

The role of education in reducing income disparities in Morocco: empirical evidence from the ARDL approach

Le rôle de l'éducation dans la réduction des disparités de revenu au Maroc : une mise en évidence empirique par l'approche ARDL

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Abstract:

This paper seeks to provide empirical evidence on the contribution of human capital, measured by education, to reducing income inequalities in Morocco over the period from 1984 to 2015. The analysis of the dynamics of variables related to education and income disparities has revealed two major findings. Firstly, the educational level of the Moroccan labor force is notably weak, with an average of barely six years of schooling, as well as the persistence of educational inequalities over time and across regions, along with high dropout and repetition rates. These factors suggest a limited contribution of human capital accumulation of reducing income disparities in Morocco. Secondly, the persistence of income inequalities between different social classes, where a minority of the population holds a substantial share of wealth, is an undeniable reality. Furthermore, the ARDL time series estimation technique has yielded important results. In the short term, educational disparities are likely to make income distribution more egalitarian. Regarding the expansion of education, measured by the average number of years of schooling, it has no significant immediate effect on the dependent variable. This result suggests that wage inequalities in Morocco are in a "composition" phase and have not yet reached a "compression" phase. However, in the long-term relationship, the only variable having a significant effect on the dependent variable is the average number of years of schooling. Thus, a 1% increase in the average level of education reduces educational inequalities by 0.05%. Consequently, the estimated relationship suggests that an increase in investment in education in Morocco would not only raise the average level of schooling but also reduce educational inequalities, both of which are likely to reduce income inequalities.

Keywords : Educational inequality, level of education, income inequality, Morocco, ARDL.

Classification JEL : D30, I21, O55

Paper type : Empirical Research

Résumé :

Ce papier tente d'apporter des preuves empiriques sur la contribution du capital humain, mesuré par l'éducation, dans la réduction des inégalités de revenus au Maroc sur la période 1984 -2015. Le diagnostic de la dynamique des variables liées à l'éducation et les disparités de revenu a révélé deux constats majeurs. D'une part la faiblesse du niveau d'instruction de la population active marocaine, laquelle ne dépasse guère 6 années d'études ainsi que la persistance des inégalités éducatives à l'échelle temporelle et spatiale et de forts taux d'abandon scolaire et de redoublement. Des facteurs qui suggèrent une contribution limitée de l'accumulation du stock de capital humain à la réduction des disparités de revenus au Maroc. D'autres parts, la persistance des inégalités de revenus entre les différentes classes sociales, où une minorité de la population détient une grande part de la richesse est une réalité incontestable. En outre, la technique d'estimation en série chronologique ARDL a permis de faire ressortir d'importants résultats. À court terme, les disparités éducatives sont susceptibles de rendre la répartition du revenu plus égalitaire. S'agissant de l'expansion de l'éducation, mesurée par le nombre moyen d'années de scolarisation, celle-ci n'exerce aucun effet significatif instantané sur la variable dépendante. Ce résultat suggère que les inégalités de salaires au Maroc sont en phase de "composition" et n'ont pas encore atteint la phase de "compression". En revanche, sur la relation de long terme, la seule variable exerçant un effet significatif sur la variable dépendante est le nombre moyen d'années de scolarisation. Ainsi, une hausse du niveau moyen d'instruction de 1% diminue les inégalités éducatives de 0,05%. Par conséquent, la relation estimée suggère qu'une augmentation de l'investissement dans l'enseignement au Maroc permettrait non seulement d'élever le niveau moyen de scolarisation, mais aussi de réduire les inégalités en matière d'éducation, deux facteurs susceptibles de réduire les inégalités de revenu.

Mots clés : Inégalité éducative, niveau d'éducation, inégalité des revenus, Maroc, ARDL.

JEL Classification : D30, I21, O55

Type du papier : Recherche empirique

1. Introduction

While research on inequalities dates back a long way (Kuznets, 1955), it has nevertheless experienced considerable renewal over the last decade (Piketty, 2014; Clements et al., 2015; Dabla-Norris et al., 2015; Stiglitz, 2015; Alvaredo et al., 2018; Hanushek and Woessmann, 2020; Molla, 2021; Munir et al., 2023). It emerges that the increase in inequalities is attributable to a series of factors, including globalization, the liberalization of factor and product markets, technological changes, the increased participation of low-skilled workers in the labor market, the decline in the share of high-level labor, marginal income tax rates, the bargaining power of high incomes, and so on (Hoeller et al., 2014). While all these factors are considered important, human capital often takes center stage (Morrisson et Murtin, 2013; Castelló-Climent et Doménech, 2017).

In particular, the available literature shows that the expansion of education is not only important for economic growth (Barro, 2013) but can also help break the intergenerational transmission of poverty and reduce income inequalities (Kotera and Seshadri, 2017; Gregg et al., 2019). However, the process through which the expansion of education exerts its impact on inequalities seems more complex than it appears (Chiswick, 1968; Knight and Sabot, 1983). This is evidenced by the ambivalence of the empirical literature's results on the true impact of education on inequalities. While some studies have found a negative effect (De Gregorio and Lee, 2002; Yang and Qui, 2016; Coady and Dizioli, 2018; Ozdemir, 2020), others have found no significant effect on reducing income inequalities (Ram, 1990; Park, 1996), and some even found an aggravating effect on these inequalities (Ferreira and Gignoux, 2008; Shimeles and Nabassaga, 2017).

These contradictory results have directed research towards another direction: to what extent does the reduction in educational inequalities affect income inequalities (Checchi 2001; Mayer 2010; Bloome et al., 2018). Here too, the literature provides ambivalent results. While some studies show that greater dispersion of education has an unequalizing effect on income distribution, other studies do not identify any significant effect of schooling inequality on income inequality (Ram, 1984; Földvári and Van Leeuwen, 2011). Moreover, this literature seems to converge on the fact that the impact of educational inequalities on income inequalities is inversely related to the level of development of countries. Indeed, several studies support a positive and statistically significant relationship between schooling inequalities and income inequalities for developing economies (Coady and Dizioli, 2017; Lee and Lee, 2018). The ambivalent results of the relationship between education and inequalities highlight other channels that may affect income inequalities. While technological change occupies a central place in this regard (Jaumotte et al., 2013; Kharlamova et al., 2018) in advanced economies, it remains that for many developing countries, this channel does not seem to function appropriately, particularly due to the weakness of their human capital accumulation and quality (Wedgwood, 2007). This would be particularly true for Morocco, where the poor quality of educational institutions affects equal access to quality education and, consequently, income distribution. Indeed, the literature on inequalities in Africa (Okojie and Shimeles, 2006; Van de Walle, 2009) emphasizes two general conclusions. The first focuses on the surprisingly high level of inequalities, while the second emphasizes their development costs. Some studies have also attempted to examine the regional profile of inequality (urban versus rural, for example, Bigsten et al., 2003; Ssewanyana et al., 2004), or the profile of this inequality by income category (Woolard et al., 2000; Ssewanyana et al., 2004). Nevertheless, very few studies have empirically examined the determinants of income inequality (Milanovic, 2003; Anderson and McKay, 2004) and even fewer have looked at the exact contribution of education to income distribution in Morocco (El Aynaoui and Ibourk, 2010).

This paper aims to fill this gap and, using the ARDL method, highlight the impact of education on income inequalities in Morocco. It contributes to the current literature in several ways. Firstly, it focuses on the specific case of Morocco, where our knowledge of the link between education and income distribution is quite limited. Secondly, it goes beyond analyzing the effects of schooling on inequalities to also consider the effects of inequality in access to education. Lastly, but by no means least, the contribution of this article lies in its essentially operational scope. Its results can help design targeted interventions that could improve the contribution of education to reducing income inequalities in Morocco.

The rest of the paper is organized as follows. Section 2 briefly reviews the theoretical and empirical literature on the existing relationship between education and income inequalities. Section 3 analyzes the trends in the level of education and educational and income inequalities in Morocco, while comparing them with those of some similar economies. Section 4 presents the research methodology, highlighting the estimation strategy and selected variables. Section 5 presents the empirical results. Section 6 discusses these results, while Section 7 concludes.

2. Literature review

The theory of human capital, rooted in rational choice theory, postulates that the level of education affects income distribution (Mincer, 1974). This association, however, is more complex and depends on several factors. The positive impact of education on income reduction is, for instance, less evident when considering the evolving rates of return on education. Chiswick (1968) shows, for example, that the expansion of education, by reshaping the structure of labor supply, can in the short-term increase income inequalities and reduce them in the long term, as the wage premium for skilled workers decreases.

