states may become “locked in” lower skill intensive natural resource based industries or supporting services and the return on education investments may decrease (Glyfason, 2000).

Institutions also play a large, unprecedented role in development. Generally institutional quality is defined as formal mechanisms for political rule-making, enforcement, security of property rights, and non-distortionary policies (Acemoglu et al, 2001). The definition of institutions may also suggest some level of social norms and adherence to cultural rules. Economists have heavily studied the role of institutions on economic growth and development, usually proxying institutional quality with an observable phenomena such as; enforcement of property rights and contracts (Roderick, 1999), development of financial sector (Levine, 1997), protection against expropriation (Acemoglu et al, 2001), enforcement of law, time to start a business, cost to register property (doingbusiness.org, World Bank, 2012), and perception of corruption (Svensson, 2005). In general, researchers find a strong and positive correlation between institutional quality and income or economic development at the macroeconomic level.⁴

Weak institutions have been suggested to arise from exploitative tendencies in the political and governing body of a country. In this sense governments may inadvertently or even deliberately neglect investments in services such as education that develop human capital within their own country (Acemoglu et al., 2001). The role of institutions is perhaps best explained by an example. Acemoglu et al (2001a), cite institutional quality as a major mechanism for the economic growth and stability that Botswana has experienced in recent years. Against a cascade of poor-performing African countries, Botswana is often hailed as a success story with an income per capital almost four times the African average and an annual growth rate upwards of 7% from 1965 to 1998 (Acemoglu et al, 2001a). The author’s first point out that there is almost universal agreement that Botswana has been able to achieve this growth performance because of its ability to adopt "good policies." They suggest that in Botswana, the system of rule of law

⁴ See any of the above referenced papers

functions adequately, where state and private predation have been limited. Regardless of windfall revenues from mining, there has been limited instability or conflict for control of diamonds and other natural resources. Furthermore, the government has invested heavily in infrastructure, education and health. These institutions, the authors argue, were inherited from the British and developed into a "meritocratic, relatively non-corrupt and efficient bureaucracy" (Acemoglu et al, 2001a).⁵ Similarly, others have shown that institutional weaknesses such as corruption directly hinder supply side investments in education. For example Reinikka and Svensson (1996) find that because of corruption, only 13% of school funding actually made it from the central government to the local schools in Uganda (Reinikka and Svensson, 1996). The differences in institutions from Botswana and Uganda go hand in hand with stark differences in development outcomes: Uganda' GDP per capita is approximately \$1,300 while Botswana's is over 12 times that at \$16,000 per capita (IMF, 2011). Clearly institutions do not explain all heterogeneity between countries; however they play an important role in the development of nations and make a relevant mechanism for this type of study.

This paper aims to bridge the gaps in some of the seminal research discussed above. Firstly, the author is unaware of any multi-country studies that examine the variation in determinants of educational attainment. Cross-country studies as an approach in macroeconomics is common and researching the role of education on economic growth, or determinants of education enrollments at the macroeconomic level is well documented. For example Oketch (2006) who researches the determinants of human capital formation across African countries, Barro (2001) who emphasizes the role of education on long term growth, and Collier and Gunning (1999), who investigate the microeconomic decision making of households and firms across Africa. Previously published work that analyzes the microeconomic determinants of education in Africa use similar data sources, however researchers have typically limited their empirical studies to one country or compare two countries or regions in effort to build more detailed case studies.⁶

Secondly, this paper attempts to link the effect of natural resources and institutions to households' decision making on education investment. While this study does not develop a

⁵ This paragraph draws from Acemoglu et al (2001a)

⁶ See the many sources discussed in this paper or Behrman (1997) for an excellent literature review of mother's schooling and child education.

causal relationship, it attempts to shed light on how determinants of educational demand may be influenced by exogenous political economic characteristics such as resource dependence and levels of corruption. Throughout this paper, I aim to answer the following questions: first of all, are the determinants of demand in educational attainment homogenous across Sub-Saharan African countries? And what effect do exogenous political economy characteristics of countries have on the decision making process of individuals' education at the household level? Specifically, do natural resource wealth and a weak institutional quality lower the educational prospects of children?

III. Hypothesis:

Firstly, it is hypothesized that demographic and household characteristics which determine educational success in children in Sub-Sahara Africa are heterogeneous. There are a number of reasons for why this could be the case. Educational characteristics vary greatly across the region, for example the rate of completion for primary schooling as described by the World Bank ranges from 32% in Chad to 91% in Kenya (WDI, 2011), the adult literacy rate varies from 34% in Chad to 92% in Zimbabwe (WDI, 2011), government expenditure per student ranges significantly, and enrollment rates by country, age groups, gender, and location vary dramatically across the region (WDI, 2011). In addition, high levels of income inequality in many of the countries of the region reflect high variability between the access and quality of schooling for the rich and poor (Oyelere, 2010). Furthermore, the 50 plus countries and territories that make up Sub-Sahara Africa contain a vast number of languages, religions, ethnicities, tribes, and cultures. Individual villages, towns, and cities –let alone at the country level –are likely to have their own social and cultural norms, traditions, and perspectives on education. Considering this short list of dimensions, it is easily plausible that there should be a high level of variability in determinants of educational outcomes across the region.

Secondly, this paper argues that heterogeneity in the educational prospects of children could be linked to exogenous characteristics of the political economy that may change the decision making process that households face when considering investment in human capital development. Specifically that dependence of natural resources such as oil, diamonds, precious

minerals, and weak institutional infrastructure can lower the educational prospects of children. Thus, it is hypothesized that in countries with high levels of resource dependence and low levels of institutional quality there is lower educational mobility and the levels of parental educational and wealth strongly predict the educational prospects of their children.

This is hypothesized to occur both through demand and supply side functions of education. From a demand perspective the main channel that I suggest will be affected by institutional quality and natural resources, and thereby affect the educational prospects of households is the role of the labor market. Families in resource abundant states may choose to forgo education and work in basic services and occupations supporting the resource industry. Thus they should postpone investment in human capital as the perceived returns are low. In these societies, traditional trade and manufacturing sectors become eroded by an emphasis on resource commodities which results in less demand for educated labor. The potential returns in terms of wages, opportunities, and perceived benefits for educated workers is less, families therefore invest less in education (Collier, 1999; Birdsall, 2001; Sachs and Warner, 1997). Investing in human capital becomes risky and less profitable compared to the alternatives. Additionally, parents may underestimate the returns to education when reviewing the decision making of others in their social circles and communities, which in turn creates a vicious cycle of parents who opt out of their children's education (Collier and Gunning, 1999). In these resource abundant states, I expect to diminished levels of schooling attainment and suggest that levels of parental educational and wealth should more strongly predict the education attainment of their children.

Considering the supply side equation of education, the main channel that should transmit the effects of natural resources and institutional quality onto educational attainment is the supply of education. Lack of institutional quality and dependence on natural resource wealth are hypothesized to reduce the access to and quality of education. There are several potential channels predicting a negative impact on the supply of education.

Firstly, natural resource dependent countries face higher volatility in primary commodities than do economies based on traditional manufacturing sectors (Reinhart and Wickham 1994). A higher volatility in government income may lead to erratic expenditure in education and related infrastructure. Secondly, natural resource wealth and lower quality of institutions have been correlated with higher levels of income inequality (Leamer et al. 1999).

Higher income inequality in a country may be a determinant or an outcome of heterogeneous educational prospects for individuals in different socioeconomic classes. In such a situation children of the wealthy may be more likely to attend private schools and tutorship, while the poor are presented with exponentially lower quality government schools and teachers (Oyelere, 2010). Thirdly, mineral dependence has been suggested to increase the likelihood of civil war (Collier and Hoeffler, 2004). Civil war and conflict can disrupt the possibility for children to attend school for a vast number of reasons including forced migration, infrastructural damage, and safety concerns, among many others.

Finally, while weak institutions as previously described imply weaker levels of democracy and higher extractive political tendencies, natural resource wealth can be connected to a less democratic society as well. Michael Ross argues that natural resource wealth reduces a government's dependence on taxes, retards the emergence of a middle class, and supplies the government with enough money to bribe or suppress potential dissenters (Ross, 2003). Several studies have found a negative association between dependence on mineral exports and levels of democracy (Ross 2001).⁷ I expect to find that because natural resources and lack of institutions can create supply side impediments to education, educational mobility should be low, and parents with higher educational and wealth endowments correspond to children with higher levels of education. In resource poor countries, or countries with higher institutional quality, the previously mentioned channels should interfere with education supply to a lesser extent. In this situation there may be more equal opportunities and availability for children to attend school, thus the parental characteristics will have less an effect on their children's outcomes.

IV. Theoretical Approach:

This section of the paper details the theoretical underpinnings of the research at hand.

Human Capital:

⁷ These two paragraphs are influenced by Ross (2003).

There are several models of human capital development and accumulation that outline the basis of treating education an investment good. The foundations of these models show that education is an investment with direct and opportunity costs for schooling versus the perceived future benefits and returns to education. In this case the optimal level of schooling increases with increasing returns to human capital and decreases with increasing direct and opportunity costs (Becker, 1975; Becker and Tomes, 1976). Simplified, parents choose a level of education for their children based on costs, their wealth constraints, opportunity costs, returns to education, and preferences (Becker, 1975, 1985).

This paper relies heavily on the model of a household's demand for education as outlined by Paul Glewwe (2002) where households make decisions on the education of children by weighing the expected returns of education against the direct and indirect costs of additional years of schooling (Glewwe, 2002; Glewwe and Zhao, 2010). A household's demand for years of schooling, denoted by S , is a function of the factors that influence the benefits and costs of additional schooling. Glewwe outlines four types of factors: child personal characteristics (PC), household characteristics (HC), community characteristics (CC), and school and teacher characteristics (SC). This can be expressed as:

$$(1) S = f(PC, HC, CC, SC) + \varepsilon,$$

As in other empirical evaluations of education demand it is challenging if not impossible to accurately estimate many child personal characteristics such ability, therefore this effect will be represented in the error term. This study also omits school and teacher characteristics from the estimation, which is described further in the succeeding section. In a related vein, quality–quantity trade off models of household ‘production’ suggest that parents maximize utility as a function of their desired number of children, the ‘quality’ of children, and consumption of goods and leisure of household members, subject to time and wealth constraints (Becker and Tomes 1976, Tansel, 2002). This suggests that parents make decisions about the number of children and the desired outcomes of those children in their household subject to several elements within their consideration set.

Intergenerational Mobility:

A second heavily discussed and theorized discipline this paper leverages is research regarding intergenerational mobility. Intergenerational mobility generally refers to the composition of all factors of an individual's family background that affect his or her future. Economists have long studied sources of intergenerational transmission that impact development in children such as education, income and wealth, and asset holdings (Björklund and Jäntti, 1997; Belzil and Hansen, 2003; among others). The two factors most often described in the literature and the basis of this paper are parental education and household economic status (Behrman et al. 2001; Filmer & Pritchett 1998).

Theory suggests that within societies with imperfect social mobility, wealth and parental education will be correlated with the educational success of their children (Becker 1997; Agee and Crocker, 1996). Individuals who are 'well educated', 'well off' and 'who promote educational attainment' are most likely to have better educated children (Chevalier et al, 2003). As discussed, many studies addressing demand for education have stressed the importance of parental background on child education attainment. Belzil and Hansen (2003) try to quantify to what extent parental background matters, and find that family background variables account for up to 85% in the explainable variation in child school attainment (Belzil and Hansen, 2003).

Seminal literature on the topic suggests that parents may be altruistic and care for the welfare of the child (Becker and Tomes, 1976), or parents may perceive their child as an investment good and invest in the well-being of the child to mitigate risk and distribute resources throughout generations (Homans, 1958). Additionally, parent's educational backgrounds can represent their education and genetic preferences (Tansel, 2000). A mother's level of education has also been cited to represent household investments, opportunity cost for her time, and efficient household production, when assuming a mother is the primary care provider of her child (Leibowitz, 1974; Tansel, 2000).

Theory also suggests that parents can "socialize" their children by exerting effort to improve their well-being (Clausen, 1968; Billingham, 2007). This may be a contribution by early learning and reading to children or playing a more active teaching role in summer months when children are out of school (Chevalier et al, 2003). However, it is important to note that the theory of socialization in regards to the education of children has been researched primarily in high-income countries.

Recent literature suggests that there are three different types of factors that may determine educational mobility: genetics, parental behavior, and environmental factors. Many educational mobility studies take parental behavior as exogenously determined and focus on environmental factors such as access to schooling and wealth (Bauer and Riphahn, 2007). This paper does the same. Researchers often discuss and attempt to distinguish between biological effects (nature) and socialization (nurture) in intergenerational mobility or transmission studies (Dohmen et al, 2011), however this paper does not attempt to differentiate between genetic and behavioral determinants and only looks at the combined phenomena.

Least Developed Countries:

The above theoretical approaches to the research questions at hand need to be considered under the purview of Sub-Sahara Africa and least developed countries. This section attempts to discuss some of the particulars of human capital and Sub-Sahara Africa.

While parental education and wealth are important indicators of child education, in Sub-Sahara Africa wealth and education levels are generally low to begin with. From a comparative perspective the World Bank's World Development Indicators states that the adult literacy rate (individuals over the age of 15 who can read and write a short, simple statement) was 62.3% in Sub-Sahara African countries, compared to 98.8% in OECD countries in 2009. In the pooled dataset of 21 Sub-Sahara African countries, 38.8% of the sample over the age of 15 had completed at least primary school and only 10.54% over the age of 20 had completed at least secondary school. Similarly, the poverty headcount ratio (percentage of the population living under \$2 per day (PPP)) for Sub-Saharan Africa was 69.2% in 2008. This number is effectively zero in OECD countries where the GDP per capita is upwards of \$34,000, or more than 26 times that of Sub-Sahara Africa (WDI, 2011).

The structure of households and family composition in Africa is greatly different than in most high-income countries. Fertility rates in Sub-Sahara Africa are on average 5 children per woman compared to 1.7 in OECD countries (WDI, 2011). This also skews heavily from urban to rural populations. Compared to other regions of the world, African families have less rapidly moved away from having larger numbers of children and investing in education. This may be because parents are rationally choosing to have more children in order to diversify their sources

of future income (Collier and Gunning, 1999). The opportunity costs for sending a child to school and away from the household are high, especially in rural areas where agricultural and family assistance is often required by children. These differences between rural and urban markets are stark. While rural areas have less access to schooling institutions and infrastructure, they also have clear labor market distinctions. In urban areas, the perceived job opportunities could have a strong influence on parent's decision making for their children's education. Whereas in rural environment lack a modern sector and job opportunities can make investing in human capital risky.

Gender differences in not only the returns to education, but also in the role within the household are heavily compounded in Sub-Sahara Africa (Schultz, 1993). Parents can have differential preferences between their son's and daughter's education. This differential preference may be due to perceived or real differences in labor market returns to education (Rosenzweig and Schultz, 1982). It may also likely be due to the mothers' and fathers' role in the household (Glick and Sahn, 2000). And, because historically girls have achieved less education than boys this may likely be a causal link to their increased rates of fertility (Collier and Gunning, 1999). Finally, parents in Sub-Sahara Africa, for many of the reasons discussed above, are more likely to underestimate the returns to education for their children and choose to opt them out. Especially when faced with the decisions made by others in their social circles and communities. As Paul Collier and Jan Willem Gunning (1999) point out, these information cascades in turn can contribute to a vicious cycle of parents choosing to forgo their children's education.

