

Inequality of Pre-University Educational Opportunities in Egypt: An Empirical Analysis

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Abstract

*Fair distribution of educational opportunities among people means that individuals' **access to education doesn't depend on conditions beyond their control such as social class, religion, gender, place of birth or other parental characteristics.** This paper addresses the issue of inequality of educational opportunities for pre-university education in Egypt using Human Opportunity Index, based on the data of the Income, Expenditure and Consumption Survey 2014/2015 implemented by the Central Agency for Public Mobilization and Statistics. The paper also uses a logistic regression technique **to assess the factors that affect children's educational enrolment.** The paper presents several results, the most important one is that primary education in Egypt is fair and equal if compared to preparatory and secondary education in terms of providing educational services. The results of the Logistic Regression (LR) model show that there **are many significant variables that affect children's school enrolment** i.e. the educational level of the household head and the place of residence.*

Key words: *Equality of educational opportunity, human opportunity index, logistic regression, Egypt.*

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Introduction

“Improving education is of great importance to the public”, Biltagy (2019_a). Equality of educational opportunities affects the society as a whole, as it leads to improve productivity, increase production and competitiveness among all individuals in the community. Every child deserves an opportunity for good **education. If a child’s** access to education depends on some circumstances such as caste, religion, gender, place of birth, or other parental characteristics, then it leads to disparity in access based on circumstances which are beyond the control of a child, this unacceptable disparity (inequality of opportunity) needs to be measured and addressed.

Therefore, the main objective of this paper is to address the issue of inequality of educational opportunities for pre-university education in Egypt because of its significant impact on human capital, labour market, income levels and economic welfare. Biltagy (2019_b) found that the disparities in wages can be attributed to real differences in characteristics of individuals, mainly education, the sector of employment and experience.

The structure of the paper is as follows, first, it presents the literature review on the inequality of educational opportunities and then, it proposes the data description and the empirical analysis. Finally, the logistic regression model and the main results are introduced followed by the conclusion and the reference list.

Literature Review

The concept of equal educational opportunities is discussed in many studies focusing on the role of education in social, economic and political development (Mason, 2004, Ansalone, 2009, Ferreira and Gignoux, 2010, Brunori et al., 2011, Pignataro, 2012, Biltagy, 2012_a, 2012_b and Biltagy 2019_c). Some other studies focused on inequality in access to educational opportunities among different social and economic groups, and it was found that the government has a vital role in achieving equal opportunities, since it should provide equal educational chances for all citizens. It is noticed that developed countries are more fortunate in educational outcomes compared to developing countries (Tilak, 1979).

By studying the inequality of educational opportunities among children in some Latin American countries i.e. Brazil, Chile, Colombia, and Mexico, it was concluded that the level of parental education and the size of the family had a significant impact on the access of black and white children to education, whereas low family incomes had a major role in inequality in access to educational opportunities (Troche, 2010). Using the data of the Youth Survey 2009 and the Income, Expenditure and Consumption Survey for 2008/2009, it was found that the differences in financial resources and cultural background of the family had an influential role in the inequality in educational opportunities in the Egyptian educational system (World Bank, 2012).

Some studies focused on addressing the issue of education, but as a source of inequality, as education contributes to income inequality. Education was found to have a role in intergenerational inequality. Furthermore, a strong positive relationship between enrolment rates and the pattern of equal distribution of income was proved, as regression coefficients showed that there is an important significant relationship between the equitable provision of educational opportunities and their availability through the expansion of public investments in education and fair distribution of income. It was concluded that the enrolment rates in primary education had a vital effect on the interpretation of the pattern of income distribution for 40% of people with low-income, while the enrolment rates in secondary education affected 60% of individuals with middle and high incomes, which means that expansion in secondary

education has important repercussions on the re-distribution of incomes (Chenery et al., 1979 and Carneiro, 2008).