This non-linear effect is also supported by Knight and Sabot (1983), who show that the expansion of education exerts two contradictory effects on inequalities. The first effect, referred to as the *composition effect*, has a similar impact to the process postulated by Kuznets. It results from the changing proportion of the workforce in favor of educated workers and tends to increase inequality. The second effect, known as the *compression effect*, tends to decrease inequalities in the long term as the qualification premium decreases due to the increase in the supply of skilled workers and the intensification of their competition in the labor market.

This reasoning aligns with the endogenous growth theory, according to which investments in education increase productivity and innovation, thus reducing income inequalities in the long term (Lucas, 1988). Furthermore, social capital theory posits that education contributes not only to individual human capital but also to collective social capital by strengthening networks and social relationships that facilitate cooperation and economic growth. Inequality in access to education can thus amplify income inequalities by limiting opportunities for disadvantaged social classes (Coleman, 1988).

Kuznets (1995) showed that economic progress generates inequality, which diminishes over time with the increase in per capita income. The relationship between education and inequality also seems to take an inverted "U" shape. However, the educational Kuznets curve is only verified when the standard deviation of schooling is used as a measure of inequality (Ram, 1990; Thomas et al., 2001; Lim and Kam, 2008). Regarding capital inequalities, Piketty (2014), examining numerous historical data, found that the return on capital is always higher than economic growth. According to him, in capitalism, if governments do not intervene, wealth will inevitably concentrate in the hands of a few, leading to increased inequalities.

However, according to human capital theorists, education is likely to exert a paradoxical effect on income inequalities. This complex process explains the ambivalence of the empirical literature's results. Some studies show that the expansion of education has indeed contributed to reducing inequalities (De Gregorio and Lee, 2002; Yang and Qui, 2016; Coady and Dizioli, 2018; Hanushek and Woessmann, 2020; Castelló-Climent and Doménech, 2022). Other studies

have found, however, that this expansion has no significant effect on reducing income inequalities (Ram, 1990; Park, 1996; Agasisti and Longobardi, 2014; Ozdemir, 2020), even if it can positively affect individuals' income (Mace, 1980). Furthermore, some studies have found that the expansion of education is likely to exacerbate income inequalities (Ferreira and Gignoux, 2008; Shimeles and Nabassaga, 2017; Shukla and Mishra, 2020; Munir et al., 2023). Moreover, several studies show that the positive effect of education on reducing income inequalities depends on the level of education (Chetty et al., 2014; Psacharopoulos and Patrinos, 2018). Checchi (2001) finds, for instance, that this positive effect is only significant if the initial level of education is low and the expansion of education is rapid.

In addition to the effect of the average level of schooling, other studies have also tried to examine the link between inequalities in terms of schooling and income inequalities (Hanushek and Kimko, 2000; Checchi and Garonna, 2010; Lindahl et al., 2015; Chetty et al., 2020). Indeed, while the available literature shows a constant or increasing return on additional years of schooling, which reduces income inequality, it remains that several studies show that the role of education expansion in reducing income inequalities tends to diminish as countries develop. Using data for 146 countries from 1950 to 2010, Castelló-Climent and Doménech (2014) find that despite a significant reduction in human capital inequality worldwide, income distribution inequality has barely changed. Therefore, improving education is not a sufficient condition to reduce income inequality, even though it significantly improves the living standards of people at the bottom of the income distribution. Indeed, Coady and Dizioli (2017) found, using dynamic panel estimation techniques, a positive and statistically significant relationship between schooling inequalities and income inequalities, particularly in emerging and developing economies. This positive relationship for developing countries is also confirmed by Lee and Lee (2018), who studied a panel of 60 developing countries using data from 1980 to 2015. These authors show that a more equal distribution of education significantly contributes to reducing income inequalities. These results suggest that the impact of educational inequalities on income inequalities is inversely related to the level of development of countries. However, it should be noted that the results of the empirical literature on the effect of educational inequality on income inequality depend on how inequalities are measured. Indeed, Psacharopoulos (1977), Lam and Levison (1990), De Gregorio and Lee (2002), and Mayer (2010), who used the standard deviations of average years of schooling to measure educational inequality, found a positive correlation between educational inequality and income inequality. Conversely, Ram (1984), Park (1996), and Digdowiseiso (2009), who used the same measure, found no significant effect of human capital inequality on income distribution. Moreover, the relationship between income inequality and educational inequality seems to be more positive when the Theil index (Pose and Tselios, 2009) or the Gini coefficient (Jun et al., 2009; Abdelbaki, 2012) are used as measures of inequalities.

Following a review of the theoretical foundations and empirical findings relating to the relationship between education and income inequality within developing countries, we formulate the following hypotheses to guide our analysis:

Hypothesis 1: The expansion of education helps to reduce income inequality in the long term by increasing productivity and improving access to better-paid employment opportunities for educated individuals.

Hypothesis 2: In the short term, a rapid expansion of education could increase income inequality by intensifying competition on the labor market for skilled jobs, temporarily reducing the wage premium for educated workers.

Hypothesis 3: The effect of education on income inequality varies according to the economic context of countries, insofar as a more equitable distribution of education is associated with a significant reduction in income disparities in developing economies.

Hypothesis 4: The effects of education on income inequality are moderated by institutional and contextual variables, such as national education policies and labor market structure.

3. Trends in education level, educational inequalities, and income inequalities in Morocco

The table 1 below highlights the evolution of educational inequalities within the Moroccan population over the period 1950-2015. In 2015, the education level of the working population was estimated at 6.02 years of schooling. This has been on an upward trend: from 0.3 years in 1950 to 2.45 years in 1985. Subsequently, it recorded an increase of about one year every ten years. However, it remains lower than the education levels observed in developing countries (7.1 years) and in industrialized countries (11 years) (Barro and Lee, 2013)¹. At the same time, the evolution of the distribution of education in Morocco, measured by the Gini coefficient, has decreased during the period considered. It has almost halved, from 0.95 in 1950 to 0.5 in 2015. Overall, it seems that the reduction in illiteracy is the main factor. Indeed, Morocco has experienced a significant decrease in the share of the non-schooled population: it has been reduced by more than half over the period considered, from 96% in 1950 to 35% in 2015. This reduction has been more pronounced over the last ten years (2.85% on average per year), while it was only 1.8% in the 1980s and 1990s, only 1.3% in the 1970s, and 0.80% in the 1960s. This evolution is linked to the performance of the primary education cycle, whose attendance was 27.4% (of the population aged between 15 and 64 years) in 2015, compared to only 1.5% in 1950.

Table 1: Evolution of the Average Years of Schooling and the Education Gini Index (1950-2015) for the Moroccan Population Aged 15 to 64

Year	Average years of schooling	Education Gini Index	Proportion of the Population by Educational Attainment Level (in %)			
			Non-schooled	Primary	Secondary	Higher
1950	0,30	0,95	96,17	1,51	2,08	0,25
1955	0,39	0,94	94,99	1,85	2,91	0,25
1960	0,51	0,93	93,47	2,62	3,4	0,5
1965	0,75	0,91	90,85	3,05	5,52	0,58
1970	1,05	0,88	86,22	5,8	6,89	1,01
1975	1,43	0,85	80,72	9,38	8,1	1,8
1980	1,88	0,81	75,4	12,01	9,58	3,01
1985	2,45	0,77	69,28	14,91	11,36	4,45
1990	3,05	0,72	62,67	18,2	13,22	5,91
1995	3,64	0,68	56,9	20,35	15,49	7,26
2000	4,09	0,64	52,12	22,25	17,73	7,9
2005	4,63	0,60	46,39	24,65	20,04	8,93
2010	5,27	0,55	40,46	26,33	23,2	10,02
2015	6,02	0,50	35,02	27,39	23,43	14,16

Source: Author's calculation based on Barro-Lee data (1950-2015).

Moreover, a significant proportion of the population (23.4%) had reached a secondary education level in 2010, while it was only 13.2% in 1990. It can be deduced that in Morocco, despite a relative decrease in educational inequalities since 1950, the education level of the working population remains low.

¹ It should be noted that the calculations were performed on the latest version of the Barro-Lee database: "September 2021 Update: Barro-Lee Estimates of Educational Attainment for the Population Aged 15 to 64 from 1950 to 2015."