V. Methodology:

Data Description:

This study leverages the Demographic and Health Surveys (DHS) supported by the USAID office. The DHS data are nationally-representative household surveys that collect information on a wide range of topics such as education, health and nutrition, household and demographic information, family planning, etc across over 80 low-income countries around the

world. The DHS data selected for use in this paper are limited to 21 Sub-Saharan African countries listed by year below:

Table 1:

Country / Territory	Year of DHS Data	Country / Territory	Year of DHS Data
Burkina Faso	2003	Namibia	2006-07
Cameroon	2004	Niger	2006
Chad	2004	Nigeria	2008
Congo Republic	2005	Sao Tome & Principe	2008-09
Democratic Republic of the Congo	2007	Senegal	2005
Gabon	2000	Sierra Leone	2008
Ghana	2008	Tanzania	2010
Kenya	2008-09	Uganda	2006
Malawi	2010	Zambia	2007
Mali	2006	Zimbabwe	2005-06
Mozambique	2009		

The above countries and datasets were selected primarily based on three different factors. First of all, the country must obviously be located in Sub-Sahara Africa. Secondly, recency of data was an important in the selection criteria. No dataset featured is older than 2003, with the mean year being 2006. Finally, the study only selects countries with datasets with large enough populations of men, women, and children. The Demographic and Health Surveys are taken at the household level and appropriated into datasets by Male, Female, and Household specific questionnaires. For example one data file will contain information on the location and characteristics of the actual household dwelling and number of family members, while another will ask Men about their employment and consumption habits, and finally another will ask Women about family planning and nutrition questions. For this analysis, the data files are merged by household number forming household clusters for husband, wife, and children (and all other relatives living in same household) for each country set. In addition, I create a master pooled data set which gives us a view into over 800,000 individuals, or more than 100,000 households in Sub-Sahara Africa.

Descriptive Statistics:

See Table 1 in the appendix

Dependent Variable:

The main interest of this study is to understand how household, demographic, and family characteristics affect a child's prospects of education success. The dependent variable in this case is a binary outcome variable indicating if at least primary schooling has been attained. I employ a similar model for secondary schooling where the independent variable simply becomes a binary variable indicating whether secondary schooling is attained.

Explanatory Variables and Predictions:Age

The age and age-squared variables (AGE and AGE2, respectively) are included in the model to identify any effects and non-linear effects from the age of the individual. The model restricts ages from 15 through 36 following others who analyze children over the age of 15 (Tansel 2002; Filmer and Pritchett, 1999). Age cohort effects are mixed: some have found no effects (Glick and Sahn, 2000), and some have found significant changes in cohorts suggesting that changes are linked to differences in schooling supply over time (Tansel, 1997). In this study I do not examine cohort effects, as it would be difficult to draw conclusions across countries; however results are expected to show positive effects from age, and negative from age-squared indicating a non-linear relationship.

Parental Background:

The characteristics presented as those of the child's Mother and Father could benefit from a short explanation: these characteristics relate to the male head of the household and the female head of the household, determined by the survey data for sex and relationship to household head. In this case someone can be a female head of the household and be classified as the 'mother' or a

male head of the household and classified as ‘father’, therefore, a ‘mother’ can also be the spouse of the male household head and a ‘father’ can also be the male spouse of a female household head. Thus the study does not use data that explicitly states an individual is a biological mother or father of a child. This choice was made in an effort to expand sample size and in order to include employment characteristics among other characteristics not present in the household level datasets. The nature of the survey datasets do not explicitly ask about parental characteristics, unless the respondent is under the age of 17. Therefore this approach gives us a larger view of the audience with minimal disturbance.

To the best of the author’s knowledge, this approach is in line with related literature and similar data sets. Other studies do in fact vary with their usage of characteristics of the household head versus the biological parent as explanatory variables, for example Tilak (2002) uses household head in his study of rural India and Lincove (2009) uses biological mother’s years of schooling in her analysis of Nigeria. Tansel (2002) limits his study of Turkey to the household head and spouse's own children by eliminating grandchildren and other relatives, however indicates that this may render the sample non-random and potentially cause estimation bias (Tansel 2002). This is very similar to the approach taken in this study; however this study does in fact include grandchildren, and adopted or foster children under the category of sons and daughters of the household head and spouse.

The specific variables included into the estimation to understand the parental education background effect on children are single years of education accumulated for the female head of the household and the male head of the household (MOMEDUYRS and DADEDUYRS respectively). I expect there to be a strong relationship between parental education accumulation and a child’s probability of successful education outcomes. It is important to note that a strong correlation reiterates a lack of mobility and insinuates that a child’s family background determines his or her success rather than the child’s abilities and desire to enroll in school.

A dummy variable, MOMHOME, is included to capture the effect of a non-working mother (or female head of household/spouse) on the child’s education attainment. The data does not distinguish if the mother is unemployed and out of work, or rather a stay at home mother. The expected effect of a child’s mother being out of the workforce is questionable: on one hand we might expect that a stay at home mom will have more time to invest in and socialize the child’s education and development, and can oversee household duties allowing the child to

concentrate on human capital accumulation. On the other hand, an unemployed mother might signal that the mother lacks education herself and therefore cannot commit to meaningful work. Since the estimation controls for wealth, a likely scenario is the latter where a non working mother lowers the probability of her child completing primary schooling.

The dummy variable, SELFEMP, is included where a 'yes' value represents either the head of the household or spouse of the head of the household being self employed. The variable is included as it is expected to capture effects of alternative opportunities for the child's time (Tansel 2002). If a parent is involved in an entrepreneurial activity such as local food vending, farming, or running an informal service, the child is expected to have a lower probability of completing primary schooling because of the opportunity costs associated with attending school versus taking part in the family business directly or as an indirect consequence such as maintaining the household while parents are perhaps occupied with work duties.

Household Composition and Characteristics

The composition of a household and its characteristics are expected to play a large role in the demand for education of children in Sub-Saharan Africa primarily because it alters the marginal costs of children's time and the opportunity costs associated with attending school (Glick and Sahn, 2000). Household composition generally focuses on the number of family members in the household, the number of young children, and the birth order of children. Dumas and Lambert (2007) suggest that in Sub-Saharan Africa, elder children are less likely to be enrolled in school firstly because of a liquidity constraint that prevents the eldest child in a household to attend school. This constraint is often relaxed for younger siblings if the elder is engaged in income earning work, or the parents have accumulated additional wealth and savings over the course of time since having their first child. Another possible reason for the reduced schooling demand for the eldest child is that it is often the case the parents want to keep the eldest boy at home either for cultural reasons or as a form of informally insuring that they are looked after in old age (Dumas and Lambert, 2007).

Including definitive birth order characteristics would restrict the dataset significantly therefore I include two of the three aforementioned variables attempting to capture household characteristic effects. Firstly, included in the estimation is HHKIDS which is the total number of sons, daughters, grandchildren, and adopted or foster children in the household. HHYOUNG is

also a discrete variable indicating the number of all children in the household under the age of five years old. It is expected that both of these variables will negatively affect the probability that an individual will complete primary education. As the number of young children increases, the chances are that the elder children, or children of school age, will face the opportunity trade off of going to school versus staying at home and caring for the younger siblings, this effect is suspected to be intensified for school aged girls (Collier and Gunning, 1999; Glick and Sahn, 2000).

The dummy variable, DEATH12, indicates whether a member of the household died in the last 12 months. As other researchers have pointed out, the loss of a household member can alter the opportunity costs of a child going to school if an income earner passes away. Alternatively, a death in the household can also result in direct costs for a funeral or other cultural or religious arrangements.

There are characteristics of the location of the household included in the study that may also affect the determinants and demand for educational attainment. RURAL is a dummy variable indicating whether the household is located in a rural location versus urban. A rural household is expected to reduce the probability for educational attainment for children for a number of reasons. Firstly the family is more prone to be employed in the agricultural sector where child labor may supersede the incentive to invest in education. Secondly, in a rural and theoretically more remote area, less supply of and access to schools and educational institutions is likely. Therefore the direct and indirect costs to attend schools further away from the household are larger and thereby decrease the probability that the child will accumulate education.

Similarly, the dummy variable FARMLAND designates whether a household owns arable land usable for agriculture. While varying from country to country, this variable should intuitively be correlated with a household being in a rural location⁸ therefore, it is expected to reduce the probability that a child attains primary education. Owning arable farmland is interestingly not correlated with the one of the household head members being self employed or working in agricultural related field (See Table 4 in appendix). This could be because owning arable, rural land in Sub-Saharan Africa might have different implications than it does in higher-

⁸ The pooled data shows only a slight correlation between the variables ($r = 0.458$ in pooled sample), and slightly negatively correlated with wealth ($r = -0.578$ in pooled sample). See Table 4 in appendix for details.

income countries. For example, those who own smaller plots of land may be sustenance farmers, not necessarily as their main occupation, but rather for farming necessary staples for the extended family.

Information Access

The variable MEDIA, a dummy variable, is a proxy for access to information and media based on household ownership of a television or radio. The variable is slightly correlated with the DHS wealth index (see Table 4 appendix) because, as discussed in further detail in the following section, the wealth variable used in this estimation is an index created from ownership of various assets. This is potentially problematic and could introduce some degree of multicollinearity. When controlling for wealth, I expect that this variable allows us to capture the effect a ‘more informed’ household might have on education attainment. By this I suggest that ‘less informed’ households may underestimate the returns to education when reviewing the decision making of others in their social circles and communities. DHS sponsored studies make similar connections when connecting access to information to family planning and fertility.

As many have hypothesized, (Collier and Gunning (1999), Banerjee and Duflo (2011), Jensen (2010), Nguyen (2008)) parents in Sub-Saharan Africa, particularly in rural communities, may underestimate the private returns to the investment in education of their children. Based on the previously discussed household theory of human capital all households make somewhat heterogeneous decisions and calculations about investing in their children’s human capital development, there is the possibility for information cascades since households may base their decisions on the observed decisions of others (Collier and Gunning 1999). Jones (1997) finds this in his study in Ethiopia of neighbors who mimic each others decisions about childrens participation in school. As Collier and Gunning point out, this has the potential to create a path-dependant trap at the aggregate level. When households withdraw their childrens from the education system, other parents decide that it is not a wise investment and follow suit within their own households (Collier and Gunning 1999).

Wealth and Income

The variable of choice for this model is ideally household income, however because several sources of measurement error in obtaining this metric, this study leverages the wealth index from DHS survey data like many others . A principal components analysis is used to construct the wealth index from household ownership of various consumer items from the general areas; assets (such as a radio or television); vehicles (such as a car, motorcycle, or bicycle); services (if a household has electricity, access to running water, and type of toilet facility); and other household dwelling characteristics (type of flooring, roofing, etc) (Filmer and Pritchett, 1999). The wealth index, WEALTH within the model, categorizes households into quintiles based on the distribution of the household population rather than on the distribution of households within a specific country. The quintiles range from poorest, poorer, middle, richer, to richest. It is been shown in much of the literature that wealth plays a large role in the educational attainment of a child, this paper hypothesizes likewise.

As a proxy for access to formalized credit, savings, and financial institutions I include the dummy variable BANK indicating that the household has a formal bank account. While this variable suffers from the same potential multicollinearity problems as access to media information, when controlling for wealth this again becomes less of an issue. Having access to and participating in formal savings may be normal for the wealthy; however for the poor it is by no means commonplace, especially in rural regions. In fact, in the pooled dataset close to 49.9% of urban households have a bank account, whereas only 14.2% of rural households do. I hypothesize that households with a bank account are likely more wealthy, but also may have more access to formal infrastructure and perhaps educational institutions. Additionally, it is plausible that households who save income in a formal bank account are less present bias and more willing to seek longer term investments, such as the education of their children.

Model Specification:

Because the dependent variable has a simple binary outcome, a probit model is used to describe the relationship of the explanatory variables on the outcome that a child will at least attain primary schooling. An ordered probit should be used if there are more than two outcomes of the dependent variable (Greene, 2003) such as in Tansel (2002), Glick and Sahn (2000) among others. A probit model is more appropriate here than ordinary least squares, as OLS

assumes continuous distribution for the dependent variable and would result in bias estimates in our case.

Model 1:

For the country specific analysis of variability in determinants in demand of education attainment across 21 Sub-Saharan African countries the probit model is as follows:

$$P = \beta X + e \quad (1)$$

Where P is the dependent variable for child education attainment indicated by a dummy variable, Primary, the level of education completed at least primary school. X is a vector of individual (PC), household (HC), and community (CC) explanatory variables, and e is normally, independently distributed disturbance term. β is the vector of coefficients that are of particular interest in the regression estimations.

Model 2:

Follows the structure of Model 1 above;

$$S = \beta X + e \quad (2)$$

However, S, the dependent variable for child education attainment, now represents Secondary, the level of education completed at least secondary school. Select explanatory variables are dropped in order to account for reduced observations and boys and girls are pooled into a single sample.

Model 3:

Model 3 merges all of the country specific data with relevant explanatory variables into a single pooled data set. Within the pooled dataset it is possible to add exogenous macroeconomic level indicators by country such as a measure of institutions and of natural resource dependence. With this added to the pooled dataset, it becomes possible to examine the effects of the explanatory variables upon educational attainment while considering the macroeconomic groupings as well.

Since the country specific datasets each have a sample size with a great deal of variability (for example Nigeria N = 120,326, whereas Sao Tome & Principe N = 8,707) I overcome any potential weighting bias by using the sample weights provided in DHS survey data. This is a standard approach as outlined by DHS instructions and used broadly in analyses leveraging similarly survey data set across statistical software. Without doing this, countries with larger datasets would sway the estimation and cause strong bias in the results. Imagine Nigeria has 35,796 primary school graduates whereas Sao Tome and Principe only has 1,470, the explanatory variables that affect Nigerian primary school attainment would influence the results of the pooled sample. Accurately weighting the dataset by the sampling information provided in each country specific dataset eliminates this bias. It then becomes possible to classify the countries into cohorts based on their institutional quality and natural resources (the classification of data is discussed in detail below) and apply the models (1) and (2) above.

Exogenous Data and Classification:

The first classification scheme the study exploits is based on institutional quality. Three measures of corruption are used to proxy institutional quality and development across the countries included in the study. The first two are the 2005 and 2010 Corruptions Perceptions Indexes from Transparency International. The Corruption Perceptions Index (CPI) ranks countries according to the perception of corruption in the public sector. The CPI is an aggregate indicator that combines different sources of information about corruption drawn from 13 surveys and assessments (TI.com, 2012). The downfall of the CPI is that because of its methodology, it is not suitable for trend analysis or comparing individual countries at different time periods. Given this, I place more weight on the 2005 CPI, since the mean year of the DHS data included in the

study is 2006. The 2010 CPI is included as verification; however reviewing the chart below it is apparent that categorical changes are minimal.

The third indicator used for institutional quality is the Worldwide Governance Indicators (WGI), provided by the World Bank. This study uses one of the six indicators, Control of Corruption. This indicator is based on a wide variety of data sources reporting the perceptions of governance of a large number of survey respondents and expert assessments (WGI, 2011). Because the WGI is constructed in a way where trending is possible, the WGI data outlined in the chart below is matched by the year of the country's DHS data source. For example, if the Nigeria DHS data source used in this study is from 2008, and Mali's is from 2006, the WGI data below for Nigeria is from 2008 and Mali is from 2006.

