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# Assessing Inequalities of Opportunity in Education in Morocco: An Econometric Analysis

Fouzia Ejjanoui 

Department of Economics, FSJES, Sidi Mohamed Ben Abdellah University, Fes, Morocco  
Email: [fouzia.ejjanoui@usmba.ac.ma](mailto:fouzia.ejjanoui@usmba.ac.ma)

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## Abstract

This study examines the evolution of inequalities of opportunity in school access and educational attainment in Morocco between 1998 and 2014. It analyses how individual, household and parental circumstances shape children's educational trajectories using data from the ENNVN 1998–1999 and RGPH 2014. Two econometric approaches are applied: a probit model to estimate school enrolment and a right-censored ordered probit model to assess attainment levels. Focusing on children aged 12–19, predicted probabilities are used to identify the most and least advantaged profiles. The results show that children from advantaged backgrounds are significantly more likely to enrol and progress, while disadvantaged children face higher risks of non-enrolment and early dropout. Although disparities have slightly declined, they remain substantial. These findings highlight persistent opportunity gaps and the need for targeted, equity-oriented policies. Beyond socio-economic implications, educational inequality also affects environmental education and sustainability learning in Morocco. Unequal access to education may limit environmental literacy, climate awareness and the capacity of vulnerable populations to engage in sustainable practices, thereby constraining progress toward Sustainable Development Goal 4.7.

**Keywords:** Censored ordered probit model; education; Education for Sustainable Development; inequality of opportunity; Morocco

## Introduction

Education is widely recognised as a key driver of socio-economic development and social mobility, particularly in developing countries. In Morocco, expanding access to schooling has long been a central policy priority, with sustained efforts to reduce gender and socio-economic disparities in educational outcomes. Despite these advances, significant inequalities in both school access and educational attainment persist, reflecting deep-rooted structural constraints.

Beyond its socio-economic role, educational inequality also shapes unequal access to environmental knowledge and sustainability competencies. From an environmental education perspective, unequal access to schooling may constrain the development of sustainability-related competencies. This is particularly critical in contexts where vulnerable populations are also more exposed to environmental risks. In contexts such as Morocco, where exposure to climate risks is increasing, unequal schooling trajectories may translate into disparities in environmental awareness and adaptive capacity. From an Education for Sustainable Development (ESD) perspective, education is a key channel through which individuals acquire the knowledge, values and skills necessary to engage with environmental challenges (UNESCO, 2017; UNESCO, 2020).

As such, persistent inequalities in schooling may reinforce both social and environmental vulnerabilities, particularly among rural and low-income populations.

This paper adopts an inequality of opportunity framework (Roemer, 1998), which distinguishes between circumstances beyond individual control – such as gender, place of residence, parental education and household wealth – and effort-based outcomes. This perspective is complemented by the capabilities approach (Sen, 1999), which conceptualises education as a means of expanding individuals' freedoms, and by Bourdieu's theory of social reproduction (Bourdieu, 1986), which emphasises the intergenerational transmission of disadvantage. Together, these frameworks provide a structural lens through which educational inequalities can be understood, including their implications for sustainability-related capabilities.

Since independence, Morocco has implemented a series of reforms aimed at improving access to education and promoting equity, notably the National Charter for Education and Training (1999), the Emergency Programme (2009–2012) and the Strategic Vision 2015–2030. While these reforms have contributed to near-universal primary enrolment, significant challenges remain in terms of retention and equitable progression, particularly at the secondary level. Inequalities linked to gender, place of residence and socio-economic background continue to shape educational outcomes.

Empirical evidence consistently highlights the role of household resources, parental education, gender and residence in determining schooling outcomes, both in Morocco and internationally (e.g., Assaad *et al.*, 2019; Connelly & Zheng, 2003; Psacharopoulos & Arriagada, 1987). In Morocco specifically, studies confirm the importance of socio-economic background and school conditions in shaping educational performance (Ibourk, 2013; Liouaeddine *et al.*, 2017; Mourji & Abbaia, 2013). These factors reflect persistent inequalities of opportunity that influence children's educational trajectories over time.

Against this backdrop, this study analyses the evolution of inequality of opportunity in education in Morocco between 1998 and 2014 using nationally representative microdata (ENNVM 1998–1999 and RGPH 2014). It examines how individual and household characteristics affect both school enrolment and educational attainment and how these inequalities have evolved over time.

Although the primary focus of this study is educational inequality, its implications extend directly to environmental education and ESD. In contexts where access to schooling is unequal, opportunities to acquire environmental literacy, sustainability competencies and climate-related knowledge are also unevenly distributed. Consequently, disadvantaged populations may face a dual constraint: limited access to education and reduced capacity to engage with environmental challenges. This study therefore contributes to understanding the structural roots of unequal participation in sustainability learning, particularly in developing countries such as Morocco.

This paper contributes in three main ways. First, it provides a long-run comparative assessment (1998–2014) of inequality of opportunity in education using harmonised microdata. Second, it applies probit and right-censored ordered probit models to jointly analyse school access and educational attainment, offering a comprehensive perspective on educational trajectories. Third, it extends the analysis beyond traditional socio-economic determinants by linking educational inequalities to unequal opportunities in environmental and sustainability-related learning, thereby contributing to the literature on Education for Sustainable Development.

The remainder of the paper is organised as follows. Section Access to education and educational attainment: a brief literature review reviews the literature on the determinants of schooling and educational attainment. Section Overview of the Moroccan school system presents the Moroccan education system. Section Methodology outlines the econometric methodology. Section Data and explanatory variables describes the data. Section Descriptive statistics presents descriptive statistics. Section Empirical results discusses the empirical results, and Section Conclusion concludes.

## Access to education and educational attainment: a brief literature review

### ***Determinants of schooling and educational attainment***

The literature on the determinants of schooling and educational attainment overwhelmingly emphasises the central role of individual and family circumstances in shaping educational outcomes. Research conducted in Morocco confirms this pattern, showing that pupils' characteristics, household living conditions, and school environments are decisive factors influencing performance and progression (Ibourk, 2013; Liouaeddine *et al.*, 2017; Mourji & Abbaia, 2013). International studies provide consistent evidence that household economic resources are strongly associated with both school enrolment and the eventual level of education attained (Connelly & Zheng, 2003; Glewwe & Jacoby, 1994; Maitra, 2003; Psacharopoulos & Arriagada, 1987).

Numerous contributions also highlight persistent gender disparities, although findings remain mixed. While poverty tends to constrain girls' schooling more severely, improvements in household welfare frequently exert stronger positive effects on girls than on boys (Burney & Irfan, 1995; Dreze & Kingdon, 2003; Glick & Sahn, 2000; Handa, 2002; Lincove, 2009). Birth order has also been identified as an important determinant, with earlier-born children often receiving fewer educational investments in poorer households (Booth & Kee, 2009). The child's place of residence similarly constitutes a structural factor of inequality, with rural children – particularly girls – consistently disadvantaged relative to their urban counterparts (Dreze & Kingdon, 2003; Handa, 2002).

Parental education emerges as one of the most robust predictors of children's schooling, operating as a key mechanism for the intergenerational transmission of socio-economic status (Glick & Sahn, 2000; Haveman & Wolfe, 1995; Tansel, 1997). Most studies find a strong positive association between parents' education and both enrolment and attainment, although the Moroccan case reveals some nuances, notably weaker effects of mothers' education in certain contexts.

Broadly speaking, a large body of national and international research underscores the importance of factors such as gender, residence, household income, parental education and school infrastructure in shaping access to schooling and educational attainment. These predetermined circumstances generate persistent inequalities of opportunity that affect children's educational trajectories over time (UNICEF, 2017).

### ***Theoretical perspectives on educational inequality***

From a theoretical perspective, these empirical findings can be interpreted within the framework of inequality of opportunity (Roemer, 1998), which distinguishes between circumstances beyond individual control – such as family background, gender and location – and outcomes partly shaped by individual effort. Within this framework, educational inequalities are not merely the result of individual choices but reflect structural constraints that limit opportunities from the outset.

This perspective is closely related to the capabilities approach developed by Sen (1999), which conceptualises education not only as an investment in human capital but also as a fundamental means of expanding individuals' capabilities and freedoms. In this view, unequal access to education implies unequal opportunities to develop essential capabilities, including the ability to participate fully in social, economic and civic life.

Similarly, Bourdieu's theory of social reproduction (Bourdieu, 1986) highlights the role of cultural capital and intergenerational transmission mechanisms in perpetuating educational inequalities. Differences in family resources – economic, social and cultural – shape children's aspirations, learning conditions and academic success, thereby reinforcing existing social hierarchies across generations.