There is a considerable body of literature that deals with unequal educational opportunities. Most studies of inequality in opportunities are based on the Human Opportunity Index (HOI) proposed by Ferreira et al. (2008), which combines coverage and inequality of opportunity. Singh (2011) addressed inequality in access to primary education for Indian children, based on a set of circumstances such as gender, residence area (urban/ rural), household head type, per capita household expenditure and family size. He found that there is a difference in the inequality of educational opportunities among the different geographic regions in India. An improvement witnessed between 1992-1993 and 2005-2006 due to the low-level of inequality of opportunities in primary education, but there was still a significant difference among regions. Moreover, Singh et al. (2014) tried to measure the inequality of educational opportunities in completing primary and secondary education for males and females separately in India using data from the youth survey in India: Situation and Needs for 2006/2007, carried out by the International Institute for Population Sciences and the Population Council in cooperation with the Ministry of Health. The study was based on a set of factors i.e. mother and father educational attainment, the work status of parents, religion, place of residence and wealth index. It was found that unequal opportunities in the completion of secondary education are more than double the level of inequality of opportunities upon completion of primary education.

The inequality of educational opportunities in Turkey is measured by Ferreira and Gejnnox (2010) using the demographic and health survey data, they found that there are gender differences in enrolment between urban and rural, and there is an impact of wealth, parents' education and the number of children of the family on the likelihood of female enrolment in education. On the other hand, Owens and Candipan (2019) proposed the geospatial procedure in order to study the features of public schools serving high and low-income neighbourhoods in US metropolitan areas in 2013/2014. They argued that low-income neighbourhoods are served by schools with lower fiscal and social assets and lower student achievement compared to schools serving high-income neighbourhoods. Furthermore, these disparities are increased when metropolitan neighbourhoods are categorized by income.

Some other studies concentrated on analyzing the equality of opportunity in education in some Southeast Asian countries i.e. Bangladesh, Bhutan, Indonesia, Pakistan, the Philippines, Sri Lanka and Vietnam using the Human Opportunity Index. It was concluded that, the most important factors influencing the individual equal access to educational opportunities, especially in the primary level of education are the per capita household expenditure, the educational level of the household head and the residence area, (Son, 2012; Thai & Thu, 2015).

There are a few studies on unequal opportunities in Egypt, such as Ersado and Aran (2014), which examined the inequality of opportunities in Egypt, based on 2000-2008 demographic and health survey data and it found that Egypt has made significant progress in the availability and accessibility of basic services (water, sanitation, education, health and nutrition) for children. There has also been a marked improvement in favour of the poor, which has been translated into a decline in inequality of opportunity over the past decade. Moreover, the study ascertained that

family background, especially parents' education, wealth and geographical factors; affect the Egyptian children access to education. More specifically, father education is the most significant element explaining the variation in the enrolment rates in Egypt at both primary and secondary levels of education. The reasons of the lack of enrolment and the dropout rates of education for some young children (8-15 years) were examined in five Arab countries i.e. Egypt, Morocco, Algeria, Syria and Tunisia by analyzing the social, economic and cultural backgrounds using multilevel logistic regression (Smith, 2007). Also, Filmer (2005) tried to examine the impact of gender and standard of living on the access to education and educational attainment in forty-four countries, including Egypt. He concluded that there are gender gaps in the enrolment rates in urban and rural areas, and that the socio-economic situation is an important variable affecting the access to education.

To assess the inequality of educational opportunity in primary, preparatory, and secondary education in Egypt, between urban and rural areas and by regions the following null-hypothesis is tested:

H₀₁: There will be no statistically significant difference between children that are enrolled in education and those not enrolled in education due to; their gender; their age; their place of residence; the age of the head of the household; the gender of the head of the household; the level of education of the head of the household; the size of the family.

Method

The paper is based on the data of Egypt's Household Income, Expenditure and Consumption Survey (HIECS) 2015, provided by the Central Agency for Public Mobilization and Statistics (CAPMAS). The survey sample was 25000 households distributed as 45% for urban and 55% for rural areas on 24 periods (the period length is one week) with 1042 household per week in the first half of 2015, and the same households were visited in the second half of 2015.

The response rate was 95.9% and the survey data were collected by automatically integrated system using laptops in the household interview. The number of households surveyed was 23976 with 10967 in urban areas and 13009 in rural ones. The number of respondents was 102263 with 43940 were in urban areas and 58323 in rural regions (CAPMAS, 2015).

The paper uses the human opportunity index to assess the inequality of educational opportunity in primary, preparatory and secondary education in Egypt, between urban and rural areas and by regions. To test the null-hypothesis a logistic regression model is used to identify the main determinants that affect children school enrolment.

Human Opportunity Index (HOI)

The methodology uses the human opportunity index to assess the inequality of educational opportunity in primary, preparatory, and secondary education in Egypt, between urban and rural areas and by regions. The HOI measures the contribution of inequality of opportunities given the circumstance variables.

$$HOI = \bar{\pi}(1 - D)$$

$\bar{\pi}$ is the level of coverage

D measures the degree of inequality of opportunity, therefore $(1 - D)$ represents the equality of opportunity.

$$D = \frac{1}{2\bar{\pi}} \sum_{i=1}^n w_i \left| \hat{\pi}_i - \bar{\pi} \right|$$

n : The number of households.

W : Weight of the sample.

π_i : The percentage of people who have the access to the educational opportunities.

$\bar{\pi}$: The level of coverage. (source: Son, 2012).

Human opportunity index measures the state's progress towards the goal of providing equal opportunities for all individuals by determining the proportion of opportunities distributed unfairly. The value of the indicator improves when the coverage increases and the inequality decreases. It also helps the country and policymakers to develop the government programs targeting the most disadvantaged groups. (Velez, 2014).

It is calculated based on a set of variables like gender, age, place of residence, household head educational level, household head work status and region. It is calculated for primary school attendance for children aged (6-12 years) and preparatory and secondary school attendance for children aged (13-17 years).

Results

Inequality of Opportunity in Education

Table 1 illustrates that the overall coverage or a percentage of Egyptian children who do not suffer from unequal educational opportunities is 89.4%. Furthermore, 85.7% of educational opportunities are reasonably available. The difference indicator (D) demonstrates that there are 4.2% of the educational opportunities are not evenly allocated equitably among Children. Regarding the variations by urban and rural areas, the percentage of Egyptian children who do not suffer from unequal educational opportunities is 92.1% in urban areas compared to 87.7% in rural areas. The HOI shows that only 89% of urban children have reasonably available educational opportunities compared to 83.7% in rural areas. Moreover, 3.4% of educational opportunities are not allocated equitably among children in urban areas compared to 4.5% in rural areas and the difference in the HOI between urban and rural areas is 5.26%.

Table 1:
Human Opportunity Index for Education in Egypt (Percentage)

Areas	Overall Coverage (C)	HOI	Difference Indicator (D)	Difference in HOIs
Urban areas	92.1	89.0	3.4	
Rural areas	87.7	83.7	4.5	5.26
Total Egypt	89.4	85.7	4.2	

Source: Calculation based on HIECS 2015

Table 2 shows that the overall percentage of Egyptian children who do not suffer from unequal accesses to primary educational opportunities is 94.2% and 92.7% of those children can get primary educational opportunities based on equal opportunity principle, while 1.7% of primary educational opportunities are not evenly allocated equitably among children. Regarding the differences by areas, the percentage of Egyptian children who do not suffer from unequal primary educational opportunities is 95.6% in urban areas compared to 93.3% in rural areas. The HOI indicates that 94.2% of urban children have fair primary education opportunities compared to 91.8% in rural areas. Additionally, 1.4% of primary educational opportunities are not allocated equitably among children in urban areas compared to 1.6% in rural areas and the difference in the HOI between urban and rural is 2.4%.

Table 2:
Human Opportunity Index for Primary Education (6-12 Years)

Areas	Overall Coverage (C)	HOI	Difference Indicator (D)	Difference in HOIs
Urban areas	95.6	94.2	1.4	
Rural areas	93.3	91.8	1.6	2.4
Total Egypt	94.2	92.7	1.7	

Source: Calculation based on HIECS 2015

Table (3) presents the HOI for Preparatory/ Secondary Education (13-18 Years) in Egypt. It demonstrates that, compared to primary education, children in the preparatory and secondary levels suffer from a decline in the distribution of educational opportunities based on the equal opportunity principle and the HOI for primary education is higher than preparatory and secondary education. There are 83.6% of Egyptian children who do not suffer from unequal preparatory and secondary educational opportunities and 78.1% of secondary and secondary education is available based on the equal opportunity principle. Concerning urban and rural differences, the percentage of children with equal educational opportunities in preparatory and secondary level is 88.0% in urban areas compared to 80.5% in rural areas. The HOI clarifies that 83.3% of urban children have fairly opportunities of preparatory and secondary education and 5.3% of educational opportunities are not distributed equally among urban children, compared to 6.8% in rural areas. The urban-rural difference is 8.3%.

Table 3:
Human Opportunity Index for Preparatory/ Secondary Education (13-18 Years)

Areas	Overall Coverage (C)	HOI	Difference Indicator (D)	Difference in HOIs
Urban areas	88.0	83.3	5.3	
Rural areas	80.5	75.0	6.8	8.3
Total Egypt	83.6	78.1	6.6	

Source: Calculation based on HIECS 2015

Table (4) displays the regional differences in the distribution of educational opportunities for children in primary education. It is clear that the percentage of Egyptian children who do not suffer from unequal educational opportunities in primary education is larger in the urban governorates than rural ones. Urban governorates have the highest rates of access to primary education, followed by lower and upper urban. The highest percentage of educational opportunities that are not equally distributed is 2.1% in upper rural, followed by 1.6% in urban governorates.

Table 4:
Human Opportunity Index for Primary Education (6-12 Years) by Region

Areas	Overall Coverage (C)	HOI	Difference Indicator (D)	Difference in HOIs
Urban governorates	95.89	94.35	1.60	
Lower Urban	95.39	94.11	1.35	0.24
Lower Rural	94.84	93.81	1.10	0.3
Upper Urban	95.25	93.90	1.41	-0.09
Upper Rural	91.28	89.35	2.11	4.5
Frontier Urban	96.09	94.14	2.03	-4.8
Frontier Rural	28.70	28.70	0.00*	
Total	94.19	92.68	1.60	

* Due to small sample size.

Source: Calculation based on HIECS 2015

Table (5) presents the regional differences in the distribution of educational opportunities for children in preparatory and secondary education. The percentage of Egyptian children who do not suffer from unequal educational opportunities in preparatory and secondary education is greater in urban areas than in rural ones with 88.8% for lower urban and 86.8% for urban governorates. The percentage of children with equal educational opportunities in preparatory and secondary levels in upper urban is 85.02%, followed by lower urban with percentage of 84.53%. The highest percentage of educational opportunities that are not equally distributed is 7.3% in upper rural areas.

Table 5:
Human Opportunity Index for Preparatory/ Secondary Education (13-18 Years) by Region

Areas	Overall Coverage (C)	HOI	Difference Indicator (D)	Difference in HOIs
Urban governorates	86.83	81.28	6.39	
Lower Urban	88.80	84.53	4.81	-3.3
Lower Rural	84.42	79.40	5.94	5.1
Upper Urban	88.93	85.02	4.40	-5.6
Upper Rural	76.34	70.78	7.28	14.2
Frontier Urban	89.36	83.62	6.43	-12.8
Frontier Rural	78.42	72.97	6.95	10.7
Total	83.64	78.10	6.62	

Source: Calculation based on HIECS 2015.

Logistic Regression Model

$$P(y=1) = \frac{(\beta_0 + \beta_1 x_1 + \dots + \beta_k x_k)}{1 + (\beta_0 + \beta_1 x_1 + \dots + \beta_k x_k)} \quad (1)$$

Equation (1) represents the form of the logistic regression function that links the dependent variable in its binary form with the explanatory variables based on the logistic regression model presented by Gumusa and Chudgar (2016). The model takes the exponential form, to convert into a linear one; the logit function is used as shown in equation (2).

$$\ln \frac{p(y=1)}{1-p(y=1)} \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \dots + \beta_k x_k = \quad (2)$$

The binary variable is children school enrolment ($y = 1$ enrolled, $y = 0$ not enrolled).

The independent variables are:

X_1 Gender (Male=1, Female=2).

X_2 Age as a continuous variable.

X_3 Place of residence (Urban=1, Rural=2).

X_4 Household head's age as a continuous variable.

X_5 Household head's gender (Male=1, Female=2).

X_6 Family Size.

X_7 Household head's education grouped in 6 categories

(Illiterate is the reference group, X_{71} reads and writes, X_{72} primary/preparatory, X_{73} secondary, X_{74} above average, X_{75} university and above).

X_8 Average per capita household expenditure.

Logistic Regression Equation

$$\text{Log } y = 2.8015 - 0.1343 X_1 - 0.1544 X_2 - 0.2007 X_3 + 0.0098 X_4 + 0.3342 X_5 - 0.0455 X_6 + 0.6532 X_{71} + 0.8082 X_{72} + 1.6145 X_{73} + 2.0586 X_{74} + 2.3367 X_{75} + 0.00006 X_8$$

The model chi-square for the binary logistic model equals to 1397.22 and it is significant at the significance level $\alpha = 0.05$ ($p \leq 0.05$). (See table 6).