The second classification used in this study is based on natural resource dependence. I use trade export data on fuel and minerals from the United Nations Conference on Trade and Development (UNCTAD). From the UNCTAD I derive exports by Standard International Trade Classifications (SITC). Specifically, exports of fuels (SITC 3), and ores, metals, precious stones and non-monetary gold (SITC 27, 28, 68, 667, 971) as a percentage of all trade export products. These provide fuel exports, mineral exports, and fuel and mineral exports as a percentage of total exports. As other researchers have classified, when fuel or mineral exports constitute more than 25 % of a county's total export base (non-services), the country is classified as 'mineral or fuel dependent' which is consistent with the International Monetary Fund's (IMF) definition of export dependence (Haglund, 2011). This approach is similar to key literature in the resource curse area of academic research where similar metrics have been constructed by Glyfasson (2001), and Ross (1999). Others, such as Sachs and Warner (1995) and Manzano and Rigobon (2001), consider share of resources exports as a percentage of Gross Domestic Product (GDP). The same approach discussed in the preceding paragraph about matching year of the export data to the year of the survey data is used here as well.

The data for institutions and natural resources that this study leverages appear to be only weakly correlated with each other (Spearman rank correlation, $r = 0.40$, see Table 3 in appendix for more details). This indicates that the proxy variables for institutions and natural resources do not completely explain each other and that there is a justifiable basis for analyzing the two exogenous political structures previously hypothesized.

Table 5: Country and Institutional Indicator:

Country	2005 CPI		2010 CPI		WGI Control of Corruption	
	Value	Category	Value	Category	Value	Category
Burkina Faso	3.40	Med	3.10	Med	3.05	High
Cameroon	2.20	Low	2.20	Low	2.45	Low
Chad	1.70	Low	1.70	Low	2.04	Low
Congo Republic	2.20	Low	2.15	Low	2.15	Low
Dem. Rep. Congo	2.00	Low	2.02	Low	2.02	Low
Gabon	2.90	Med	2.80	Med	2.98	Med
Ghana	3.50	High	4.10	High	3.85	High
Kenya	2.10	Low	2.10	Low	2.24	Low
Malawi	2.80	Med	3.40	Med	3.00	Med
Mali	2.90	Med	2.70	Med	2.76	Med
Mozambique	2.80	Med	2.70	Med	2.69	Med
Namibia	4.30	High	4.40	High	4.43	High
Niger	2.40	Low	2.60	Low	2.54	Low
Nigeria	1.90	Low	2.40	Low	2.45	Low
Sao Tome & Principe	2.70	Med	2.99	Med	2.99	Med
Senegal	3.20	Med	2.90	Med	2.87	High
Sierra Leone	2.40	Low	2.40	Low	2.46	Low
Tanzania	2.90	Med	2.70	Med	2.95	Med
Uganda	2.50	Low	2.50	Low	2.43	Med
Zambia	2.60	Med	3.00	Med	3.20	Med
Zimbabwe	2.60	Med	2.40	Low	2.23	Low

Country and Natural Resource Indicator:

Country	Mineral & Fuel Dependence		Fuel Dependence		Mineral Dependence	
	Value	Category	Value	Category	Value	Category
Burkina Faso	0.01	Low	0.00	Low	0.01	Low
Cameroon	0.53	Med	0.48	Med	0.04	Low
Chad	0.89	High	0.89	High	0.00	Low
Congo Republic	0.93	High	0.87	High	0.06	Low
Dem. Rep. Congo	0.87	High	0.16	Low	0.71	High
Gabon	0.79	High	0.75	High	0.04	Low
Ghana	0.27	Low	0.05	Low	0.22	Low
Kenya	0.09	Low	0.04	Low	0.05	Low
Malawi	0.06	Low	0.00	Low	0.06	Low
Mali	0.43	Med	0.00	Low	0.43	Med
Mozambique	0.27	Low	0.09	Low	0.18	Low
Namibia	0.59	Med	0.01	Low	0.57	High
Niger	0.30	Low	0.16	Low	0.14	Low
Nigeria	0.95	High	0.95	High	0.00	Low
Sao Tome & Principe	0.18	Low	0.18	Low	0.00	Low
Senegal	0.23	Low	0.19	Low	0.04	Low
Sierra Leone	0.57	Med	0.10	Low	0.47	Med
Tanzania	0.36	Med	0.12	Low	0.24	Low
Uganda	0.12	Low	0.01	Low	0.12	Low
Zambia	0.78	High	0.01	Low	0.77	High
Zimbabwe	0.38	Med	0.01	Low	0.37	Med

Testing Variation:

An important aspect of the paper deals with discussing the differences between the effects of household and family variables across different groupings, whether these groupings are based on the country themselves or a classification of natural resources or institutional quality. For example, the study questions if the years of schooling of the father has a strong effect on the probability a child completes primary school not only across different countries in Sub-Saharan Africa, but also across different levels of institutional quality. To sufficiently answer this and similar questions, there must be a semi-rigorous approach to testing the differences of coefficients across groups.

The traditional econometric approach would be to use regression interactions. In a regression interaction equation one simply creates a model that includes the grouping terms (generally a dummy variable) and then ‘interacts’ the variable in question with that grouping term. The interacted coefficients such as $\text{group1} \times \text{variable}$, and $\text{group2} \times \text{variable}$ are the focus of this type of exercise. One can then test if the two interacted variables are significantly different from each other and is able to conclude if there are group based effects on the variable of interest. In the case of this paper, the variables above may be low CPI*fathers education level and high CPI*fathers education level to see if there is a significant difference across institutional quality in the effect of fathers education on a child’s probability of primary school completion.

Allison (1999) however, argues that when using binary regression models (logit and probit), there is a large potential for bias in cross-group comparisons. As opposed to linear regressions, coefficients in binary models are confounded with unobserved heteroskedasticity. This heteroskedasticity (differences in residual variation) can produce apparent differences in slope coefficients that are not indicative of true differences, especially when there are groups based on a discrete variable (such as level of institutional quality) (Allison, 1999; Williams, 2009). For this reason, this study approaches testing differences between groups in two regards. Firstly, looking at country by country heterogeneity among specific variable coefficients, I use a regression interaction system. This allows us to set a binary dummy variable for each country and create an interaction term for the variables of interest with limited bias. Secondly, when testing of statistical differences in specific coefficients across levels of natural resources and

institutional quality, instead of using a potentially bias regression interaction which rely heavily on slope coefficients for multiple discrete variables, this study generally leverages the ‘seemingly unrelated estimations’ function in STATA.⁹ This allows one to test if coefficients across groups are equal to each other via an adjusted Wald test with an F-test. Rejecting the null hypothesis in these tests indicates statistically significantly differences across groups. These test results are mentioned where appropriate in the findings section below and also included in Tables 14 and 15 in the appendix for reference.

Potential Endogeneity:

Empirical approaches to understand determinants of education attainment using theoretical models such as Glewwe’s and the quantity–quality model discussed earlier have inherent problems of endogeneity. In such models households demand a level of schooling as a function of a number of characteristics which may be interrelated or interdependent, or parents jointly determine the quantity and quality of children subject to a wealth constraint. In this study, many of the factors that could cause potential endogeneity remain unobserved.

This implies that estimates of the effects of variables on schooling attainment will potentially be biased to some extent. The probit model used for estimation allows us to focus less on the actual value of the coefficient but rather on the relative extent of the influence on the probability of educational success compared to other variables in the model. In select cases I investigate and discuss the marginal effects of a specific variable. In these cases, the marginal effect values may likely suffer from an inherent bias, however there are no plausible instruments that would effectively solve this problem of endogeneity across such a large number of countries.

VI. Findings and Discussion:

Pooled Estimations

⁹ The command –SUEST- in STATA Version 11.2, is a postestimation command with typical applications such as tests for intramodel and cross-model hypotheses across similar and diverse datasets.

First, I implement the model (1) for primary school and the model (2) for secondary schooling attainment on the entire pooled dataset (N= 818,250). This provides a brief test of the model accuracy as well as the predicted effects of the explanatory variables.

The results are summarized in Table 6 and a brief synopsis follows below, however most of these findings are discussed in greater detail in the proceeding paragraphs. Firstly, the estimation finds that regarding primary school attainment, father's educational background has a larger effect on sons compared to the mother, however this is not statistically significant ($p=0.03481$), and a Mother's educational background has a larger effect on daughters compared to the father (statistically significant at $p= 0.0005$). This finding is in line with traditional wisdom in high-income countries that the mother's education plays a larger factor (Tansel, 2002; Behrman, 1997). I find that the Mother's educational background has a larger effect than the father's for both sons and daughters in regards to secondary schooling (statistically significant at $p=0.0130$ and $p=0.0012$ respectively).

The result of the pooled sample model indicates that household composition plays an important role in the education attainment of children. As hypothesized, as the number of siblings and the number of young children in the household increase, the probability of education attainment decreases. Additionally, rural households face a lower probability that children will accumulate education attainment. The exception in the results is for girls in secondary schools. Finally, household wealth has a positive and significant effect upon the probability a child will accumulate education, more so for secondary schooling than for primary. Wealth effects in terms of specific hypotheses are discussed at length below.

The pooled model regressions indicate that the explanatory variables and datasets selected meet the expectations outlined in the methodology section, therefore we now turn to findings that are specific to the hypotheses previous discussed.

Finding 1: Primary Schooling Determinants are Heterogeneous

The empirical results suggest that the determinants of demand in educational attainment for primary schooling are not homogenous across Sub-Saharan African countries. There are predictors included in the model that do not differ greatly between countries, which are discussed

below. However the results point to significant variability between countries in regards to household composition and parental educational background.

Household Composition:

The probit results show great variability in the effect of siblings on the probability a child completes primary education. In general the results show that having more siblings often leads to *greater* success rates in terms of completing primary school, however as noted and discussed below, more young family members under the age of 5 negatively contribute to the child's educational success. It is important to note, that the positive correlation between total number of siblings at the individual country level is in conflict to the findings previously presented from the pooled sample. A good explanation for why this occurs does not necessarily exist; perhaps the predictive power in the pooled sample is greater with the larger sample size. Regardless, the findings from the pooled estimation show that the coefficients are small or insignificant indicating a miniscule effect.

A simple regression interaction model indicates that the coefficients for number of total children in a household are significantly different across countries. These results are detailed in Table 14 of the appendix. Examining the effect on boys in six countries in which the variable is significant, it appears that five countries have a positive coefficient and only one has a negative coefficient (Kenya). To reiterate, a greater number of siblings were expected to have a negative effect on schooling education. The effect of siblings in the household on girls in the ten countries in where the variable was significant shows that five countries have a positive coefficient and five have a negative. These findings suggest that number of siblings may have a positive effect on boys however on girls there are mixed results. In some countries it appears to be beneficial but in just as many countries it may be detrimental.

It is very well possible that the number of siblings and children in a household effect boys and girls differently. For girls, results may be mixed because perhaps girls are traditionally expected to play a caretaking role for younger siblings and in many cases in the dataset these girls are negatively affected by this path dependency. On the other hand, boys may benefit from their female siblings. If there is a positive correlation between siblings and educational attainment for boys, it may be because their female siblings forgo education for their sake. More

generally, incrementally more members in the household may help reduce the tasks, chores, or responsibilities (such as fetching water) of the school aged children and allow them to attend school more often. Similarly, a larger family size could redistribute the costs of household duties and childcare to other members of the household allowing some to attend work or school. In contrast, Banerjee and Duflo (2011), suggest that a larger family size corresponds to a decrease in education attainment, with the exception being Ghana and Cote d'Ivoire, in a household level study focused on developing countries across the world (Montgomery et al, 1995 as cited in Banerjee and Duflo, 2011).¹⁰ Perhaps having additional children in the household is also correlated with wealth or another variable which may be predictive of educational attainment. Another possible explanations for this is that increasing the number of siblings, if older, may have “hand me down” effects of education. In that once an elder siblings begins on a path towards education, their siblings follow in his or her footsteps. We do not investigate this virtuous cyclical theory in this paper; however it presents an interesting area of future research.

Parental Education;

As discussed in the theoretical section above, intergenerational education mobility should play an important role in the probability of children’s education attainment for a number of different of reasons. To briefly summarize, theory suggests that wealth and parental education should be correlated with the educational success of their children, and parents who are well educated, wealthy, and who foster their children’s education will have better educated children. Additionally that gender may play a role in that a mother’s level of education may represent the investments a household is willing to make in education. And that parents may likely have an unequal effect on their children where the mother’s or the father’s educational background has more of an effect than the spouse. Finally, in societies where parental education heavily predicts their children’s outcomes, intergenerational educational mobility is said to be low in that parental background is more important than the abilities and skills of a child within a more equal opportunistic education system.

¹⁰ In this dataset the study finds the the total number children negatively effects education outcomes in Ghana, however for boys this coefficient is not statistically signifincat. Cote d'Ivoire is not included in this study because of recency of available data.

A significant finding showing the heterogeneity between countries is the variety in the effect of parent's education upon their children's probabilities to complete primary school. Similar to the tests for household composition, tests for heterogeneity among parental backgrounds influence on education attainment are carried through across country groups. The results presented in Table 14 in the appendix suggest that these effects are significantly different between countries; the exception is for the level of mother's education on their sons in regards to secondary education. Within several countries the results point to a relatively even transmission of educational background onto children. For example, mothers' and fathers' educational attainment have close to the same effect on their sons in Namibia, Mali, Kenya, Malawi, and Tanzania, as is the case with their daughters in Senegal, Niger, Nigeria, Chad, and Tanzania. The parental effect in other countries is much more diverse. Taking Cameroon as an example, for young boys, the effect of the mother's educational background is more than three times larger than the effect of their fathers, similarly for girls in Namibia (statistically significant at $p=0.0021$ and $p=0.0588$ respectively).

As eluded to in the theoretical section of the paper, parental level of education may influence children in a number of ways. Parents may actively exert effort onto the development of their children, theory predicts that more educated and wealthier parents will be able to do more of this approach (Chevalier et al, 2003). Dohmen et al, define this approach as *direct socialization* where parents exert effort in order to cause the child to have certain traits (Dohmen 2011) either because the parents exhibit altruism or because they perceive their child as an investment. On the other hand, *oblique socialization*, is possible (Dohmen et al suggest this becomes apparent when direct socialization fails) where the child may be influenced by randomly determined individuals from the surrounding population (Dohmen et al 2011). Recent literature exploring intergenerational transmissions between parent and child describe this phenomenon as socialization in which parents have unequal impacts on the child (Dohmen et al., 2011). In this study no attempt is made to disentangle the socialization effect from parents, rather this finding accentuates the amount of heterogeneity between households across Sub-Saharan African countries.

Fathers:

In some countries, fathers have a particularly low effect on the educational attainment of their children. In these cases the low coefficients indicate that an increase in the years of education of the father would only increase the probability the child completes primary school to a minimum degree. Gabon, Malawi, Tanzania, and Cameroon show this effect particularly well where the coefficient for fathers education (DADEDUYRS) is less than 0.05, only coefficients significant with at least $p < 0.05$ are considered (19 countries). The effect of a father's education on their daughters is particularly weak in select countries as well, specifically Malawi and Cameroon. Therefore it is fair to conclude that in Malawi and Cameroon the educational background of the father has a relatively low impact on the child's chances of completing primary school.

This is not the case in other countries however where the father's education plays a significant role in the prospects of the child. The empirical results show that father's education matters a great deal on the future educational prospects of their sons in Burkina Faso, Sao Tome and Principe, Niger, and Chad. In these countries with the addition of Mali, the background education of the father also had a significantly large effect on the prospects of their daughters.