Table 2: Contribution of each education cycle to the average years of schooling, 1950-2015

Year	Primary	Secondary	Higher	Total
1950	0,17	0,12	0,01	0,30
1955	0,22	0,17	0,01	0,39
1960	0,29	0,21	0,01	0,51
1965	0,41	0,32	0,01	0,75
1970	0,60	0,42	0,02	1,05
1975	0,85	0,54	0,04	1,43
1980	1,11	0,71	0,07	1,88
1985	1,41	0,91	0,13	2,45
1990	1,76	1,12	0,18	3,05
1995	2,08	1,34	0,22	3,64
2000	2,33	1,52	0,25	4,09
2005	2,63	1,73	0,28	4,63
2010	3,04	1,92	0,32	5,27
2015	3,43	2,15	0,43	6,02

Source: Author's calculation based on Barro-Lee data (1950-2015).

Indeed, the analysis of data related to school dropout and repetition in Morocco reveals that these issues are particularly persistent at the primary and secondary levels, especially at the end of each cycle. This supports the observation that, in the primary cycle, the average duration of schooling is slightly more than half of the six years of study in this cycle. This is a characteristic of educational systems in developing countries where failure and dropout rates are very high, resulting in a low level of education. This also explains the heterogeneous contribution of the different education cycles to the population's level of education (table 2). Furthermore, the phenomenon of grade repetition is much more significant in countries where the gross enrollment rate in secondary education is low. It is clear that grade repetition constitutes a significant obstacle to student success in the educational system and further exacerbates school dropout. Moreover, according to the results of the PISA survey (2018), the proportion of students who have repeated a grade at least once in Morocco is 49%. By comparison, this rate is only 11% in Jordan and 7% in Turkey. It is therefore clear that in Morocco, the persistent phenomena of early grade repetition and school dropout constitute an obstacle to achieving the objectives of the various successive educational reforms and policies, namely the compulsory completion of education levels, particularly secondary education.

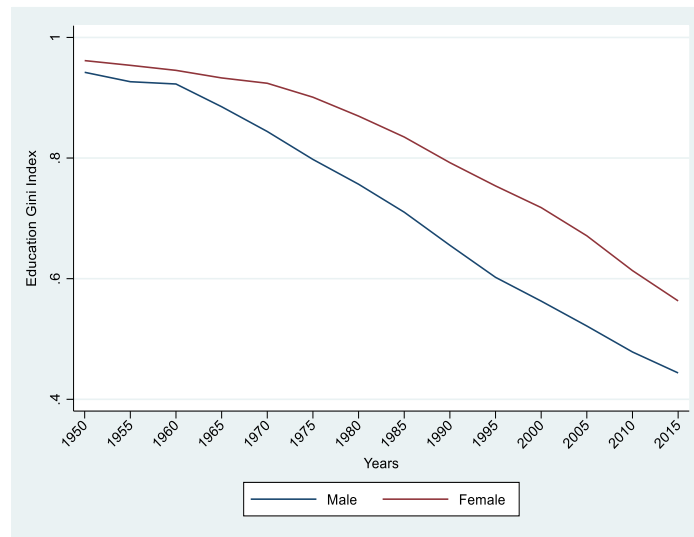
Beyond these factors, it is important to question the efficiency of the educational system (human, material, and financial resources mobilized), the relationships between educational inputs and outputs, the quality of teaching, and the distribution and management of resources in both cycles (primary and lower secondary). The graph 1 below shows the results of the calculation of the education Gini index by gender. Starting from practically the same level of educational inequality in 1950, the evolution of its distribution has been marked by a greater reduction in inequalities in favor of men. Indeed, since the 1960s, educational inequalities among men have significantly decreased, with the Gini index being around 0.44 in 2015. In contrast, educational inequality among women has decreased more slowly (0.56 in 2015). By analyzing the education Gini index in more detail by gender, we can decompose it into two elements: within-group inequality, which refers to inequalities within groups, and between-group inequality, which denotes inequalities between groups (genders). This decomposition is carried out using the following formula (Bhattacharya and Mahalanobis, 1967; Pyatt, 1976; Zhang and Li, 2002):

$$G = P_1^2 \left(\frac{\mu_1}{\mu} \right) G_1 + P_2^2 \left(\frac{\mu_2}{\mu} \right) G_2 + G_B$$

In this equation, P_i represents the share of the population by education level, μ_i corresponds to

the average years of schooling, and G_i ($i=1,2$) represents the education Gini index for men and women, respectively. The term G_B , on the other hand, represents the residual that captures the proportion of inequality between genders.

Graph 1: Evolution of the Education Gini Index by Gender in Morocco over the Period 1950-2015



Source: Author's calculation based on Barro-Lee data (1950-2015).

Table 3: Decomposition of the Education Gini Index by Gender over the Period 1950-2015

Years	Within (Female)	Within (Male)	Between (gender inequalities)
1950	0,20	0,30	0,50
1955	0,18	0,32	0,50
1960	0,18	0,32	0,50
1965	0,16	0,33	0,51
1970	0,16	0,32	0,51
1975	0,17	0,31	0,52
1980	0,18	0,30	0,52
1985	0,19	0,29	0,52
1990	0,21	0,28	0,52
1995	0,21	0,27	0,52
2000	0,22	0,26	0,51
2005	0,23	0,26	0,51
2010	0,24	0,25	0,51
2015	0,25	0,24	0,51

Source: Author's calculation based on Barro-Lee data (1950-2015).

According to the calculations (table 3), the weight of educational inequalities between genders (men and women) is predominant in explaining total inequality (representing 50% of it). This contribution of the gender gap even shows a slight increase from 1965 onwards.

Table 4: Evolution of the Average Years of Schooling and the Education Gini Index by Age Group in Morocco over the Period 1955-2015

Age Group	Average years of schooling			Education Gini Index		
	1955	1985	2015	1955	1985	2015
15-24	0,54	3,55	8,54	0,93	0,68	0,32
25-34	0,39	2,76	6,47	0,94	0,75	0,47
35-44	0,30	1,70	5,57	0,95	0,84	0,53
45-54	0,24	0,79	4,28	0,96	0,91	0,65
55-64	0,18	0,41	2,78	0,95	0,94	0,75

Source: Author's calculation based on Barro-Lee data (1950-2015).

The table 5 and graph 2 below illustrate the changes observed in the average duration of education and the education Gini index for a group of Southern Mediterranean countries. It is important to note that these countries had very low but relatively similar levels of education and socio-economic development to those of Morocco in the 1950s. The comparative analysis shows that by 2015, it is possible to classify the countries into three categories based on the level of educational inequalities: the first group with a Gini coefficient below 30% (Turkey and Jordan); the second group characterized by a Gini coefficient between 30% and 40% (Algeria, Libya, Tunisia, Iran, Syria, Mauritania); and the third group with educational inequalities equal to or exceeding 50% (Morocco and Yemen).

Table 5: Average Level of Education and Education Gini Coefficient in Southern Mediterranean Countries in 2015

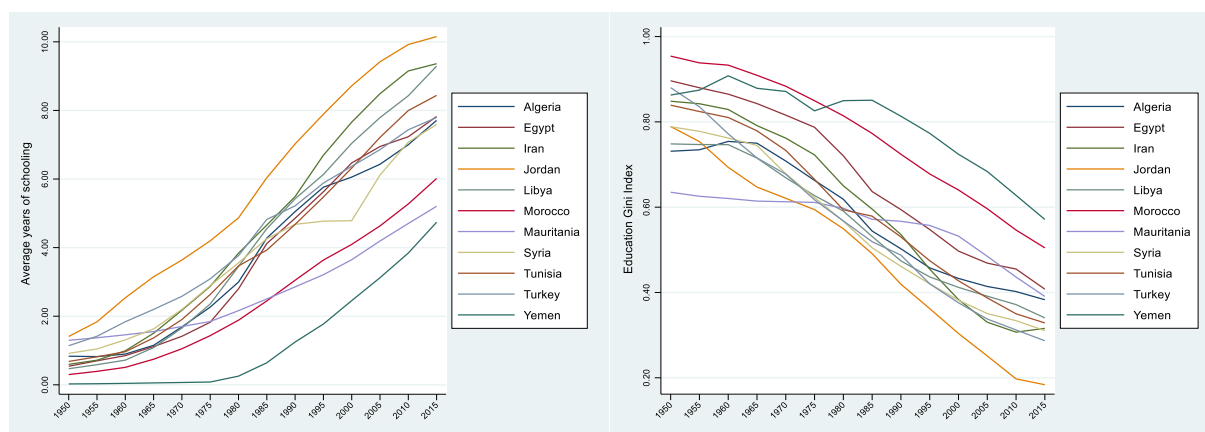
Country	Average years of schooling	Education Gini Index	Proportion of the Population by Educational Attainment Level (in %)			
			Non-schooled	Primaire	Secondaire	Higher
Jordan	10,15	0,18	3,84	11,98	70,98	13,19
Turkey	7,79	0,29	4,03	36,38	44,79	14,8
Syria	7,59	0,31	10,43	43,19	38,89	7,49
Iran	9,36	0,32	10,73	17,42	41,65	30,2
Tunisia	8,44	0,33	12,63	28,81	43,15	15,41
Libya	9,29	0,34	15,68	24,29	25,51	34,52
Algeria	7,71	0,38	13,78	42,93	27,07	16,6
Mauritania	5,21	0,39	23,32	57,58	16,43	2,67
Egypt	7,82	0,41	31,29	5,57	48,55	14,66
Morocco	6,02	0,50	35,02	27,39	23,43	14,16
Yemen	4,74	0,57	46,03	22,83	24,12	7,02

Source: Author's calculation based on Barro-Lee data (1950-2015).