Table 6:
Goodness of fit test

Chi square	d.f	Sig.
1397.22	11	0.0000

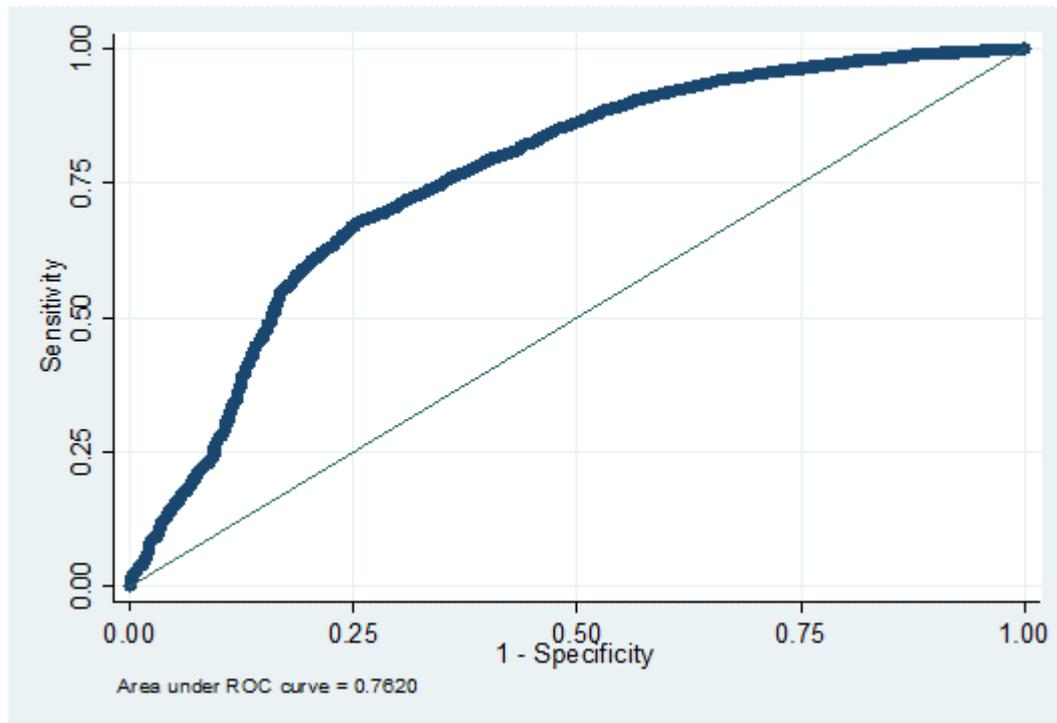
The goodness of fit is estimated by using two methods. The first is the classification table, and the second is the roc curve. The classification table as presented by table (7) indicates that the ability of the model to classify the cases correctly is about 89.37%, which means that the model is able to represent the data correctly.

Table 7:
The Classification table of Binary Logistic Regression

Observed	Predicted		Total
	Enrolled in education	Not enrolled in education	
Enrolled in education	13439	1596	15035
Not enrolled in education	4	8	12
Overall percentage			89.37

Regarding the Roc curve, the area under the curve can judge the validity of the model i.e. as this area approaches one, the model will be worthy. Figure (1) ascertains that the area under the Roc curve is about 0.8 which means that the model is praiseworthy.

Figure 1:
Roc Curve of Binary Logistic Regression



Binary Logistic Regression Analysis

According to the results of the analysis as shown in table 8, there are statistically **significant** ($p \leq 0.05$) effects of all independent variables on the dependent one i.e. the children's school enrolment.

The model only explains about 13.68% ($R^2 = 0.1368$) of the differences of children's enrolment in education. There is a noticeable effect on enrolment due to the gender of children. A male has a probability of being enrolled in education that is greater by (0.1343) than that of a female. There is a negative relationship between age and enrolment in education i.e. as age increases by one year, the probability of enrolment in education decreases by (0.1544). In addition, living in urban areas makes the probability of enrolment in education greater by 0.2007 than living in rural regions. Moreover, living in urban areas makes the probability of enrolment in education greater by 0.2007 than living in rural regions.