Mothers:

Similarly, the results point to variation among the effect of mother's education on children. As Table 7 suggests, the educational attainment of mothers have a particularly low effect on increasing the probability that their son will complete primary school in Congo, Sierra Leone, and Zambia. In addition, education of mothers appears to have a low effect on their daughters' future educational prospects in Ghana and Kenya.

The years of schooling of mothers however plays particularly large role in other countries. The effect of education of mothers onto their sons is significantly large in both Cameroon and Gabon, where the results also indicate that the father's background education on sons is particularly small (statistically significant at $p = 0.0021$ and $p = 0.0101$ respectively). Mother's education also plays a large role in the success of her daughter in Cameroon. In addition, the results show significant importance of mothers' education on her children in Mozambique and Zimbabwe as well.

As in Jere Behrman's influential literature review of the role of mother's schooling on child education (1997) this study compares marginal effects of an additional year of parental education on the child's probability of completing primary school education. As presented in Behrman's literature review (1997) constructing a ratio of mother's to father's schooling effects allows simple interpretation of the heterogeneity of these effects. The results presented below in Table 9 clearly suggest a significant variance across countries in the role of mother's background in comparison to the father's.

Behrman investigates a wide variety of literature, many which use different explanatory variables to understand child schooling. The results presented in this paper best align with literature Behrman reviews and classifies as: "[Parent's] Grades Attained to Time of Survey" and "Years/Grades of Completed Schooling."¹¹ In Behrman's analysis of published work, there is a relatively scarce body of empirical evidence for Sub-Sahara Africa. In fact the only relevant study included in this sub topic is regarding Ghana and Côte d'Ivoire which investigates data collected in 1987/1988. The more recent results for Ghana presented here are consistent for girls (Tansel, 1997; Glewwe and Jacoby, 1994 find a ratio of approximately 0.7 whereas mine is 0.63), however differ for boys (in a similar age range Tansel, 1997 finds a ratio of 1.2, whereas mine is 0.70). Tansel's approach differs dramatically however, leveraging a different model as well as an instrumentated approach. Since this is the only basis for comparison it is difficult to judge which is correct or more accurate. They may both be completely correct, as the data sets are from different sources and differ by 21 years. Regardless, this exercise builds upon the available data and to the author's best knowledge, this type of large scale comparison of the effects of mothers' and fathers' education on children in Sub-Sahara Africa is new evidence suggesting strong heterogeneity in the background variables that determine education attainment in children.

¹¹ Detailed results from the literature review can be found in Table A1.10 and Table A1.14 of the appendix in Behrman, 1997.

Table 9: Marginal Effects of Parental Education in Years (Primary)**Girls**

Marginal Effects of Parental Education in Years:

Country	Father Edu	Mother Edu	Sig	Ratio of Mother's to Father's Schooling Effects
Cameroon	0.009	0.033		3.855
Congo DRC	0.011	0.026		2.310
Malawi	0.010	0.022		2.218
Uganda	0.012	0.026		2.094
Zambia	0.017	0.024		1.389
Namibia	0.011	0.013		1.202
Nigeria	0.011	0.013		1.202
Niger	0.014	0.015		1.095
Senegal	0.011	0.010		0.918
Chad	0.017	0.015		0.896
Burkina Faso	0.015	0.012		0.771
Tanzania	0.016	0.012		0.759
Kenya	0.016	0.012		0.733
Ghana	0.011	0.007		0.628
Mali	0.026	0.003	&	0.112
Congo	0.014	0.005	#	-
Mozambique	0.013	0.032	#	-
Sao Tome	0.024	0.020	#	-
Sierra Leone	0.016	0.005	#	-
Zimbabwe	0.003	0.028	#	-
Gabon	-	-		-

All coefficients presented have statistical significance p-value<0.05 unless otherwise noted:

& p-value<0.10

one of two coefficients not statistically significant p-value>0.10

Table for Boys as well as additional evidence is presented in Tables 9 and 10 of the Appendix

The variability in mother's educational effects may be linked to strikingly low and diverse levels of mother's education across countries to begin with. As noted in the summary

statistics in Table 1 in the appendix, mothers' education in accumulated years ranges from under a single year on average in Burkina Faso to an average 6.5 years in Zimbabwe. The variability across countries and the overall low level (mean 3.51 years) may be compounding the effects of mother's education on her children in country comparisons.

The heterogeneity associated between parents effects on their children may also be explained potentially by intrahousehold relationships. As Glick and Sahn (2000) suggest, heterogeneous results between parental transmission align with the predictions from a collective household model in which the household preferences of mothers and fathers differ and each partner's power over resources is a function of his or her education (Glick and Sahn, 2000). This insinuates that the uneven transmission of educational background on to child may be a function of accumulated education. Intuitively it is also expected that higher levels of accumulated education should correlate with higher levels of socialization. At the aggregate level, countries with higher levels of average schooling for mothers are significantly correlated with countries that have an uneven transmission of mothers to fathers effects for primary schooling ($r=0.6378$, $p\text{-value}=0.0079$). However, these results do not explain the entire phenomenon, rather suggest that as the level of education of women increases, there is increased heterogeneity in parental education level effects onto children. There is reasonable basis for a hypothesis that suggests educated women have a more prominent role in the household thus their socialization and education transmission effects increase compared to the father. Or alternatively, as women become more educated they are more likely to join the formal labor market and along with changes in household income improve the access a child has to schooling thereby increasing mobility. There are many relevant hypotheses however there does not seem to be an apparent mechanism that completely explains this variability, and alternative explanations cannot be ruled out.

Homogenous Findings:

The individual country level estimation results also reveal select predictors of primary school attainment in children are relatively homogenous across countries. The dummy variable indicating whether the household is located in a rural area of the country provides relatively homogenous results across countries. In every instance with the exception of Namibia, the results

indicate a significant and large negative effect on the probability that the child will complete primary education. As described in detail in the methodology section, this is likely because rural households face increased direct and indirect costs of education such as opportunity costs of attending school versus working in the agricultural sector (which is often considered family work if the household owns or operates farming land), or the household is situated in a more remote area which is likely to be less accessible to schools and schooling institutions.

The data suggests that across all Sub-Saharan African countries in our sample household wealth has a highly positive and significant effect on primary school attainment for boys and girls. In many of the countries examined it is the most important variable in the estimation with the largest effect on the probability the child will complete primary school education. Wealth effects were predicted to impact attainment in this respect, the results more specifically are discussed in the findings below.

The results also indicate that increasing the number of children in the household under the age of five years old, has a negative and significant effect on the probability the child will complete primary school. These findings are robust across countries in the dataset without exception. Interestingly, results do not indicate that this is necessarily an isolated phenomenon that negatively impacts girls. The probit estimations show that in almost half of the countries in the dataset with significant coefficients (7/15), young children in the household negatively affects both boys and girls relatively equally, or negatively affect boys *more than* girls. Testing the coefficients for significance across countries shows an equal negative impact of younger children in the household between genders.¹² However, this is in stark contrast to the findings of Glick and Sahn (2000) from West Africa who conclude that domestic responsibilities (proxied by the number of young siblings) impinge strongly on girls' education but not on boys' (Glick and Sahn, 2000). This could perhaps be due to the fact that Glick and Sahn use data from 1990 which is on average more than 16 years older than the dataset used in this study. It is possible that social norms and traditional household responsibilities have become more gender neutral across generations. Traditionally economists have suggested that as income per capita increases gender inequality should diminish (Dollar and Gatti, 1999). Sub-Sahara Africa has witnessed aggregate GDP per capita growth since the 1990s, however there has been high variability between countries (WDI, 2011). During this time period income inequality has decreased in

¹² Tests for significance were carried through, although not reported in this paper.

many Sub-Saharan African countries such as Mali, Mozambique, Namibia, Niger, Chad, and the Democratic Republic of Congo (WDI, 2011). These align with six of seven the aforementioned countries in which young children in the household negatively affect both boys and girls relatively equally, the exception being Uganda. Additionally, girls enrollment rates in school have risen, and the completion rate of primary schooling in aggregate across Sub-Sahara Africa for girls has increased dramatically from under 47% in 1991, to over 63% in 2009 (WDI, 2011). These findings could perhaps suggest a change in gender equality at the household level, however this is not the focus of the paper and the topic is suggested for a future, and more in depth analysis. Perhaps more plausible is the fact that these findings represent many countries across Sub Sahara Africa, while Glick and Sahn (2000) specifically investigate Conarky, Guinna and the opposing findings reflect different social norms and heterogeneity between Conarky and other geographic areas and cultures.

Finding 2: Determinants of Secondary Education are Relatively Homogeneous

Turning to secondary education attainment, it is important to note that it is not possible to directly compare probit coefficients presented in Table 7 from model (1) regressing household characteristics onto attainment of primary schooling to the coefficients presented in Table 8 from model (2) where the determinants of secondary education attainment are investigated. The models differ slightly in the included explanatory variables and most importantly boys' and girls' attainment are combined in a single model to increase sample size of those who completed secondary schooling. Additionally, Sao Tome and Principe cannot be included because of low secondary school completion sampling.

In general the results indicate that household characteristics that predict secondary education are relatively homogenous between countries included in this study. Lack of variation in the individual country by country regressions may be explained by the fact that boys' and girls' attainments are merged and the model is unable to distinguish important household level and gender effects as presented with results from primary schooling attainment. It also could point to the hypothesis that correlates of secondary schooling are indeed more homogenous than primary schooling across Sub-Sahara Africa.

The estimations presented in Table 8 suggest several findings. Firstly, as found with primary schooling attainment, household wealth has a highly positive and highly significant effect on the probability an individual will complete secondary schooling across countries included in this study. Secondly, owning a bank account has a strong and positive effect on the probability of secondary schooling attainment in every country that this data is available (7). This is interpreted as a correlative effect and not necessary causal. As hypothesized, households with a bank account are likely more wealthy, but also may have increased access to formal infrastructure and perhaps educational institutions. Perhaps these households do in fact have increased access to schooling, or perhaps households that are likely to save and invest financially, are likely to do the same with respect to human capital.

The results are also in line with the homogenous findings from primary school attainment in that rural households are less likely to attain secondary education. Again, similar to primary schooling attainment the exception is Namibia. Published evidence from Namibia is scarce, however an unpublished working paper from Adegboye et al. (2011), find rural households to produce a negative odds ratio on an individual's highest level of education completed. The authors use a significantly different empirical specification and attempt to answer very different questions however this is the only empirical exercise found for Namibia, which is surprising considering the wealth of DHS data available.

Again, findings indicate that household composition matters significantly. Increasing the number of children under the age of five in a household reduces the probability of secondary schooling attainment in all countries. Slight differences are presented with total number of children in the household; the results indicate that more siblings reduce the probability of attainment in all countries except for two cases (Chad and Nigeria).

Finally, levels of parental education clearly have an effect on the probability of an individual to complete secondary school, however the results indicate that overall parental background matters significantly less than intuitively suggested and originally hypothesized. In Table 10 the marginal effects for parental education on primary and secondary education are presented. In these estimations I combine boys and girls for primary schooling attainment as was done for secondary. The marginal effects of parents education is significantly less for secondary school compared to primary school attainment, on average three times less. The pooled data estimations also show that parental education effects are approximately 1.5 times larger for

primary school attainment compared to secondary. Tests for significance indicate that both mothers' and fathers' education level effects are significantly different for boys, girls, and boys and girls between primary and secondary schooling attainment, where all tests show significance with $p < 0.05$ (not presented).

Finding 3: Intergenerational Education Mobility Increases with Institutional Quality

By running the probit model (3) on the pooled dataset segmented by institutional quality I find that the intergenerational effects of parental education decreases as institutional quality increases. As previously discussed, this study uses CPI data from 2005 and 2010, as well as the World Bank's World Governance Indicators for quality of institutions. What these results indicate is that essentially higher quality institutions in countries such as Ghana and Namibia, are correlated with a mechanism that allows educational mobility to flourish (relatively speaking) compared to countries with lower quality institutions. Table 15 in the appendix shows that these differences are statistically significant across groups at $p\text{-value} < 0.10$ with some exceptions.

Table 11

Boys:		Marginal Effects:	
CPI2010	Pr(y=1)*	DADEDUYRS	MOMEDUYRS
Low	65.33%	2.56%	1.41%
Med	43.88%	2.63%	1.96%
High	85.99%	1.69%	0.87%
		P=0.1401	P=0.0712
Girls:		Marginal Effects:	
CPI2010	Pr(y=1)*	DADEDUYRS	MOMEDUYRS
Low	62.12%	2.08%	2.97%
Med	43.24%	2.25%	2.53%
High	90.30%	1.21%	1.01%
		P=0.0033	P=0.0242

* Predicted probability that child will attain primary education from probit estimation. All values statistically significant at $p < 0.05$

The marginal effects of parental education vary between high and low institutional qualities. As shown above in Table 11, for both boys and girls marginal effects of both father's and mother's background education is larger in the low institutional quality category compared to the countries classified under high institutional quality. These differences are statistically significant with $p < 0.10$ with the exception of father's education on boys ($p = 0.1401$). In this binary response probit model, marginal effects show the effect of a small change of X (in this case father's or mothers years of education) on the probability of Y (primary school attainment) occurring. In countries with high corruption, or a low CPI score, the marginal effect of parental education on their children's primary school attainment is larger than it is in our grouping of countries with lower corruption perceptions levels. When comparing coefficients and institutional quality categorization (low, med, high), we cannot draw significant conclusions if comparing each country individually.

There are several possible explanations as to why groupings of countries associated with weaker institutions and higher corruption may have decreased education mobility for primary schooling. One aspect of the original hypotheses stated that countries with lower corruption, there may be a better supply of education and more equal opportunities and availability for children to attend school, thus the parental characteristics will have less an effect on their children's outcomes. As briefly discussed in the background section, Reinikka and Svensson (1996) have shown in their empirical account of Uganda that during the early 1990s local schools only received a fraction of the public funding designated by the central government and most schools received nothing. Public funding for education was effectively captured by corrupt local officials and politicians. In addition, the researchers show that schools in better communities were able to claim a higher share of the funding (Reinikka and Svensson, 1996). Furthermore, there are additional channels that could affect the supply of education previously mentioned that researchers have shown to go hand in hand with corruption such as volatility in government income, higher income inequality, higher probability of civil war and conflict. It is likely that similar mechanisms may be at play for the findings in this study. In countries that

suffer from corruption and weak institutions, the opportunities afforded to school age children may be heterogeneous across regions because of any of these factors. In this study, the results suggest that lower mobility is present with a higher share of corruption; similarly, parental education may matter more, and better predict child educational success because the schooling opportunities available to children are plagued by a corrupt infrastructure as shown in Uganda.

It is important to note that this is only a correlative finding, and a causal approach is difficult to identify because of a possible element of reverse causation. It may be suggested that higher levels of corruption can lead to worse schooling institutions and worse schooling outcomes. However, it may also be the case that worse schooling outcomes can be a cause of higher levels of corruption.

A second hypothesis originally discussed suggested that increased mobility in countries with higher quality institutions may be explained by higher demand and wages for skilled and educated labor. Researchers have suggested that improvements in manufacturing and tradable good sectors can lead parents to incrementally invest in their children's education because of the perceived returns (Birdsall, 2001). Comparatively, in countries with higher corruption and weaker institutions the contrary may occur, perceived returns to education may be low because a weakened labor market. Researchers suggest that in Sub-Sahara Africa private firms face far greater problems of contract enforcement than in other regions because of higher levels of corruption in commercial courts, which inhibits their competitiveness and success (Collier and Gunning, 1999). Intuitively, regions that face higher levels of corruption should realize less competitive and weakened labor markets (Ades and Di Tella, 1999). This is an interesting, yet unproven hypothesis as to why educational mobility and outcomes may be lower in higher corrupt regions.