Moreover, starting from a high level of educational inequalities in the 1950s, the Gini index has shown rather divergent trends from one country to another. Indeed, it has significantly decreased in Jordan, Tunisia, Turkey, Iran, and Syria.

These countries have achieved considerable progress in terms of literacy and preschool education. Morocco, like Egypt and Yemen, has experienced relatively high levels of educational inequalities despite the progress made in schooling, particularly at the primary level. Nonetheless, a large portion of the population remains unschooled. It is clear that combating illiteracy remains a major challenge for these nations.

Graph 2: Evolution of the Average Level of Education and the Education Gini Coefficient in Southern Mediterranean Countries over the Period 1950-2015



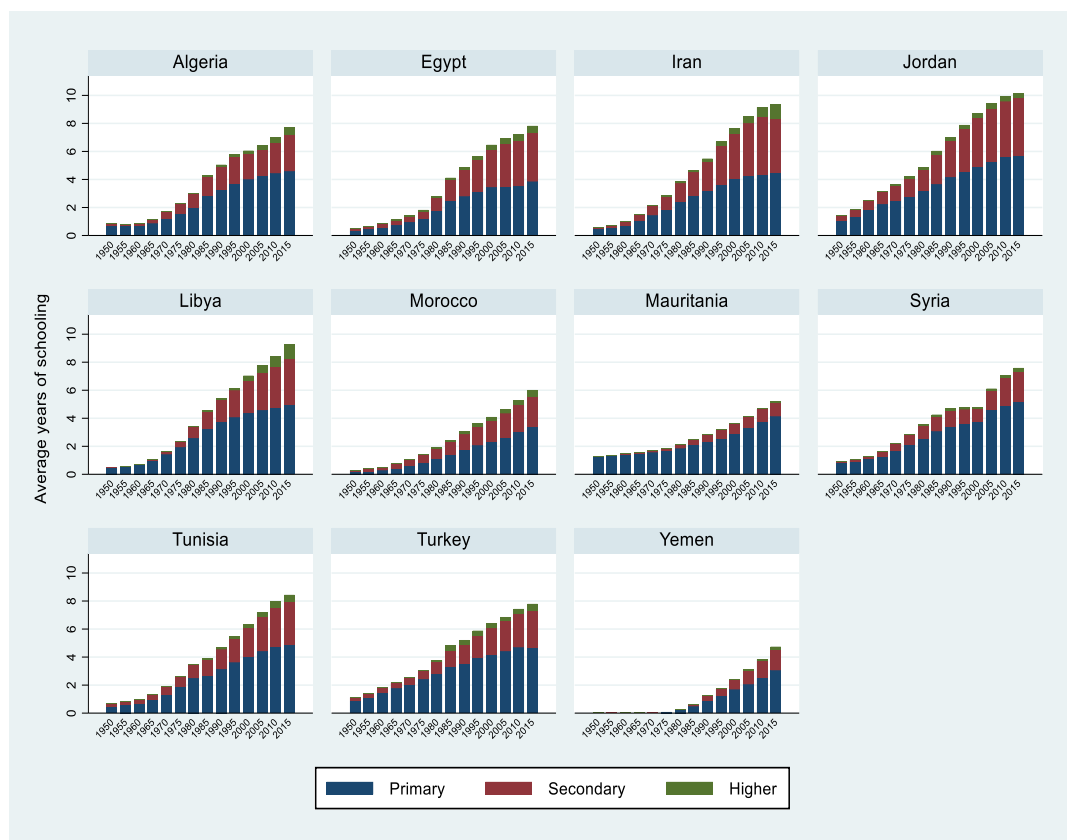
Source: Author's calculation based on Barro-Lee data (1950-2015).

Additionally, Morocco and Turkey have a similar proportion of their populations reaching higher education levels. However, Turkey, which has more selective access to higher education, presents a higher average level of education and lower educational inequality, largely due to a low illiteracy rate and a significant portion of the population completing both primary and secondary education. Compared to Morocco, Syria has succeeded in generalizing basic education while making significant progress in literacy. Consequently, the country has achieved a more equitable distribution of education, as evidenced by its relatively low Gini index. Libya, Jordan, Tunisia, and Iran have also reached high levels of education and show a notable proportion of their populations attaining higher education. For example, in Jordan, while only 12% of the population aged 15-64 had left school with a primary education level in 2015, 71% had reached secondary education, and 13% had enrolled in higher education. Regarding Egypt and Iran, it seems that a more significant contribution from secondary education is behind the improvement in the average level of education (Graph 3 below).

Furthermore, the generalization of primary education plays a significant role in the growth of average schooling duration in Morocco, although this contribution is less important than that observed in Mauritania.

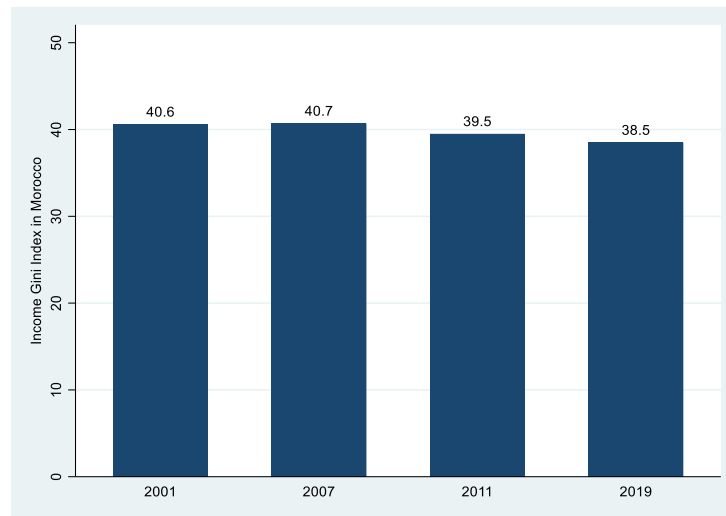
Moreover, and with reference to the national income survey conducted by the High Commission for Planning in 2019, the calculated Gini index for income (in %) shows a marginal decrease in income inequalities compared to those recorded in 2001, 2007, and 2011 (Graph 4). It should be noted that during the period 2001-2007, the extent of income inequalities did not change. In 2013, the Gini coefficient was around 39.5%. This level significantly decreased in 2019, reaching 38.5%. However, during the same year, the standard of living per capita was characterized by persistent social inequalities, as the richest half of households monopolized three-quarters of total expenditures, while this share was only 24.9% for the other half of the poorest households (HCP, 2019).

Graph 3: Contribution of Education Levels to the Average Years of Schooling over the Period 1950-2015



Source: Author's calculation based on Barro-Lee data (1950-2015).