Taken together, these complementary frameworks provide a robust conceptual foundation for understanding how structural inequalities in initial conditions translate into unequal educational trajectories and outcomes over time.

### ***Education, inequality and sustainability capabilities***

In parallel to the literature on educational inequality, a growing body of research highlights the central role of education in fostering ESD. According to UNESCO (2017), inclusive and quality education is a fundamental condition for achieving sustainability goals, as it enables individuals to acquire the knowledge, skills, values and attitudes necessary to address environmental challenges. This perspective is reinforced by Sustainable Development Goal 4.7, which emphasises the importance of equipping all learners with competencies related to sustainable development, environmental protection and climate action.

The literature on ESD further emphasises that equitable access to quality education is a fundamental condition for developing sustainability competencies. Without inclusive educational systems, the distribution of environmental knowledge and adaptive capacities remains uneven, reinforcing existing social and environmental inequalities.

Several studies underline that education is a key driver of environmental awareness and pro-environmental behaviour. For instance, Filho *et al.* (2018) show that access to education significantly enhances individuals' capacity to understand and respond to environmental issues, particularly in developing countries. Similarly, Jucker (2011) argues that education systems play a crucial role in shaping sustainability-oriented values and behaviours, while Wals (2015) highlights the transformative potential of education in promoting critical thinking and sustainable lifestyles. Sterling (2001) further emphasises that education is not only a means of knowledge transmission but also a critical lever for societal transformation toward sustainability.

From a capabilities perspective, education expands individuals' ability to understand environmental risks, engage in sustainable practices and participate in environmental decision-making. However, inequalities in access to education may translate into unequal environmental capabilities. Disadvantaged populations – particularly those in rural or low-income contexts – often face a double constraint: limited access to formal education and reduced exposure to environmental learning opportunities (UNESCO, 2020). In such contexts, unequal educational opportunities may reinforce environmental vulnerabilities and limit individuals' capacity to respond effectively to climate-related challenges.

Despite this growing body of literature, empirical studies rarely integrate structural inequality frameworks with environmental education outcomes, particularly in the context of developing countries. While the determinants of educational inequality are well documented and the role of education in sustainability is increasingly recognised, the link between inequality of opportunity in education and unequal access to sustainability-related capabilities remains underexplored.

This study seeks to address this gap by combining an inequality of opportunity framework with an Education for Sustainable Development perspective. By doing so, it provides a more comprehensive understanding of how structural inequalities in education may translate into unequal participation in sustainability-oriented learning.

### **Overview of the Moroccan school system**

Education has long been regarded as a central pillar of Morocco's economic and social development strategy, and successive governments have prioritised expanding access to schooling. Since independence, the country has implemented successive reforms – including the 1999 National Charter for Education and Training, the 2009–2012 Emergency Plan and the Strategic Vision for Education 2015–2030 – aimed at universalising basic education, improving quality and

promoting equity. Measures such as the Tayssir conditional cash transfer programme and targeted initiatives to develop pre-schooling, rural education and girls' schooling have contributed to substantial gains in enrolment at both primary and secondary levels.

The current education system consists of pre-school and primary education, lower and upper secondary schooling and higher education. Primary enrolment is now nearly universal, with particularly strong progress in rural areas. Secondary education has also witnessed marked improvements, although urban–rural disparities persist (Table 1).

Despite these advances, the system continues to face structural challenges. Dropout remains a major concern, especially at the secondary level, and significant gender and spatial inequalities endure.

Overall, while reforms have expanded access and strengthened the institutional framework, school dropout continues to impede educational progress (Table 2). Understanding the underlying determinants of these persistent disparities – particularly those linked to individual and family characteristics – remains essential for designing more effective education policies.

**Table 1.** Specific schooling rates (%) by level, area and gender<sup>1</sup>

| Area     | Gender       | Primary     |              | Lower secondary |             | Upper secondary |             |
|----------|--------------|-------------|--------------|-----------------|-------------|-----------------|-------------|
|          |              | 1999–2000   | 2018–2019    | 1999–2000       | 2018–2019   | 1999–2000       | 2018–2019   |
| Urban    | Boys         | 92.5        | 97.1         | 92.1            | 99.7        | 66.8            | 83.7        |
|          | Girls        | 87.4        | 97.0         | 77.7            | 99.4        | 53.6            | 87.8        |
|          | <b>Total</b> | <b>89.9</b> | <b>97.0</b>  | <b>84.9</b>     | <b>99.6</b> | <b>60.1</b>     | <b>85.7</b> |
| Rural    | Boys         | 76.3        | 103.9        | 44.7            | 87.0        | 14.0            | 47.9        |
|          | Girls        | 62.1        | 103.3        | 24.2            | 75.8        | 5.2             | 35.6        |
|          | <b>Total</b> | <b>69.5</b> | <b>103.6</b> | <b>34.8</b>     | <b>81.5</b> | <b>9.7</b>      | <b>41.9</b> |
| National | Boys         | 83.8        | 100.0        | 66.1            | 94.2        | 40.5            | 68.2        |
|          | Girls        | 74.2        | 99.7         | 49.9            | 89.3        | 30.3            | 65.5        |
|          | <b>Total</b> | <b>79.1</b> | <b>99.8</b>  | <b>58.1</b>     | <b>91.8</b> | <b>35.4</b>     | <b>66.9</b> |

<sup>1</sup>Percentage of the population of a specific age enrolled, whatever the educational attainment.

**Table 2.** School dropout rate (%) by level and gender

| Level           | Gender       | 2008–2009   | 2009–2010   | 2010–2011   | 2011–2012   | 2012–2013  | 2013–2014   | 2014–2015   | 2015–2016   |
|-----------------|--------------|-------------|-------------|-------------|-------------|------------|-------------|-------------|-------------|
| Primary         | Boys         | 4.1         | 2.8         | 2.4         | 2.5         | 1.2        | 1.8         | 1.9         | 1.5         |
|                 | Girls        | 5.2         | 3.9         | 3.8         | 4.0         | 2.7        | 3.4         | 4.0         | 2.4         |
|                 | <b>Total</b> | <b>4.6</b>  | <b>3.3</b>  | <b>3.1</b>  | <b>3.2</b>  | <b>1.9</b> | <b>2.5</b>  | <b>2.9</b>  | <b>1.9</b>  |
| Lower secondary | Boys         | 14.0        | 14.3        | 11.7        | 11.2        | 10.6       | 11.7        | 13.6        | 12.7        |
|                 | Girls        | 11.9        | 11.1        | 9.6         | 9.3         | 7.6        | 9.2         | 10.4        | 8.5         |
|                 | <b>Total</b> | <b>13.1</b> | <b>12.9</b> | <b>10.8</b> | <b>10.4</b> | <b>9.3</b> | <b>10.6</b> | <b>12.2</b> | <b>10.8</b> |
| Upper secondary | Boys         | 15.6        | 13.1        | 11.4        | 10.7        | 8.9        | 11.6        | 14.3        | 12.7        |
|                 | Girls        | 14.4        | 13.0        | 11.9        | 11.4        | 8.4        | 12.1        | 13.6        | 10.3        |
|                 | <b>Total</b> | <b>15.0</b> | <b>13.0</b> | <b>11.7</b> | <b>11.0</b> | <b>8.7</b> | <b>11.9</b> | <b>13.9</b> | <b>11.5</b> |

## Methodology

This study examines two key aspects of education in Morocco: school access and dropout rates. To investigate these outcomes, two variables were defined. The first is a binary indicator of school access, analysed using a Probit model. The second captures the highest educational level attained and is treated as an ordered categorical variable. Given that some children remain enrolled at the time of the survey, a Censored Ordered Probit (COP) model, following King *et al.*, (1987), is employed to account for censoring. This approach is consistent with econometric studies dealing with incomplete educational trajectories, where the final level of attainment is not fully observed at the time of data collection, as also highlighted in previous empirical work (Assaad *et al.*, 2019; Hisarciklilar, 2002).

Formally, let each child  $i$  have an unobservable (latent) continuous variable  $S_i^*$  representing the desired level of schooling. This latent variable is determined by a vector of explanatory variables  $S_i$ , as follows:

$$S_i^* = X_i'\beta + \varepsilon_i, \quad (1)$$

where  $\beta$  is an unknown parameter vector and  $\varepsilon_i$  is a random error term assumed to follow a normal distribution.

The observed schooling level  $S_i^*$  corresponds to the realised category of education for each child, depending on whether the child has completed or is still attending school, with currently enrolled children treated as *censored observations*. The empirical analysis was conducted on a subsample of individuals aged 12–19, for whom the highest level of education attained was upper secondary school.