Furthermore, perceived returns to education may be lower than in countries with low corruption, because educational or workforce ability becomes less important than finding the best way through red tape and through loopholes. Households in highly corrupt states may weigh the decisions between investing in education and the opportunity cost of the child's time elsewhere and conclude that educational ability is not what drives success, but rather bribery, cheating, and 'knowing the right people.' This hypothesis is interesting and plausible, however inherently difficult to measure and certainly unproven.

It is also important to note, that these institutional quality findings explain solely an effect upon primary schooling attainment. The results do not indicate that groupings of countries by weaker or stronger institutions have any differential effects on secondary schooling attainment. In the estimations for secondary schooling attainment (see Graphs 1), it appears that both low and high levels of corruption correlate with a relatively high degree of educational mobility. In these results the medium level of corruption is associated with a high effect of parental education on child secondary schooling attainment, i.e. low mobility.

Finding 4: Household Wealth and Institutional Quality

While the importance of parental educational background decreases as corruption decreases, household wealth appears to become more important. As presented in Table 12, the results indicate that the marginal effects of household wealth increase.

Incorporating the original model (1) into a multivariate logistic regression estimation, I regress primary school attainment on the discussed explanatory variables in both groupings of low and high institutional quality countries. The logit regression allows us to analyze the odds ratio of any particular explanatory variable or factor variable. In this case, the coefficient of interest is Household Wealth, particularly the high wealth quintile “5.” The odds ratio (OR) replaces the normal coefficient. The odds ratio is used to assess the probability of a particular outcome. It is a relative measure of probability allowing a researcher to interpret how much more likely an individual associated with some factor will result in a positive outcome compared to someone who is not associated (Bland and Altman, 2000).

Table 13 shows that for an individual belonging to the highest wealth class (richest) the odds of attaining primary school education (vs. not completing) increase by a factor of 9.65 in countries grouped by low corruption (High CPI) compared to 1.89 in countries grouped by high corruption (Low CPI). In low corruption countries, individuals belonging to the highest wealth quintile have almost eight times the chances of completing at least primary schooling over the poorest quintile of the population (9.65 odds ratio compared with 1.00). While in highly corrupt countries, households in the top wealthiest 20% of the population have only a slight advantage in

primary schooling attainment (1.89 times the odds over the baseline 1.00 associated with the poorest quintile).

There are a few reasons for why wealth may play more of an important role in less corrupt societies. As discussed previously, in Sub-Sahara Africa for many households the opportunity costs of attending school instead of working or partaking in family activities along with the direct costs of traveling to school, purchasing school uniforms, books, and school fees make education a relatively expensive endeavor. In a less corrupt society, the education and labor markets are more developed in the sense that education more closely resembles a normal investment good. Wealthier households should face less of a budget constraint compared to the less wealthy and should be able to demand higher quantities of education. They will likely be able to afford the direct and indirect costs associated with schooling. Therefore wealth should play a large factor in determining the quantity of education attainment. Additionally, in a more developed market, there should theoretically be more public funds invested in school infrastructure (that actually get to the schools without being captured along the way). Here it is expected that parental education matters less and the opportunity for children should be higher while for parents the returns to education become more visible. Parents and individuals see the rationale to invest in education, there are better schooling infrastructures, and the wealthy have the means to take advantage of educational investments.

In a marketplace plagued by high levels of corruption on the other hand, the direct costs and opportunity costs should be greater than or equal to a low corruption market. Higher corruption along with volatility in government income, higher income inequality, higher probability of civil war and conflict may decrease the supply of education. As the costs to attend school increase, even wealthy households decide to opt out of the education system. Furthermore, the returns to education may become less visible and households choose not to invest. This rationale is almost identical to that discussed in Finding 3. In a corrupt economy that is more driven by bribery, why should rational households invest in education when it may be a more efficient use of time and money for children to remain at home?

Finding 5: Mineral and Fuel dependence Affects Secondary Education Mobility

Considering mineral and fuel dependence there appears to be a correlative link between natural resources and schooling attainment. My original hypothesis suggested that mineral and fuel wealth should alter the decision making ability of a household and be correlated with reduced primary school educational attainment. The results indicate mineral and fuel dependence seems to more strongly affect secondary education. It is worthwhile to note that within an additional model divorcing fuel dependence and mineral dependence and analyzing the variables independently the results were inconclusive. This data is not presented in the paper.

The results indicate that as the amount of mineral and fuel dependence increases from low, medium, to high, there is a clear *increase* in educational mobility, meaning that parents education have less of an effect on the probability that a child will attain at least primary or secondary education. This is firstly counter to original hypotheses, and secondly contrary to the results found in regards to institutional quality. As suggested the results are weak for primary education, but strong for secondary. Table 15 in the appendix presents tests for heterogeneity across groupings; the variables are not all significant for primary education as they are for secondary.

Original hypotheses based on seminal macroeconomic cross-country studies on natural resources suggested that as dependence and wealth of natural resources increases the effect of family wealth and parental education becomes more important in household's decisions pertaining to children's education. Recall the core hypotheses as to why this should occur: 1) natural resource wealth may affect the labor market by inhibiting traditional trade and manufacturing sectors and result in less demand for educated labor, 2) educational supply as provided by the state may deteriorate due to higher volatility in primary commodities, higher levels of income inequality, higher likelihood of civil war, and weakened institutes which lead to extractive and capture tendencies in the elite, thereby implying that parental success (wealth and education) would more determine their child's education.

There are several proposed reasons why the results point to the opposite. Firstly, the findings may be purely random. Limitations of the methodology are that it is an attempt to investigate household decisions from a macroeconomic perspective. There are inherently only a small number of countries grouped into classifications and therefore a single country can bias results significantly. Additionally the findings may be effects of a small proportion of graduates, another source of potential bias. The probability for a boy in the pooled data set to complete

secondary education is only 2.76% in the low mineral and fuel dependent country grouping (1.58% for girls) and increases by four percentage points to 6.74% in a high mineral and fuel dependence classification (4.45% for girls).

Secondly, Jean-Philippe Stijns (2009) suggests an almost perfectly counter argument to one of the original hypothesis. Finding that subsoil wealth is systematically correlated with better outcomes in human capital accumulation, Stijns suggests that this is because of aggregate wealth effects (Stijns, 2009). This wealth effect takes part in that natural resource abundance raises aggregate income and government revenues, allowing a country to better fund public education (Stijns, 2009). While many researchers suggest that windfall wealth spoils nations, the counter argument is presented by Stijns in this case. Additional government funding of educational infrastructure should theoretically improve equal opportunity for enrollment at the secondary schooling level, this therefore provides a possible explanation for the finding that parental education mobility increases. Stijns goes on to discuss an early paper by Hirschman (1977) claiming that an increase in production activity should generate additional government revenues, and that any increase in this share should lead to an increase of educational spending. Hirschman suggests that increases in resource extraction activities should actually generate more educational spending than other activities (Hirschman, 1977 as cited in Stijns, 2009).

As mentioned this is a plausible theory, however two additional robustness checks would help verify it. The first being, if results point to a similar relationship with primary schooling attainment and natural resources, and secondly, if educational spending has a positive relationship with educational outcomes. Mentioned above, primary schooling attainment and natural resource dependence have a similar yet weaker relationship. Regarding educational outcome and spending, World Bank World Development Indicators allow a simple correlative analysis comparing education expenditure per student as a percentage of GDP per capita for primary and secondary schooling compared to the net enrollment rate. Graph 2 in the appendix show that the relationship is negative. Sub-Saharan African countries in our dataset that have higher net enrollment rates have generally lower expenditures per capita. A slightly positive relationship appears to exist for expenditure and primary completion rate; however these results are not conclusive by any means. Additionally, Hanushek and Kimko (2000) find that direct spending on schools is unrelated to student performance, and what really matters is the quality of education which produces a high quality workforce (Hanushek and Kimko, 2000). These

findings point to weaknesses in Stijn's argument about wealth effects stemming from sub-soil wealth, at least in Sub-Sahara Africa, his hypothesis may very well hold true when including higher income countries with subsoil wealth reserves such as Saudi Arabia, Norway, and Canada.

This counter finding may be explained by an additional hypothesis: that in resource dependent states regardless of parental background education secondary attainment remains low and even households with high levels of education either do not see the returns to investing in education or their environment lacks the supply of schooling institutions. I test this by investigating a smaller subset of the sample population with parents with high levels of education (greater than 1 standard deviation from the mean). The findings indicate that within our dataset, the probability of an individual to complete secondary education in high resource dependent states is substantially lower than those from less dependent states, even when the individuals' parents have very high levels of education ($p[y]= 31.68\%$, high resources effects probability by -14.05% at $p=0.001$). This implies that while educational mobility may be increasing at the aggregate level, the probability of completing secondary education is still significantly worse. From this data point, I am hesitant to corroborate Stijn's findings and suggest that natural resource dependence, albeit correlated with increased mobility, still appears to be associated with worse secondary schooling outcomes.

VII. Conclusion:

This paper set out to explore the determinants of demand for education across households in a wide array of Sub-Saharan African countries. A primary goal of the study was to affirm that the determinants for education are heterogeneous across the region. Additionally I set out to understand if these determinants can be linked via various channels in the supply and demand for education through exogenous political economy characteristics. While this study does not develop a causal relationship, in a number of ways I demonstrate how education determinants and correlates have heterogeneous effects in light of distinct macroeconomic environments.

The study brings together five core findings. Firstly, I confirm that determinants of demand in educational attainment for primary schooling are not homogenous across Sub-Saharan

African countries. The results of a large scale cross-country analysis point to significant variability between countries in regards to household composition and parental educational background. I compare the marginal effects of an additional year of parental education on a child's probability of completing primary school by constructing a ratio of mother's to father's schooling effects, as presented in Behrman's influential literature review (1997). Findings show that the ratio of mothers to fathers schooling effects varies considerably (from approximately 3.5 to 0.5 for primary schooling and 2.1 to 0.6 for secondary schooling). This paper provides evidence suggesting strong heterogeneity in the parental background variables that determine education attainment in children.

Secondly, the levels of education attained by parents clearly have an effect on the probability of an individual to complete secondary school, however parental background matters significantly less than it does for primary school attainment for both boys and girls. The marginal effects of parents education is on average three times less for secondary school compared to primary school attainment. These findings are strong and significant across estimations.

Thirdly, countries with lower levels of corruption are correlated with higher levels of educational mobility. I suggest that within countries with lower corruption there exists a better supply of education with more equal opportunities and availability for children to attend school, thus the parental characteristics have less an effect on their children's outcomes. Yet the fourth finding suggests that household wealth appears to become more important in predicting the probability that an individual will attain primary schooling in countries with higher quality institutions. In low corruption countries, individuals belonging to the highest wealth quintile have almost ten times the chances of completing at least primary schooling over the poorest quintile of the population. While in highly corrupt countries, households in the top wealthiest 20% of the population have only a slight advantage in primary schooling attainment. In these countries, the education and labor markets are perhaps more developed and wealthier households are more to able to afford the costs associated with schooling. Therefore wealthier households invest more heavily in the education of their children.

Finally, as the amount of mineral and fuel dependence increases, there is an increase in educational mobility. There is a potential wealth effect that takes place allowing natural resources to increase the aggregate income and revenues of a resource rich country, perhaps better enabling that country to fund public education. This is a cautious interpretation of the

finding as there are many empirical studies that find evidence supporting the opposite conclusions.

Limitations of the study stem from two main areas. Because the methodology of the study relies on over twenty varied country specific datasets the possibility for adequate instrumental variables is close to zero. Proceeding with the non-instrumented models quite possibly leads to a degree of endogenous bias in the coefficient results. From this standpoint the study attempts to give less importance to the actual coefficient values in most cases and rather discuss the magnitude, sign, and relative effect. Secondly when analyzing institutional characteristics, the study becomes essentially an attempt to investigate household decisions from a macroeconomic perspective. Because of the small number of countries grouped into classifications we inherently place a large degree of importance upon a single country and can expect bias from this sample size issue.

Nevertheless, while the methodology of the study is non-perfect, the results presented clearly indicate that exogenous factors have a large, significant, correlative impact on schooling outcomes. The findings provide firstly new evidence regarding educational attainment determinants in Sub-Sahara Africa, and secondarily a general perspective on topics for future research. Investigating in further detail the elements that cause heterogeneity in educational demand determinants across countries could be a feasible and important research area, as it would provide further insight into enhancing attainment in low performance countries and regions. Coupling this research with detailed firm-level data may shed further light on the role of the labor market on education demand. A relatively simple next step should be to expand the dataset beyond Sub-Sahara Africa. One could then determine if the findings for intergenerational educational mobility and measures of natural resource dependence and corruption hold when other regions and additional low and middle income country's datasets are included. Finally, leveraging a specific policy change or event (such as discovery or creation of a new market of natural resources) as an instrument to investigate a causal link between exogenous political economy characteristics and changes in the educational market would be a very worthwhile exercise and would contribute further to the hypotheses and findings this paper discusses.