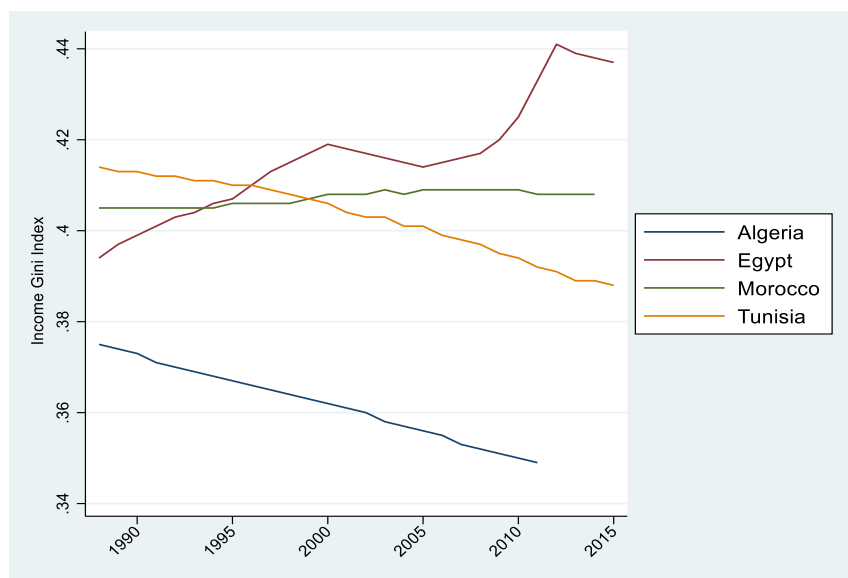
Graph 4: Evolution of the Income Gini Index between 2001 and 2019 in Morocco



Source: Author, based on data from the High Commission for Planning (HCP), National Income Survey (ENSR) 2019.

In another survey published by the High Commission for Planning in 2020, addressing the impact of the health crisis on the economic, social, and psychological situation of households, it was found that the incidence of poverty increased from 1.7% before the health crisis to 11.7% during the lockdown (increased sevenfold at the national level). By area of residence, the extent of inequalities also had significant repercussions on the disparity between urban and rural areas. Thus, the vulnerability ratio varied from 4.9% to 11.9% in urban areas, while it increased from 14.6% to 20.2% in rural areas (HCP, 2020).

Graph 5: Evolution of the income Gini Index of Morocco and Neighboring Countries



Source: Author, based on data from SWIID Solt, Frederick (2016).

At the same time, the vulnerability rate more than doubled, rising from 7.3% to 16.7%. This degradation in the standard of living is also evident in the calculation of the income Gini index, which increased from 38.5% before the health crisis to 44.4% in the first quarter of 2020. This is undeniable proof of the pandemic's impact on Morocco's socio-economic fabric and the widening of social inequalities (HCP, 2020). It should be noted that the issue of inequalities (in general and income in particular) is a common problem among North African sub-region

countries. Indeed, with the exception of Algeria and Tunisia, income inequalities remain persistent in Morocco and continue to grow in Egypt.

4. Methodology and data

We are now attempting to study the extent to which income disparities respond to changes in the average level of schooling and educational inequalities in Morocco. We begin the empirical analysis with an econometric model that integrates the methodology of previous studies (Lin, 2007; Shahpari and Davoudi, 2014). First, the control variables used to explain income inequality include the average number of years of schooling (μ) and educational inequality ($Gini_{educ}$). En outre, une forme quadratique de type Kuznets (1955) est généralement utilisée pour investiguer la relation entre le niveau de développement économique et l'inégalité des revenus. Furthermore, a quadratic form of the Kuznets-type is generally used to investigate the relationship between the level of economic development and income inequality. Thus, the relationship can be written as follows:

$$Gini_{income_t} = \alpha_1 + \alpha_2 \ln(gdp_t) + \alpha_3 [\ln(gdp_t)]^2 + e_t \quad (1)$$

Where $Gini_{income_t}$ is the Gini coefficient of income at time t , $\ln(gdp_t)$ is the logarithm of the gross domestic product per capita at period t , $\ln(gdp_t)^2$ is the square of the logarithm of the gross domestic product per capita, and e_t is the error term. Intuitively, we would expect a positive sign for the coefficient α_2 and a negative sign for the coefficient α_3 . After incorporating the control variables related to education, the previous equation becomes:

$$Gini_{income_t} = \alpha_1 + \alpha_2 \ln(gdp_t) + \alpha_3 [\ln(gdp_t)]^2 + \alpha_4 \mu_t + \alpha_5 Gini_{educ} + e_t \quad (2)$$

The empirical literature also proposes other control variables that can explain income inequalities, such as the fertility rate, since a high fertility rate is likely to reduce the disposable income of the poorest (La Croix and Doepke, 2003), or the ratio of high-tech products to total exports due to the impact on the demand for highly skilled workers (Lin, 2007). However, due to the limited number of available observations for certain variables and in order to focus the study on the exclusive impact of the educational sphere on income inequality in Morocco, we will limit ourselves to the previously mentioned control variables. To examine whether the level of income and education-related variables have an impact on income inequalities, we specify, based on the previous equation, an Autoregressive Distributed Lag (ARDL) model. Several reasons justify this methodological choice. First, this dynamic model allows capturing temporal effects (adjustment delays, anticipation, etc.) in explaining a variable. Second, it provides the possibility to model stationary time series that are not integrated of the same order. And third, it is possible to distinguish the short-term and long-term effects of the studied relationship. Let us recall that our objective here is to determine the impact of the level of income (Gdp_{pc}), educational inequalities ($Gini_{educ}$) and the average number of years of schooling ($Mean_{schooling}$) on the income Gini index ($Gini_{income}$). The model to be estimated thus takes the following form:

$$Gini_{income} = f(Gdp_{pc}, Gini_{educ}, Mean_{schooling}) \quad (3)$$

And to capture the short-term and long-term impact of our explanatory variables above on the income Gini index, it is rewritten as follows:

$$\Delta Gini_{income_t} = \alpha_0 + \sum_{i=1}^p \alpha_{1i} \Delta gdp_{t-i} + \sum_{i=0}^q \alpha_{2i} \Delta gdp_{t-i}^2 + \sum_{i=0}^q \alpha_{3i} \Delta Gini_{educ_{t-i}} + \sum_{i=0}^q \alpha_{4i} \Delta Mean_{schooling_{t-i}} + \beta_1 gdp_{t-i} + \beta_2 gdp_{t-i}^2 + \beta_3 Gini_{educ_{t-i}} + \beta_4 Mean_{schooling_{t-i}} + e_t \quad (4)$$

Where

- Δ : first difference operator ;
- α_0 : constant ;

- $\alpha_1 \dots \alpha_4$: short-term effects;
- $\beta_1 \dots \beta_4$: long-term dynamics of the model;
- $e \sim iid(0, \sigma)$: terme d'erreur (bruit blanc).

To determine the optimal lags (p, q) of our model, we will use the Akaike AIC, Schwarz SIC, and Hannan-Quinn information criteria. The structure of equation (4) suggests the presence of a cointegration relationship between the variables, conditioning the estimation of short-term and long-term coefficients. The data used for the empirical analysis are annual and extracted from multiple sources (Table 6 below). Regarding the disposable income Gini index, it is derived from the Standardized World Income Inequality Database (SWIID) by Solt (2020). The GDP per capita data comes from the World Bank WDI database.

As for the educational variables, the average number of years of schooling is directly taken from the Barro and Lee (2010) database². The education Gini index is calculated from the same database following the methodology of Thomas et al. (2001). Given the availability of observations, this study covers the period from 1984 to 2015. From the graph 6 below, the impact of income level (GDP per capita) on income inequalities appears positive, which is consistent with the Kuznets hypothesis, according to which as economies develop, inequality increases up to a certain threshold.

Table 6: Data used

Variables	Description	Source
$Gini_{income}$	Disposable income Gini index	SWIID (Solt, Frederick. 2020)
$Gini_{educ}$	Education Gini index	Barro et Lee (2015)
$Mean_{schooling}$	Average years of schooling (population aged 15 to 64)	Barro et Lee (2015)
Gdp_{pc}	Gross domestic product per capita (current prices)	World Bank (WDI)

Source : Authors.

5. Empirical results

5.1. Descriptive and pre-test results

Regarding the education-related indicators, it appears that a greater dispersion of educational inequalities tends to increase income inequalities. On the other hand, the expansion of education, measured by the average years of schooling, is likely to exacerbate these inequalities. The literature proposes a wide range of tests to evaluate whether a data series is stationary or not. Among these tests are the Augmented Dickey-Fuller test, the Phillips-Perron test, the Andrews and Zivot test, the Ng-Perron test, the KPSS test, the Ouliaris-Park-Perron test, the Elliott-Rothenberg-Stock test, etc. Among these options, three tests are considered relatively simple to use and are commonly employed. The ADF test is effective for detecting the presence of autocorrelation in errors, the PP test is suitable for situations where heteroscedasticity is present, while the AZ test is used for series exhibiting structural breaks or endogenous regime changes. Thus, given that we suspect autocorrelation in the errors of our series, we use the ADF test.

² As a reminder, we performed on the latest version of the Barro-Lee database: "September 2021 Update: Barro-Lee Estimates of Educational Attainment for the Population Aged 15 to 64 from 1950 to 2015." Furthermore, in order to harmonize the database (annual frequency time series) and given that Barro-Lee data are provided in 5-year averages, we applied linear interpolation for the education Gini index and the average years of schooling.

Table 7: Result of the ADF Stationarity Test

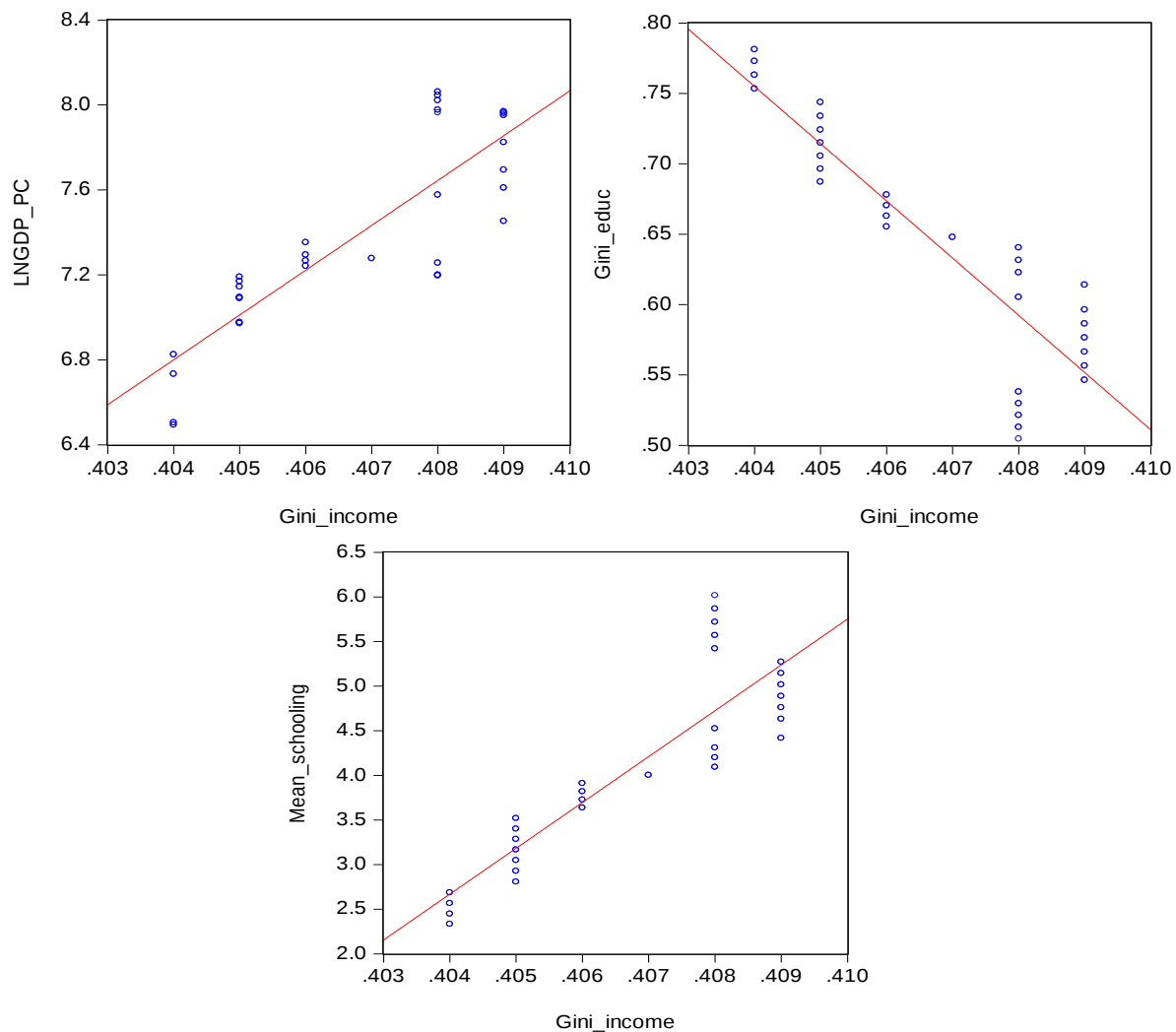
Variables	Integration order	Level		First Difference		Second Difference	
		Value	Prob.	Value	Prob.	Value	Prob.
$Gini_{income}$	I (1)	-1.14	0.9047	-6.10***	0.0000		
Gdp_{pc}	I (1)	-1.91	0.6233	-4.61***	0.0009		
$Gini_{educ}$	I (2)	-3.53	0.0534			-5.88***	0.0000
$Mean_{schooling}$	I (2)	-1.37	0.8483			-5.38***	0.0000

*, **, and *** are significant at the 10%, 5%, and 1% levels, respectively.

Source: Author's estimates

According to the ADF test results, reported in Table 7, the series are not integrated of the same order. The income Gini coefficient and GDP per capita are integrated of order 1 (stationary in first difference), while the educational variables are integrated of order 2 (stationary in second difference). Regarding cointegration, several tests are cited in the literature, primarily those by Engle and Granger (1987), Johansen (1991), and Pesaran et al. (2001). In this study, we used the Pesaran et al. (2001) test as it is the only one that allows for testing cointegration on series that are not stationary of the same order. It is important to note that we employed the Schwarz Information Criterion (SIC) to choose the optimal ARDL model. This criterion allows us to select the model that presents statistically significant results while having the fewest possible parameters (Graph 7).

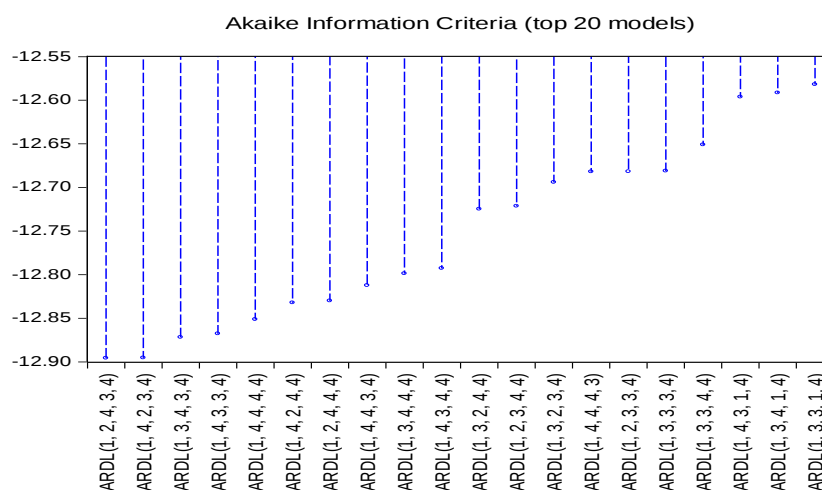
Graph 6: Correlations between the income Gini index and GDP per capita as well as educational variables



Source: Author's calculation.

In light of the results obtained (Table 8 below), the ARDL (1,2,4,3,4) model is the most optimal among the 19 others presented. Furthermore, the model's diagnostic tests first show that there is no autocorrelation of errors or heteroscedasticity, that the errors are normally distributed, and that the above model is well-specified (table 9). The null hypothesis is accepted for all these tests. Our model is thus statistically validated. The estimated ARDL (1,2,4,3,4) model shows good overall performance, explaining 52% of the variation in the income Gini coefficient in Morocco over the period from 1984 to 2015.

Graph 7 : SIC Graph Value



Source: Author's calculation.

Table 8: Optimal ARDL (1,2,4,3,4) Model

Dependent Variable: DGINI_INCOME				
Variables	Coefficient	Std. Err.	t-Statistic	Prob.
DGINI_INCOME (-1)	-0.664715	0.108555	-6.123282	0.0005
DLNGDP_PC	0.062561	0.018842	3.320304	0.0128
DLNGDP_PC (-1)	0.031020	0.017673	1.755270	0.1226
DLNGDP_PC (-2)	-0.053104	0.013263	-4.003966	0.0052
DLNGDP_PC2	-0.004160	0.001263	-3.292770	0.0133
DLNGDP_PC2(-1)	-0.001968	0.001205	-1.633297	0.1464
DLNGDP_PC2(-2)	0.003925	0.000920	4.268872	0.0037
DLNGDP_PC2(-3)	-0.000110	5.94E-05	-1.850940	0.1066
DLNGDP_PC2(-4)	-0.000170	5.73E-05	-2.962479	0.0210
DDGINI_EDUC	-0.217532	0.092530	-2.350948	0.0510
DDGINI_EDUC (-1)	-0.308120	0.094460	-3.261901	0.0138
DDGINI_EDUC (-2)	-0.242926	0.108221	-2.244714	0.0597
DDGINI_EDUC (-3)	0.540777	0.109996	4.916335	0.0017
DDMEAN_SCHOOLING	0.001376	0.007928	0.173506	0.8672
DDMEAN_SCHOOLING (-1)	-0.003081	0.007859	-0.392015	0.7067
DDMEAN_SCHOOLING (-2)	-0.013369	0.007651	-1.747399	0.1241
DDMEAN_SCHOOLING (-3)	-0.023141	0.007177	-3.224249	0.0146
DDMEAN_SCHOOLING (-4)	-0.055820	0.008492	-6.573634	0.0003
C	0.000222	8.47E-05	2.623391	0.0342
R-Square	0.866898	Mean dependent var		0.000115
Adjusted R-Square	0.524636	S.D. dependent var		0.000516
S.E. of regression	0.000356	Akaike info criterion		-12.89564
Sum squared resid	8.86E-07	Schwarz criterion		-11.97626
Log likelihood	186.6433	Hannan-Quinn criter.		-12.63089
F-statistic	2.587259	Durbin-Watson stat		2.720165
Prob(F-statistic)	0.027763			

Source: Author's estimates.

Moreover, the results of the cointegration test corroborate the existence of a cointegration relationship between the analyzed series (the value of the F-statistic is higher than the expected upper bound for a series integrated of order 1), which allows us to estimate the long-term effects of $d\ln gdp_pc$, $d\ln gdp_pc2$, $ddgini_educ$, and $ddmean_schooling$ on $dgini_income$ (table 10).

Table 9: Diagnostic Tests of the ARDL (1,2,4,3,4) Model

Test Hypothesis	Test	Value	Probability
Autocorrelation	Breusch-Godfrey (LM test)	2,13	0,21
Heteroscedasticity	Breusch-Pagan-Godfrey	0,54	0,85
	Arch-test	2.26	0.14
Normality	Jarque-Bera	1.89	0.38
Specification	Ramsey (Fisher)	0.08	0.93

Source : Author's estimates.

Table 10: Bounds Cointegration Test by Pesaran et al. (2001)

Variables	$Dgini_income$, $d\ln gdp_pc$, $d\ln gdp_pc2$, $ddgini_educ$, $ddmean_schooling$	
Calculated F-stat	13.96	
Critical value	Lower bound	Upper bound
1%	3.75	5.06
5%	2.86	4.01
10%	2.45	3.52

Source: Author's estimates.

However, before estimating the short-term and long-term coefficients, we will first examine the correlation and causality between the variables (table 11). The table below provides information on the relationship between the dependent variable ($Gini_{income}$) and the independent variables, with the degree of association being greater than 0.50 in the first column. The causality test will provide further insights.

Table 11: Simple Correlation Matrix

	$Gini_{income}$	$Gini_{educ}$	$\ln gdp_{pc}$	$\ln gdp_{pc}^2$	$Mean_{schooling}$
$Gini_{income}$	1	-0.893780	0.844515	0.839843	0.877345
$Gini_{educ}$	-0.893780	1	-0.967302	-0.967785	-0.999034
$\ln gdp_{pc}$	0.844515	-0.967302	1	0.999479	0.964665
$\ln gdp_{pc}^2$	0.839843	-0.967785	0.999479	1	0.965764
$Mean_{schooling}$	0.877345	0.999034	0.964665	0.965764	1

Source: Author's estimates.

The causality test according to Toda-Yamamoto (1995) relies on the Wald statistic "W", which follows a Chi-square distribution. The null hypothesis states the absence of causality between the variables (probability greater than 5%). According to the test results (table 12), we can deduce the following causalities in the sense of Toda-Yamamoto:

- A unidirectional causality between the income Gini index ($Gini_{income}$) and the education Gini index ($Gini_{educ}$): income inequalities impact educational inequalities.
- A unidirectional causality between the education Gini index ($Gini_{educ}$) and the level of income ($\ln gdp_{pc}$): educational inequalities influence the level of income.
- A unidirectional causality between the level of income ($\ln gdp_{pc}$) and the average years of schooling ($Mean_{schooling}$): the level of income impacts the average level of education.

Table 12: Toda-Yamamoto (1995) Causality Test

<i>k</i>	<i>d_{max}</i>	Dependent Variables	Explanatory or causal variables				
			<i>Gini_{income}</i>	<i>Gini_{educ}</i>	<i>lngdp_{pc}</i>	<i>lngdp_{pc}²</i>	<i>Mean_{schooling}</i>
4	2	<i>Gini_{income}</i>	-	1.72 (0.4216)	1.02 (0.5996)	1.46 (0.4816)	2.29 (0.3176)
		<i>Gini_{educ}</i>	4.61* (0.0995)	-	1.82 (0.4011)	1.91 (0.3838)	1.80 (0.4064)
		<i>lngdp_{pc}</i>	0.78 (0.6752)	6.48** (0.0391)	-	1.90 (0.3856)	2.54 (0.2804)
		<i>lngdp_{pc}²</i>	0.80 (0.6685)	6.54** (0.0393)	1.88 (0.3898)	-	2.72 (0.2566)
		<i>Mean_{schooling}</i>	1.12 (0.5703)	0.056 (0.9722)	4.76* (0.0924)	5.00* (0.0819)	-

() : probability (p-value); *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.
Value = Statistics of χ^2 ; *k* : optimal lag for the VAR in levels; *d_{max}* : maximum order of integration of the variables.

Source: Author's calculation (EViews 10 estimates)

5.2.Results

The data presented in Table 13 reveal that the adjustment coefficient, also known as the "error correction term," is statistically significant. Its negative estimation and deviation from the interval [0,1] in absolute terms confirm the existence of a long-term relationship ("cointegration") between the variables, supporting an error correction process. Furthermore, it is important to note the following:

Table 13: Results of the Short-Term Coefficient Estimation

Dependent Variable: DGINI_INCOME			
Variable	Coefficient	t-stat	Prob
<i>D(DLNGDP_PC)</i>	0.062561	1.722821	0.1286
<i>D(DLNGDP_PC (-1))</i>	0.053104	2.077556	0.0764
<i>D(DLNGDP_PC2)</i>	-0.004160	-1.708535	0.1313
<i>D(DLNGDP_PC2(-1))</i>	-0.003925	-2.215009	0.0623
<i>D(DLNGDP_PC2(-2))</i>	0.000110	0.960406	0.3688
<i>D(DLNGDP_PC2(-3))</i>	0.000170	1.537155	0.1681
<i>D(DDGINI_EDUC)</i>	-0.217532	-1.219847	0.2620
<i>D(DDGINI_EDUC (-1))</i>	0.242926	1.164725	0.2823
<i>D(DDGINI_EDUC (-2))</i>	-0.540777	-2.550961	0.0381
<i>D(DDMEAN_SCHOOLING)</i>	0.001376	0.090028	0.9308
<i>D(DDMEAN_SCHOOLING (-1))</i>	0.013369	0.906681	0.3947
<i>D(DDMEAN_SCHOOLING (-2))</i>	0.023141	1.672981	0.1382
<i>D(DDMEAN_SCHOOLING (-3))</i>	0.055820	3.410891	0.0113
CointEq(-1)	-0.664715	-7.957032	0.0001

Source: Author's calculation (EViews 10 estimations).

Table 14: Results of the Long-Term Coefficient Estimation

Dependent Variable : DGINI_INCOME			
Variable	Coefficient	t-stat	Prob
<i>DLNGDP_PC</i>	0.024315	1.006971	0.3475
<i>DLNGDP_PC2</i>	-0.001491	-0.929746	0.3834
<i>DDGINI_EDUC</i>	-0.136841	-0.549808	0.5995
<i>DDMEAN_SCHOOLING</i>	-0.056488	-3.541545	0.0095
<i>C</i>	0.000133	1.442161	0.1925

Source: Author's calculation (EViews 10 estimations).