For this population, the categorical variable  $S_i$  takes four possible values:

$$S_i = \begin{cases} 0 & \text{enrolled in primary but did not complete} \\ 1 & \text{Primary completed} \\ 2 & \text{Lower secondary completed} \\ 3 & \text{Upper secondary completed} \end{cases} \quad (2)$$

The relationship between the latent variable  $S_i^*$  and the observed categories  $S_i$  can then be defined by a series of threshold parameters  $\mu_j$ :

$$S_i = \begin{cases} 0 & \text{if } S_i^* \leq \mu_0 \\ 1 & \text{if } \mu_0 < S_i^* \leq \mu_1 \\ 2 & \text{if } \mu_1 < S_i^* \leq \mu_2 \\ 3 & \text{if } S_i^* > \mu_2 \end{cases} \quad (3)$$

The thresholds  $\mu_0, \mu_1, \mu_2$  mark the transition points between successive education levels, with  $\mu_{j+1} > \mu_j$ .

Assuming a normal distribution for the error term  $\varepsilon_i$ , the log-likelihood function can be written as:

$$\begin{aligned} \ln Li = & (1 - c_i) \ln [S_{i0} \phi(\mu_0 - \beta X_i) + S_{i1} [\phi(\mu_1 - \beta X_i) - \phi(\mu_0 - \beta X_i)] \\ & + S_{i2} [\phi(\mu_2 - \beta X_i) - \phi(\mu_1 - \beta X_i)] + S_{i3} [1 - \phi(\mu_2 - \beta X_i)] \\ & + c_i \ln [S_{i0} \phi(\mu_0 - \beta X_i) + S_{i1} [\phi(\mu_1 - \beta X_i) - \phi(\mu_0 - \beta X_i)] \\ & + S_{i2} [\phi(\mu_2 - \beta X_i) - \phi(\mu_1 - \beta X_i)] + S_{i3} [1 - \phi(\mu_2 - \beta X_i)] \end{aligned} \quad (4)$$

where  $c_i$  is a binary indicator equal to 1 if the observation is censored (child still in school) and 0 otherwise. The indicator  $S_{ik} = 1$  if  $S_i = k$ , and  $S_{ik} = 0$  otherwise, for  $k = 0, \dots, 3$ . The parameters  $\beta$  and thresholds  $\mu_0, \mu_1, \mu_2, \mu_3$  are estimated by maximum likelihood.

Once the parameters are estimated, the predicted probabilities of attaining each educational level can be derived as follows:

$$\hat{P}_r(S = 0) = \phi(\hat{\mu}_0 - \hat{\beta}X) \quad (5)$$

$$\hat{P}_r(S = 1) = \phi(\hat{\mu}_1 - \hat{\beta}X) - \phi(\hat{\mu}_0 - \hat{\beta}X) \quad (6)$$

$$\hat{P}_r(S = 2) = \phi(\hat{\mu}_2 - \hat{\beta}X) - \phi(\hat{\mu}_1 - \hat{\beta}X) \quad (7)$$

$$\hat{P}_r(S = 3) = 1 - \phi(\hat{\mu}_2 - \hat{\beta}X) \quad (8)$$

These estimated probabilities are then used to identify the most advantaged and the least advantaged children and to characterise educational inequalities according to individual and household-level determinants.

## Data and explanatory variables

### Data

This study utilises two datasets – the 1998–1999 National Survey of Household Living Standards (ENNVM) and the 2014 General Population and Housing Census (RGPH) – to examine the evolution of educational inequality in Morocco over a 15-year period of reforms and public programmes.

The analysis focuses on two outcomes: access to education and the highest level of education attained, specifically upper secondary. The subsample comprises individuals aged 12–19 whose highest completed or attainable education is upper secondary, and only children of the household head are included to maintain consistency between individual and household characteristics.

Based on these selection criteria, table 3 summarises the sizes and the distribution of the samples by gender and residence for both years.

**Table 3.** Sample sizes and distribution (%) by gender and place of residence (in 1998 and 2014)

|             | <i>All</i>     | <i>Male</i> | <i>Female</i> | <i>Urban</i> | <i>Rural</i> |
|-------------|----------------|-------------|---------------|--------------|--------------|
| ENNVM 98–99 | <b>5,673</b>   | 48.88       | 51.12         | 54.88        | 45.12        |
| RGPH 2014   | <b>436,263</b> | 57.22       | 42.65         | 57.30        | 42.70        |

### Explanatory variables

The models are estimated using a set of explanatory variables reflecting individual, household and parental characteristics, selected on the basis of theoretical insights, previous empirical research and data availability. At the individual level, three variables are included: sex (binary, with males as the reference), age (treated as categorical due to the narrow 12–19 age range) and birth order, constructed following Booth and Joo Kee's (2009) adjusted method.

Household characteristics comprise place of residence (urban as the reference), region (harmonised into seven macro-regions for 1998 and twelve economic regions for 2014), wealth level (measured using expenditure per capita deciles in 1998–1999 and an MCA-based wealth index decile structure in 2014) and household size, defined as the number of sons and daughters of the household head to capture sibship effects relevant to schooling investments.

Parental characteristics are directly observed for 1998–1999 but proxied by the attributes of the household head and spouse in 2014, as parental links cannot be identified in the census. Two variables are constructed: combined parental education (four categories, with both parents uneducated as the reference) and father’s employment status (wage earner as the reference, versus employer or self-employed). Mothers’ employment is excluded due to persistently low female labour force participation.

Descriptive statistics

This section provides a descriptive analysis of Morocco’s schooling outcomes, focusing on two key dependent variables: access to education and educational attainment, for the 12–19 age group in 1999 and 2014. By comparing the plausible age for completing each educational level with these variables, the analysis highlights substantial improvements over the period while revealing persistent inequalities.

National enrolment rates increased markedly from 71.37% in 1998 to 95.58% in 2014. Gender disparities in access have largely disappeared: by 2014, enrolment was nearly equal for boys (96.74%) and girls (94.32%). Gains were particularly pronounced in rural areas, where access rose from 51.29% to 91.51%, demonstrating the effectiveness of education-support measures. By age, near-universal enrolment was observed among 12-year-olds, regardless of gender or residence (Table 4).

Table 4. Distribution (%) by age, sex, localisation and school access (in 1998 and 2014)

| Age <sup>1</sup> | ENNVM 1998–1999 |       |        |       |       | RGPH 2014 |       |        |       |       |
|------------------|-----------------|-------|--------|-------|-------|-----------|-------|--------|-------|-------|
|                  | National        | Male  | Female | Urban | Rural | National  | Male  | Female | Urban | Rural |
| 12               | 78.11           | 85.31 | 70.67  | 93.16 | 61.96 | 97.27     | 97.80 | 96.73  | 98.81 | 95.33 |
| 15               | 71.61           | 82.67 | 60.46  | 86.68 | 53.46 | 96.07     | 97.38 | 94.71  | 98.89 | 92.47 |
| 19               | 66.99           | 77.70 | 56.45  | 85.12 | 45.16 | 94.01     | 95.41 | 92.15  | 98.18 | 87.41 |
|                  | 71.37           | 82.08 | 60.89  | 88.83 | 51.29 | 95.58     | 96.74 | 94.32  | 98.62 | 91.51 |

<sup>1</sup>I used only plausible transition ages from one level to another.

Educational attainment also improved substantially. In 1998, 46.86% of 12–19-year-olds had left school without a certificate, compared to 22.03% in 2014. Primary completion rose from 16% to 56%, while lower secondary completion among 15-year-olds remained limited at approximately 33% in 2014, indicating persistent dropout between primary and lower secondary levels, particularly in rural areas. Upper secondary completion for 18–19-year-olds increased from 6% in 1998 to 25% in 2014, though rural completion rates remained below 11%. Notably, girls outperformed boys at this level (33.77% versus 20.59%), reflecting improved persistence among female students (Table 5).

Table 5. Distribution (%) by age and educational attainment (in 1998 and 2014)

| Age <sup>1</sup> | ENNVM 1998–1999 |       |       |      | RGPH 2014 |       |       |       |
|------------------|-----------------|-------|-------|------|-----------|-------|-------|-------|
|                  | S0              | S1    | S2    | S3   | S0        | S1    | S2    | S3    |
| 12               | 84.40           | 15.60 | 0.00  | 0.00 | 44.53     | 55.47 | 0.00  | 0.00  |
| 15               | 37.45           | 58.37 | 4.18  | 0.00 | 16.02     | 51.73 | 32.25 | 0.00  |
| 19               | 31.80           | 37.62 | 24.51 | 6.07 | 17.40     | 28.21 | 28.21 | 26.17 |
|                  | 46.86           | 41.38 | 10.87 | 0.89 | 22.03     | 48.72 | 23.38 | 5.87  |

<sup>1</sup>I used only plausible transition ages from one level to another.