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IX. Appendix:

Table 2: Summary Statistics

Variable	Pooled		Burkina Faso		Cameroon		Chad		Congo Republic		Congo, Democratic		Gabon		Ghana	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
PRIMARY EDU	0.22	0.41	0.09	0.28	0.30	0.46	0.12	0.32	0.41	0.49	0.29	0.45	0.31	0.46	0.33	0.47
SECONDARY EDU	0.05	0.21	0.01	0.09	0.03	0.16	0.02	0.14	0.06	0.23	0.07	0.25	0.03	0.18	0.08	0.27
AGE	21.55	18.82	21.61	19.06	21.40	18.38	19.71	17.47	21.65	17.61	20.38	17.53	24.81	20.64	23.34	19.24
DAD EDU YRS	4.76	4.93	1.02	2.91	5.74	4.57	2.78	4.46	8.64	4.56	7.66	4.53	6.42	4.91	6.10	5.49
MOM EDU YRS	3.51	4.19	0.83	2.40	4.47	3.93	1.26	2.84	6.37	4.05	4.51	4.05	4.67	4.03	4.19	4.75
RURAL	0.69	0.46	0.81	0.39	0.58	0.49	0.56	0.50	0.37	0.48	0.58	0.49	0.40	0.49	0.52	0.50
WEALTH	2.97	1.42	3.01	1.37	2.94	1.39	3.46	1.52	3.13	1.41	3.01	1.41	-	-	2.67	1.50
HHKIDS	4.82	3.85	6.03	4.46	4.79	4.00	5.17	3.58	4.09	2.99	4.52	2.85	-	-	3.81	2.58
HHYOUNGKIDS	1.65	1.48	2.00	1.73	1.69	1.56	1.81	1.43	1.36	1.11	1.62	1.24	1.56	1.66	1.18	1.11
Observations N	815033		54784		36388		23929		21714		37443		31447		30447	

Variable	Kenya		Malawi		Mali		Mozambique		Namibia		Niger		Nigeria	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
PRIMARY EDU	0.31	0.46	0.15	0.36	0.08	0.28	0.20	0.40	0.37	0.48	0.07	0.26	0.30	0.46
SECONDARY EDU	0.13	0.33	0.04	0.20	0.01	0.10	0.03	0.18	0.11	0.31	0.01	0.09	0.12	0.32
AGE	22.25	18.96	20.71	18.30	21.18	18.85	20.29	16.98	24.83	19.94	20.49	18.69	21.38	18.82
DAD EDU YRS	7.25	4.79	5.85	3.92	1.63	3.74	5.84	3.47	6.07	5.08	1.46	3.59	5.43	5.66
MOM EDU YRS	6.06	4.65	4.15	3.57	1.02	2.65	4.14	3.17	6.18	4.72	1.14	2.78	4.17	5.03
RURAL	0.76	0.43	0.89	0.31	0.69	0.46	0.46	0.50	0.60	0.49	0.67	0.47	0.72	0.45
WEALTH	2.95	1.49	3.02	1.36	2.95	1.39	3.60	1.39	3.11	1.36	3.36	1.47	2.75	1.40
HHKIDS	3.79	2.44	3.72	2.12	4.70	3.03	3.40	2.24	3.73	2.93	5.85	4.30	4.58	3.29
HHYOUNGKIDS	1.27	1.10	1.31	0.97	1.66	1.32	1.36	1.04	1.22	1.16	2.04	1.70	1.64	1.39
Observations N	24783		88361		64284		10856		19462		39348		120326	

Variable	Sao Tome & Prin.		Senegal		Sierra Leone		Tanzania		Uganda		Zambia		Zimbabwe	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
PRIMARY EDU	0.23	0.42	0.09	0.28	0.17	0.38	0.33	0.47	0.16	0.37	0.29	0.46	0.38	0.49
SECONDARY EDU	-	-	0.01	0.10	0.03	0.18	0.01	0.08	0.03	0.17	0.06	0.24	0.03	0.18
AGE	21.84	18.43	22.12	19.53	23.10	19.80	21.81	18.93	19.02	17.18	20.03	17.63	22.93	19.16
DAD EDU YRS	5.24	2.84	1.73	3.71	3.39	5.12	5.48	3.79	5.95	4.15	7.36	3.93	7.22	3.71
MOM EDU YRS	3.98	2.58	1.07	2.50	1.76	3.59	4.72	3.73	3.81	3.78	5.61	3.70	6.50	3.59
RURAL	-	-	0.65	0.48	0.63	0.48	0.80	0.40	0.89	0.31	0.63	0.48	0.68	0.46
WEALTH	2.91	1.36	2.64	1.31	3.08	1.42	3.09	1.37	2.90	1.43	3.02	1.38	2.97	1.44
HHKIDS	3.27	2.14	9.99	7.10	3.85	2.52	4.35	3.07	4.42	2.60	3.87	2.33	3.59	2.54
HHYOUNGKIDS	1.16	0.89	2.94	2.42	1.39	1.22	1.52	1.39	1.65	1.14	1.45	1.04	1.17	1.03
Observations N	6445		51404		31973		39430		31377		26597		24235	

Table3:

Pearson's correlation coefficient matrix of institutions and natural resources

	FuelMinDep	WD_WGI	CPI2005	CPI2010
FuelMinDep	1.000 na			
WD_WGI	-0.5530* <i>0.000</i>	1.000 na		
CPI2005	-0.6047* <i>0.000</i>	0.8885* <i>0.000</i>	1.000 na	
CPI2010	-0.4980* <i>0.000</i>	0.8408* <i>0.000</i>	0.8371* <i>0.000</i>	1.000 na

p-value in italics

Table 4: Pearson's correlation coefficient matrix of select explanatory variables

	DADEDUYRS	MOMEDUYRS	MOMHOME	SELFEMP	RURAL	BANK	MEDIA	FARMLAND	WEALTH	DIED12MO	HHKIDS	HHYOUNGKIDS
DADEDUYRS	1.000											
MOMEDUYRS	0.7032* 0.000	1.000										
MOMHOME	-0.0139* 0.000	-0.0114* 0.000	1.000									
SELFEMP	0.0247* 0.000	0.0207* 0.000	-0.2447* 0.000	1.000								
RURAL	-0.3198* 0.000	-0.3186* 0.000	-0.0746* 0.000	0.0933* 0.000	1.000							
BANK	0.4360* 0.000	0.4435* 0.000	-0.0278* 0.000	-0.1080* 0.000	-0.3715* 0.000	1.000						
MEDIA	0.1909* 0.000	0.1944* 0.000	0.0173* 0.000	-0.0135* 0.000	-0.2228* 0.000	0.2600* 0.000	1.000					
FARMLAND	-0.2197* 0.000	-0.2435* 0.000	-0.0616* 0.000	0.0972* 0.000	0.4584* 0.000	-0.2805* 0.000	-0.1204* 0.000	1.000				
WEALTH	0.4135* 0.000	0.4177* 0.000	0.0324* 0.000	-0.0438* 0.000	-0.5784* 0.000	0.5046* 0.000	0.4150* 0.000	-0.3722* 0.000	1.000			
DIED12MO	-0.0367* 0.000	-0.0380* 0.000	0.0063* 0.000	0.0018 0.337	0.0186* 0.000	-0.0192* 0.000	-0.0017 0.325	0.0191* 0.000	-0.0364* 0.000	1.000		
HHKIDS	-0.1973* 0.000	-0.1946* 0.000	0.0191* 0.000	-0.0163* 0.000	0.0227* 0.000	-0.0376* 0.000	0.0848* 0.000	0.1397* 0.000	-0.0152* 0.000	0.0446* 0.000	1.000	
HHYOUNGKIDS	-0.1366* 0.000	-0.1229* 0.000	0.1021* 0.000	0.0852* 0.000	0.0756* 0.000	-0.1072* 0.000	0.0385* 0.000	0.0858* 0.000	-0.0817* 0.000	0.0064* 0.0003	0.6250* 0.000	1.000

p-value below coefficient

* indicates significant at p<0.01

Table 6: Pooled Estimates

Dependent Variable:	Primary education attainment		Secondary education attainment	
Variable	Boys	Girls	Boys	Girls
AGE	0.198 ***	0.161 ***	0.748 ***	0.764 ***
AGE2	-0.004 ***	-0.003 ***	-0.014 ***	-0.014 ***
DAD EDU YRS	0.083 ***	0.071 ***	0.042 ***	0.036 ***
MOM EDU YRS	0.078 ***	0.094 ***	0.060 ***	0.061 ***
MOMHOME (unemploy)	-0.224 ***	-0.229 ***	-0.100 ***	-0.226 ***
RURAL	-0.326 ***	-0.271 ***	-0.024	0.092 *
MEDIA	0.173 ***	0.096 ***	0.255 ***	0.238 ***
WEALTH	0.101 ***	0.129 ***	0.167 ***	0.238 ***
HHKIDS	-0.003	-0.021 ***	-0.009 *	-0.029 ***
HHYOUNGKIDS	-0.075 ***	-0.112 ***	-0.113 ***	-0.216 ***
Constant	-2.896 ***	-2.386 ***	-11.907 ***	-12.03 ***
N	41682	30748	41682	30748
r2_p	0.218	0.272	0.269	0.309

legend: * p<.1; ** p<.05; *** p<.01

Table 7: Summarized Results: Individual Countries Determinants of Primary School Attainment

Dependent: at least Primary school attainment

Boys:

Variable	Namibia	Ghana	Zambia	Burkina Faso	Gabon	Malawi	Sao Tome & Princ.	Tanzania	Senegal	Mali
AGE	0.259 ***	0.327 ***	0.512 ***	-0.204 ***	0.105	0.375 ***	0.247 *	0.462 ***	-0.055	-0.180 **
AGE2	-0.006 ***	-0.007 ***	-0.010 ***	0.004 **	-0.001	-0.007 ***	-0.005 *	-0.009 ***	0.001	0.003
DAD EDU YRS	0.057 ***	0.062 ***	0.072 ***	0.105 ***	0.043 ***	0.038 ***	0.144 ***	0.032 **	0.072 ***	0.062 ***
MOM EDU YRS	0.051 ***	0.043 ***	0.028 *	0.055 ***	0.099 ***	0.047 ***	0.054	0.046 ***	0.060 ***	0.064 ***
MOMHOME (unemploy)	-0.191	-0.219	-0.186	-0.151	-0.539	-0.102	-0.019		-0.067	-0.041
SELFEMP	-0.014	0.026	-0.245 **			-0.021	-0.014		-0.103 **	
RURAL	0.254 *	-0.437 ***	-0.177	-0.700 ***	-0.598 ***	-0.274 ***		-0.066	-0.359 ***	-0.325 ***
BANK	0.247 **	0.176 *	0.441 ***			0.212 ***		0.278		
MEDIA	-0.203	0.213 **	0.156	0.021	0.005	-0.021	0.414 *	0.135	0.156 *	0.273 ***
FARMLAND	0.273 **	-0.120	0.107			-0.021	-0.409 ***	0.193		
WEALTH	0.327 ***	0.205 ***	0.223 ***	0.159 ***	0.223 ***	0.169 ***	0.184 **	0.180 ***	0.167 ***	0.178 ***
DIED12MO	-0.010		-0.016			-0.092	-0.174			
HHKIDS	0.021	-0.013	0.056 **	0.011	0.000	-0.013	0.039	0.008	0.004	0.049 ***
HHYOUNGKIDS	-0.092 *	-0.051	-0.097	-0.034	-0.156 ***	0.004	-0.088	-0.128 ***	-0.052 ***	-0.136 ***
Spouse selfemp				0.059	0.137			-0.106		0.216 **
Constant	-3.760 ***	-3.530 ***	-7.138 ***	1.624 **	-2.548 *	-5.300 ***	-4.468 ***	-5.650 ***	-0.553	0.950
N	942	1752	1003	2363	724	3708	421	1143	4473	1781
r2_p	0.215	0.29	0.238	0.177	0.321	0.131	0.21	0.13	0.192	0.196

legend: * p<.1; ** p<.05; *** p<.01

Girls:

Variable	Namibia	Ghana	Zambia	Burkina Faso	Gabon	Malawi	Sao Tome & Princ.	Tanzania	Senegal	Mali
AGE	0.182 *	0.238 ***	0.278 ***	0.206	0.070	0.282 ***	0.106	0.240 *	-0.071	0.027
AGE2	-0.004 **	-0.006 ***	-0.006 ***	-0.005 *	-0.002	-0.006 ***	-0.002	-0.006 **	0.001	-0.002
DAD EDU YRS	0.044 ***	0.050 ***	0.069 ***	0.073 ***	0.004	0.031 ***	0.077 **	0.065 ***	0.057 ***	0.096 ***
MOM EDU YRS	0.101 ***	0.031 **	0.096 ***	0.056 **	-0.002	0.069 ***	0.066	0.049 ***	0.053 ***	0.011
MOMHOME (unemploy)	-0.211	0.097	-0.376 ***	-0.414	-0.152	0.024	0.156	-	-0.002	-0.437 *
SELFEMP	-0.409 **	0.174 *	-0.251 **		-0.272 ***	-0.008	-0.177		-0.128 **	
RURAL	0.186	0.131	-0.313 **	-0.660 0***	-0.517 ***	-0.365 ***		0.050	-0.402 ***	-0.259 *
BANK	0.122	0.141	0.110			0.274 ***		-0.045		
MEDIA	0.014	0.067	0.056	0.013	0.493 ***	-0.104	-0.367	-0.106	0.016	0.087
FARMLAND	0.118	0.100	-0.265 *			-0.088	-0.002	0.186		
WEALTH	0.225 ***	0.347 ***	0.199 ***	0.284 ***		0.166 ***	0.377 ***	0.398 ***	0.199 ***	0.232 ***
DIED12MO	0.045		0.079			-0.342 ***	0.152			
HHKIDS	-0.005	-0.039 **	0.068 ***	-0.030 **		-0.031 **	-0.099 **	0.049 *	0.011 **	0.018
HHYOUNGKIDS	-0.099 **	-0.147 ***	-0.107 *	-0.056 *	-0.046 **	-0.021	-0.066	-0.226 ***	-0.097 ***	-0.124 **
Spouse selfemp				0.089				-0.008		0.072
Constant	-2.334 **	-2.745 ***	-3.909 ***	-3.141 **	-0.342	-3.752 ***	-1.908	-3.419 **	-0.463	-1.258
N	1059	1437	790	1195	1058	2464	296	891	4760	751
r2_p	0.226	0.272	0.307	0.323	0.073	0.157	0.21	0.23	0.225	0.249

Table 7: Summarized Res
Dependent: at least Primary

Boys:

Variable	Mozambique	Cameroon	Niger	Sierra Leone	Nigeria	Uganda	Congo Repub.	Kenya	Zimbabwe	Chad
AGE	0.335	0.191 *	-0.005	0.100	0.322 ***	0.751 ***	0.187 **	0.554 ***	-0.593	0.124
AGE2	-0.007	-0.003	-0.001	-0.002	-0.006 ***	-0.015 ***	-0.003	-0.011 ***	0.015	-0.002
DAD EDU YRS	0.042	0.049 ***	0.164 ***	0.057 ***	0.060 ***	0.060 ***	0.072 ***	0.056 ***	-0.003	0.109 ***
MOM EDU YRS	0.053	0.151 ***	0.003	0.036 **	0.064 ***	0.040 ***	0.039 ***	0.048 ***	0.072 **	0.040 **
MOMHOME (unemploy)	-	-0.661 ***	0.325 **	0.011	-0.423 ***	0.313	-0.207	-0.030	-0.074	-0.184
SELFEMP				-0.088	-0.294 ***	-0.312 ***	-0.147	-0.091		-0.210 **
RURAL	-0.520 **	-0.207	-0.531 ***	-0.567 ***	0.037	0.101	0.226 *	-0.150	-0.752	-0.065
BANK				-0.207	0.184 ***				0.452	
MEDIA	0.195	0.124	0.003	-0.030	-0.027	-0.026	0.109	0.237 *	0.668 ***	0.109
FARMLAND				-0.155	-0.080	0.064		-0.005	0.320	
WEALTH	0.290 ***	0.178 ***	0.115	0.312 ***	0.344 ***	0.267 ***	0.196 ***	0.148 **	0.172	0.434 ***
DIED12MO					0.001	-0.072			1.202 **	
HHKIDS	0.042	0.015	0.018	0.029	0.022 ***	0.037 **	0.014	-0.037 *	0.011	0.096 ***
HHYOUNGKIDS	-0.269 *	-0.057	-0.114 **	-0.070 *	-0.046 **	-0.145 ***	-0.120 ***	-0.145 ***	-0.127	-0.156 ***
Spouse selfemp	0.109	0.268 *	0.573						0.345	
Constant	-4.920 **	-3.577 ***	-1.275	-1.644 *	-4.114 ***	-10.181 ***	-3.342 ***	-7.025 ***	5.231	-3.968 ***
N	236	875	825	1347	6521	1179	1219	1384	294	1205
r2_p	0.249	0.321	0.315	0.293	0.281	0.226	0.163	0.211	0.302	0.338

legend: * p<.1; ** p<.05; **

Girls:

Variable	Mozambique	Cameroon	Niger	Sierra Leone	Nigeria	Uganda	Congo Repub.	Kenya	Zimbabwe	Chad
AGE	0.226	0.155	-0.046	-0.179 **	0.278 ***	0.451 ***	-0.016	0.610 ***	0.497	0.159
AGE2	-0.006	-0.003	0.000	0.003	-0.006 ***	-0.009 ***	0.000	-0.012 ***	-0.011	-0.004 *
DAD EDU YRS	0.054	0.034 *	0.067 ***	0.058 ***	0.057 ***	0.046 ***	0.054 ***	0.061 ***	0.011	0.071 ***
MOM EDU YRS	0.128 ***	0.132 ***	0.073 ***	0.016	0.069 ***	0.097 ***	0.021	0.044 ***	0.124 ***	0.064 ***
MOMHOME (unemploy)	-	-0.208	-0.462 *	0.048	-0.534 ***	0.246	-0.261 *	0.106	-	-0.152
SELFEMP				-0.017	-0.140 **	-0.154	-0.270 ***	-0.049		-0.092
RURAL	-0.267	-0.271 *	-0.472 **	-0.615 ***	0.064	-0.037	-0.249 **	0.232	-0.021	-0.119
BANK				0.074	0.062				0.345	
MEDIA	0.538 *	0.156	0.176	0.018	-0.126 *	0.175	0.072	-0.025	0.096	0.020
FARMLAND				0.107	0.119	-0.238		0.173	0.241	
WEALTH	0.631 ***	0.240 ***	0.404 **	0.273 ***	0.384 ***	0.303 ***	0.214 ***	0.333 ***	0.245 *	0.480 ***
DIED12MO					0.065	0.068			-0.127	
HHKIDS	0.010	-0.010	0.021	0.018	0.008	0.041 *	-0.008	-0.042 *	0.034	0.081 ***
HHYOUNGKIDS	-0.319 **	-0.073	-0.194 ***	-0.073	-0.167 ***	-0.141 ***	-0.070	-0.102 *	-0.128	-0.155 ***
Spouse selfemp	0.980 ***	0.285	0.277						-0.382	
Constant	-5.928 *	-2.822 *	-1.983	1.329	-3.468 ***	-6.743 ***	0.148	-8.360 ***	-6.184 *	-4.444 ***
N	206	689	499	921	3822	1058	1096	1047	232	791
r2_p	0.35	0.299	0.367	0.279	0.3	0.293	0.168	0.266	0.252	0.331

Table 8: Summarized Results: Individual Countries Determinants of Secondary School Attainment

Dependent: at least Secondary school attainment

Boys and Girls

Variable	Namibia	Ghana	Zambia	Burkina Faso	Gabon	Malawi	Senegal	Mali	Mozambique	Tanzania
AGE	0.780 ***	1.386 ***	1.246 ***	0.994 ***	0.596 ***	0.893 ***	0.316 ***	0.572 ***	0.699 **	2.014 ***
AGE2	-0.014 ***	-0.028 ***	-0.024 ***	-0.020 ***	-0.009 ***	-0.016 ***	-0.005 ***	-0.009 **	-0.012 **	-0.041 ***
DAD EDU YRS	0.014	0.039 ***	0.085 ***	0.077 ***	0.057 ***	0.042 ***	0.041 ***	0.049 ***	-0.043 *	0.130 ***
MOM EDU YRS	0.055 ***	0.026 **	0.050 ***	0.036	0.073 ***	0.064 ***	0.032 ***	0.020	0.095	-0.017
MOMHOME (unemploy)	-0.078	-0.318	-0.215	0.191	-0.064	-0.087	-0.018	0.278	-	-
SELFEMP	-0.057	0.138	-0.314 ***	-	-0.003	-0.180 ***	-	-	-	-
RURAL	0.199 **	-0.071	-0.026	-0.358	-0.554 ***	-0.248 ***	-0.328 ***	-0.182	-	-0.319
BANK	0.475 ***	0.411 ***	0.523 ***	-	-	0.243 ***	-	-	-	-
MEDIA	0.041	0.075	0.119	-0.403 *	0.137	0.023	0.568 **	-	-	0.540
FARMLAND	-0.034	-0.022	0.326 ***	-	-	-0.093	-	-	-	-
WEALTH	0.398 ***	0.268 ***	0.356 ***	0.218 **	-	0.230 ***	0.148 ***	0.408 ***	-	0.261 *
DIED12MO	0.135 *	-0.050	-0.050	-	-	-0.118	-	-	-	-
HHKIDS	0.000	-0.029	0.008	-0.006	-	-0.043 ***	0.007	-0.021	0.057	0.019
HHYOUNGKIDS	-0.039	-0.110	-0.098	0.001	-0.095 **	-0.091 **	-0.118 ***	-0.167 **	-0.646 ***	-0.065
Spouse selfemp	-	-	-	-	-	-	-	-0.078	0.143	-0.487 **
Constant	-13.278 ***	-18.800 ***	-19.118 ***	-14.617 ***	-11.185 ***	-13.385 ***	-7.359 ***	-11.895 ***	-10.338 ***	-28.397 ***
N	2001	1437	1793	3558	1995	6172	9233	2123	204	2034
r2_p	0.289	0.382	0.448	0.335	0.325	0.344	0.217	0.399	0.229	0.385

legend: * p<.1; ** p<.05; *** p<.01

Variable	Cameroon	Niger	Sierra Leone	Nigeria	Uganda	Congo, Rep	Zimbabwe	Chad	Congo, DR
AGE	1.705 **	1.315 **	0.769 ***	0.956 ***	0.875 ***	0.412 ***	2.795 ***	0.872 ***	1.275 ***
AGE2	-0.032 **	-0.023 **	-0.013 ***	-0.018 ***	-0.016 ***	-0.006 ***	-0.063 ***	-0.015 ***	-0.023 ***
DAD EDU YRS	-0.104 *	0.080 ***	0.033 ***	0.019 ***	0.051 ***	0.007	0.056 *	0.066 ***	0.034 *
MOM EDU YRS	0.360 ***	0.033	0.041 ***	0.027 ***	0.040 ***	0.065 ***	0.042	0.040 **	0.073 ***
MOMHOME (unemploy)	-	-0.571	-0.013	-0.191 ***	0.150	-0.084	-	-0.018	-0.489
SELFEMP	-0.021	-	-0.197 *	-0.063 *	-0.175	-0.109	-0.137	-	-
RURAL	0.409	-	-0.376 **	-0.067 *	-0.152	-0.767 ***	0.560	-0.237	-0.091
BANK	0.081	-	0.195 *	0.234 ***	-	-	-	-	-
MEDIA	1.075	-1.007 **	0.132	-0.103 **	0.009	-0.162	-	-0.093	0.363 **
FARMLAND	0.280	-	0.012	-0.011	-0.110	-	0.038	-	-
WEALTH	0.329	0.323	0.344 ***	0.334 ***	0.184 ***	0.325 ***	0.226	0.430 ***	0.189 ***
DIED12MO	-	-	0.016	0.110	-	-	-	-	-
HHKIDS	-0.099 *	0.001	-0.028	0.019 ***	-0.012	-0.020	-0.158 *	0.077 ***	-0.016
HHYOUNGKIDS	-0.673 **	-0.270 **	0.002	-0.150 ***	-0.191 ***	-0.077	-0.370 *	-0.270 ***	-0.145 **
Spouse selfemp	1.112 **	0.635	-	-	-	-	-0.080	-	-
Constant	-27.972 ***	-21.424 ***	-13.404 ***	-13.663 ***	-13.255 ***	-9.212 ***	-33.460 ***	-15.489 ***	-19.193 ***
N	666	690	2268	10343	2237	2315	361	1996	1803
r2_p	0.569	0.438	0.366	0.326	0.356	0.292	0.387	0.392	0.399

legend: * p<.1; ** p<.05; *** p<.01

Table 9: Marginal Effects of Parental Education in Years (Primary)**Girls**

Marginal Effects of Parental Education in Years:

Country	Father Edu	Mother Edu	Sig	Ratio of Mother's to Father's Schooling Effects
Cameroon	0.009	0.033		3.855
Congo DRC	0.011	0.026		2.310
Malawi	0.010	0.022		2.218
Uganda	0.012	0.026		2.094
Zambia	0.017	0.024		1.389
Namibia	0.011	0.013		1.202
Nigeria	0.011	0.013		1.202
Niger	0.014	0.015		1.095
Senegal	0.011	0.010		0.918
Chad	0.017	0.015		0.896
Burkino Faso	0.015	0.012		0.771
Tanzania	0.016	0.012		0.759
Kenya	0.016	0.012		0.733
Ghana	0.011	0.007		0.628
Mali	0.026	0.003	&	0.112
Congo	0.014	0.005	#	-
Mozambique	0.013	0.032	#	-
Sao Tome	0.024	0.020	#	-
Sierra Leone	0.016	0.005	#	-
Zimbabwe	0.003	0.028	#	-
Gabon	-	-		-

Boys

Marginal Effects of Parental Education in Years:

Country	Father Edu	Mother Edu	Sig	Ratio of Mother's to Father's Schooling Effects
Cameroon	0.013	0.039		3.074
Congo DRC	0.024	0.006	#	-
Malawi	0.013	0.016		1.242
Uganda	0.018	0.012		0.669
Zambia	0.019	0.007		0.387
Namibia	0.013	0.014		1.077
Nigeria	0.013	0.014		1.077
Niger	0.038	0.001	#	-
Senegal	0.019	0.016		0.824
Chad	0.028	0.010		0.364
Burkino Faso	0.028	0.015		0.527
Tanzania	0.009	0.013		1.408
Kenya	0.017	0.014		0.851
Ghana	0.014	0.010		0.696
Mali	0.018	0.018		1.028
Congo	0.020	0.010		0.533
Mozambique	0.012	0.015	#	-
Sao Tome	0.045	0.017	&	0.376
Sierra Leone	0.015	0.010		0.627
Zimbabwe	-0.001	0.015	#	-
Gabon	-	-		-

All coefficients presented have statistical significance p-value<0.05 unless otherwise noted:

& p-value<0.10

one of two coefficients not statistically significant p-value>0.10

Table 10: Marginal Effects of Parental Education in Years (Boys and Girls)

Boys and Girls (Primary)

Marginal Effects of Parental Education in Years:

Country	Father Edu	Mother Edu	Sig	Ratio of Mother's to Father's Schooling Effects
Congo DRC	0.018	0.016		0.898
Malawi	0.012	0.018		1.559
Nigeria	0.012	0.014		1.141
Gabon	0.018	0.018		1.014
Sierra Leone	0.015	0.007		0.444
Kenya	0.017	0.013		0.779
Senegal	0.014	0.013		0.891
Uganda	0.016	0.020		1.257
Ghana	0.011	0.007		0.628
Chad	0.022	0.013		0.570
Zambia	0.019	0.015		0.809
Tanzania	0.012	0.012		0.998
Cameroon	0.011	0.036		3.401
Namibia	0.012	0.016		1.348
Niger	0.028	0.006	#	-
Burkino Faso	0.023	0.015		0.648
Mali	0.021	0.012		0.604
Congo	0.017	0.008		0.447
Mozambique	0.012	0.023	#	-
Zimbabwe	0.001	0.020	#	-
Sao Tome	0.036	0.019		0.519
Avg.	0.017	0.015		0.997

Boys and Girls (Secondary)

Marginal Effects of Parental Education in Years:

Country	Father Edu	Mother Edu	Sig	Ratio of Mother's to Father's Schooling Effects
Congo DRC	0.003	0.007	&	2.139
Malawi	0.005	0.007		1.520
Nigeria	0.005	0.006		1.410
Gabon	0.004	0.005		1.289
Sierra Leone	0.003	0.004		1.238
Kenya	0.009	0.009		0.998
Senegal	0.002	0.002		0.789
Uganda	0.005	0.004		0.787
Ghana	0.007	0.004		0.659
Chad	0.005	0.003		0.606
Zambia	0.011	0.006		0.591
Tanzania	0.003	0.000	#	-
Cameroon	-0.001	0.008	#	-
Namibia	0.003	0.010	#	-
Niger	0.003	0.001	#	-
Burkino Faso	0.002	0.001	#	-
Mali	0.002	0.001	#	-
Congo	0.001	0.006	#	-
Mozambique	-0.008	0.017	#	-
Zimbabwe	0.006	0.004	#	-
Sao Tome	-	-		-
Avg.	0.005	0.005		1.093

All coefficients presented have statistical significance p-value<0.05 unless otherwise noted:

& p-value<0.10

one of two coefficients not statistically significant p-value>0.10

Table 11: Marginal Effects of Edu and CPI

Boys:		Marginal Effects:	
CPI2010	Pr(y=1x)*	DADEDUYRS	MOMEDUYRS
Low	65.33%	2.56%***	1.41%***
Med	43.88%	2.63%***	1.96%***
High	85.99%	1.69%***	0.87%*
		p=0.1401	p=0.0712

Girls:		Marginal Effects:	
CPI2010	Pr(y=1x)*	DADEDUYRS	MOMEDUYRS
Low	62.12%	2.08%***	2.97%***
Med	43.24%	2.25%***	2.53%***
High	90.30%	1.21%***	1.01%**
		p=0.0033	p=0.0242

* Predicted probability that child will attain primary education from probit estimation
 legend: * p<.1; ** p<.05; *** p<.01

Table 12: Marginal Effects of Wealth and CPI

Boys:		Marginal Effects:			
CPI2010	Pr(y=1x)*	HH WEALTH	CPI2005	Pr(y=1x)*	HH WEALTH
Low	65.33%	4.20%	Low	66.02%	4.50%
Med	43.88%	4.00%	Med	51.72%	4.83%
High	85.99%	6.71%	High	85.99%	6.71%
		p=0.0000			p=0.0000

Girls:		Marginal Effects:			
CPI2010	Pr(y=1x)*	HH WEALTH	CPI2005	Pr(y=1x)*	HH WEALTH
Low	62.12%	3.50%	Low	63.40%	3.67%
Med	43.24%	5.71%	Med	54.59%	6.08%
High	90.30%	5.57%	High	90.30%	5.57%
		p=0.0000			p=0.0000

* Predicted probability that child will attain primary education from probit estimation
 All HH Wealth coefficients significant at p<.01

Table 13: Logit Regressions and Odds Ratios (Primary Education Attainment)

Logit Regression and Odds Ratio
High CPI2010 (Low corruption)

Variable	Odds Ratio	Robust SE	P-value	[95% Conf. Interval]	
AGE	1.60	0.15	0.00	1.34	1.91
AGE2	0.99	0.00	0.00	0.99	0.99
DAD EDU YRS	1.10	0.01	0.00	1.07	1.13
MOM EDU YRS	1.11	0.02	0.00	1.07	1.14
MOMHOME (unemp.)	0.68	0.13	0.04	0.46	0.99
RURAL	1.05	0.15	0.74	0.80	1.38
MEDIA	1.17	0.14	0.20	0.92	1.49
WEALTH					
1 - (Poorest)	1.00	-	-	-	-
2 - (Poorer)	1.70	0.24	0.00	1.29	2.24
3 - (Middle)	3.00	0.50	0.00	2.16	4.17
4 - (Richer)	4.32	0.90	0.00	2.87	6.51
5 - (Richest)	9.65	2.80	0.00	5.46	17.06
HHKIDS	1.00	0.02	0.90	0.96	1.04
HHYOUNGKIDS	0.86	0.04	0.00	0.78	0.94

N = 5190

Low CPI2010 (High corruption)

Variable	Odds Ratio	Robust SE	P-value	[95% Conf. Interval]	
AGE	1.54	0.05	0.00	1.44	1.64
AGE2	0.99	0.00	0.00	0.99	0.99
DAD EDU YRS	1.12	0.01	0.00	1.11	1.14
MOM EDU YRS	1.16	0.01	0.00	1.14	1.18
MOMHOME (unemp.)	0.75	0.04	0.00	0.67	0.83
RURAL	0.50	0.03	0.00	0.44	0.57
MEDIA	1.59	0.08	0.00	1.44	1.76
WEALTH					
1 - (Poorest)	1.00	-	-	-	-
2 - (Poorer)	1.40	0.09	0.00	1.24	1.58
3 - (Middle)	1.61	0.13	0.00	1.38	1.88
4 - (Richer)	1.82	0.15	0.00	1.54	2.14
5 - (Richest)	1.89	0.19	0.00	1.55	2.30
HHKIDS	1.02	0.01	0.06	1.00	1.03
HHYOUNGKIDS	0.79	0.02	0.00	0.76	0.82