The level of income (GDP per capita) exerts a positive but non-significant effect on income inequalities in the short term, and this effect is less than proportional: a 1% increase in GDP per capita increases income inequalities by 0.06% in the short term. This effect does not reverse

over time but decreases in magnitude and becomes statistically significant at the 10% level: the income level from one year ago increases income inequalities in Morocco by approximately 0.05%. Moreover, in line with the Kuznets hypothesis, GDP per capita squared exerts a negative effect on income inequality. This effect, although very marginal, becomes statistically significant starting from the first lag of the control variable. Thus, the economic development from one year ago (or a 1% increase in GDP per capita squared) reduces income inequality by 0.003%. Regarding the control variables related to education in the short-term relationship, there is no significant effect of educational inequalities (measured by the education Gini index) on income inequalities at time t and time $t - 1$. However, the impact becomes statistically significant at time $t - 2$ and the variable's coefficient shows the expected sign. Indeed, a 1% increase in educational inequalities decreases income inequalities by approximately 0.54%. This means that in the short term, educational inequalities are likely to make income distribution more egalitarian. Among the mechanisms identified by the literature that can explain the increase in income inequalities in a country are the imbalances between the supply and demand of skilled workers. Given that this gap is not as significant at the national level (due to the prevalence of precarious work and the weak demand for highly skilled workers), it is not able to exert an expansive effect on income inequalities. Among the mechanisms identified by the literature that can explain the increase in income inequalities in a country are the imbalances between the supply and demand of skilled workers. Given that this gap is not as significant at the national level (due to the prevalence of precarious work and the weak demand for highly skilled workers), it is not able to exert an expansive effect on income inequalities.

Regarding the average level of education, it does not have any significant immediate effect on the dependent variable. The effect becomes significant from period $t - 3$ and is less pronounced than that of educational inequality. Specifically, a 1% increase in the average schooling level raises income inequality by 0.05%. This result is somewhat counterintuitive, as schooling is generally considered a means to achieve a more equitable income distribution. However, it should be noted that in Morocco, the average level of education (6 years) remains very low compared to other countries at a similar level of economic development. This situation still does not facilitate the shift in labor demand from unskilled to skilled workers.

It is widely accepted that skill-biased technological changes, with trade openness as the transmission channel, increase the relative demand for skilled workers, which in turn raises the income of skilled workers relative to that of unskilled workers. Consequently, income inequality has risen in Morocco during this period despite the continuous increase in investments in the education sector.

The table 14 above provides the estimated long-term elasticities, which display the expected results. Similar to the short-term coefficients, the effects of the income level (GDP per capita) on income inequality are positive initially, but turn negative as the income level increases. However, the impact remains statistically insignificant. Conversely, in the long-term relationship, the only variable exerting a significant effect on the dependent variable is the average number of years of schooling. Thus, in the long term, a 1% increase in the average level of education reduces educational inequality by 0.05%. This result corroborates the findings of Lin (2007) and Shahpari & Davoudi (2014). Therefore, the estimated result of equation (4) suggests that an increase in investment in education in Morocco would not only raise the average level of schooling but also reduce educational inequality, both of which could help to decrease income inequality.

6. Discussions

The empirical results highlight complex dynamics in the relationship between education, economic development and income inequality in Morocco, and raise major questions about the effectiveness of current and future policies aimed at reducing income inequality through

educational investment and economic development. Confirmation of a cointegrating relationship between these variables indicates that a gradual adjustment is taking place towards a long-term equilibrium, where the effects of income and educational variables are likely to stabilize. However, the differentiated short- and long-term effects observed here are a reminder that reducing economic inequality in Morocco remains a complex objective, dependent on a variety of structural factors.

From a theoretical point of view, the results relating to per capita income partially confirm the Kuznets curve, according to which income inequalities increase in the early phases of economic development and then decrease. This process, which highlights the persistence of inequalities in the short term, is consistent with the observations of recent studies in other developing countries, such as those by Bhorat et al. (2020), who note that initial economic growth in emerging economies can often temporarily worsen income disparities before redistributive benefits become apparent. This pattern is particularly relevant for Morocco, where economic development remains unevenly distributed and often concentrated in specific urban areas, leaving large rural segments relatively less impacted.

The policy implications of these findings are substantial. In the short term, the fact that educational inequalities can paradoxically reduce income inequalities suggests that policies aimed at immediately reducing educational disparities could have unexpected effects on income distribution. However, a reduction in educational inequalities remains imperative in the long term, especially as the economic benefits of education are clearly documented in recent literature. For example, Lee and Lee (2018) point out that raising education levels generally helps to improve social mobility and reduce income disparities, but only when accompanied by support measures for better integration of graduates into the labor market. These results confirm that Morocco could benefit from an education policy focused not only on increasing enrolment rates, but also on aligning skills with the real needs of the labor market. This would require close cooperation between the public sector, the private sector and educational institutions to anticipate the skills needed in growth areas.

As for the weak impact of the average level of schooling in the short term, this result highlights a problematic dimension: the relatively low level of education does not yet allow for a significant improvement in income distribution, an observation shared by Hanushek and Woessmann (2020), who note that high levels of skills are essential for education to have a real impact on productivity and, ultimately, income inequality. In the case of Morocco, this implies that educational reforms must aim to improve the quality of education beyond access and enrolment statistics alone. A policy that encourages the development of more advanced skills in strategic areas for the Moroccan economy - such as information technology, tourism and green industries - could stimulate demand for skilled workers, thereby reducing income disparities in the long term.

Furthermore, the limited effect of economic development on inequality, highlighted in the long-term results, suggests that Morocco could benefit from a strengthened redistributive policy. Progressive tax policies and improved social coverage, as advocated by Piketty (2014) in his analyses of global inequality, could mitigate the disparities induced by the current model of economic development. Modernizing taxation and strengthening support programs for disadvantaged regions would be relevant responses to prevent economic growth from further accentuating inequalities, a trend observed in several developing countries according to recent analyses by the World Bank (2023).

Finally, the positive long-term effects of investment in education confirm the importance of a sustained commitment in this area. Morocco would do well to draw inspiration from the examples of countries such as Chile and South Korea, which have demonstrated that a substantial increase in investment in education, combined with accompanying policies in key economic sectors, can lead to a reduction in inequality. Educational reforms in these countries

have transformed low-income economies into emerging powers with high social mobility, a model potentially applicable in the Moroccan context if investments are strategically oriented and inclusive.

In conclusion, these results underline the need for Morocco to adopt a multi-dimensional approach, combining improved education with economic and fiscal reforms aimed at creating a more equitable environment. Such an approach would be essential if advances in school enrolment and economic growth are to translate into an effective reduction in income inequalities.

7. Conclusion

The analysis of the dynamics of variables related to education and income disparities in Morocco has revealed two major findings. Firstly, there is the weakness of the educational level of the Moroccan labor force, which barely exceeds six years of schooling (lagging far behind neighboring countries such as Tunisia, Jordan, and Turkey), the persistence of educational inequalities over time and space, and high dropout and repetition rates. All these factors suggest a limited contribution of human capital accumulation to reducing income disparities in Morocco. Secondly, the analysis of income distribution in Morocco has unveiled an important aspect: the persistence of income inequalities between different social classes. This situation, where a minority of the population holds a significant share of wealth, is an undeniable reality. It undermines social cohesion and challenges the principle of equality.

To empirically verify the relationship between our variables of interest, we estimated the impact of income level (measured by GDP per capita) and variables related to education on income inequalities using the ARDL approach. After conducting stationarity and model diagnostic tests, we obtained short-term and long-term coefficients as estimated by the ARDL method. The results show that, in the short term, educational disparities are likely to make income distribution more egalitarian. As for the expansion of education, measured by the average number of years of schooling, it has no significant immediate effect on the dependent variable. Furthermore, it appears that in Morocco, educational inequalities have a negative effect on income inequalities. This result suggests that wage inequalities in Morocco are in a "composition" phase and have not yet reached a "compression" phase. Moreover, educational variables alone are not likely to explain income distribution (technology, quality of institutions, etc.). For example, countries where the distribution of education is relatively equal, such as Scandinavian countries, have not succeeded in completely eradicating income inequalities. However, in the long-term relationship, the only variable having a significant effect on the dependent variable is the average number of years of schooling. Thus, in the longer term, an increase of 1% in the average level of education decreases educational inequalities by 0.05%. Therefore, the estimation of equation (4) suggests that an increase in investment in education in Morocco would not only raise the average level of schooling but also reduce educational inequalities, both of which are likely to reduce income disparities.

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