Furthermore, household wealth exhibits a strong positive association with schooling outcomes (Table 6). In 1998, only 46.08% of children from the poorest decile were enrolled, rising to 83.81% in 2014, while enrolment among the wealthiest decile approached universality. School dropout and upper secondary completion remain strongly stratified by wealth: in 2014, dropout among the poorest was 44.73% versus 3.20% among the richest, and upper secondary completion was eighteen times higher among the wealthiest (17.96% versus 1.13%). Parental education also plays a critical role: children with at least one parent educated to secondary or higher level were almost universally enrolled, while 92.46% of children with illiterate parents were not. Conversely, father's occupational status shows no consistent relationship with schooling outcomes.

**Table 6.** Distribution (%) by educational attainment and individual characteristics (in 1999 and 2014)

| Variables                                                                    | ENNVN 1998–1999  |                        |       |       |      | RGPH 2014        |                        |       |       |       |
|------------------------------------------------------------------------------|------------------|------------------------|-------|-------|------|------------------|------------------------|-------|-------|-------|
|                                                                              | Access to school | Educational attainment |       |       |      | Access to school | Educational attainment |       |       |       |
|                                                                              |                  | S0                     | S1    | S2    | S3   |                  | S0                     | S1    | S2    | S3    |
| <b>Localisation</b>                                                          |                  |                        |       |       |      |                  |                        |       |       |       |
| Urban                                                                        | 88.83            | 38.87                  | 45.70 | 14.21 | 1.22 | 98.62            | 12.81                  | 48.41 | 30.24 | 8.53  |
| Rural                                                                        | 51.29            | 62.75                  | 32.74 | 4.21  | 0.30 | 91.51            | 35.50                  | 49.17 | 13.36 | 1.98  |
| <b>Gender</b>                                                                |                  |                        |       |       |      |                  |                        |       |       |       |
| Male                                                                         | 82.08            | 45.33                  | 40.58 | 11.12 | 1.15 | 96.74            | 22.39                  | 50.26 | 22.60 | 4.75  |
| Female                                                                       | 60.89            | 48.00                  | 42.41 | 10.68 | 0.74 | 94.32            | 21.63                  | 47.00 | 24.25 | 7.11  |
| <b>Wealth Index (decile)</b>                                                 |                  |                        |       |       |      |                  |                        |       |       |       |
| 1 <sup>st</sup>                                                              | 46.08            | 66.32                  | 30.90 | 2.78  | 0.00 | 83.81            | 44.73                  | 44.86 | 9.28  | 1.13  |
| 2 <sup>nd</sup>                                                              | 50.46            | 64.42                  | 30.98 | 4.29  | 0.31 | 92.21            | 36.70                  | 48.76 | 12.78 | 1.76  |
| 3 <sup>rd</sup>                                                              | 69.35            | 56.16                  | 36.99 | 6.58  | 0.27 | 93.49            | 33.54                  | 50.76 | 13.89 | 1.82  |
| 4 <sup>th</sup>                                                              | 60.73            | 57.21                  | 35.58 | 6.98  | 0.23 | 95.99            | 28.90                  | 52.04 | 16.61 | 2.46  |
| 5 <sup>th</sup>                                                              | 76.69            | 50.00                  | 40.97 | 8.37  | 0.66 | 97.27            | 25.18                  | 52.61 | 19.17 | 3.04  |
| 6 <sup>th</sup>                                                              | 80.21            | 46.00                  | 42.00 | 10.89 | 1.11 | 98.36            | 17.69                  | 54.34 | 23.86 | 4.11  |
| 7 <sup>th</sup>                                                              | 81.63            | 43.95                  | 42.25 | 12.10 | 1.70 | 98.50            | 15.23                  | 53.12 | 26.41 | 5.24  |
| 8 <sup>th</sup>                                                              | 83.30            | 34.11                  | 50.70 | 14.49 | 0.70 | 99.04            | 9.47                   | 48.97 | 33.03 | 8.52  |
| 9 <sup>th</sup>                                                              | 88.07            | 36.75                  | 48.72 | 13.03 | 1.50 | 99.38            | 6.07                   | 44.50 | 37.53 | 11.90 |
| 10 <sup>th</sup>                                                             | 89.66            | 23.31                  | 48.24 | 26.29 | 2.17 | 99.47            | 3.20                   | 37.88 | 40.96 | 17.96 |
| <b>Parent's education</b>                                                    |                  |                        |       |       |      |                  |                        |       |       |       |
| Two parents have no level of education                                       | 63.83            | 52.18                  | 39.58 | 7.75  | 0.48 | 92.46            | 30.60                  | 48.68 | 17.46 | 3.26  |
| Two parents or at least one of the parents has the primary level             | 83.25            | 46.09                  | 42.86 | 10.22 | 0.83 | 97.76            | 19.24                  | 51.44 | 24.18 | 5.14  |
| Two parents or at least one of the parents has the lower secondary level     | 93.79            | 30.60                  | 47.00 | 20.19 | 2.21 | 98.26            | 15.03                  | 46.78 | 29.46 | 8.72  |
| Two parents or at least one parent has the upper secondary level or superior | 97.70            | 22.22                  | 45.45 | 28.96 | 3.37 | 99.12            | 7.24                   | 46.26 | 34.16 | 12.34 |
| <b>Father's activity</b>                                                     |                  |                        |       |       |      |                  |                        |       |       |       |
| Salaried                                                                     | 75.93            | 47.12                  | 39.83 | 11.89 | 1.16 | 93.98            | 26.39                  | 49.56 | 19.86 | 4.19  |
| Employer                                                                     | 65.09            | 46.42                  | 43.84 | 9.22  | 0.52 | 97.28            | 18.79                  | 49.15 | 25.33 | 6.73  |

Chi-square tests of independence confirmed that all considered explanatory variables – gender, residence, household wealth, parental education and others – are significantly associated with schooling outcomes. These findings support the inclusion of these variables in subsequent econometric analyses to formally quantify their effects on educational access and attainment.

## Empirical results

This section presents and interprets the empirical findings from two models: a simple probit model for school access and a censored ordered probit model for educational attainment. Explanatory variables were first analysed individually and then jointly, enabling the identification of the most and least advantaged children in terms of educational opportunities. The discussion draws on both the 1998 and 2014 datasets, highlighting consistent patterns and the evolution of inequalities over the 15-year period (Tables 7–10).

**Table 7.** Binary probit estimates of access to school (1998–1999)

|                                                                               | All                  | Localisation         |                      | Gender               |                      |
|-------------------------------------------------------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
|                                                                               |                      | Urban                | Rural                | Male                 | Female               |
| <b>Localisation (urban omit.)</b>                                             |                      |                      |                      |                      |                      |
| Rural                                                                         | −1.188***<br>(0.052) | −                    | −                    | −1.041***<br>(0.082) | −1.298***<br>(0.069) |
| <b>Gender (male omit.)</b>                                                    |                      |                      |                      |                      |                      |
| Female                                                                        | −0.759***<br>(0.046) | −0.538***<br>(0.085) | −0.858***<br>(0.056) | −                    | −                    |
| <b>Parent's education (two parents have no level of education omit.)</b>      |                      |                      |                      |                      |                      |
| Two parents or at least one of them has the primary level                     | 0.493***<br>(0.064)  | 0.525***<br>(0.111)  | 0.467***<br>(0.080)  | 0.584***<br>(0.102)  | 0.446***<br>(0.084)  |
| Two parents or at least one of them has the lower secondary level             | 0.899***<br>(0.147)  | 1.056***<br>(0.269)  | 0.826***<br>(0.188)  | 0.415**<br>(0.195)   | 1.330***<br>(0.228)  |
| Two parents or at least one of them has the upper secondary level or superior | 1.298***<br>(0.302)  | 1.036***<br>(0.311)  | (empty)              | (empty)              | 1.110***<br>(0.319)  |
| <b>Father's activity (salaried omit.)</b>                                     |                      |                      |                      |                      |                      |
| Employer                                                                      | 0.056<br>(0.050)     | 0.096<br>(0.087)     | 0.038<br>(0.066)     | 0.047<br>(0.075)     | 0.047<br>(0.069)     |
| <b>Household per capita expenditure decile (1<sup>st</sup> decile omit.)</b>  |                      |                      |                      |                      |                      |
| 2 <sup>nd</sup>                                                               | −0.033<br>(0.081)    | −0.032<br>(0.202)    | −0.015<br>(0.090)    | −0.035<br>(0.113)    | −0.001<br>(0.119)    |
| 3 <sup>rd</sup>                                                               | 0.187**<br>(0.083)   | 0.103<br>(0.199)     | 0.281***<br>(0.095)  | 0.143<br>(0.120)     | 0.269**<br>(0.120)   |
| 4 <sup>th</sup>                                                               | 0.379***<br>(0.086)  | 0.622***<br>(0.205)  | 0.310***<br>(0.099)  | 0.389***<br>(0.127)  | 0.413***<br>(0.122)  |
| 5 <sup>th</sup>                                                               | 0.549***<br>(0.092)  | 0.702***<br>(0.208)  | 0.485***<br>(0.108)  | 0.513***<br>(0.134)  | 0.608***<br>(0.130)  |
| 6 <sup>th</sup>                                                               | 0.634***<br>(0.096)  | 0.855***<br>(0.211)  | 0.554***<br>(0.116)  | 0.604***<br>(0.144)  | 0.706***<br>(0.133)  |
| 7 <sup>th</sup>                                                               | 0.698***<br>(0.100)  | 1.020***<br>(0.224)  | 0.543***<br>(0.120)  | 0.495***<br>(0.142)  | 0.895***<br>(0.143)  |

(Continued)

Table 7. (Continued)

|                             | All                  | Localisation        |                      | Gender               |                        |
|-----------------------------|----------------------|---------------------|----------------------|----------------------|------------------------|
|                             |                      | Urban               | Rural                | Male                 | Female                 |
| 8 <sup>th</sup>             | 0.901***<br>(0.123)  | 1.121***<br>(0.238) | 0.824***<br>(0.157)  | 0.864***<br>(0.195)  | 0.977***<br>(0.162)    |
| 9 <sup>th</sup>             | 0.816***<br>(0.125)  | 0.949***<br>(0.227) | 0.802***<br>(0.181)  | 0.585***<br>(0.189)  | 1.003***<br>(0.169)    |
| 10 <sup>th</sup>            | 0.971***<br>(0.188)  | 1.110***<br>(0.295) | 0.942***<br>(0.283)  | 1.419***<br>(0.491)  | 0.898***<br>(0.221)    |
| <b>Age (12 years omit.)</b> |                      |                     |                      |                      |                        |
| 13                          | −0.034<br>(0.089)    | 0.221<br>(0.181)    | −0.141<br>(0.104)    | 0.024<br>(0.138)     | −0.080<br>(0.119)      |
| 14                          | −0.183**<br>(0.088)  | −0.011<br>(0.165)   | −0.239**<br>(0.104)  | −0.106<br>(0.135)    | −0.241**<br>(0.118)    |
| 15                          | −0.346***<br>(0.091) | −0.312*<br>(0.160)  | −0.316***<br>(0.112) | −0.327**<br>(0.138)  | −0.367***<br>(0.123)   |
| 16                          | −0.391***<br>(0.091) | −0.096<br>(0.168)   | −0.510***<br>(0.111) | −0.335**<br>(0.140)  | −0.413***<br>(0.121)   |
| 17                          | −0.401***<br>(0.096) | −0.212<br>(0.169)   | −0.458***<br>(0.119) | −0.373***<br>(0.141) | −0.430***<br>(0.133)   |
| 18                          | −0.537***<br>(0.093) | −0.414**<br>(0.161) | −0.571***<br>(0.116) | −0.480***<br>(0.137) | 0.601***<br>(0.119)    |
| 19                          | −0.447***<br>(0.097) | −0.266<br>(0.171)   | −0.529***<br>(0.121) | −0.484***<br>(0.145) | −0.601***<br>(0.129)   |
| <b>Birth order</b>          | 0.171***<br>(0.061)  | 0.168<br>(0.105)    | 0.171**<br>(0.077)   | 0.053<br>(0.092)     | 0.260***<br>(0.084)    |
| <b>Number of siblings</b>   | −0.002***<br>(0.010) | −0.005*<br>(0.022)  | −0.001**<br>(0.012)  | −0.001**<br>(0.015)  | −0.0007***<br>(0.0148) |
| <b>Constant</b>             | 1.572***<br>(0.150)  | 1.031***<br>(0.303) | 0.576***<br>(0.162)  | 1.932***<br>(0.233)  | 0.602***<br>(0.199)    |
| <b>Number of obs.</b>       | <b>5,099</b>         | <b>2,706</b>        | <b>2,380</b>         | <b>2,474</b>         | <b>2,474</b>           |

Note: \*, \*\* and \*\*\* denote statistical significance at the 10%, 5% and 1% levels, respectively, based on *p*-values.

Table 8. Binary probit estimates of access to school (2014)

|                                                                          | All                  | Localisation         |                      | Gender               |                     |
|--------------------------------------------------------------------------|----------------------|----------------------|----------------------|----------------------|---------------------|
|                                                                          |                      | Urban                | Rural                | Male                 | Female              |
| <i>Localisation (urban omit.)</i>                                        |                      |                      |                      |                      |                     |
| Rural                                                                    | −0.400***<br>(0.012) | −                    | −                    | −0.275***<br>(0.017) | 0.504***<br>(0.016) |
| <i>Gender (male omit.)</i>                                               |                      |                      |                      |                      |                     |
| Female                                                                   | −0.330***<br>(0.008) | −0.049***<br>(0.016) | −0.446***<br>(0.010) | −                    | −                   |
| <i>Parent's education (two parents have no level of education omit.)</i> |                      |                      |                      |                      |                     |
| Two parents or at least one of them has the primary level                | 0.419***<br>(0.012)  | 0.249***<br>(0.020)  | 0.506***<br>(0.016)  | 0.392***<br>(0.018)  | 0.444***<br>(0.016) |

(Continued)

Table 8. (Continued)

|                                                                               | All                  | Localisation         |                      | Gender               |                      |
|-------------------------------------------------------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
|                                                                               |                      | Urban                | Rural                | Male                 | Female               |
| Two parents or at least one of them has the lower secondary level             | 0.315***<br>(0.014)  | 0.234***<br>(0.025)  | 0.341***<br>(0.017)  | 0.341***<br>(0.021)  | 0.300***<br>(0.018)  |
| Two parents or at least one of them has the upper secondary level or superior | 0.348***<br>(0.021)  | 0.216***<br>(0.027)  | 0.555***<br>(0.037)  | 0.302***<br>(0.030)  | 0.398***<br>(0.030)  |
| <b>Father's activity (salaried omit.)</b>                                     |                      |                      |                      |                      |                      |
| Employer                                                                      | 0.137***<br>(0.009)  | 0.032*<br>(0.016)    | 0.180***<br>(0.011)  | 0.094***<br>(0.013)  | 0.174***<br>(0.012)  |
| <b>Wealth Index (1 decile omit.)</b>                                          |                      |                      |                      |                      |                      |
| 2 <sup>nd</sup>                                                               | 0.388***<br>(0.013)  | 0.411***<br>(0.039)  | 0.376***<br>(0.014)  | 0.368***<br>(0.020)  | 0.413***<br>(0.017)  |
| 3 <sup>rd</sup>                                                               | 0.515***<br>(0.012)  | 0.374***<br>(0.039)  | 0.532***<br>(0.013)  | 0.518***<br>(0.019)  | 0.522***<br>(0.017)  |
| 4 <sup>th</sup>                                                               | 0.685***<br>(0.016)  | 0.540***<br>(0.041)  | 0.705***<br>(0.018)  | 0.634***<br>(0.025)  | 0.730***<br>(0.022)  |
| 5 <sup>th</sup>                                                               | 0.741***<br>(0.017)  | 0.540***<br>(0.035)  | 0.779***<br>(0.021)  | 0.696***<br>(0.026)  | 0.781***<br>(0.023)  |
| 6 <sup>th</sup>                                                               | 0.760***<br>(0.020)  | 0.591***<br>(0.033)  | 0.882***<br>(0.034)  | 0.622***<br>(0.028)  | 0.891***<br>(0.028)  |
| 7 <sup>th</sup>                                                               | 0.775***<br>(0.025)  | 0.578***<br>(0.038)  | 0.919***<br>(0.041)  | 0.679***<br>(0.036)  | 0.857***<br>(0.034)  |
| 8 <sup>th</sup>                                                               | 0.906***<br>(0.027)  | 0.726***<br>(0.038)  | 1.249***<br>(0.068)  | 0.743***<br>(0.037)  | 1.061***<br>(0.040)  |
| 9 <sup>th</sup>                                                               | 1.031***<br>(0.029)  | 0.898***<br>(0.040)  | 1.181***<br>(0.074)  | 0.927***<br>(0.042)  | 1.113***<br>(0.041)  |
| 10 <sup>th</sup>                                                              | 0.946***<br>(0.031)  | 0.871***<br>(0.040)  | 1.038***<br>(0.169)  | 0.799***<br>(0.042)  | 1.087***<br>(0.046)  |
| <b>Age (12 years omit.)</b>                                                   |                      |                      |                      |                      |                      |
| 13                                                                            | -0.068***<br>(0.018) | -0.062**<br>(0.031)  | -0.065***<br>(0.022) | -0.052*<br>(0.027)   | -0.081***<br>(0.025) |
| 14                                                                            | -0.149***<br>(0.018) | 0.027<br>(0.033)     | -0.225***<br>(0.02)  | -0.067**<br>(0.027)  | -0.215***<br>(0.024) |
| 15                                                                            | -0.194***<br>(0.018) | 0.039<br>(0.034)     | -0.288***<br>(0.021) | -0.088***<br>(0.027) | -0.274***<br>(0.024) |
| 16                                                                            | -0.321***<br>(0.017) | -0.056**<br>(0.032)  | -0.428***<br>(0.020) | -0.233***<br>(0.026) | -0.392***<br>(0.023) |
| 17                                                                            | -0.390***<br>(0.017) | -0.087***<br>(0.032) | -0.516***<br>(0.021) | -0.275***<br>(0.026) | -0.486***<br>(0.024) |
| 18                                                                            | -0.483***<br>(0.017) | -0.128***<br>(0.032) | -0.635***<br>(0.021) | -0.383***<br>(0.025) | -0.575***<br>(0.024) |
| 19                                                                            | -0.487***<br>(0.018) | -0.157***<br>(0.033) | -0.637***<br>(0.022) | -0.366***<br>(0.026) | -0.606***<br>(0.025) |
| <b>Birth order</b>                                                            | 0.056<br>(0.010)     | 0.127<br>(0.020)     | -0.027<br>(0.012)    | 0.078<br>(0.015)     | 0.033*<br>(0.014)    |

(Continued)

Table 8. (Continued)

|                           | Localisation        |                     |                     | Gender              |                     |
|---------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
|                           | All                 | Urban               | Rural               | Male                | Female              |
| <b>Number of siblings</b> | −0.060<br>(0.002)   | −0.045<br>(0.005)   | −0.062<br>(0.002)   | −0.055<br>(0.003)   | −0.065<br>(0.003)   |
| <b>Constant</b>           | 1.966***<br>(0.027) | 1.841***<br>(0.052) | 1.675***<br>(0.030) | 1.796***<br>(0.040) | 1.777***<br>(0.037) |
| <b>Number of obs.</b>     | <b>340,506</b>      | <b>189,863</b>      | <b>150,632</b>      | <b>178,490</b>      | <b>162,016</b>      |

Note: \*, \*\* and \*\*\* denote statistical significance at the 10%, 5% and 1% levels, respectively, based on *p*-values.

Table 9. Censored ordered probit estimates of educational attainment (1998–1999)

|                                                                               | Localisation         |                     |                    | Gender               |                      |
|-------------------------------------------------------------------------------|----------------------|---------------------|--------------------|----------------------|----------------------|
|                                                                               | All                  | Urban               | Rural              | Male                 | Female               |
| <b>Localisation (urban omit.)</b>                                             |                      |                     |                    |                      |                      |
| Rural                                                                         | −0.470***<br>(0.049) | –                   | –                  | −0.437***<br>(0.064) | −0.553***<br>(0.078) |
| <b>Gender (male omit.)</b>                                                    |                      |                     |                    |                      |                      |
| Female                                                                        | 0.034<br>(0.042)     | 0.096*<br>(0.051)   | −0.078<br>(0.079)  | –                    | –                    |
| <b>Parent's education (two parents have no level of education omit.)</b>      |                      |                     |                    |                      |                      |
| Two parents or at least one of them has the primary level                     | 0.004<br>(0.051)     | 0.046<br>(0.061)    | −0.138<br>(0.099)  | 0.084<br>(0.068)     | −0.095<br>(0.079)    |
| Two parents or at least one of them has the lower secondary level             | 0.328***<br>(0.079)  | 0.324***<br>(0.089) | 0.332*<br>(0.183)  | 0.354***<br>(0.111)  | 0.309***<br>(0.114)  |
| Two parents or at least one of them has the upper secondary level or superior | 0.697***<br>(0.097)  | 0.730***<br>(0.105) | −0.401<br>(0.391)  | 0.645***<br>(0.133)  | 0.772***<br>(0.146)  |
| <b>Father's activity (salaried omit.)</b>                                     |                      |                     |                    |                      |                      |
| Employer                                                                      | −0.102**<br>(0.044)  | −0.079<br>(0.054)   | −0.126<br>(0.084)  | −0.112*<br>(0.059)   | −0.094<br>(0.069)    |
| <b>Household per capita expenditure decile (1st decile omit.)</b>             |                      |                     |                    |                      |                      |
| 2 <sup>nd</sup>                                                               | 0.029<br>(0.111)     | 0.179<br>(0.196)    | 0.067<br>(0.140)   | −0.121<br>(0.134)    | 0.491**<br>(0.209)   |
| 3 <sup>rd</sup>                                                               | 0.119<br>(0.106)     | 0.239<br>(0.187)    | 0.194<br>(0.137)   | −0.015<br>(0.131)    | 0.554**<br>(0.194)   |
| 4 <sup>th</sup>                                                               | 0.031<br>(0.104)     | 0.244<br>(0.180)    | 0.074<br>(0.144)   | −0.102<br>(0.128)    | 0.482**<br>(0.194)   |
| 5 <sup>th</sup>                                                               | 0.198*<br>(0.104)    | 0.420**<br>(0.179)  | 0.203<br>(0.144)   | −0.022<br>(0.130)    | 0.749***<br>(0.191)  |
| 6 <sup>th</sup>                                                               | 0.291***<br>(0.104)  | 0.483***<br>(0.179) | 0.303**<br>(0.148) | 0.094<br>(0.130)     | 0.823***<br>(0.190)  |
| 7 <sup>th</sup>                                                               | 0.262**<br>(0.104)   | 0.569***<br>(0.178) | 0.059<br>(0.157)   | 0.062<br>(0.131)     | 0.801***<br>(0.191)  |
| 8 <sup>th</sup>                                                               | 0.454***<br>(0.109)  | 0.687***<br>(0.181) | 0.339*<br>(0.176)  | 0.257*<br>(0.138)    | 0.972***<br>(0.197)  |

(Continued)

Table 9. (Continued)

|                             | Localisation         |                      |                     | Gender              |                      |
|-----------------------------|----------------------|----------------------|---------------------|---------------------|----------------------|
|                             | All                  | Urban                | Rural               | Male                | Female               |
| 9 <sup>th</sup>             | 0.362***<br>(0.109)  | 0.627***<br>(0.180)  | −0.100<br>(0.208)   | 0.117<br>(0.140)    | 0.944***<br>(0.195)  |
| 10 <sup>th</sup>            | 0.751***<br>(0.124)  | 0.897***<br>(0.189)  | 0.738**<br>(0.299)  | 0.654***<br>(0.162) | 1.158***<br>(0.212)  |
| <b>Age (12 years omit.)</b> |                      |                      |                     |                     |                      |
| 13                          | 0.828***<br>(0.089)  | 0.856***<br>(0.108)  | 0.752***<br>(0.164) | 0.902***<br>(0.124) | 0.723***<br>(0.131)  |
| 14                          | 1.188***<br>(0.089)  | 1.236***<br>(0.106)  | 1.098***<br>(0.165) | 1.180***<br>(0.122) | 1.190***<br>(0.133)  |
| 15                          | 1.439***<br>(0.091)  | 1.556***<br>(0.110)  | 1.257***<br>(0.170) | 1.554***<br>(0.124) | 1.278***<br>(0.136)  |
| 16                          | 1.578***<br>(0.090)  | 1.609***<br>(0.107)  | 1.540***<br>(0.169) | 1.590***<br>(0.122) | 1.590***<br>(0.135)  |
| 17                          | 1.670***<br>(0.092)  | 1.737***<br>(0.110)  | 1.556***<br>(0.175) | 1.763***<br>(0.125) | 1.554***<br>(0.138)  |
| 18                          | 1.650***<br>(0.091)  | 1.658***<br>(0.108)  | 1.590***<br>(0.174) | 1.647***<br>(0.122) | 1.667***<br>(0.140)  |
| 19                          | 1.712***<br>(0.094)  | 1.655***<br>(0.113)  | 1.861***<br>(0.181) | 1.775***<br>(0.128) | 1.624***<br>(0.143)  |
| <b>Birth order</b>          | 0.107**<br>(0.054)   | 0.138**<br>(0.064)   | 0.033<br>(0.102)    | 0.022<br>(0.071)    | 0.255***<br>(0.084)  |
| <b>Number of siblings</b>   | −0.021**<br>(0.010)  | −0.050***<br>(0.014) | −0.012*<br>(0.015)  | −0.018**<br>(0.013) | −0.023***<br>(0.017) |
| <b>Cut1</b>                 | 1.273***<br>(0.151)  | 1.449***<br>(0.225)  | 1.705***<br>(0.229) | 1.074***<br>(0.193) | 1.806***<br>(0.256)  |
| <b>Cut2</b>                 | 2.320***<br>(0.155)  | 2.387***<br>(0.230)  | 3.043***<br>(0.243) | 2.109***<br>(0.199) | 2.886***<br>(0.264)  |
| <b>Cut3</b>                 | 3.002***<br>(0.1793) | 3.060***<br>(0.251)  | 3.794***<br>(0.308) | 2.872***<br>(0.235) | 3.480***<br>(0.293)  |
| <b>Number of obs.</b>       | <b>3,772</b>         | <b>2,503</b>         | <b>1,269</b>        | <b>2,165</b>        | <b>1,607</b>         |

Note: \*, \*\* and \*\*\* denote statistical significance at the 10%, 5% and 1% levels, respectively, based on *p*-values.

Table 10. Censored ordered probit estimates of educational attainment (2014)

|                                                                          | Localisation         |                     |                      | Gender               |                      |
|--------------------------------------------------------------------------|----------------------|---------------------|----------------------|----------------------|----------------------|
|                                                                          | All                  | Urban               | Rural                | Male                 | Female               |
| <b>Localisation (urban omit.)</b>                                        |                      |                     |                      |                      |                      |
| Rural                                                                    | −0.355***<br>(0.006) | −                   | −                    | −0.149***<br>(0.008) | −0.584***<br>(0.008) |
| <b>Gender (male omit.)</b>                                               |                      |                     |                      |                      |                      |
| Female                                                                   | 0.013***<br>(0.004)  | 0.242***<br>(0.007) | −0.201***<br>(0.006) | −                    | −                    |
| <b>Parent's education (two parents have no level of education omit.)</b> |                      |                     |                      |                      |                      |
| Two parents or at least one of them has the primary level                | 0.171***<br>(0.006)  | 0.154***<br>(0.008) | 0.199***<br>(0.008)  | 0.148***<br>(0.008)  | 0.204***<br>(0.008)  |

(Continued)

Table 10. (Continued)

|                                                                               | All                 | Localisation        |                     | Gender              |                     |
|-------------------------------------------------------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
|                                                                               |                     | Urban               | Rural               | Male                | Female              |
| Two parents or at least one of them has the lower secondary level             | 0.334***<br>(0.007) | 0.418***<br>(0.010) | 0.241***<br>(0.010) | 0.359***<br>(0.010) | 0.319***<br>(0.010) |
| Two parents or at least one of them has the upper secondary level or superior | 0.531***<br>(0.009) | 0.537***<br>(0.011) | 0.516***<br>(0.017) | 0.550***<br>(0.013) | 0.520***<br>(0.014) |
| <b>Father's activity (salaried omit.)</b>                                     |                     |                     |                     |                     |                     |
| Employer                                                                      | 0.055***<br>(0.005) | 0.057***<br>(0.007) | 0.058***<br>(0.007) | 0.056***<br>(0.006) | 0.056***<br>(0.007) |
| <b>Wealth Index (1st decile omit.)</b>                                        |                     |                     |                     |                     |                     |
| 2 <sup>nd</sup>                                                               | 0.138***<br>(0.009) | 0.205***<br>(0.021) | 0.124***<br>(0.011) | 0.146***<br>(0.013) | 0.143***<br>(0.014) |
| 3 <sup>rd</sup>                                                               | 0.227***<br>(0.009) | 0.264***<br>(0.022) | 0.240***<br>(0.010) | 0.219***<br>(0.012) | 0.248***<br>(0.013) |
| 4 <sup>th</sup>                                                               | 0.316***<br>(0.010) | 0.312***<br>(0.021) | 0.335***<br>(0.012) | 0.316***<br>(0.014) | 0.334***<br>(0.01)  |
| 5 <sup>th</sup>                                                               | 0.368***<br>(0.010) | 0.388***<br>(0.019) | 0.400***<br>(0.012) | 0.348***<br>(0.013) | 0.403***<br>(0.015) |
| 6 <sup>th</sup>                                                               | 0.528***<br>(0.010) | 0.516***<br>(0.018) | 0.629***<br>(0.017) | 0.496***<br>(0.014) | 0.582***<br>(0.015) |
| 7 <sup>th</sup>                                                               | 0.574***<br>(0.012) | 0.550***<br>(0.020) | 0.643***<br>(0.019) | 0.562***<br>(0.016) | 0.605***<br>(0.018) |
| 8 <sup>th</sup>                                                               | 0.924***<br>(0.012) | 0.897***<br>(0.020) | 1.024***<br>(0.025) | 0.906***<br>(0.017) | 0.966***<br>(0.018) |
| 9 <sup>th</sup>                                                               | 1.156***<br>(0.012) | 1.127***<br>(0.020) | 1.189***<br>(0.028) | 1.139***<br>(0.017) | 1.196***<br>(0.019) |
| 10 <sup>th</sup>                                                              | 1.443***<br>(0.014) | 1.393***<br>(0.021) | 1.347***<br>(0.069) | 1.474***<br>(0.020) | 1.428***<br>(0.022) |
| <b>Age (12 years omit.)</b>                                                   |                     |                     |                     |                     |                     |
| 13                                                                            | 0.551***<br>(0.009) | 0.573***<br>(0.013) | 0.513***<br>(0.012) | 0.570***<br>(0.012) | 0.541***<br>(0.013) |
| 14                                                                            | 0.844***<br>(0.009) | 0.916***<br>(0.013) | 0.758***<br>(0.012) | 0.928***<br>(0.013) | 0.762***<br>(0.013) |
| 15                                                                            | 1.056***<br>(0.009) | 1.181***<br>(0.014) | 0.931***<br>(0.013) | 1.194***<br>(0.013) | 0.923***<br>(0.014) |
| 16                                                                            | 1.058***<br>(0.009) | 1.143***<br>(0.014) | 0.954***<br>(0.013) | 1.223***<br>(0.013) | 0.894***<br>(0.013) |
| 17                                                                            | 1.016***<br>(0.009) | 1.066***<br>(0.013) | 0.926***<br>(0.013) | 1.137***<br>(0.013) | 0.881***<br>(0.014) |
| 18                                                                            | 0.952***<br>(0.009) | 0.962***<br>(0.013) | 0.894***<br>(0.013) | 1.031***<br>(0.013) | 0.856***<br>(0.014) |
| 19                                                                            | 0.888***<br>(0.009) | 0.898***<br>(0.013) | 0.822***<br>(0.014) | 0.961***<br>(0.013) | 0.797***<br>(0.015) |
| <b>Birth order</b>                                                            | -0.006<br>(0.006)   | -0.035<br>(0.008)   | 1.833*<br>(0.023)   | -0.010<br>(0.008)   | 0.004<br>(0.008)    |
| <b>Number of siblings</b>                                                     | 0.054<br>(0.001)    | 0.077<br>(0.002)    | 1.454<br>(0.021)    | 0.058<br>(0.002)    | -0.050*<br>(0.002)  |

(Continued)

Table 10. (Continued)

|                       | All                 | Localisation        |                      | Gender              |                     |
|-----------------------|---------------------|---------------------|----------------------|---------------------|---------------------|
|                       |                     | Urban               | Rural                | Male                | Female              |
| <b>Cut1</b>           | 0.307***<br>(0.015) | 0.476***<br>(0.025) | 0.476***<br>(0.020)  | 0.473***<br>(0.021) | 0.124***<br>(0.022) |
| <b>Cut2</b>           | 1.147***<br>(0.016) | 1.176***<br>(0.026) | −0.041***<br>(0.001) | 1.295***<br>(0.022) | 0.990***<br>(0.023) |
| <b>Cut3</b>           | 1.505***<br>(0.017) | 1.541***<br>(0.027) | 0.028***<br>(0.008)  | 1.685***<br>(0.023) | 1.327***<br>(0.024) |
| <b>Number of obs.</b> | <b>322,819</b>      | <b>186,844</b>      | <b>135,975</b>       | <b>170,647</b>      | <b>152,172</b>      |

Note: \*, \*\* and \*\*\* denote statistical significance at the 10%, 5% and 1% levels, respectively, based on *p*-values.