The results indicate that, if the household head is female, the probability of a child's enrolment in education is greater by 0.3342 than if the head of the household is male. Also, noticeable is a direct positive relationship between the age of the household head and the probability of enrolment in education, as the age of the household head increases by one year, the probability of enrolment in education increases by (0.0098).

Table 8:
Results of Binary Logistic Regression Model

Variable	B	Odds Ratio= Exp (B)	Standard error	Z	P > z]95% Conf. Interval]	
Gender (male / female)	-0.1343	0.8743	0.04888	-2.40	0.016	0.7836	0.9756
Age in complete years	-0.1544	0.8569	0.0071	-18.58	0.000	0.8430	0.8710
Residence (Urban / Rural)	-0.2007	0.8181	0.0529	-3.11	0.002	0.7208	0.9286
Type of household head (Male/ Female)	0.3342	1.3967	0.1217	3.84	0.000	1.178	1.657
Age of household head in complete years	0.0098	1.0099	0.0031	3.24	0.001	1.004	1.0159
Family size	-0.0455	0.9555	0.0154	-2.83	0.005	0.9259	0.9861
Educational status of household head							
Illiterate							
Reads and writes	0.6532	1.9217	0.1550	8.10	0.000	1.641	2.646
Primary and preparatory	0.8082	2.2439	0.1887	9.61	0.000	1.092	2.563
Secondary	1.6145	5.0254	0.4291	18.39	0.000	4.253	5.943
above average	2.0586	7.8351	1.7229	9.36	0.000	5.091	12.057
University and above	2.3367	10.3466	1.8169	13.31	0.000	7.334	14.597
Average per capita household expenditure	0.00006	1.000064	0.00001	5.74	0.000	1.000042	1.000086
Constant Term	2.8015	16.469	4.435	10.40	0.000	9.716	27.918

Pseudo R² = 0.1368

There is also a positive relationship between the educational level of the head of the family and children's enrolment in education. Where the head of the family reads and writes, the probability of enrolment in education is greater by (0,6532) than if the head of the family is illiterate, keeping other factors constant. If the head of the household has a primary or preparatory certificate, this also makes the probability of enrolment in education greater by 0.8082 than if the head of the household is illiterate. Moreover, where the head of the household has a secondary certificate this makes the probability of enrolment in education greater by (1,6145) than if the head of the household is illiterate. Also, if the head of the household has an above-average education certificate, this makes the probability of enrolment in education greater by (2,0586) than being illiterate. Likewise, if the head of the family holds a university education or higher, the probability of enrolment in education is greater by (2.3367) than being illiterate.

The results reveal that the larger the size of the family the less the probability of enrolment in education differs by 0.0455. Further, there is a positive correlation between the average per capita expenditure of the household and the enrolment in education, if the household per capita expenditure increases by one unit; the probability of enrolment in education also increases by 0.00006.

As there were statistically significant differences across the variables - *gender; age; place of residence; the age of the head of the household; the gender of the head of the household; the level of education of the head of the household; the size of the family* - the null-hypothesis is therefore rejected. In accordance with Popper's theory of falsification (Popper, 2002) under the scientific research paradigm the logic of the theory proposed in this study is not proven beyond reasonable doubt as there may be other variables

that impact upon the model. The R^2 of the model being only 13.68% confirms the limitations.

Conclusion

Consistent with the literature parental characteristics, especially parental education (Singh, 2011) can affect the overall development of the child. Moreover, parental education is highly correlated to the household wealth and size, which may indirectly affect the tendency of parents to send their children to schools (Gumus and Chudgar, 2016). The more educated the parents are, the more likely they will insist on their children completing the higher levels of schooling (Keng, 2004).

Furthermore, the results highlight the existence of a positive relationship between the average per capita expenditure of the household and the probability of enrolment in education. In addition, the results indicate that the larger the size of the family by one person the less the probability of enrolment in education. There is evidence from the literature that the **family size affects children's** education enrolment in many developing countries, especially for females, in which the cost of education is considered a challenge for families with a large number of children. In many countries, older children may drop out of school to join the labour market in order to financially help their families (Gumus and Chudgar, 2016). Also, many studies have shown an inverse relationship between the number of children in the family and the educational opportunities available for them due to the limited financial resources (Keng, 2004).

In summary, the results indicate that the main variables that affect the **probability of children's** enrolment in education are the household head's educational attainment level, the type of household head and the place of residence.

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