WORKING PAPERS

The greater mothers' empowerment, the higher girls' schooling: Evidence from DHS monogamous households

Sandrine Aïda KOISSY-KPEIN

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(Preliminary version)

SANDRINE AÏDA KOISSY-KPEIN

ERDI-Afrilux[1]
CEPS/INSTEAD
Differdange-Luxembourg
www.ceps.lu

s.koissy-kpein@ceps.lu

Abstract: This paper uses Demographic and Health Surveys (DHS) from 23 sub-Saharan African countries to highlight the link between mothers' empowerment and gender bias in schooling decisions in monogamous households. Based on the collective model of Chiappori (1988, 1992), the analysis starts with the argument that altruistic fathers and mothers have different effects on the education of their sons and daughters as a result of differences in their preferences and/or in the children's human capital technologies. Our empirical analysis uses traditional indicators of women's empowerment (education, labor market participation) and more fastidious indicators provided by DHS surveys (access to mass media, decisions about the use of earnings, etc.). The results suggest that empowering mothers could lead to improving girls' school attendance.

JEL Classification D190, O150

INTRODUCTION

Gender equality and equity in education are part of the Millennium Development Goals and constitute one of six objectives of the program "Education for All" signed by 164 governments at the World Forum on Education in Dakar in 2000; however, despite major progress, equal participation of girls and boys in schooling remains a challenge in sub-Saharan Africa. This region has low enrollment rates and strong gender disparities in education. It is clear that the inequality in levels of education of girls and boys is closely related to poverty; however, unequal treatment is not linked exclusively to poverty (or explained exclusively by poverty). This problem generally reflects broader disparities within a society. These can be the result of social standards – represented by gender[2] – that guide behavior and determine the roles of women (girl-children) and men (boy-children) in the family, the household, and the society.

The aim of this paper is to examine the aspect of gender bias due to gender relations in the household. With this intention, the paper examines the influence of mothers' empowerment on gender differences in schooling decisions.

The schooling decision used to be studied within the framework of the traditional unitary household model, which ignored the "gendered" nature of the decision-making process in households. This model attributes no importance to the way that income, roles, and leisure are distributed among family members. It does not satisfy the basic principle of the neoclassical theory of *methodological individualism,* the notion that all economic models must find their meaning in individual behavior. It supposes a common family income where all sources of revenue are added, while empirical studies reject the hypothesis of income pooling in household models. This model supposes common preferences, while empirical analysis reveals the existence of a preference for gender of offspring, affecting the behavior of the household. For example, Thomas (1994, 2004) finds that children's health achievement is linked to educational attainment and non labor income of the parent of the same sex as the child. King and Lillard (1987) find that among the Chinese in Malaysia, mother's education has a positive effect on boys' and girls' schooling but father's education affects only sons' attainment. Recent works use contingent valuation to study the intrahousehold decision-making process and show that husbands' and wives' behavioral characteristics might not be pooled. Whittington et al. (2008) found that wives were significantly more likely than husbands to allocate vaccines to their daughters rather than to their sons at lower prices. In a general way, the studies reveal that women and girls encounter more difficulties than men and boys, partly because they have less decision-making power.

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[2] "Gender" refers to a set of implicit and explicit rules governing relations between men and women, giving them distinct values, roles, attitudes, work, and obligations.

The decision-making process within the family has received increasing attention recently. Developed since 1980, new collective models of household preserve intra-family differences and show how gender relations affect decisions regarding allocation of resources, distribution of roles, and labor supply in the family. Among these models, one considers household decisions to be the result of household members' engaging in cooperative Nash bargaining (Manser & Brown, 1980; McElroy, 1990; McElroy & Horney, 1981) and another as Pareto-efficient outcomes reached through collective decision-making processes among individuals of divergent preferences (Chiappori, 1988, 1992). Non cooperative models of the household have also been used but have led to non-Pareto optimal results (Udry 1996; Bergtröm, 1996). The new collective models assume that household allocation outcomes are the result of a bargaining process in which household members – generally parents – seek to allocate resources they control to goods they individually prefer. Literature based on new models of the household reveals that improvements in women's status, particularly in terms of their position within the household, will enhance child survival and improve the schooling chances of children, especially girls. For instance, Thomas (1990) shows that unearned income controlled by mothers has stronger impacts on family health than income under a father's control. Hoddinott and Haddad (1995) found that children in Cote d'Ivoire are in a favorable situation when the mother controls an important part of the resources. According to Prabhu (2010), husbands and wives claimed to differ in their decision making when interviewed separately but not jointly. The author found that wives were more likely to change their opinion to align with that of their spouse; however, women with more children were more likely not to change their opinion, supporting the literature that women seem to improve the health of children.

Despite methodological contributions, there is very little literature about collective models of the household and education demand of children. In this paper, education of children is characterized as a public good within marriage, and we suppose that husband and wife value the schooling of boys and girls differently. The paper uses Demographic and Health Surveys (DHS) from 23 sub-Saharan African countries to highlight the link between mothers' empowerment and gender bias in schooling decisions in monogamous households. The aim is to compare the impact on schooling decisions of traditional indicators of women's empowerment with more fastidious indicators provided by DHS surveys. Section 1 provides brief findings related to the issue of gender bias in schooling. Section 2 presents a basic model of a bargaining process in schooling of children. Sections 3 and 4 present empirical analysis, discussion, and results of estimation. The results suggest that empowering mothers leads to improvement in girls' participation at school.

1. GENDER BIAS IN SCHOOLING DECISIONS: THEORY AND FINDINGS

There is a very large body of literature on determinants of schooling in developing countries. This section provides a brief survey of theory and findings closely related to the issue investigated in this paper.

Models of education demand are generally based on quantity-quality models developed by Becker and Lewis (1973), and Becker and Tomes (1976, 1986) that describe households' simultaneous decisions regarding fertility and investment in the quality of children. Authors interested in the determinants of gender bias in education demand show how a household's decision-maker has an interest in maintaining inequality between genders. A first explanation is based on altruistic behavior of the household head, who determines efficient allocation of resources among children. A second explanation is based on strategic behavior of the household head to ensure future remittances when financing children's education.

Becker and Lewis (1973) suggest that a household seeks a maximum number of children of the best quality; thus if children have different abilities, the household invests in education of the most able one. This conclusion implies that girls are disadvantaged if they are seen as less able than their brothers. The quantity-quality model implies that a child with only sisters receives a higher investment than a child with only brothers. Morduch (2000) and Garg and Morduch (1998) show that there is a net advantage for a child to have only sisters.

According to Becker and Tomes (1976, 1986), the household head compares the household's well-being effect, which constrains to compensate the less able, with the price effect, which encourages strengthening of the abilities of the most able. Becker and Tomes (1986) show that the second effect prevails. Consequently, girls are less educated if they are considered less able. In the same way, a gender bias emerges if capacities also reveal the ability to succeed in the labor market. In the poor household, boys are favored since the rotten kid theorem implies that the most able children have an incentive to voluntarily transfer money to the girls.

If schooling costs are most important for girls, they are less educated and boys are educated at an optimal or under-optimal level, depending on household resources. For example, Mason and Khander (1996) show that direct costs of schooling are higher for girls than for boys in Tanzania; Lavy (1996) notices that the distance to school has a more negative impact on girls than on boys in Ghana Alderman and Gertler (1997) note that girls' education is more sensitive to prices and incomes than that of boys; and Alderman and King (1998) reveal that gender bias in education is most important in poor households; finally, Glick and Sahn (2000) found that the higher the household wealth, the higher girls' participation in school and the lower their dropout rate, whereas no effect was found on boys' education.

Barham et al. (1995), Balestrino (1997), Behrman et al. (1982), Alderman and King (1998), Alderman and Gelter (1997), and Cremer and Pestiau (2004) note that the problem relates not only to budget constraints but also to the expected benefits of educational investment, especially expected remittances. Girls are less educated because they are less profitable. This is partly because of labor market discrimination (access and wage), and partly because of the remittances themselves, which are usually lower from girls than from boys.

According to Becker (1991) and Barnet-Verzat and Wolff (2002), interdependence of the labor and marriage markets implies that girls' opportunities to find a husband who provides for their needs reduces parents' incentive to send them to school. Conversely, boys' education increases men's opportunities in both labor and marriage markets. Echevarria and Merlo (1999) show that a relatively small biological difference between men and women is enough to understand a relatively large difference in the level of education between men (boys) and women (girls). All the factors connected with child bearing decrease labor market participation, productivity, and labor income of a wife. The authors consider a bargaining process where husbands (who want a child) partially compensate their wives for income lost as a consequence of child bearing,[3] increasing the returns on investment in women's education. Hence, parents who choose the level of education for their children must anticipate and solve the bargaining problem faced by their children in adulthood. Consequently, parents who take these facts into account provide more resources for boys' education than for girls. The authors note that the time cost of having a child increases with the number of children. They construct an indicator of child cost and, using data from 164 countries, show that average child cost is higher in developing countries than in developed countries. This explains the lower schooling of girls in developing economies.

Less schooling of girls is due mainly to the greater difficulties for women to value their human capital (Appleton, 1990). In societies where women are not expected to be economically independent, parents may be less motivated to invest in girls' human capital.

2. BARGAINING OVER BOYS AND GIRLS: A BASIC MODEL

The new collective models of household behavior were developed in the 1980s to fill the gaps in the traditional unitary model concerning the income pooling hypothesis or "methodological individualism"[4] (Chiapporri, 1988, 1992). Despite the methodological contribution, there is very little literature about collective models of the household and education demand of children. For a non exhaustive list, we can cite the works of Emerson and

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[3] The wife accepts having a baby if and only if the compensation is higher than lost income.
[4] This principle states that all economic models must find their meaning in the behavior of individual agents. Therefore, it is preferable in modeling the behavior of a household to characterize each of the individuals who compose it by his or her own preferences.

Portela (2001) for Brazil, Park (2007) for Indonesia, Roushdy (2004) for Egypt, and Koissy-Kpein (2008) for Côte d'Ivoire, Guinea, and Ghana. Authors confirm rejection of the income pooling hypothesis and the bargaining process for schooling decisions.

Our analysis starts with an illustration of the argument that altruistic fathers and mothers may have different impacts on their sons' and daughters' outcomes because of differences in their preferences and/or differences in the children's human capital technologies. The collective model of Chiappori (1988, 1992) remains appropriate because it leaves the underlying nature of the allocation process within the household unspecified but assumes that resource allocations are Pareto efficient. So, we have a set of weights such that a general household's utility function can be represented by a linear combination of father's and mother's utilities, where the weights on each person's utility reflect his or her bargaining power in the household. The model supposes that each half of the couple is characterized by his or her own utility function and that spouses are not altruistic toward their partner but only toward their children. The problem of the parents can be written as maximization of a social function of well-being:

$$\underset{C_m, C_f, q_b, q_g}{Max} \quad W = \pi(W_m, I_m; E_m)U_m(C_m, q_b, q_g) + (1 - \pi(W_m, I_m; E_m))U_f(C_f, q_b, q_g) \quad (2.1)$$

Subject to the budget constraint: $C_m + C_f + p_{sb}S_b + p_{sg}S_g = W_m + I_m + W_f + I_f$ (2.2)

Where U_m and U_f represent the utilities of the mother (m) and the father (f), which are quasi concave, twice differentiable, and increasing in each argument. Component C_i represents consumption by member i (i = m, f) of the couple; q_b and q_f represent the average quality of boys and girls. A child's average quality is determined by the quality production function $q_j = Q_j(S_j, h_j)$, where S_j represents the schooling attendance of child j, and h_j represents a vector of other qualities such as ability and health. Component π represents the function of distribution, a weighting factor contained in [0,1]. It generally depends on all variables that can affect the distribution of power within the household: prices, incomes (W_m and I_m), assets, sex-ratio, property rights, and education. Here, we suppose that π depends on a set of indicators of mother's empowerment in the household (E_m). This enables locating the exit from negotiation between the father and mother. The preferences of the mother are imposed in a dictatorial way in the household if $\pi = 1$.
The Lagrangian of the problem is as follows:

$$L_{(C_m, C_p, S_b, S_g)} = \left[\pi(W_m, I_m; E_m) * U_m(C_m, Q_b, Q_g) - (1 - \pi(W_m, I_m; E_m)) * U_f(C_f, Q_b, Q_g)\right]$$
$$- \lambda(C_m + C_f + p_{sb}S_b + p_{sg}S_g - (W_m + I_m + W_f + I_f)) \qquad (2.3)$$

The first order conditions give:

$$\frac{\partial L}{\partial C_m} = \pi(W_m, I_m; E_m) * \frac{\partial U_m}{\partial C_m} - \lambda = 0 \qquad (2.4)$$

$$\frac{\partial L}{\partial C_f} = (1 - \pi(W_m, I_m; E_m)) * \frac{\partial U_f}{\partial C_f} - \lambda = 0 \qquad (2.5)$$

So $\pi(W_m, I_m; E_m) * \dfrac{\partial U_m}{\partial C_m} = (1 - \pi(W_m, I_m; E_m)) * \dfrac{\partial U_f}{\partial C_f} \Rightarrow \dfrac{\partial U_m / \partial C_m}{\partial U_f / \partial C_f} = \dfrac{(1 - \pi(W_m, I_m; E_m))}{\pi(W_m, I_m; E_m)}$ (2.6)

Relation (2.6) shows how the preferences of the parents interact with their decision-making power. The ratio of the marginal utility of the mother to the marginal utility of the father is a decreasing function of π. This implies that, for the same level of well-being, a rise in the level of consumption of the father will coincide with a decrease in the mother's bargaining power.

Concerning education demand, the first order conditions give:

$$\frac{\partial L}{\partial S_b} = \pi(W_m, I_m; E_m) * \frac{\partial U_m}{\partial S_b} + (1 - \pi(W_m, I_m; E_m)) * \frac{\partial U_p}{\partial S_b} - \lambda p_{sb} = 0 \qquad (2.7)$$

$$\frac{\partial L}{\partial S_g} = \pi(W_m, I_m; E_m) * \frac{\partial U_m}{\partial S_g} + (1 - \pi(W_m, I_m; E_m)) * \frac{\partial U_p}{\partial S_b} - \lambda p_{sg} = 0 \qquad (2.8)$$

(2.4) in (2.7) or (2.8) implies that

$$\pi(W_m, I_m; E_m) * \frac{\partial U_m}{\partial S_i} + (1 - \pi(W_m, I_m; E_m)) * \frac{\partial U_p}{\partial S_i} - \pi(W_m, I_m; E_m) * \frac{\partial U_m}{\partial C_m} p_{si} = 0 \; ; for \; j = b, g \quad (2.9)$$

And $\underbrace{\pi(W_m, I_m; E_m) \dfrac{\partial U_m}{\partial S_j} + (1 - \pi(W_m, I_m; E_m)) \dfrac{\partial U_f}{\partial S_j}}_{B} = \underbrace{\pi(W_m, I_m; E_m) \dfrac{\partial U_m}{\partial C_m} p_{s_j}}_{A}$ (j = g, b) (2.10)

Relation (2.10) implies that at the optimum, the marginal cost in terms of consumption (A) is equal to the marginal benefit of investment in education (B). Marginal benefit increases with parental weighted preferences for schooling. The marginal cost of schooling increases with the costs of schooling of girls (or boys) and weighted preference for consumption.

At the optimum, the net marginal gain of educational investment, which is equal to the difference between the marginal benefit of educational investment and the marginal cost of educational investment, is null.

The educational demand function of child j can be: $S_j = (X_j, \pi(W_m, I_m; E_m))$ for j = g, b with X_j representing a set of characteristics of child j such as age, rank among children, and sex.

Several cases explain gender bias in schooling, i.e., $S_g < S_b$:

- Where parents have no preference for the gender of offspring and get the same level of satisfaction from the schooling of children, i.e.

$$\frac{\partial U_m}{\partial S_g} = \frac{\partial U_m}{\partial S_b} = \frac{\partial U_f}{\partial S_g} = \frac{\partial U_f}{\partial S_b},$$

$S_g < S_b$ if $\pi * \frac{\partial U_m}{\partial S_g} + (1-\pi) * \frac{\partial U_p}{\partial S_g} - \pi * \frac{\partial U_m}{\partial C_m} p_{sg} < \pi * \frac{\partial U_m}{\partial S_b} + (1-\pi) * \frac{\partial U_p}{\partial S_b} - \pi * \frac{\partial U_m}{\partial C_m} p_{sb}$

to simplify, we have $-p_{Sg} < -p_{Sb}$ or $p_{Sg} > p_{Sb}$, so girls are less educated in this case because of the higher costs of schooling than those for boys.

- Where parents prefer boys. The parents get more important satisfaction from education of boys and devote more resources to the schooling of boys than to that of girls.

- The most interesting case for our analysis is that where a father prefers sons ($\frac{\partial U_f}{\partial S_b} > \frac{\partial U_f}{\partial S_g}$) and a mother prefers daughters $\frac{\partial U_m}{\partial S_g} > \frac{\partial U_m}{\partial S_b}$. Indeed, studies conducted in demography, sociology, and anthropology have revealed differences in preference for the gender of offspring. For instance, authors have noted that parents with boys are less likely to want another child, while the reverse is true for parents with girls, who expect to have a boy (Andersson et al., 2004; Quintero Gonzalez & Koestner, 2005; Dahl & Moretti, 2008). Dahl and Moretti (2008) use data from China, Vietnam, Mexico, Kenya, and the USA. They talk about boys' polarization and note that pregnant women have a higher probability of being married before delivery if the child is a boy, lower probability of divorce, and in case of divorce, the father has a greater probability of seeking custody of children if they are mainly boys. Authors reveal for Kenya that mothers with girls have a higher probability to be in polygamous household. For Brazil, USA, and Ghana, Thomas (1990, 1994) shows that the mother has a greater influence on girls' nutritional status, while the father has a greater influence on boys' nutritional status. King and Lillard (1987) found the same results for Malaysia, and Koissy-Kpein (2008) for Côte d'Ivoire, Ghana, and Guinea, and these authors conclude that mothers have a preference for girls' schooling.

  o For the same level of costs of schooling ($p_{Sg}=p_{Sb}$), we have $\pi * \left[\frac{\partial U_m}{\partial S_g} - \frac{\partial U_m}{\partial S_b} \right] < (1-\pi) * \left[\frac{\partial U_p}{\partial S_b} - \frac{\partial U_p}{\partial S_g} \right]$. This means that bargaining power of the mother is lower than the bargaining power of the father. Consequently, girls are less educated because of the mother's power in the household decision-making process.

o If we slacken the hypothesis of identical costs, the schooling of girls could be more expensive for the mothers. Thomas (1990) suggests that mothers prefer girls in terms of care and food because girls help with domestic tasks. In this context, the loss caused by schooling can be heavier for mothers. Parish and Willis (1993) note that the mother "sacrifices" some of her daughters to provide a better education to the others.

The collective model indicates that the relative position of mothers within the family, especially in terms of bargaining power, could explain the differences in educational investment between girls and boys. The difficulty is providing a measure of women's empowerment in a household. Various authors have argued that women's empowerment cannot be measured directly, but only through proxies such as health, educational level, and knowledge (Ackerly, 1995). Economists tend to focus on assets (Thomas et al., 1997; Quisumbing, 1994), unearned income (Schultz, 1990; Thomas, 1990), transfer payments and welfare receipts (Lundberg et al., 1997), or labor income[5] (Koissy-Kpein, 2008). Thomas et al. (1997) use assets at marriage because in some parts of Indonesia (for example), spouses can take what they brought into the marriage with them in case the marriage dissolves. Koissy-Kpein (2008) uses labor income because the report "Engendering Development" (World Bank, 2001) indicates that women have weaker decision-making power in the household because of their limited capacity to act independently (particularly if they are not actively participating in the job market). Authors have generally found that women's relative advantage in assets or income share leads to benefits for sons, but not necessarily for daughters (Hoddinott & Haddad, 1995, for Cote d'Ivoire; Thomas et al., 1997, for Indonesia; Koissy-Kpein, 2008, for Guinean monogamous household).

The level of education has also been used as a proxy for bargaining power (Thomas, 1994; Gertler & Glewwe, 1992; Tansel, 1997; Glick & Sahn, 2000). Koissy-Kpein (2008) uses the following proxies related to education: education of the mother, education of the mother compared with that of the father, education of the mother compared with that of the father and/or the other wives in polygamous households. Analysts also note the effect of marriage market conditions, summarized by sex ratio[6] (ratio of males to females computed by age and others factors like region of residence, employment status, etc.) or laws governing divorce (Lundberg, Pollak, & Wales, 1997; Chiappori, Fortin, & Lacroix, 2002; Koissy-Kpein, 2008). However, sex ratio seems debatable, especially in countries where polygamy has a legal status or is tolerated. Koissy-Kpein (2008) also uses, for Guinean polygamous household, mothers' rank in polygamous unions as proxy for the marriage market.

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[5] The author uses IV-estimation to correct the problem of endogenous labor income.
[6] Sex ratio is the usual distribution factor in economic analysis, but analysts doubt the relevance of sex ratio as a measure of external opportunities for remarriage.

3. EMPIRICAL STRATEGY AND MEASURE OF MOTHERS' EMPOWERMENT

A. A PROBIT MODEL OF SCHOOL PARTICIPATION[7]

In the previous section, the educational demand function of child j is:

$S_j = (X_j, \pi(W_m, I_m; E_m))$ for j = g, b.

The dependant variable is binary and $S_j = \begin{cases} 1\,with\ probability\ p\ if\ the\ child\ \ j\ attends\ school \\ 0\,with\ probability\ (1-p)\ if\ the\ child\ \ j\ does\ not\ go\ to\ school \end{cases}$

Let us suppose S_j*, a latent variable observable only if child j goes to school.

We have: $S_j^* = X_j^{'} \beta_1 + empowerment_i \beta_2 + u_j$ and $S = \begin{cases} 1\ if\ S_j^* > 0 \\ 0\ if\ S_j^* \le 0 \end{cases}$

X represents a set of characteristics with β the associated parameters; the component empowerment represents a set of elements representing the bargaining power of the mother of child j and u_j the error.

$$\Pr\left[school_j = 1 \middle| X_j\right] = \Pr\left[school* > 0\right] = \Pr\left[X_j^{'}\beta + u_j > 0\right] = \Pr\left[-u_j < X_j^{'}\beta\right] = F(X_j^{'}\beta)$$

Where F is a cumulative distribution function (CDF) of –u, which equals the CDF of u in the usual case of density symmetric about 0.

The variables that can affect school participation are those traditionally used to analyze the demand for education: sex (girl = 1), age, household wealth (see the mode of calculation in appendix), residence (urban = 1), the number of older (younger) sisters (brothers), father's education and mother's education.[8] We pay special attention to mothers' empowerment indicators.

B. DEFINITION AND MEASURE OF MOTHERS' EMPOWERMENT OR MOTHERS' AUTONOMY

A range of terms has generally been used to talk about "women's status": empowerment, autonomy, bargaining power, domestic economic power, authority, valuation, position in society, women's well-being, etc. (Malhotra et al., 2002; Smith et al., 2003, for a discussion).

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[7] See CAMERON, C. A. & TRIVEDI, P. K. 2005. *Microeconometrics: Methods and Applications,* New York, Cambridge University Press, pp. 470-471.
[8] The education variable is the effective number of years or level of schooling; therefore it does not take repeated classes into account.

Women's status is considered in both absolute and relative terms to men's, and there is a debate that autonomy refers to independence while empowerment refers to the power relationship with others in interdependence (Govinddasamy & Malhotra, 1996). In the economic literature, the two elements are the same. Indeed, according the marriage market theory (Becker, 1981), individuals marry because they expect that the output for a couple is at least equal to single output. The precursors of collective models and bargaining models define a number of factors that influence the utility of reservation in a couple (or output single) and threaten the stability of the couple. These factors act like indexes of autonomy for a single person whereas they can be interpreted as like indexes of empowerment for a couple. The new models of household behavior suppose that the threat of independence (or autonomy) explains inter household bargaining power in interdependence and thus empowerment. Consequently, empowerment and autonomy are the same while the greater a woman's ability to act independently outside the household, the greater her bargaining power within the household. For instance, if a woman has no better alternative than to stay with her husband (low autonomy), she will have no interest in disagreeing with him in the decision-making process (empowerment). The World Bank report titled "Engendering Development" (2001) takes up this idea. The report reveals that women in the household have less bargaining power because of their lower capacity to act independently from the couple. In our analysis, all the terms used to define empowerment are the same and refer to women's control vis-à-vis family, community, and society. Moser (1989) defines empowerment as "the capacity of the women to increase their own autonomy and their internal force," which is identified as "the right to make choices in the life and to influence the direction of the changes via the capacity to acquire control on the material and nonmaterial resources." We employ this definition as a reference point in this paper, because it combines the three essential ideas of choice, control, and power.

Data limitations present an important constraint in terms of both measurement and comparability of women's empowerment. In recent years, data collection methods have become more sophisticated, and they provide important guidance for future efforts at measuring women's empowerment (Malhotra et al., 2002).

In the economic literature, authors have generally focused on quantitative determinants of empowerment such as education, control of resources, and marriage market conditions. Economists pay little attention to the impact of qualitative factors on bargaining power. Malhotra et al. (2002) or Agarwal (1997) discuss a complex range of factors, especially qualitative ones that affect bargaining power in the household. The authors note the complexity, importance, and multiple effects of social norms on the bargaining process within the household. Authors generally build indexes of autonomy starting from answers to questions about elements such as physical abuse, freedom of movement, decision making with regard to meals or purchases, doctor visits, etc. (Smith et al., 2003 ; Durrant & Sathar, 2000; Jejeebhoy, 1998). Jejeebhoy (1998) notes that women who are beaten up are most likely to be the most powerless; they have little autonomy, in particular in terms of decision-making, mobility,

control over resources, or taking care of themselves or their infants. Jejeebhoy (1998), for India, and Roushdy (2004), for Egypt, find that domestic violence affects the autonomy of women, but also, the care and the nutritional status of children. Durrant and Sathar (2000) consider the effect of external environment and community and show, for Pakistan, that control of resources and absence of *purdah* and domestic violence decrease the risk of infant mortality. Folbre (1997) insists that property rights and low security of land rights for women imply that women depend on their (male) husbands or their parents for access to land (ownership). Clark (2004), Bruce and Clark (2003), and Clark et al. (2006) note that young married women may use condoms more rarely because of a lack of bargaining power in their marriage.

This analysis starts with the traditional determinants proposed by the economic literature:

- Education of the mother in years.[9] In a second estimation, the component mother's education is replaced by "mother more educated than father."

- Women's control over resources within the household through labor activity (especially, outside the household or on their own land). Concerning labor activities, it is difficult to talk about autonomy or empowerment when a woman works for her husband, a relative of hers, or a relative of her husband. In these cases, on the contrary, we face a relationship of dependence. In our analysis, mothers who work on the farm of a relative or on the farm of the husband are comparable to women who are housewives. Anderson and Eswaran (2009) find the same result.

We intend to construct indexes of empowerment with qualitative determinants reflected in the DHS women's questionnaire:

- Women were asked about the decision maker regarding use of contraception: mainly the mother, mainly the husband, joint decision, or other.
- Women were asked about decisions about spending their own money, household purchases (in general), household purchases for daily needs, visits to family members and relatives, meals to be cooked, their own health, etc.
- Women were asked about access to mass media and frequency of listening to the radio or watching TV: not at all, less than once a week, at least once a week, almost every day.

Indicators are divided into three categories: (1) decisions for the mother (health, how to spend her own money, contraceptive use, visits to family members and relatives) taking into account the mother's independence in decisions concerning herself, (2) decisions for the household (purchases, daily needs, and food to be cooked each day) taking into account the effect of the mother's weight in decisions concerning the household in interdependency with the husband, and (3) decisions about media access. Exposure and access to media represent an opportunity

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[9] This variable concerns the years of education corresponding to grade and level. It allows us to avoid repeated years or years of interruption.

to receive information concerning child care, children's (girls') education, family planning, women's rights, etc., to increase knowledge and shape beliefs, and, in the same way, to increase women's ability to negotiate in the household (Clark, 2004).

We intend to use weights for answers to questions about the decision maker in the household and make a sum for each category; thus the mother has 2 points if she decides alone, 1 point if she decides with her husband/partner or other person, and 0 points otherwise.[10] We delineate this difference between autonomous and joint decisions because of Prabhu's (2010) findings. Indeed, he reveals the complexity of intrahousehold decision making by showing that, for Indian households of Navi-Mumbai, husbands' and wives' demand and willingness to pay for malaria vaccines differed significantly when they were interviewed separately but not when interviewed jointly. When husbands and wives had an opportunity to change their opinion during the joint interview, the author found that wives were more likely to change their opinion to align with that of their spouse. The responses of husbands during joint interviews were more consistent with their responses in separate interviews.[11]

Concerning access to media (radio and TV), the mother gets 2 points if she watches TV almost every day, 1 point for at least once a week, and 0 points otherwise.

For an alternative measure of women's empowerment, the component "labor activity" is removed when we have a higher probability of correlation with the proxies of empowerment. On one hand, labor market participation represents an important part of women's emancipation and can increase their weight in the decision-making process in the household. On the other hand, more emancipated women, who have a greater weight in the decision-making process in the household, can be those who work outside the household. Here, we can have a bias of simultaneity. So, we finally obtain an ambiguous link of causality between labor activity and proxies for the decision-making process.

4. DATA AND DESCRIPTIVE ANALYSIS

The Demographic and Health Surveys (DHS) program was originally developed by the U.S. Agency for International Development (USAID). Since 1984, the program collects, analyzes, and disseminates accurate and representative data by means of more than 200 surveys in more than 75 countries. Concerning the quality of the data, the DHS surveys are among the best concerning developing countries. They are organized with the support of ICF Macro, based in the United States. DHS samples are representative at national and sub national levels.[12] DHS

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[10] For instance, the maximum for the first category decision for the mother is 8 points. This means that the mother is her own decision maker for her own health, the use of her own money, contraceptive use, and visits to family or relatives.

[11] Prabhu (2010) notes that if wives had no source of income or if they were housewives, they were more likely to change their opinion when interviewed with husbands. This result probably shows the link between bargaining power and control of resources. This means that women with some source of income are more likely to retain their opinion and may have some decision-making power in the household.

[12] http://www.measuredhs.com/

surveys provide cross-country comparable data because their methodologies and questionnaires are standardized. The surveys offer detailed information on various subjects, including education, health, and participation in the labor market, as well as a women's questionnaire providing detailed information on women's activities and participation in the decision-making process.

The paper is based on information about children between the ages of 7 and 18 who live with their two parents in monogamous households. The dependent variable is whether or not a child is currently attending school. The DHS women's questionnaire provides information on women younger than 49 years; consequently, the analysis concerns children with a mother between 18 and 49 years. We have a sample of 23 countries: Angola (2006-07), Benin (2001), Burkina Faso (2003), Chad (2004), Cameroon (2004), Comoros (1996), Congo Brazza. (2005), Congo Rep. (2007), Côte d'Ivoire (1998-99), Ethiopia (2005), Gabon (2000), Ghana (2008), Guinea (2005), Kenya (2003), Lesotho (2004), Liberia (2007), Madagascar (2003-04), Malawi (2004), Mali (2006), Mozambique (2003), Namibia (2006-07), Niger (2006), and Senegal (2005). For Angola, we have no information about current participation in education; for Gabon, Chad, and Comoros, it is not possible to match children aged 14-18 with information on their mothers; hence, to obtain comparable results, we work with a sample of 19 countries.

Table 1 shows the sample of 131,293 children between the ages of 7 and 18 (69,906 boys and 61,387 girls) living with their two parents in monogamous households. The descriptive statistics suggest that 65.75% of children in our sample currently attend school, and the proportion of girls in school (64.40%) is lower than that of boys (66.93%). In 4 of the 19 countries, participation rates are lower than 50%; for example, in Burkina Faso, 38.81% of children in the sample currently attend school. In 11 of the 19 countries, 7 out of 10 children in the sample currently attend school.[13] Concerning gender differences, participation rates of girls are generally lower than those of boys. For example, in Guinea, 54.52% of boys currently attend school, while only 48.97% of girls go to school. In 5 out of 19 countries, we note that participation rates are higher for girls than for boys: Lesotho, Liberia, Madagascar, Malawi, and Namibia. In Lesotho, for example, 90.91% of girls currently attend school, versus 81.28% of boys.

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[13] Remember that the sample is not representative of these countries' reality since here we are using children between the ages of 7 and 18 who live with their two parents in a monogamous household.

country	children		boys		girls		difference
	n	Proportion	n	Proportion	n	Proportion	
Benin	8583	69.84%	4708	73.53%	3875	65.34%	8.19%
Burkina	4705	38.81%	2561	39.44%	2144	38.06%	1.38%
Cameroon	4291	84.83%	2191	86.49%	2100	83.10%	3.39%
Congo Brazza	2912	91.52%	1472	92.46%	1440	90.56%	1.90%
Congo Rep.	6072	74.34%	3155	78.03%	2917	70.35%	7.69%
Cote d'Ivoire	1214	51.89%	675	54.81%	539	48.24%	6.58%
Ethiopia	11208	47.39%	5951	48.88%	5257	45.69%	3.19%
Ghana	2088	84.58%	1076	85.13%	1012	83.99%	1.14%
Guinea	3206	54.52%	1656	59.72%	1550	48.97%	10.75%
Kenya	4591	86.10%	2423	86.63%	2168	85.52%	1.11%
Lesotho	3532	85.96%	1816	81.28%	1716	90.91%	-9.63%
Liberia	3251	65.18%	1684	65.08%	1567	65.28%	-0.20%
Madagascar	5507	80.21%	2854	79.36%	2653	81.12%	-1.75%
Malawi	7131	84.42%	3643	84.02%	3488	84.83%	-0.81%
Mali	8199	47.58%	4367	49.78%	3832	45.07%	4.71%
Mozambique	6324	71.71%	3321	75.13%	3003	67.93%	7.20%
Namibia	1947	86.59%	975	85.13%	972	88.07%	-2.94%
Niger	4841	41.73%	2581	45.33%	2260	37.61%	7.72%
Senegal	4003	56.73%	2076	58.67%	1927	54.64%	4.03%
Total	131293	65.75%	69906	66.93%	61387	64.40%	2.53%

Concerning mother's empowerment, the statistics in table 2 suggest a lower level of education of mothers. In only 8 out of 19 countries do we note that mothers' education level is higher than 4 years of education: Cameroon, Congo Brazza, Congo Rep., Ghana, Kenya, Lesotho, Madagascar, and Namibia. For example, we have a mean of 7.4 years of mothers' education for Namibia, 5.11 for Cameroon, and 7.15 for Congo Brazza. In all these countries at least 6 out of 10 children or girls currently attend school. Three countries among the five that record greater participation of girls than of boys have mothers with average education level higher than 6 years, and the two others countries record average education level higher than 3 years. Table 2 also provides an interesting conclusion about the link between mother's education and participation of girls. Indeed, in Lesotho, approximately 91% of girls in the sample currently attend school (and 81% of boys currently attend school), and in this country, approximately 68% of the mothers in the sample are more educated than their husbands. Additional examples come from Namibia and Madagascar, where approximately 35% and 27% of the mothers, respectively, are more educated than the fathers.

Table 2. Characteristics of mothers

Country	Education (years)	Mother more educated than father	Uneducated mothers	Labor activity$^\$$	decision for mother	decision for household	access to media
Benin (2367)	1.3177 (2.8960)	0.0752	0.7689	0.6946	3.4512 (1.7479)	3.0511 (1.5894)	1.2070 (1.2711)
Burkina (1247)	1.0000 (2.7554)	0.0794	0.8516	0.4723	1.6087 (1.7471)	2.4266 (1.6763)	1.0433 (1.1884)
Cameroon (1153)	5.1127 (3.9512)	0.1856	0.2619	0.6175	2.7311 (1.9168)	3.2943 (1.6399)	1.2749 (1.4701)
Congo B. (852)	7.1561 (3.7162)	0.1890	0.0939	0.6702			1.4859 (1.4087)
Congo R. (1440)	4.8125 (4.1596)	0.1063	0.2667	0.5875	2.0875 (1.7272)	2.9035 (1.7346)	0.8569 (1.2484)
Cote d'Ivoire (739)	1.8038 (3.1939)	0.1800	0.6793	0.7591			1.1691 (1.4180)
Ethiopia (2736)	1.3746 (3.3043)	0.0581	0.7869	0.2189	2.1715 (1.4122)		0.4357 (1.0284)
Ghana (636)	4.5535 (4.7827)	0.1258	0.4355	0.7972	3.4604 (1.4480)		1.9654 (1.3465)
Guinea (988)	1.0233 (2.9488)	0.0486	0.8563	0.7227	2.6346 (1.7292)	2.9198 (1.6853)	0.8947 (1.1534)
Kenya (1231)	6.2088 (4.5767)	0.2258	0.2226	0.6198	3.0545 (1.9807)	3.3184 (1.6216)	1.8205 (1.3426)
Lesotho (1066)	6.7008 (2.5294)	0.6782	0.0281	0.4268	2.5681 (1.8099)	3.9510 (1.3728)	1.1839 (1.1796)
Liberia (1007)	3.1251 (5.3632)	0.0695	0.5472	0.6634			1.0586 (1.2355)
Madagascar (1556)	6.3991 (4.7176)	0.2699	0.1632	0.6819	3.3425 (1.4480)	4.3451 (1.2334)	2.1934 (1.5389)
Malawi (1920)	3.1328 (3.2613)	0.1443	0.3807	0.5818	1.7553 (1.4813)	2.1273 (1.5419)	1.4026 (1.0495)
Mali (2095)	0.9389 (2.5853)	0.0773	0.8434	0.4401	1.7041 (1.7211)	1.8496 (1.8392)	1.6449 (1.4300)
Mozambique (1770)	1.9944 (2.5477)	0.1079	0.4864	0.6328	2.4904 (1.6342)	3.1992 (1.5192)	1.2164 (1.3289)
Namibia (680)	7.4059 (4.6636)	0.3456	0.1265	0.5603	3.4464 (1.7351)		2.4088 (1.4018)
Niger (1218)	1.0731 (2.8695)	0.0747	0.8333	0.4278	1.7488 (1.7817)	1.5567 (1.6955)	1.0246 (1.2856)
Senegal (964)	1.3278 (2.8708)	0.0902	0.7822	0.4616	1.7648 (1.7419)	2.3410 (1.5343)	2.1504 (1.3615)

$\$$ Proportion of women who work on own land, are self employed for own account or work outside the household

5. RESULTS

A. TRADITIONAL MEASURES OF WOMEN'S EMPOWERMENT: EDUCATION AND SHARE OF INCOME DEVOTED TO HOUSEHOLD

Results of the traditional measures of mothers' empowerment are presented in tables 3–5. The tables report elasticities in the form $\partial(\ln y)/\partial(X)$, and these elasticities give the percentage change in the probability of school participation in response to one unit change in the explanatory variable.

Concerning mother's education, the results suggest that children, both boys and girls, have a greater probability of attending school when mothers are educated. The results suggest for Burkina Faso, for example, that one additional year of a mother's education increases the probability of child participation in school by 7.7%. The effect of mother's education on school participation is higher for girl's participation compared with that of boys in Cameroon, Congo Rep., Congo Brazza., Côte d'Ivoire, Ethiopia, Guinea, Kenya, Liberia, Madagascar, Malawi, Mali, Mozambique, Niger, and Senegal; representing 14 out of the 19 countries in the analysis. We can talk about a mother's preference for girl's schooling in these countries. In Côte d'Ivoire, one additional year of mother's education increases the probability of girl's participation in school by 7.6% and that of boy's participation by 3.2%. Koissy-Kpein (2007) also found that one additional year of a mother's education has a greater impact on girl's participation in school in Côte d'Ivoire and Guinea but not in Ghana. Glick and Sahn (2000) also reveal this higher impact in Guinea. Their findings confirm our results.

The effect of the mother's education on a child's participation is less than that of the father's education, except in Cameroon, Guinea, Lesotho, Liberia, Madagascar, Malawi, Mozambique, and Namibia; representing 8 out of the 19 countries in the analysis. This can be due to the lower level of mother's education in the other countries of the study. Tables 10–11, in the appendix, include the results of estimations with the components "mother is more educated than father." The results suggest that children, especially girls, are in a better situation when the mother is more educated than the father. Indeed, boys and girls have a higher probability of going to school when the mother is more educated than the father in Benin, Cameroon, Congo Rep. (for girls only), Côte d'Ivoire (for boys only), Ethiopia, Ghana, Guinea (for girls only), Kenya, Lesotho (boys only), Madagascar, Malawi, Mali, Mozambique, Namibia, and Senegal; this effect is greater on girls' education compared with that of boys in Cameroon, Congo Rep., Ethiopia, Guinea, Kenya, Madagascar, Mali, Mozambique, and Senegal, representing 9 of the 19 countries in the study. A more educated mother increases the probability of girl's participation in school by 21.5% in Guinea. For Guinean monogamous households, Koissy-Kpein (2007) also found the component "mother is more educated than father" significant and positive for girl's participation at school. The author also notes that the effect of this component is higher for girls compare to boys in

Ghana. This confirms our results; however the study by Koissy-Kpein (2007) reveals that the component is not significant for boys and girls in Côte d'Ivoire.[14]

Concerning a mother's activity (work on own land or outside the household), the results suggest that children's participation is an increasing component of mother's activity. We note that the significance of this component for boys' and girls' participation varies depending on the use of the component "mother's education" (tables 4–5) or "mother is more educated than father" (tables 10–11). This variation can be due to the endogeneity of the mother's activity since this component can be correlated with children's participation in school. We maintain that girls' participation increases with mothers' activity in Benin, Ethiopia, Ghana, Kenya, Burkina Faso, Cameroon, Liberia, Madagascar, Mali, and Mozambique (representing 10 of 19 countries). This means that a mother's autonomy or economic independence is an increasing component of girls' schooling. This effect is greater on girls' education than that of boys in Burkina Faso, Ethiopia, Kenya, Liberia, and Mozambique. In Mozambique, mothers' economic independence increases the probability of girls' participation in education by 4.8%, while the effect is not significant for boys' participation. In Ghana, mothers' economic independence increases the probability of girls' participation in school by 9.8%, and for that of boys, 6.5%.

For basic results, we note that the probability of school participation increases with age of children, boys and girls, in all the countries. As expected, girls have a lower probability than boys to go to school, except in Ghana, Liberia, Madagascar, and Malawi. For example, the results suggest that boys in Benin and Burkina Faso have a 13.8% greater chance to go to school than girls. The elasticity is higher in Côte d'Ivoire and Guinea, where boys have 22.8% and 22.9%, respectively, greater chance to go to school than girls. On similar grounds, children in urban areas have a higher probability of going to school than children in rural areas, except in Congo Brazza, Ghana, Kenya, and Lesotho. In Burkina Faso, a child from an urban area has 78.6% greater chance to go to school than a child from a rural area.

The results also suggest that father's education is an increasing component of participation in school, except for boys' participation in Ghana and girls' participation in Lesotho. The effect of father's education is greater on girls' schooling than on that of boys in 12 of 19 countries: Benin, Burkina Faso, Cameroon, Congo rep., Côte d'Ivoire, Guinea, Ethiopia, Kenya, Ghana, Mali, Mozambique, and Senegal.

Concerning sibling rivalry and the hypothesis of the quantity-quality model, the results provide interesting insights into gender inequality and preference for gender of offspring. The results suggest that children with older sisters have a greater probability of going to school in Benin, Burkina Faso, Cameroon, Ethiopia, guinea, Malawi (girls only), Mali, Niger, and Senegal (girls only), and this probability increases with the number of sisters, whereas children with older brothers have less probability of going to school in Burkina Faso, Cameroon, Congo Rep., Ethiopia, Ghana (boys only), and Lesotho (girls only), and this probability decreases with the number of brothers.

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[14] The study is based on Living Standard Measurement Surveys (LSMS) of the World Bank.

We also note for Burkina Faso, Congo Rep., Côte d'Ivoire, Ethiopia, Ghana, Kenya, and Madagascar that girls with younger brothers have a lower probability of going to school, and this probability decreases with the number of younger brothers. This result can be due to both the fact that girls take care of the younger children and the preference for boys' education. For girls, it is better to have older sisters in Benin, Burkina Faso, Cameroon, Guinea, Malawi, Mali, Niger, and Senegal. These results concerning sibling rivalry suggest a preference for boys' education. It is better for children's participation in school to have sisters than brothers. The results confirm the assumptions of the quantity-quality model: a child with only sisters receives a higher investment than a child with only brothers. The results reveal a parental preference for boys' education, but we cannot say that this preference is due to strategic or efficient behavior.

Children's participation in school is an increasing component of household wealth. The richer the household, the more likely the children will attend school. For Namibia, the second and third quintile are negative and significant for children and girls, but not significant for boys. For Cameroon, the component is not significant for boys, and for Ghana, the component is significant only for the third quintile (children and boys) and non significant for girls' estimation. These results can be due to the calculation of household wealth, but since the results are debatable in only 7 cases out of 57 (19 countries and 3 estimations by country), we do not question this mode of calculation.

To conclude this part, we note that mothers' empowerment in terms of education and labor market participation is favorable to girls' (and children's) schooling since girls (and children) have a greater probability of attending school when the mother is educated, is more educated than the father, or works outside the household or on her own land.

Table 3. Probit estimation for children's participation in school with traditional measures of empowerment

	Benin	Burkina	Came-roon	Congo B	Congo R	Cote d'Ivoire	Ethiopia	Ghana	Guinea	Kenya	Lesotho	Liberia	Mada-gascar	Malawi	Mali	Mozam-bique	Namibia	Niger	Senegal
Mother's education	0.032+	0.077+	0.019+	0.006+	0.019+	0.047+	0.028+	0.005*	0.068+	0.012+	0.014+	0.030+	0.016+	0.020+	0.050+	0.050+	0.014+	0.065+	0.029+
Mother's activity	0.140+	0.055	0.021**	0.011	-0.009	0.018	0.212+	0.057+	-0.059*	0.047+	0.021*	0.043	-0.004	-0.002	0.080+	-0.011	0.023	-0.033	0.054*
Age	0.596+	1.465+	0.244+	0.195+	0.604+	1.037+	1.115+	0.064	0.856+	-0.018	0.411+	-6.469+	0.447+	0.262+	0.867+	0.535+	-0.014	1.062+	0.818+
Age2	-0.044+	-0.107+	-0.017+	-0.014+	-0.040+	-0.083**	-0.067+	0.000	-0.061+	0.005	-0.030+	0.670+	-0.034+	-0.016+	-0.058+	-0.031+	0.007	-0.079+	-0.059+
Age3	0.001+	0.002+	0.000+	0.000**	0.001+	0.002**	0.001+	-0.000	0.001**	-0.000**	0.001+	-0.022+	0.001+	0.000	0.001+	0.000**	-0.000	0.002**	0.001+
Older brothers	0.011	-0.069+	-0.003	0.010*	-0.025+	0.019*	-0.059+	-0.005	0.008	0.004	-0.006	-0.042	-0.005	-0.006	-0.001	-0.004	-0.006	0.001	0.002
Older sisters	0.027+	0.096+	0.020+	0.001	-0.015*	0.007	0.027**	0.002	0.055**	0.002	-0.002	-0.082+	0.009	0.008	0.051+	-0.007	0.013	0.096+	0.026
Younger brothers	-0.018+	-0.037*	0.004	0.009**	0.002	0.010	-0.035+	-0.011	-0.026	-0.001	-0.006	-0.017	-0.010**	0.000	0.005	-0.003	-0.000	-0.011	0.037+
Younger sisters	-0.022+	-0.010	0.014+	0.003	-0.000	-0.000	-0.012	-0.005	0.002	0.002	-0.020+	0.018	-0.014+	0.001	0.025**	-0.008	0.005	-0.023	-0.001
Female	-0.138+	-0.138+	-0.033+	-0.017**	-0.100+	-0.228+	-0.075+	-0.005	-0.229+	-0.022+	0.082+	-0.005	-0.000	-0.002	-0.146+	-0.096+	0.026*	-0.295+	-0.082+
Father's education	0.036+	0.087+	0.013+	0.006+	0.021+	0.083+	0.057+	0.006+	0.036+	0.013+	0.004**	0.019+	0.014+	0.011+	0.068+	0.039+	0.010+	0.073+	0.064+
Urban	0.072+	0.786+	0.017*	-0.008	0.064+	0.381+	0.416+	-0.003	0.577+	-0.013	0.015	0.110*	0.023**	0.049+	0.431+	0.101+	0.033*	0.524+	0.196+
2nd quintile	0.087+	0.221+	0.000	0.024**	0.074+	0.016		-0.001	-0.042	0.047+	0.055+	0.250+	0.047+	0.065+	0.124+	0.058+	-0.041**	0.126**	0.084**
3rd quintile	0.201+	0.474+	0.040+	0.038+	0.122+	0.118	0.294+	0.070**	0.084*	0.047+	0.079+	0.162**	0.123+	0.087+	0.264+	0.108+	-0.045**	0.195+	0.171+
4th quintile	0.300+	0.899+	0.019	0.054+	0.210+	0.096	0.511+	-0.036	0.363+	0.017	0.115+	0.314+	0.138+	0.130+	0.622+	0.173+	-0.047	0.607+	0.291+
R^2	18.00	24.58	26.74	15.97	17.96	19.09	18.14	11.66	23.35	30.14	22.50	32.65	32.82	14.81	18.37	19.56	20.76	20.57	16.30
N	8583	4705	4291	2912	6072	1283	11208	2088	3206	4591	3532	3251	5507	7131	8199	6324	1947	4841	4003

$*P < 0.10, **P < 0.05, + P < 0.01$

Table 4. Probit estimation for boys' participation in school with traditional measures of empowerment

	Benin	Burkina	Came-roon	Congo B	Congo R	Cote d' Ivoire	Ethiopia	Ghana	Guinea	Kenya	Lesotho	Liberia	Mada-gascar	Malawi	Mali	Mozam-bique	Namibia	Niger	Senegal
Mother's education	0.035+	0.085+	0.016+	0.005+	0.012+	0.032**	0.026**	0.006*	0.060+	0.009+	0.024+	0.025**	0.013+	0.019+	0.035+	0.037+	0.015+	0.056+	0.021*
Mother's activity	0.144+	0.029	0.030**	0.003	-0.009	0.106	0.189+	0.051*	-0.108+	0.041+	0.027	0.023	-0.000	0.013	0.098+	-0.028	0.049**	-0.004	0.086**
Age	0.451+	1.771+	0.305+	0.131*	0.524+	1.275+	0.863+	0.020	0.745+	0.024	0.589+	-5.704+	0.456+	0.213**	0.984+	0.517+	-0.082	1.013+	0.731+
Age2	-0.032+	-0.136+	-0.022+	-0.009	-0.035+	-0.109+	-0.046+	0.003	-0.051**	0.002	-0.043+	0.592+	-0.034+	-0.011	-0.067+	-0.031+	0.014	-0.072**	-0.050**
Age3	0.001+	0.003+	0.000+	0.000	0.001+	0.003+	0.001	-0.000	0.001*	-0.000	0.001+	-0.020+	0.001+	0.000	0.001**	0.001*	-0.001	0.001*	0.001
Older brothers	0.002	-0.094+	-0.003	0.002	-0.027+	0.032**	-0.088+	-0.023*	0.021	0.007	-0.001	-0.047	-0.004	-0.009	-0.011	-0.007	-0.011	0.011	0.004
Older sisters	0.016	0.104+	0.011	0.003	-0.009	0.030	0.045**	0.017	0.033	-0.002	-0.007	-0.112+	0.009	0.000	0.027	-0.002	0.022	0.053*	0.005
Younger brothers	-0.016**	0.004	0.004	-0.000	0.015*	0.031+	-0.028**	0.011	-0.013	0.006	-0.018*	-0.015	-0.006	0.003	0.011	0.009	0.005	0.001	0.027
Younger sisters	-0.015**	-0.044	0.013**	-0.000	0.014*	0.016	0.002	0.007	0.006	0.005	-0.043+	0.030	-0.012*	0.008	0.023	-0.008	-0.003	-0.017	-0.012
Father's education	0.030+	0.087+	0.011+	0.006+	0.018+	0.063+	0.058+	0.003	0.029+	0.014+	0.007**	0.024+	0.016+	0.013+	0.064+	0.036+	0.009+	0.070+	0.058+
Urban	0.041**	0.724+	0.007	-0.020	0.029	0.272+	0.415+	-0.006	0.488+	0.003	0.036	0.081	0.017	0.060**	0.420+	0.047**	0.014	0.435+	0.200+
2nd quintile	0.041**	0.250+	-0.020	0.030**	0.044*	-0.004		0.000	-0.024	0.053+	0.123+	0.264+	0.051+	0.059+	0.129+	0.068+	-0.032	0.158**	0.102**
3rd quintile	0.157+	0.526+	0.030	0.030*	0.115+	0.289+	0.261+	0.134+	0.073	0.055+	0.146+	0.145	0.133+	0.083+	0.262+	0.084+	-0.028	0.155**	0.190+
4th quintile	0.198+	0.803+	0.002	0.050**	0.195+	0.317**	0.438+	0.021	0.325+	0.034	0.143+	0.278**	0.203+	0.108+	0.639+	0.163+	-0.041	0.561+	0.256+
R²	16.66	23.17	24.56	15.81	16.56	18.34	17.92	11.34	21.38	25.97	22.75	32.45	33.58	13.76	18.25	17.18	18.26	18.60	15.11
N	4708	2561	2191	1472	3155	690	5951	1076	1656	2423	1816	1684	2854	3643	4367	3321	975	2581	2076

*P < 0.10, **P < 0.05, + P < 0.01

Table 5. Probit estimation for girls' participation in school with traditional measures of empowerment

	Benin	Burkina	Came-roon	Congo B	Congo R	Cote d' Ivoire	Ethiopia	Ghana	Guinea	Kenya	Lesotho	Liberia	Mada-gascar	Malawi	Mali	Mozam-bique	Namibia	Niger	Senegal
Mother's education	0.031+	0.071+	0.022+	0.007+	0.027+	0.076+	0.030**	0.005	0.081+	0.012+	0.005*	0.036+	0.018+	0.021+	0.069+	0.066+	0.011+	0.077+	0.039+
Mother's activity	0.129+	0.077	0.011	0.019	-0.006	-0.092	0.239+	0.067**	0.006	0.052+	0.013	0.064	-0.009	-0.016	0.060	0.011	0.005	-0.066	0.015
Age	0.821+	1.071**	0.173**	0.262+	0.617+	0.765	1.391+	0.103	0.953**	-0.060	0.276+	-7.382+	0.424+	0.270+	0.679**	0.504+	0.038	1.120**	0.944+
Age2	-0.064+	-0.070*	-0.012*	-0.019**	-0.038+	-0.053	-0.088+	-0.002	-0.068*	0.008	-0.019+	0.763+	-0.032+	-0.016**	-0.043*	-0.026*	0.001	-0.087**	-0.071+
Age3	0.002+	0.001	0.000	0.000**	0.001*	0.001	0.002+	-0.000	0.001	-0.000**	0.000**	-0.025+	0.001+	0.000	0.001	0.000	-0.000	0.002*	0.002**
Older brothers	0.022**	-0.038	-0.002	0.018**	-0.024**	-0.016	-0.026	0.027*	-0.007	0.001	-0.010*	-0.038	-0.004	-0.002	0.009	0.001	0.000	-0.010	-0.003
Older sisters	0.044+	0.075*	0.031+	-0.002	-0.021	0.013	0.008	-0.019	0.072*	0.006	0.001	-0.042	0.009	0.019**	0.081+	-0.013	0.004	0.161+	0.051**
Younger brothers	-0.017	-0.093+	0.003	0.019+	-0.018*	-0.065**	-0.039**	-0.032+	-0.046	-0.008*	0.002	-0.020	-0.014**	-0.002	-0.005	-0.018	-0.005	-0.029	0.052**
Younger sisters	-0.035+	0.037	0.013**	0.005	-0.019*	-0.012	-0.027*	-0.017	-0.009	-0.001	-0.002	0.004	-0.016+	-0.005	0.025	-0.010	0.010	-0.029	0.016
Father's education	0.044+	0.090+	0.013+	0.006+	0.025+	0.111+	0.055+	0.010+	0.046+	0.012+	0.001	0.013*	0.012+	0.009+	0.072+	0.043+	0.010+	0.076+	0.072+
Urban	0.122+	0.861+	0.032**	0.005	0.110+	0.500+	0.425+	0.008	0.688+	-0.028**	0.004	0.144*	0.027*	0.037	0.449+	0.176+	0.045**	0.632+	0.196+
2nd quintile	0.161+	0.184**	0.020	0.015	0.113+	-0.008		0.003	-0.068	0.038+	0.004	0.230+	0.043+	0.068+	0.116**	0.043	-0.039**	0.074	0.064
3rd quintile	0.268+	0.419+	0.048+	0.043**	0.134+	-0.133	0.331+	-0.005	0.106	0.036**	0.029*	0.170*	0.109+	0.086+	0.261+	0.137+	-0.048**	0.258+	0.155**
4th quintile	0.433+	0.998+	0.043	0.056**	0.228+	-0.226	0.601+	-0.120	0.408+	-0.001	0.095+	0.347+	0.072*	0.149+	0.604+	0.180+	-0.042	0.673+	0.331+
R²	19.15	27.21	29.96	16.78	19.85	24.34	18.65	14.73	24.80	36.64	20.59	33.21	32.36	16.94	18.54	21.95	24.60	22.65	17.98
N	3875	2144	2100	1440	2917	593	5257	1012	1550	2168	1716	1567	2653	3488	3832	3003	972	2260	1927

*$P < 0.10$, **$P < 0.05$, + $P < 0.01$

B. ALTERNATIVE MEASURES OF WOMEN'S EMPOWERMENT

Alternative measures of mothers' empowerment refer to three groups of proxies and distinguish among mother's decisions for herself (power 1), mother's decisions for the household (power 2), and mother's access to mass media (power 3). We separately take into account the fact that mothers decide alone or decide with their partner. We also use weights when mother decides alone.

The results suggest that children are in a better situation when the mother decides for herself in Benin, Cameroon, Ethiopia, Ghana, Madagascar, Mali, Namibia, and Senegal (8 out of 16 countries in the study). In Ethiopia, one point for mother's decision for herself increases by 5.6% the probability of children's participation in school. The impact of decisions for herself is more significant than the impact of decisions for the household. Indeed, children have a higher probability of going to school when the mother decides for the household in Benin, Cameroon, and Mozambique. Concerning access to mass media, the results also suggest that mothers' access to media is an increasing component of school participation, except in Congo Brazza., Congo Rep., Lesotho, Malawi, Mozambique, and Namibia.

Concerning the effect of mothers' empowerment on girls' participation in school, we note for Benin, Burkina Faso, Cameroon, Ethiopia, Ghana, Guinea, and Mali (representing 7 out of 16 countries), that mother's decision for herself is an increasing component of girls' schooling, while the component "mother's decision for the household" is significant only in Mozambique. That means that the impact of mothers' autonomy is more significant for girls' schooling. Finally, mothers' access to mass media is an increasing component of girls' participation in Benin, Burkina Faso, Ethiopia, Ghana, Kenya, Liberia, Madagascar, Mali, Niger, and Senegal, representing 10 out of 16 countries. For the other countries, the component is positive but not significant (except in Niger), suggesting that propaganda campaigns for the education of girls on television or radio could have an impact through sensitization of mothers.

Table 6. Probit estimation for children's participation in school with alternative measures of empowerment

	Benin	Burkina	Came-roon	Congo B	Congo R	Cote d' Ivoire	Ethiopia	Ghana	Guinea	Kenya	Lesotho	Liberia	Mada-gascar	Malawi	Mali	Mozam-bique	Namibia	Niger	Senegal
Mother's education	0.030+	0.067+	0.017+	0.006+	0.019+	0.042+	0.022+	0.003	0.065+	0.011+	0.014+	0.026+	0.014+	0.020+	0.046+	0.049+	0.013+	0.059+	0.027+
Power1	0.014+	0.023	0.005*		-0.007		0.056+	0.021+	0.015	0.001	0.003		0.013+	0.001	0.050+	-0.007	0.013+	0.017	0.025+
Power2	0.020+	0.011	0.006*		0.007				0.004	0.005*	0.002		0.002	-0.004	-0.002	0.014+		-0.014	-0.015
Power3	0.034+	0.103+	0.007*	0.006	0.001	0.045*	0.068+	0.017**	0.031*	0.019+	0.001	0.069+	0.022+	-0.002	0.037+	-0.002	-0.005	0.093+	0.036+
Age	0.573+	1.474+	0.240+	0.194+	0.604+	1.057+	1.118+	0.044	0.846+	-0.027	0.412+	-6.478+	0.436+	0.263+	0.879+	0.533+	-0.004	1.082+	0.826+
Age2	-0.043+	-0.107+	-0.017+	-0.014+	-0.040+	-0.085**	-0.067+	0.002	-0.060+	0.006	-0.030+	0.671+	-0.033+	-0.016+	-0.059+	-0.031+	0.006	-0.081+	-0.059+
Age3	0.001+	0.002+	0.000+	0.000**	0.001+	0.002**	0.001+	-0.000	0.001**	-0.000**	0.001+	-0.022+	0.001+	0.000	0.001+	0.000**	-0.000	0.002+	0.001+
Older brothers	0.008	-0.067+	-0.005	0.010*	-0.025+	0.019*	-0.064+	-0.005	0.006	0.004	-0.006	-0.040	-0.005	-0.006	-0.003	-0.004	-0.006	-0.001	-0.000
Older sisters	0.026+	0.095+	0.019+	0.000	-0.015*	0.009	0.026*	0.002	0.053**	0.002	-0.002	-0.082+	0.008	0.009	0.046+	-0.008	0.014	0.094+	0.022
Younger brothers	-0.017+	-0.036	0.004	0.009*	0.002	0.010	-0.035+	-0.009	-0.026	-0.001	-0.006	-0.016	-0.008*	0.000	0.004	-0.002	-0.001	-0.013	0.036+
Younger sisters	-0.023+	-0.007	0.014+	0.002	0.000	0.000	-0.014	-0.006	0.003	0.001	-0.020+	0.020	-0.012+	0.001	0.025**	-0.008	0.006	-0.021	-0.001
Female	-0.138+	-0.139+	-0.033+	-0.018**	-0.100+	-0.231+	-0.072+	-0.006	-0.227+	-0.022+	0.082+	-0.007	-0.001	-0.002	-0.145+	-0.096+	0.028**	-0.298+	-0.086+
Father's education	0.037+	0.083+	0.012+	0.006+	0.021+	0.082+	0.056+	0.006+	0.035+	0.013+	0.003*	0.019+	0.014+	0.011+	0.066+	0.040+	0.010+	0.070+	0.064+
Urban	0.070+	0.719+	0.013	-0.012	0.065+	0.352+	0.368+	-0.011	0.547+	-0.015	0.015	0.073	0.018*	0.051+	0.405+	0.097+	0.035**	0.470+	0.181+
2nd quintile	0.081+	0.194+	0.000	0.022*	0.074+	0.009		-0.009	-0.052	0.038+	0.054+	0.220+	0.020	0.067+	0.090+	0.060+	-0.045+	0.064	0.067*
3rd quintile	0.194+	0.427+	0.036+	0.032**	0.122+	0.098	0.260+	0.053*	0.071	0.023	0.077+	0.127*	0.069+	0.089+	0.209+	0.110+	-0.045*	0.144+	0.131+
4th quintile	0.275+	0.776+	0.008	0.042**	0.210+	0.067	0.395+	-0.045	0.325+	-0.021	0.114+	0.232**	0.070**	0.134+	0.545+	0.173+	-0.047	0.483+	0.237+
R²	17.84	24.96	27.07	16.01	18.00	19.30	18.12	12.24	23.42	29.88	22.41	32.81	33.47	14.84	18.86	19.65	21.19	20.94	16.53
N	8583	4705	4291	2912	6072	1283	11208	2088	3206	4591	3532	3251	5507	7131	8199	6324	1947	4841	4003

*$P < 0.10$, **$P < 0.05$, + $P < 0.01$

Table 7. Probit estimation for boys' participation in school with alternative measures of empowerment

	Benin	Burkina	Came-roon	Congo B	Congo R	Cote d' Ivoire	Ethiopia	Ghana	Guinea	Kenya	Lesotho	Liberia	Mada-gascar	Malawi	Mali	Mozam-bique	Namibia	Niger	Senegal
Mother's education	0.032+	0.075+	0.014+	0.005+	0.012+	0.024	0.019*	0.005	0.055+	0.008+	0.023+	0.020*	0.011+	0.020+	0.032+	0.038+	0.015+	0.052+	0.018
Power1	0.009*	0.002	0.002		-0.020+		0.054+	0.018**	0.007	0.001	0.010		0.018+	0.000	0.047+	-0.010	0.020+	0.024	0.039+
Power2	0.024+	0.004	0.009**		0.015+				-0.005	0.005	0.001		0.003	-0.005	-0.001	0.007		-0.014	-0.014
Power3	0.034+	0.102+	0.013**	0.007	-0.009	0.064**	0.064+	0.007	0.048**	0.020+	-0.004	0.071**	0.027+	-0.002	0.038+	-0.004	-0.005	0.098+	0.026
Age	0.421+	1.785+	0.294+	0.132*	0.528+	1.322+	0.848+	0.015	0.761+	0.016	0.593+	-5.715+	0.439+	0.216**	0.981+	0.520+	-0.035	1.026+	0.749+
Age2	-0.029+	-0.137+	-0.021+	-0.009	-0.036+	-0.113+	-0.045+	0.004	-0.053**	0.003	-0.044+	0.593+	-0.032+	-0.012	-0.067+	-0.031+	0.010	-0.073**	-0.052**
Age3	0.001**	0.003+	0.000+	0.000	0.001+	0.003+	0.001	-0.000	0.001*	-0.000	0.001+	-0.020+	0.001+	0.000	0.001**	0.001*	-0.000	0.001*	0.001
Older brothers	-0.001	-0.092+	-0.006	0.002	-0.028+	0.031**	-0.092+	-0.024*	0.016	0.007	0.000	-0.044	-0.004	-0.009	-0.012	-0.006	-0.011	0.010	-0.001
Older sisters	0.015	0.104+	0.009	0.003	-0.008	0.033	0.045**	0.015	0.038	-0.001	-0.007	-0.112+	0.007	0.001	0.025	-0.003	0.024*	0.051*	-0.000
Younger brothers	-0.016**	0.003	0.003	-0.001	0.015*	0.031**	-0.030**	0.012	-0.017	0.005	-0.018*	-0.014	-0.004	0.003	0.011	0.011	0.004	0.000	0.026
Younger sisters	-0.016**	-0.043	0.013**	-0.001	0.015*	0.016	0.002	0.007	0.005	0.005	-0.044+	0.032	-0.010	0.008	0.023	-0.008	-0.001	-0.017	-0.010
Father's education	0.030+	0.085+	0.010+	0.006+	0.018+	0.064+	0.057+	0.003	0.027+	0.014+	0.006*	0.024+	0.015+	0.013+	0.062+	0.037+	0.009+	0.068+	0.058+
Urban	0.036**	0.675+	0.003	-0.023*	0.035	0.229+	0.374+	-0.009	0.462+	0.003	0.032	0.047	0.012	0.062**	0.396+	0.050**	0.013	0.380+	0.178+
2nd quintile	0.034*	0.213+	-0.019	0.028**	0.049**	-0.012		-0.002	-0.049	0.042+	0.126+	0.235+	0.014	0.062+	0.102+	0.072+	-0.043	0.095	0.091*
3rd quintile	0.150+	0.473+	0.023	0.023	0.118+	0.266+	0.229+	0.126+	0.038	0.028	0.147+	0.107	0.066**	0.086+	0.209+	0.088+	-0.030	0.104*	0.166+
4th quintile	0.183+	0.683+	-0.013	0.035	0.217+	0.265*	0.329+	0.022	0.247+	-0.011	0.152+	0.190	0.111**	0.112+	0.562+	0.171+	-0.043	0.426+	0.226+
R²	16.26	23.48	24.98	16.01	16.99	18.64	17.96	11.58	21.29	26.07	22.81	32.62	34.65	13.78	18.71	17.20	18.79	19.13	15.38
N	4708	2561	2191	1472	3155	690	5951	1076	1656	2423	1816	1684	2854	3643	4367	3321	975	2581	2076

*$P < 0.10$, **$P < 0.05$, + $P < 0.01$

Table 8. Probit estimation for girls' participation in school with alternative measures of empowerment

	Benin	Burkina	Cameroon	Congo B	Congo R	Cote d'Ivoire	Ethiopia	Ghana	Guinea	Kenya	Lesotho	Liberia	Madagascar	Malawi	Mali	Mozambique	Namibia	Niger	Senegal
Mother's education	0.028+	0.063+	0.021+	0.007+	0.027+	0.075+	0.025**	0.003	0.079+	0.013+	0.005*	0.032+	0.017+	0.021+	0.065+	0.065+	0.011+	0.070+	0.037+
Power1	0.021+	0.049**	0.007*		0.011		0.060+	0.026+	0.029*	0.001	-0.003		0.007	0.004	0.052+	-0.004	0.006	0.010	0.008
Power2	0.014*	0.021	0.002		-0.004				0.015	0.004	0.002		0.001	-0.003	-0.003	0.021**		-0.015	-0.018
Power3	0.032+	0.103+	0.001	0.005	0.017	0.017	0.075+	0.027+	0.006	0.017+	0.005	0.068*	0.016**	-0.000	0.037**	0.004	-0.004	0.085+	0.049+
Age	0.806+	1.035**	0.178**	0.263+	0.619+	0.751	1.418+	0.045	0.929**	-0.075	0.276+	-7.397+	0.417+	0.268+	0.692**	0.494+	0.031	1.155**	0.954+
Age2	-0.063+	-0.066	-0.012*	-0.019**	-0.038+	-0.052	-0.090+	0.002	-0.066*	0.010*	-0.019+	0.765+	-0.032+	-0.016**	-0.044*	-0.025*	0.002	-0.090**	-0.072+
Age3	0.002+	0.001	0.000	0.000**	0.001*	0.001	0.002+	-0.000	0.001	-0.00**	0.000**	-0.026+	0.001+	0.000	0.001	0.000	-0.000	0.002*	0.002**
Older brothers	0.020*	-0.038	-0.004	0.018**	-0.025**	-0.017	-0.032*	0.024	-0.006	0.002	-0.010*	-0.038	-0.004	-0.002	0.005	0.000	-0.000	-0.012	-0.004
Older sisters	0.042+	0.076*	0.030+	-0.002	-0.021	0.013	0.004	-0.017	0.070*	0.006	0.002	-0.044	0.008	0.018**	0.073+	-0.014	0.004	0.158+	0.049**
Younger brothers	-0.015	-0.091+	0.003	0.018+	-0.019*	-0.065**	-0.039**	-0.027**	-0.041	-0.007*	0.001	-0.020	-0.013**	-0.002	-0.006	-0.018	-0.005	-0.032	0.049**
Younger sisters	-0.035+	0.043	0.013**	0.005	-0.020*	-0.014	-0.031**	-0.019	-0.007	-0.002	-0.002	0.006	-0.015**	-0.006	0.025	-0.010	0.011	-0.027	0.014
Father's education	0.045+	0.084+	0.013+	0.006+	0.025+	0.108+	0.053+	0.010+	0.046+	0.012+	0.001	0.013*	0.011+	0.009+	0.071+	0.043+	0.009+	0.071+	0.071+
Urban	0.122+	0.762+	0.028**	0.000	0.101+	0.487+	0.367+	-0.004	0.656+	-0.033**	0.005	0.104	0.023*	0.037	0.422+	0.161+	0.048**	0.581+	0.187+
2nd quintile	0.156+	0.171**	0.020	0.014	0.107+	-0.023		-0.013	-0.060	0.033+	-0.001	0.198**	0.024	0.068+	0.076	0.041	-0.040**	0.017	0.042
3rd quintile	0.259+	0.384+	0.048+	0.038*	0.127+	-0.145	0.294+	-0.033	0.122	0.017	0.023	0.138	0.071**	0.086+	0.206+	0.132+	-0.047*	0.210**	0.100
4th quintile	0.401+	0.883+	0.041	0.047	0.196+	-0.244	0.473+	-0.147*	0.424+	-0.029	0.086+	0.270*	0.026	0.149+	0.523+	0.169+	-0.040	0.563+	0.253+
R²	19.23	27.79	30.26	16.67	19.95	24.27	18.57	15.81	25.09	35.62	20.57	33.35	32.65	16.91	19.01	22.13	24.82	22.87	18.27
N	3875	2144	2100	1440	2917	593	5257	1012	1550	2168	1716	1567	2653	3488	3832	3003	972	2260	1927

*$P < 0.10$, **$P < 0.05$, + $P < 0.01$

CONCLUSION

This paper uses DHS monogamous household data to highlight the link between mothers' empowerment and schooling of girls. The paper begins by illustrating the decision-making process concerning girls' and boys' schooling and considers a case in which father and mother bargain concerning sons and daughters according to their preferences. The assumptions of this model imply that less schooling of girls may be the result of lower empowerment of mothers in the decision-making process. In the analysis, mothers' empowerment is defined as the capacity of women to increase their own autonomy, to make or influence decisions. We compare, with an empirical analysis, indicators traditionally used in economic literature (education and labor market participation) with more fastidious indicators provided by the surveys. We build proxies by considering mothers' empowerment in decisions concerning themselves, their households, and their access to mass media. The results of our estimation suggest that mothers' empowerment in terms of education and labor market participation is favorable for girls' (and children's) education since girls (and children) have a greater probability of attending school when the mother is educated, more educated than the father, and/or working outside the household or on her own land. Indicators from DHS surveys provide additional information and reveal that children (and girls) are in a better situation when the mother makes decisions for herself. The results also suggest that access to mass media is an increasing component of children's education.

Our analysis is limited by the fact that it does not take into account dynamics of and changes in mothers' empowerment. For instance, the presence of another wife in polygamous societies may affect the bargaining power of the mother. Another example comes from Jejeebhoy (1991), who notes a dynamic relationship between the status of women and reproductive behavior in India at two successive stages. However, our conclusions can be justified by the fact that we have analyzed the decisions at a particular moment, taking into account empowerment at this time.

Another limitation of this analysis is that gender differences may be more obvious for older children (between 14 and 18 years old), since older children are socialized differently according to gender.

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Appendix

Household economic status

Concerning household economic status, the DHS surveys did not collect information on either household income or consumption expenditures; however, the surveys provide information about household ownership of various assets and goods and characteristics of the household dwelling. Various methods have been used with these kinds of data in the literature to provide information about household wealth conditions (see Filmer and Pritchett, 1998, for a review). We use information about possession of assets and goods and characteristics of household dwellings to create a proxy of household economic status. We use a weighted sum of number of durables owned. The weights are the proportion of households that do not own the good (asset or characteristic of household). This method simply reflects the scarcity of the asset. It assumes that the rarer the good, the more difficult it is to acquire and/or the more expensive, and it is reserved for privileged households. Finally, this method gives a more important weight to luxury goods and a weaker weight to goods owned by the larger masses and to goods of the first need. We construct quintiles based on distribution of the wealth index. Table 9 presents the proportion of households having each type of good: source of drinking water piped into the dwelling; flush toilet; electricity, radio, TV, refrigerator, bicycle, motorcycle, car, telephone; modern main floor material (parquet or polished wood, vinyl, ceramic, cement, carpet) in four countries of the study.

Table 9. Proportions of households having each type of good or asset in Burkina Faso, Niger, Mali and Senegal

	Burkina Faso	Niger	Mali	Senegal
source of drinking water: piped into dwelling	0.0308	0.0892	0.0688	0.1997
type of toilet facility: flush toilet	0.0162	0.0287	0.0257	0.2909
has electricity	0.1231	0.1702	0.1656	0.3980
has radio	0.6407	0.5509	0.6953	0.8637
has TV	0.1209	0.1210	0.2183	0.3520
has refrigerator	0.0459	0.0589	0.0414	0.1659
has bicycle	0.7704	0.1279	0.4327	0.1631
has motorcycle	0.2520	0.0807	0.2938	0.0695
has car/truck	0.0250	0.0388	0.0406	0.0595
has telephone	0.0328	0.0140	0.0422	0.1425
main floor material: Modern material	0.4165	0.2005	0.2254	0.5970

Probit estimation with the component "mother is more educated than father"

Table 10. Probit estimation of boys' participation in school with the component "mother is more educated than father"

	Benin	Burkina	Came-roon	Congo B	Congo R	Cote d'Ivoire	Ethiopia	Ghana	Guinea	Kenya	Lesotho	Liberia	Mada-gascar	Malawi	Mali	Mozam-bique	Namibia	Niger	Senegal
Age	0.491+	1.595+	0.272+	0.287+	0.440+	0.742**	0.786+	0.170*	0.584**	0.050	0.647+	-7.676+	0.644+	0.232+	0.739+	0.399+	-0.009	1.147+	0.694+
Father's education	0.040+	0.102+	0.022+	0.008+	0.022+	0.070+	0.064+	0.012+	0.039+	0.019+	0.019+	0.032+	0.027+	0.023+	0.073+	0.043+	0.019+	0.086+	0.066+
Urban	0.053+	0.825+	0.002	-0.026**	0.044**	0.188+	0.437+	0.021	0.515+	-0.010	0.036	0.152*	0.038**	0.052**	0.442+	0.085+	0.028	0.433+	0.197+
2nd quintile	0.068+	0.289+	-0.024*	0.037**	0.029	-0.063		0.027	0.017	0.062+	0.148+	0.270+	0.088+	0.063+	0.148+	0.071+	-0.020	0.132**	0.110+
3rd quintile	0.188+	0.484+	0.039**	0.074+	0.108+	0.146**	0.251+	0.045**	0.091**	0.088+	0.216+	0.178*	0.221+	0.096+	0.304+	0.099+	-0.019	0.208+	0.239+
4th quintile	0.295+	0.945+	0.044	0.076+	0.184+	0.249**	0.453+	-0.020	0.341+	0.084**	0.215+	0.334**	0.350+	0.159+	0.677+	0.223+	0.007	0.680+	0.279+
Mother's education	0.070+	0.071	0.055+	-0.011	0.021	0.212+	0.096+	0.058**	-0.020	0.061+	0.089+	0.000	0.057+	0.035**	0.057*	0.047+	0.083+	0.012	0.084**
Mother's activity	0.199+	0.118**	0.055+	0.024*	0.000	0.116*	0.207+	0.065**	-0.069*	0.065+	0.046**	0.073	0.048+	0.036+	0.124+	0.003	0.055**	0.073	0.115+
N	6874	3540	3244	2199	4199	1601	7645	3376	2272	3066	2620	2399	3642	4746	5596	4819	1500	3541	3030

Note: The other variables are age², age³, older brothers/sisters, younger brothers/sisters

Table 11. Probit estimation of girls' participation in school with the component "mother is more educated than father"

	Benin	Burkina	Came-roon	Congo B	Congo R	Cote d'Ivoire	Ethiopia	Ghana	Guinea	Kenya	Lesotho	Liberia	Mada-gascar	Malawi	Mali	Mozam-bique	Namibia	Niger	Senegal
Age	0.848+	1.008**	0.240+	0.169*	0.746+	0.237	1.361+	0.064	0.913**	0.016	0.326+	-7.790+	0.499+	0.330+	0.881+	0.430+	0.048	0.847**	1.071+
Father's education	0.052+	0.132+	0.031+	0.008+	0.032+	0.101+	0.070+	0.015+	0.062+	0.025+	0.005**	0.025+	0.026+	0.019+	0.093+	0.067+	0.017+	0.094+	0.082+
Urban	0.127+	0.881+	0.061+	0.019	0.147+	0.357+	0.462+	-0.008	0.667+	-0.046+	0.017	0.256+	0.056+	0.050**	0.465+	0.187+	0.005	0.698+	0.225+
2nd quintile	0.185+	0.195**	0.019	0.025*	0.104+	0.008		0.031	-0.086	0.072+	0.011	0.258+	0.078+	0.059+	0.138+	0.039	-0.018	0.064	0.075
3rd quintile	0.301+	0.451+	0.058+	0.069+	0.149+	0.017	0.291+	0.032	0.092	0.060+	0.046+	0.150	0.195+	0.089+	0.301+	0.135+	-0.007	0.253+	0.173+
4th quintile	0.559+	1.112+	0.079**	0.082+	0.296+	-0.009	0.542+	0.035	0.404+	0.008	0.090+	0.514+	0.205+	0.159+	0.691+	0.231+	0.014	0.808+	0.368+
Mother's education	0.067+	-0.032	0.066+	0.010	0.070+	0.114	0.133+	0.056**	0.214+	0.077+	0.007	-0.171**	0.061+	0.026*	0.154+	0.108+	0.057+	0.037	0.121+
Mother's activity	0.183+	0.169**	0.039+	0.016	0.011	0.043	0.261+	0.098+	0.088	0.111+	0.023*	0.142*	0.039+	0.001	0.116+	0.048**	0.023	0.010	0.054
N	5271	2907	3011	2040	3812	1366	6621	2971	2030	2728	2483	2207	3253	4390	4873	4247	1470	3012	2764

*$P < 0.10$, **$P < 0.05$, +$P < 0.01$

Note: The other variables are age², age³, older brothers/sisters, younger brothers/sisters