### Model estimates

#### Gender and place of residence

Gender remains a significant determinant of schooling outcomes. In both years, girls generally exhibit lower probabilities of school attendance, particularly in rural areas, reflecting barriers such as early marriage, household responsibilities and limited access to secondary schools. However, in urban areas, girls demonstrate higher likelihoods of progressing to advanced educational levels once enrolled, indicating greater persistence and completion relative to boys. Boys, conversely, are more prone to early dropout, often drawn into informal labour or migration.

Rural residence has a consistently negative effect on school attendance and attainment, and regional analyses reveal substantial spatial disparities across Morocco, highlighting enduring structural inequalities despite educational reforms. These spatial inequalities may also reflect a broader form of vulnerability: rural populations, while often more exposed to environmental risks, tend to have more limited access to educational opportunities, which may restrict their ability to acquire the knowledge and skills needed to understand and respond to environmental challenges. This reflects a form of double vulnerability, where educational disadvantage combines with greater exposure to environmental risks.

#### Household wealth and living standards

Household wealth is a key determinant of schooling outcomes. In 1998, its effect was stronger for girls. Wealth effects were minimal in rural areas, where local educational infrastructure and cultural norms constrained schooling opportunities even among wealthier households. By 2014, wealth became a robust predictor of both enrolment and attainment across all groups, reflecting persistent inequalities, as indicated by the high Gini index of schooling 0.55 (Conseil supérieur de l'éducation, de la formation et de la recherche scientifique, 2017). These disparities extend beyond education, contributing to unequal access to environmental knowledge and sustainability-related competencies and limiting the capacity of disadvantaged populations to engage with environmental challenges.

#### Parental characteristics

Parental education strongly increases both school access and attainment, for boys and girls alike. Children with educated parents are significantly more likely to enrol and progress, while those with illiterate parents face clear disadvantages. In contrast, father's occupation shows no significant effect, indicating that broader structural factors play a more decisive role.

#### Family structure

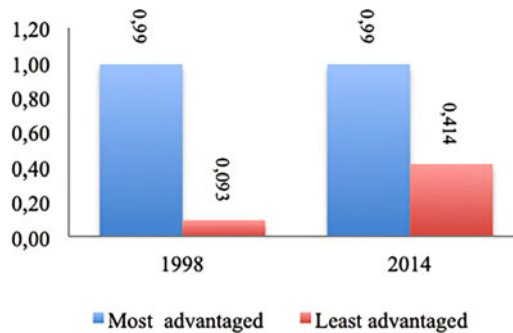
Family structure influenced schooling outcomes in 1998, with higher birth order and larger household size reducing attendance and attainment, especially for rural girls. By 2014, these effects had largely disappeared, reflecting demographic shifts and improved access to education.

### Profiles of the most and least advantaged

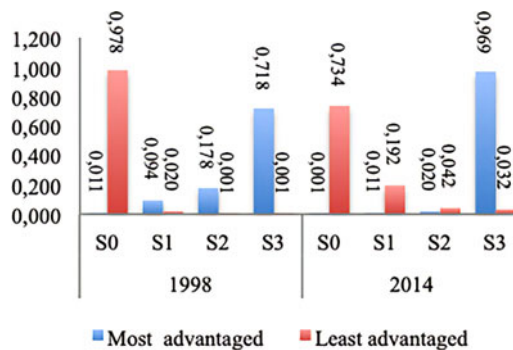
Joint analysis of all explanatory variables allows the identification of extreme profiles of advantage and disadvantage (Figures 1 and 2). In 1998, the most advantaged child – a male urban resident from the wealthiest household decile, an only child, with at least one parent educated to upper secondary or higher – had nearly 100% probability of school attendance and a 72% chance of completing upper secondary education. The least advantaged child – a female rural resident from the poorest decile, eldest of 16 children, with illiterate parents – had a 9.3% probability of attending school and a 0.1% chance of reaching upper secondary.

By 2014, improvements were observed for the disadvantaged profile (41.4% probability of school attendance), yet gaps remain pronounced, particularly for higher education levels (3.2% compared to 97% for advantaged children). Interestingly, while boys have higher initial enrolment probabilities, the most advantaged profiles to continue their studies are often female, highlighting girls' higher persistence once enrolled. Rural children consistently remain structurally disadvantaged.

**Figure 1.** Probabilities of access to school for the most and least advantaged individuals in 1998 and 2014.



**Figure 2.** Probabilities of reaching specific educational levels for the most and least advantaged individuals in 1998 and 2014.



Between 1998 and 2014, Morocco witnessed substantial improvements in both access to education and educational attainment, reflecting the impact of reforms and social programmes. Nevertheless, persistent inequalities continue to be shaped by gender, household wealth, parental education, place of residence and family structure. These findings underscore the importance of policies addressing both supply-side constraints, such as school availability and infrastructure, and demand-side determinants, including poverty, gender norms and household responsibilities. Targeted interventions aimed at the most disadvantaged groups are essential for achieving genuine equality of educational opportunity.

These results not only highlight persistent educational inequalities but also point to broader disparities in the distribution of sustainability-related capabilities. Unequal access to education may limit individuals' opportunities to acquire the knowledge and skills needed to understand environmental risks, engage in sustainable practices and participate in climate adaptation processes. From this perspective, educational inequality can be interpreted as a structural driver of inequality in environmental and sustainability-related capabilities. Disparities observed across rural areas and socio-economic groups further suggest the existence of a double constraint: disadvantaged populations often face both restricted access to education and reduced capacity to respond effectively to environmental challenges. This underscores the importance of integrating equity considerations into environmental education policies, as reducing educational inequalities is not only a matter of social justice but also a key condition for fostering inclusive and effective sustainability transitions.

## Conclusion

This paper has analysed the evolution of inequalities of opportunity in education in Morocco between 1998 and 2014, with a particular focus on school access and educational attainment. Using probit and right-censored ordered probit models applied to the ENNV 1998–1999 and RGPH 2014 datasets, the results show that individual and household characteristics – especially gender, place of residence, household wealth and parental education – remain key determinants of educational outcomes.

The findings reveal persistent and structurally rooted disparities. Children from advantaged socio-economic backgrounds are consistently more likely to enrol in school and progress through the educational system, whereas those from disadvantaged households – particularly in rural areas, from poorer families or with less educated parents – face significantly higher risks of non-enrolment and early dropout. Although inequalities have declined over time, they remain substantial, indicating that unequal circumstances continue to strongly shape educational trajectories in Morocco. These findings largely confirm well-established patterns documented in the international literature on educational inequality, while highlighting their persistence and specific implications in the Moroccan context.

The results suggest that educational policy should move beyond the expansion of supply and more directly address demand-side constraints. Poverty, gender norms and household conditions continue to play a decisive role in limiting educational access and progression. Targeted interventions aimed at disadvantaged populations are therefore essential to promote equity and enhance educational mobility.

Importantly, the findings also point to broader implications that extend beyond the education sector. Educational inequality can be understood as a structural constraint on the development of sustainability-related capabilities. Unequal access to schooling may limit individuals' ability to acquire environmental knowledge, develop critical awareness of ecological challenges and engage in sustainable practices. From this perspective, disparities in educational opportunities are likely to translate into unequal capacities to respond to environmental and climate-related risks.

This issue is particularly salient in the Moroccan context, where rural and socio-economically disadvantaged populations often face a form of double vulnerability: greater exposure to environmental risks combined with more limited access to quality education and environmental learning opportunities. As a result, educational inequalities may reinforce existing environmental vulnerabilities and constrain participation in sustainability transitions.

Strengthening educational inclusion is therefore not only a matter of social justice but also a key lever for fostering inclusive and effective responses to environmental challenges. Integrating equity considerations into environmental and sustainability education policies is essential to ensure that all individuals – not only the most advantaged – can develop the knowledge, skills and capabilities required to engage in sustainable development.

In this regard, policies targeting disadvantaged populations can serve as strategic entry points for simultaneously reducing educational inequalities and expanding access to sustainability-oriented learning. By linking educational equity with environmental capability development, this study highlights the need for more integrated policy approaches that connect education, social inclusion and sustainability in developing country contexts.

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## Author Biography

**Fouzia Ejjanoui** is an Associate Professor. Her research focuses on development economics, labour market economics, education, gender, poverty, inequality and rural and agricultural economics in the Middle East and North Africa. She holds a PhD in Economics from the Faculty of Legal, Economic and Social Sciences (FSJES) at Mohammed V University, Rabat, Morocco and an Advanced Graduate Diploma (DESA) in Economic Analysis and Development from the Faculty of Legal, Economic and Social Sciences (FSJES) at Cadi Ayyad University, Marrakech, Morocco.