N = 34681

Table 14: Regression interaction tests for heterogeneity across countries

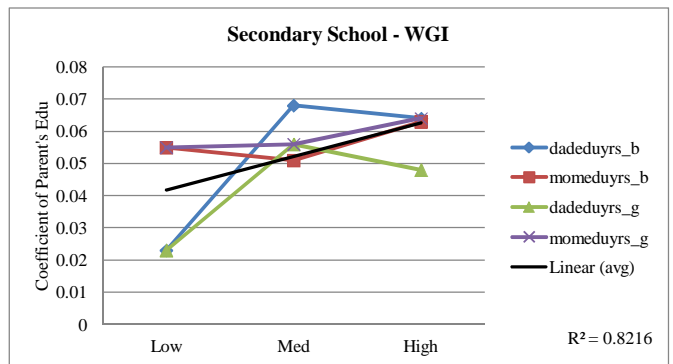
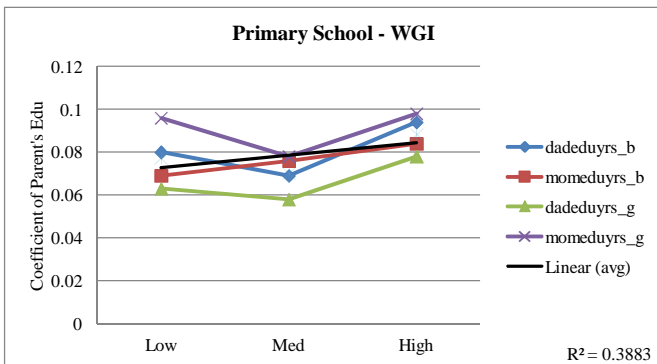
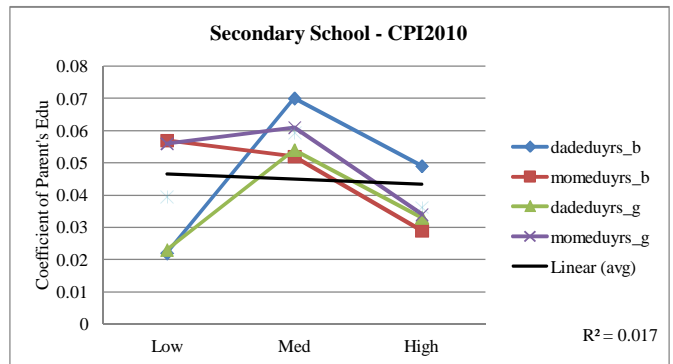
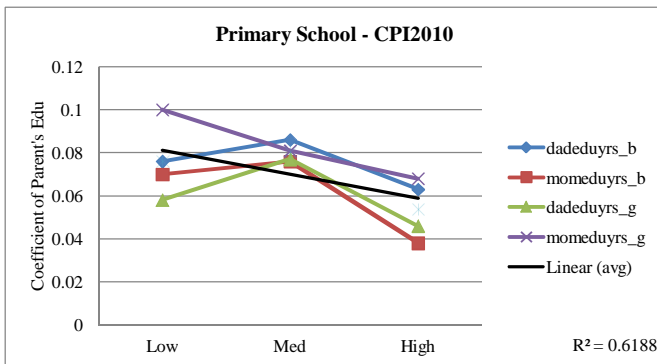
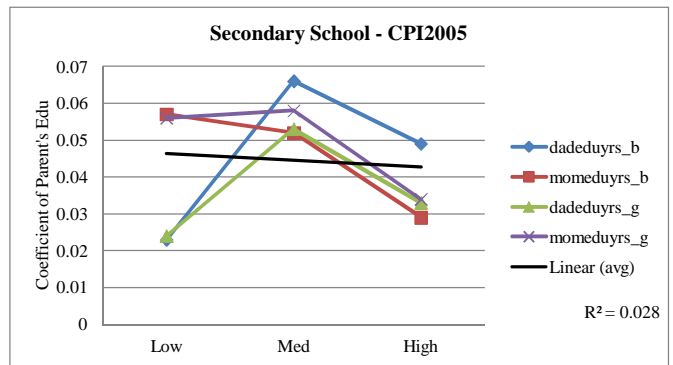
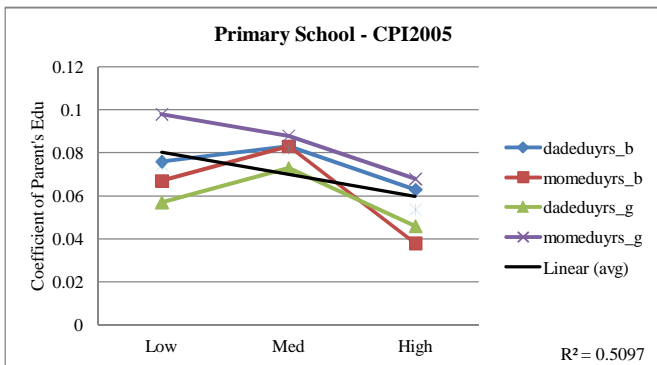
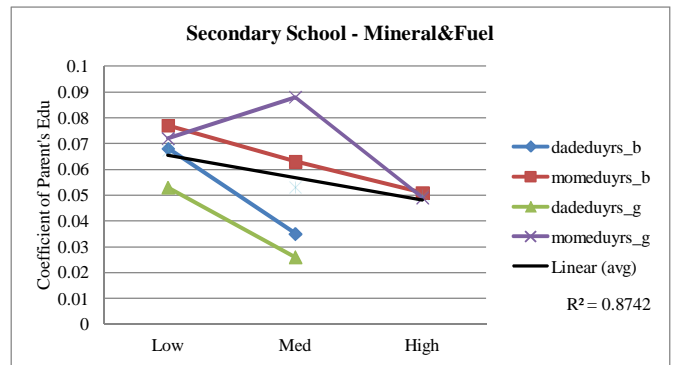
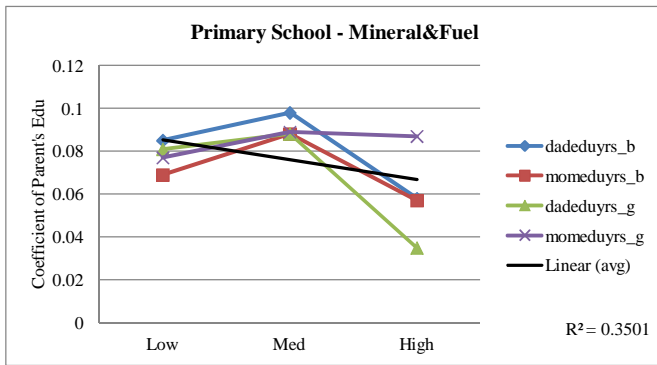
Gender	Level of Edu	Variable	Adj., Wald Test Results	Countries Significantly Different? At p<0.10
Boys	Primary	Dadeduys	F(18, 7177) = 4.48 Prob > F = 0.0000	Yes
Boys	Primary	Momeduys	F(18, 7177) = 1.72 Prob > F = 0.0288	Yes
Girls	Primary	Dadeduys	F(18, 7178) = 1.94 Prob > F = 0.0097	Yes
Girls	Primary	Momeduys	F(18, 7178) = 2.75 Prob > F = 0.0001	Yes
Boys	Secondary	Dadeduys	F(18, 7177) = 2.46 Prob > F = 0.0005	Yes
Boys	Secondary	Momeduys	F(18, 7177) = 1.17 Prob > F = 0.2729	No
Girls	Secondary	Dadeduys	F(18, 7178) = 2.25 Prob > F = 0.0018	Yes
Girls	Secondary	Momeduys	F(18, 7178) = 3.25 Prob > F = 0.0000	Yes

Gender	Level of Edu	Variable	Adj., Wald Test Results	Countries Significantly Different?
Boys	Primary	HHKIDS	F(18, 7177) = 2.51 Prob > F = 0.0004	Yes
Girls	Primary	HHKIDS	F(18, 7178) = 3.06 Prob > F = 0.0000	Yes
Boys	Secondary	HHKIDS	F(18, 7177) = 2.71 Prob > F = 0.0001	Yes
Girls	Secondary	HHKIDS	F(18, 7178) = 1.42 Prob > F = 0.1094	No

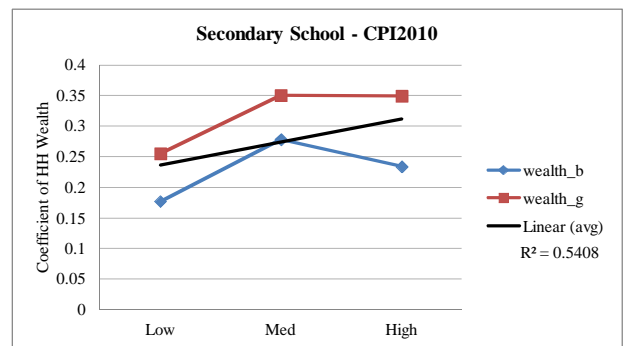
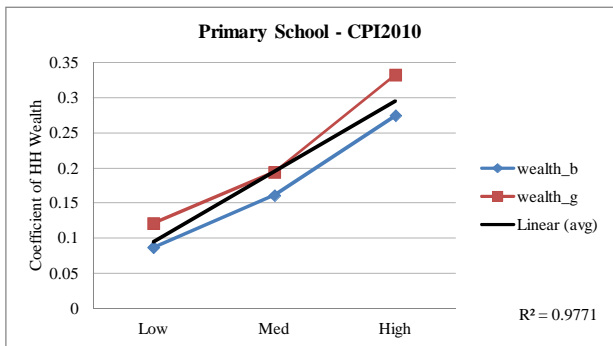
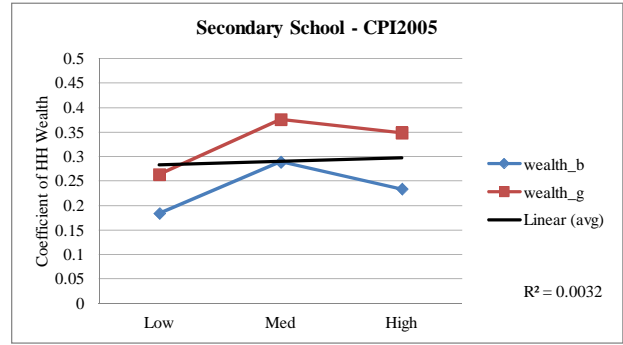
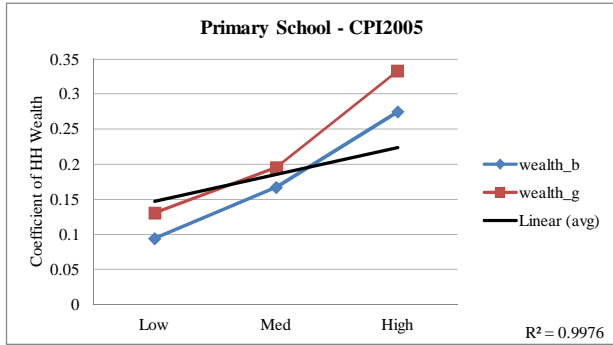
Table 15: Tests for heterogeneity across groups of Low, Med, High classification

	Gender	Level of Edu	Variable	Wald Test Results	Low, Med, High Significantly Different? At $p < 0.10$
Fuel and Mineral Resources	Boys	Primary	Dadeduysr	F(2, 7193) = 11.27 Prob > F = 0.0000	Yes
	Boys	Primary	Momeduysr	F(2, 7193) = 3.88 Prob > F = 0.0206	Yes
	Girls	Primary	Dadeduysr	F(2, 7194) = 18.27 Prob > F = 0.0000	Yes
	Girls	Primary	Momeduysr	F(2, 7194) = 0.63 Prob > F = 0.5339	No
	Boys	Secondary	Dadeduysr	F(2, 7193) = 31.77 Prob > F = 0.0000	Yes
	Boys	Secondary	Momeduysr	F(2, 7193) = 3.22 Prob > F = 0.0399	Yes
	Girls	Secondary	Dadeduysr	F(2, 7194) = 14.13 Prob > F = 0.0000	Yes
	Girls	Secondary	Momeduysr	F(2, 7194) = 5.13 Prob > F = 0.0059	Yes
CPI 2005:	Boys	Primary	Dadeduysr	F(2, 7193) = 1.76 Prob > F = 0.1726	No
	Boys	Primary	Momeduysr	F(2, 7193) = 5.44 Prob > F = 0.0043	Yes
	Girls	Primary	Dadeduysr	F(2, 7194) = 3.99 Prob > F = 0.0185	Yes
	Girls	Primary	Momeduysr	F(2, 7194) = 2.45 Prob > F = 0.0864	Yes
	Boys	Secondary	Dadeduysr	F(2, 7193) = 13.76 Prob > F = 0.0000	Yes
	Boys	Secondary	Momeduysr	F(2, 7193) = 2.72 Prob > F = 0.0657	Yes
	Girls	Secondary	Dadeduysr	F(2, 7194) = 5.07 Prob > F = 0.0063	Yes
	Girls	Secondary	Momeduysr	F(2, 7194) = 1.35 Prob > F = 0.2589	No
CPI 2010:	Boys	Primary	Dadeduysr	F(2, 7193) = 2.67 Prob > F = 0.0690	Yes
	Boys	Primary	Momeduysr	F(2, 7193) = 3.47 Prob > F = 0.0311	Yes
	Girls	Primary	Dadeduysr	F(2, 7194) = 5.62 Prob > F = 0.0037	Yes
	Girls	Primary	Momeduysr	F(2, 7194) = 3.52 Prob > F = 0.0296	Yes
	Boys	Secondary	Dadeduysr	F(2, 7193) = 15.97 Prob > F = 0.0000	Yes
	Boys	Secondary	Momeduysr	F(2, 7193) = 2.65 Prob > F = 0.0707	Yes
	Girls	Secondary	Dadeduysr	F(2, 7194) = 5.88 Prob > F = 0.0028	Yes
	Girls	Secondary	Momeduysr	F(2, 7194) = 1.58 Prob > F = 0.2063	No
WGI:	Boys	Primary	Dadeduysr	F(2, 7193) = 2.67 Prob > F = 0.0697	Yes
	Boys	Primary	Momeduysr	F(2, 7193) = 1.02 Prob > F = 0.3622	No
	Girls	Primary	Dadeduysr	F(2, 7194) = 2.21 Prob > F = 0.1103	No
	Girls	Primary	Momeduysr	F(2, 7194) = 1.70 Prob > F = 0.1827	No
	Boys	Secondary	Dadeduysr	F(2, 7193) = 16.19 Prob > F = 0.0000	Yes
	Boys	Secondary	Momeduysr	F(2, 7193) = 0.48 Prob > F = 0.6160	No
	Girls	Secondary	Dadeduysr	F(2, 7194) = 5.63 Prob > F = 0.0036	Yes
	Girls	Secondary	Momeduysr	F(2, 7194) = 0.29 Prob > F = 0.7501	No

Graphs 1



Graphs 1 (cont)



Graphs 2:

