CHAPTER 3

Educational Expansion in Africa (1965–2010): Implications for Economic Inequality between Countries

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Introduction

To its advocates, education is the '*best investment in development*,' but also '*a great equalizer*,' with benefits accruing to both individuals and nations (Ram 1990; King and Hill 1993; Downey et al. 2004). This promise of education as "*an indispensable key … to personal and social improvement*" (UNESCO 1990, 4) continues to be endorsed by major international forums, and it looms large in the UN's Sustainable Development Goal 4 (SDG4), which seeks to "ensure inclusive and equitable *quality* education" (UN 2019).

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Yet this endorsement rests on incomplete evidence. Studies have assessed the equalizing role of education within, but not *between* countries (see O'Neill [1995] for one exception).[1] This oversight is predictable, because analysts often equate income inequality with relative incomes. From that perspective, a simple comparison of national growth rates is enough to infer cross-country inequality: if poorer countries grow at a faster rate than richer ones, then inequality should narrow. Yet, as Firebaugh (1999) demonstrated, a true measure of inequality between countries depends on more than relative growth. It instead integrates information about growth in national economies *and* populations. Indeed, each of these two components can be split further. For the purpose of studying GDP inequality, demographic change can be split into population size and structure (Eloundou-Enyegue et al. 2013). Likewise, economic growth can be split into its constitutive components, whether they are drawn from standard growth accounting models (Barro 1999) or focus on the role of education, as is done here. Altogether, we seek to explain trends in income inequality based on multiple components that include the quantity and the quality of schooling.

Fifty years ago, African countries averaged a mere 1.3 years of education per adult (Barro and Lee 2013). The leading countries at the time, South Africa (4.4 years) and Lesotho (2.9 years), did not exceed an average of 5 years of schooling, while lagging nations, like Niger (0.4 years) and Central African Republic (0.5 years), did not even reach 1 year. Substantial gains have been achieved since. By 1985, African countries were averaging 3.4 years of education, with the lagging countries now near the average level observed back in 1965. In the decades to follow, this pattern persisted. As Fig. 3.1 shows, average attainment rose steadily to 5.5 years by 2010. Although these numbers remain low, compared to other world regions, they represent a fourfold increase over the 40-year period.[2] Many economists would expect inequality to follow a bell curve (Kuznets 1955), but the evidence in Fig. 3.1 shows that educational inequality across African countries declined *first*, *from 1965 to 1985,* before tapering off, from 1985 to 2010. In other words, lagging countries have

[1] For effects on personal well-being, see, for instance, Martin (1995); Ross and Wu (1995); Card (1999); Dee (2004); and Musick, Brand, and Davis (2012). For effects on economic growth, see Romer (1989); Barro (1991); Sala-i-Martin (1994); Pritchett (2001); De Gregorio and Lee (2002); and Cohen and Soto (2007).

[2] In 2010, the average number of schooling years was 5.34 in sub-Saharan Africa, compared to 10.91 years in advanced economies (Barro and Lee 2013).

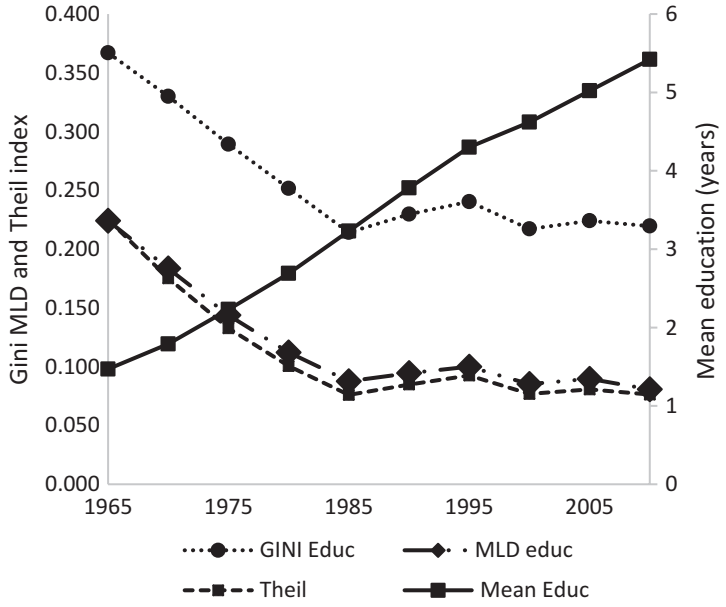

Fig. 3.1 Trends in between inequality in education. (Source: Authors' construction)

begun to catch up educationally, and since the mid-1980s, educational attainment increased almost uniformly across African countries. Fig. 3.1 plots this inequality between 1965 and 2010, using three different measures.[3] Regardless of the metric, the results show a decline. From about 0.37 in 1965, the Gini in educational attainment fell close to 0.22 in 2010, a remarkable 40 percent decline. The decline was also impressive (60 percent), when measured by the mean logarithmic deviation (MLD) and Theil indices.

However, convergence in education need not imply convergence in economic performance, for at least three reasons. First, as enrollments spread, richer countries might improve the quality of their schooling, and they have more resources to do so (Jensen 2010). Second, differences in school quality might translate into differences in economic returns

[3] These measures are somewhat complementary: the MLD is most sensitive to inequality from the bottom of the education distribution; the Theil is most sensitive to inequality near the top; and the Gini is more balanced.

(Pritchett 2001). If these returns are larger among richer nations, economic inequality will continue to widen, in spite of convergence in education. The scenario becomes even more plausible if the gains in enrollments in poorer nations come at the expense of quality. Third, even if educational inequality narrows, other components of inequality, including technology (O'Neill 1995; Sawhill et al. 2006) or demographic change (Firebaugh 1999; Eloundou-Enyegue et al. 2013) can maintain inequality.

Again, economic convergence need not follow educational convergence. Education could well stimulate growth within individual countries without being a '*great equalizer*.' Research questions about education's influence on economic convergence therefore need separate attention. We advance this line of research by examining the link between Africa's convergence in education and GDP. We focus on the 1965–2010 period, which saw remarkable gains in education. Perhaps, more importantly, this period also saw Africa's incomes diverge, while education was converging (Figs. 3.1 and 3.2). The confluence of these two trends offers a unique background for examining how trends in education contribute to

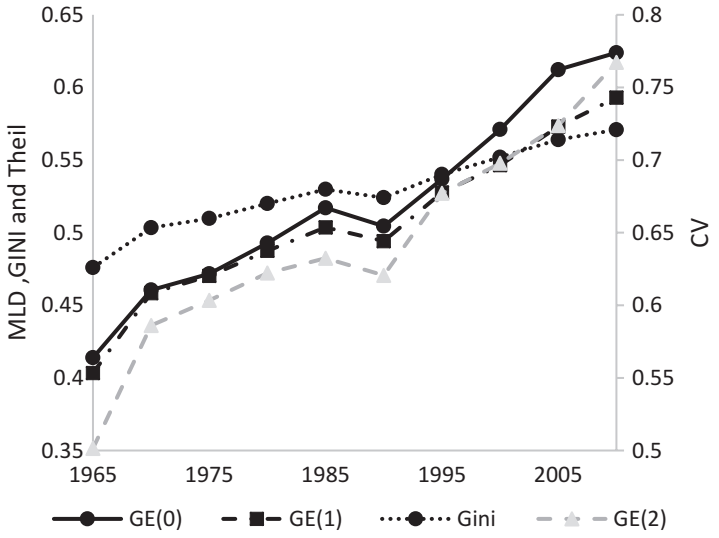

Fig. 3.2 Trends in African income inequality (1964–2010). (Source: Authors' construction; Note: CV = GE(2) is the generalized entropy single parameter class of inequality index. It is thus half the square of the coefficient of variation)

economic convergence in Africa. We ask two questions: (1) Did education work as an economic equalizer during that time period? (2) If so, which aspect (quantity vs. quality) was most influential? We rely on a decomposition method to elaborate our answers to these two questions.

Background and Significance

Education is expected to boost economic growth because it raises the productivity of other factors, notably the quality of the labor force, innovation, and technology (Barro 1991; Barro and Sala-i-Martin 1995; Rosenzweig 1995). It additionally improves health and slows population growth (King and Hill 1993). However, an economic boost from education is more likely if the skills gained are in demand and are put to use. A boost is less likely if jobs are concentrated in the agricultural and informal sectors. As it boosts growth across countries, a regional expansion of education could reduce international inequalities. If poor countries catch up educationally, the rising number and productivity of educated workers, along with slower population growth and improved health, combine to bring these countries closer to leading economies (Tamura 1991). Yet, as argued earlier, this economic convergence is not automatic, and it has not been documented within Africa.

Africa's recent advances in schooling were all the more remarkable as they occurred under a context of rapid population growth. Africa's population grew by a factor of 2.3 between 1965 and 2010, and gains in enrollment were widespread, as indicated by the trends in educational inequality shown in Fig. 3.1. Unlike education, however, economic inequality was on the rise (Fig. 3.2). Regardless of the inequality measure used, there is a clear rise in between-country income inequality between 1965 and 2010. The income Gini increased from 0.59 in 1965 to 0.94 in 2010. The 61 percent jump observed can be paralleled to the drop observed in inequality in education. In light of this close temporal correlation, the obvious question is whether education contributed to this income divergence.

Our extensive review of the literature on the contributions of education to international income inequality unearthed a single study by O'Neill in 1995. The study used a method of variance decomposition to account for the historical change in cross-country income inequality into education levels, returns to education, and a residual. It showed mixed results, with trends in schooling levels fueling convergence, while trends in returns to schooling widened inequality. It covered the years from 1967 to 1985,

and repeated the analyses for four groups of countries: world, developed countries, Europe, and least developed countries (LDCs). The study found similar results across Europe and developed countries, and the results starkly differed from those found at the global level and across LDCs. Across developed countries, the convergence in education level contributed to reduce income inequality, while the "quality" of education widened inequality, but the contribution of the former outpaced that of the latter. Across LDCs, a similar pattern was found, but the contribution of quality outpaced that of quantity. While O'Neill covered LDCs as a whole, we focus specifically on Africa.

Africa is interesting as a setting for this study. Substantively, the region covers a long span from early to more advanced stages of educational development. Furthermore, since school attainment remains low (below 6 years) in Africa, compared to advanced economies (above 10 years of schooling) (Barro and Lee 2013), there is much to be learned about the early contribution of education, especially if private returns to education are smaller early on (Kuepie et al. 2009), and if the economy remains dominated by low-skill and informal-sector occupations.

Methodologically, it is easier to test the effect of education on between-country income inequality if (as was the case in Africa) there is sufficient variance in the economic and educational trends. As a juxtaposition of Figs. 3.1 and 3.2 shows, the region's inequalities ebbed and flowed. Between 1965 and 1985, educational inequality fell by 60 percent, from 0.224 to 0.088, while both income inequality and education levels were rising. The second phase began in 1985, ending in 2010. Educational inequality remained almost constant over that period, but the average number of years of education was still increasing, and income inequality kept rising after a brief stabilization between 1985 and 1990. This variance in the trends of education and income (and their inequalities) makes it possible to test the nexus between education and income over a wider range of circumstances.

Yet another reason why Africa is uniquely interesting has to do with its demographic trends. Birth rates are falling in the region (World Bank 2019), with corresponding transformation in age structure. In response, a growing body of literature is exploring the impacts of these demographic changes on socioeconomic development (Bloom et al. 2003; Lee and Mason 2006; Eastwood and Lipton 2011; Canning et al. 2015). We can enrich this literature on demographic dividends with new insights on inequalities. Our decomposition analysis will show whether the well-

documented variation in the pace and timing of national transitions in the region (Garenne and Joseph 2002; Bongaarts 2008; Ezeh et al. 2009; Schoumaker 2009; Shapiro and Gebreselassie 2009; Bongaarts and Casterline 2013) led to a corresponding widening of economic inequality. While previous studies have investigated dividends at the national level and focused on average gains, our study will focus on the region and its between-country inequality.

Methods

A paucity of methods is one reason why the link between education and economic inequality remains understudied. Cross-country correlations have been used by default. In that perspective, if a researcher should find improvements in schooling to be systematically correlated with gain in GDP per capita, s/he might infer that growing inequalities in education would also imply growing inequalities in GDP. The faulty assumption, however, is that GDP returns to schooling are similar across countries (Kuepie et al. 2009). Moreover, this perspective falsely uses countries (rather than a region) as the unit of analysis. On the other hand, should a researcher focus on the region as analytical unit, s/he would face a daunting problem of sample size, as s/he would be dealing essentially with a sample of one.

Decomposition methods offer a solution to the problem. In the simplest case, the level of inequality within the region can be described as reflecting both the relative GDPs of countries (i_j) and their relative population sizes (p_j) (Firebaugh 1999). Thus, historical changes in inequality can be decomposed into the effects of national changes in relative population size versus relative incomes. If we use the MLD as a metric, the total inequality can be described as in Eq. 3.1, and the change in inequality can be decomposed (Eq. 3.2) as a function of the relative incomes and their share of population (see Mookherjee and Shorrocks 1982):

$$MLD_t = \sum p_{jt} * \ln\left(\frac{1}{i_{jt}}\right) \tag{3.1}$$

$$\Delta MLD \cong \left[\sum\left(\overline{i_j} - \overline{\ln\left(i_j\right)}\right) * \Delta p_j\right] + \left[\sum\left(\overline{p_j i_j} - \overline{p_j}\right) * \Delta ln\left(i_j\right)\right], \tag{3.2}$$

where barred values represent averages, and Δ marks a change between two time periods. For instance, when studying change in African inequality between 1960 and 1990, $\bar{i}_j = \left(i_j\left(1960\right) + i_j\left(1990\right)\right)/2$, and Δp = p_{1990} − p_{1960}.

However, the simple decomposition in Eq. 3.2 is limited. It does not reveal components of theoretical interest in our analysis, such as the influence of education, including its quality and quantity. It also obscures the role of influential economic variables (such as productivity) or population variables (such as age structure). Therefore, we develop a slightly more detailed explanation by re-expressing GDP per capita (i_j) as a function of GDP per working age population (π_j) and the age structure of various countries (a_j) [Eq. 3.3]:

$$i_j = g_j/n_j = \left(g_j/a_j\right) * \left(a_j/n_j\right) = \pi_j a_j, \tag{3.3}$$

where g, n, and a are the national income, the total size of the national population, and the size of the working age population, respectively.

$$\begin{aligned} \Delta MLD \cong & \left[\sum\left(\bar{i}_j - \overline{\ln\left(i_j\right)}\right) * \Delta p_j\right] + \left[\sum\left(\overline{p_j i_j} - \overline{p_j}\right) * \Delta ln\left(a_j\right)\right] \\ & + \left[\sum\left(\overline{p_j i_j} - \overline{p_j}\right) * \Delta ln\left(\pi_j\right)\right] \end{aligned} \tag{3.4}$$

Given our interest in education, we refine the last term in Eq. 3.4—the productivity effect—to highlight the role played by a well-educated workforce (Barro 1991). Using regression analysis, we express labor productivity (π) in terms of the macro returns to schooling (R), schooling levels (S), and an error term (E). We assume that education affects contemporaneously labor productivity in the following way[4]:

$$Ln\left(\pi_{jt}\right) = \alpha_{jt} + R_{jt} S_{jt} + e_{jt} \tag{3.5}$$

$$\Delta Ln\left(\pi_j\right) = \Delta a_j + \overline{R_j}\,\Delta S_j + \overline{S_j}\,\Delta R_j + \Delta e_j \tag{3.6}$$

[4]We repeated the same analysis assuming a five-year lag in the effect of education on productivity. Results (available upon request) are qualitatively similar to those presented here.

One can insert Eq. 3.6 into Eq. 3.4 and obtain yet a more detailed decomposition, Eq. 3.7. This final formulation apportions the total change in income inequality over a period into five sources[5]:

Total population (P): the changes in the relative size of African countries. Countries that grew faster during that period will have a disproportionate influence on trends.

Age structure (A): Countries whose age dependency ratios changed the most will have a disproportionate influence on trends.

The total effect of changes in countries' productivity, itself subdivided into the effects of education and other factors.

Returns to education (R). These returns change historically and in ways that vary across countries.

Education levels: the average level of education in the country.

Others: This is the part of productivity not accounted for by education.

$$\Delta MLD \cong \overbrace{\left[\Sigma\left(\bar{i}_j - \overline{\ln(i_j)}\right) * \Delta p_j\right]}^{P} + \overbrace{\left[\Sigma\left(\overline{p_j i_j} - \overline{p_j}\right) * \Delta ln\left(\alpha_j\right)\right]}^{A} + \underbrace{\left[\Sigma\left(\overline{p_i i_j} - \overline{p_j}\right) * \bar{S}_j \Delta R_j\right]}_{R} + \underbrace{\left[\Sigma\left(\overline{p_i i_j} - \overline{p_j}\right) * \bar{R}_j \Delta S_j\right]}_{S} + \underbrace{\left[\Sigma\left(\overline{p_i i_j} - \overline{p_j}\right) * \Delta e_j\right]}_{E} \quad (3.7)$$

One challenge in this analysis is to obtain R_{jt}, that is, the country- and time-specific values on the GDP returns to education. Our estimation strategy builds on the expectation that returns vary with the stage of educational development (Krueger and Lindahl 2000). Thus, we estimated the country- and period-specific parameters in Eq. 3.5 with a regression pooling data for all countries and years, but also including variables for J (dummies for country) and T (dummies of the time period):

$$\begin{aligned} Ln\left(\pi_{jt}\right) &= \alpha_{00} + \beta_{00} S_{jt} + \beta_1 J + \beta_2 T + \beta_3 J S_{jt} + \beta_4 T S_{jt} + e_{jt} \\ &= \left(\alpha_{00} + \beta_1 J + \beta_2 T\right) + \left(\beta_{00} + \beta_3 J + \beta_4 T\right) S_{jt} + e_{jt} \\ &= \left(\alpha_{jt}\right) + \left(R_{jt}\right) S_{jt} + e_{jt} \end{aligned} \quad (3.8)$$

[5] It has to be noted that a final term, the intercept or baseline productivity $\left(\left[\Sigma\left(\overline{p_j i_j} - \overline{p_j}\right) * \Delta\alpha\right]\right)$, was not considered here because it sums to zero.

This formulation in Eq. 3.8 helps move beyond a black-box understanding of the effect of quality of education. As the formula shows, this overall effect comprises a "multiplier" effect, β_3, arising from a general improvement in the global returns to schooling in year T, and a "differentiation" effect, β_4, reflecting the extent to which changes in the returns differ between countries). Following Behrman and Birdsall (1983), β_3 can also be seen as the return to the quality of schooling. Accounting for the complementarity between quantity and quality of education, the dummy variable J captures the country's school quality and the ability of the schooling system to generate necessary productive skills needed by the economy. In this respect, the value of R_{jt} can be seen as incorporating the overall return to education.

Data and Measures

The input data required to apply Eq. 3.7 was retrieved from the World Development Indicators (WDI) database (World Bank 2019) and from Barro and Lee's (2013) ("BL" hereafter) new data set of educational attainment in the world. The WDI contains over 1300 socioeconomic indicators on 54 African countries and territories for each year since 1960. The indicators taken from this database included total population, the share of the population aged 15–64, and GDP per capita at constant 2005 US$. The WDI database is extensive but plagued by missing data. For instance, the GDP is not available for all countries over the entire period covered. The BL data is available for 35 African countries, and it provides a contemporaneous measure of educational attainment at five-year intervals, from 1950 to 2010. It includes the distribution of educational attainment of country education used; for this study, it is the average number of years of school attainment for the population aged 15 and above. The data from WDI and from BL are merged to generate the data used in this chapter. The resulting merge contains the required data for 25 countries (Table 3.1).

In using these data, one has to worry about the comparability of national statistics. The GDP (at constant price) and total population are easily comparable, because they are produced for all countries and territories with a standardized procedure. In addition, they are cross-validated by the United Nations, the International Monetary Fund, and the World Bank. The age structure is found in the WDI and is based on data from the UN's Population Division. Our education variable is produced with the same procedure across counties, and its comparability has been improved to "address most of the concerns raised by critics" (Barro and Lee 2013).

Table 3.1 Country contribution to change in income inequality (1965–2010)

	Total country contribution to change in MLD (% of region)	*Sources of country contribution (% of country contribution)*					
		Population component		*Economic component*			
					Education		*Others*
		Size	*Age Structure*	*Quality*	*Quantity*	*Total*	
Algeria	−21	−74	72	−85	103	18	84
Botswana	−6	1	7	−17	92	76	17
Lesotho	−4	47	1	−17	47	30	22
Rwanda	−4	15	8	−46	59	13	64
Kenya	−4	557	−59	303	−446	−143	−255
Burundi	−2	111	−14	−45	15	−30	33
Sudan	−2	166	3	41	−45	−4	−65
Congo	−2	70	−4	−19	41	22	12
Sierra Leone	−2	124	−23	−33	−17	−50	48
Malawi	−1	−226	−77	−216	418	202	201
Cameroon	−1	−30	−116	−291	439	148	98
Benin	−1	−92	−10	−214	424	210	92
Gabon	0	−53	−55	−130	288	158	51
Ghana	0	91	5	−206	−41	−247	252
Mauritania	0	119	0	162	−61	101	−120
CAR	1	212	−36	−64	−94	−158	82
Togo	1	96	21	140	−86	54	−72
Senegal	4	40	18	54	45	99	−57
Zambia	5	57	19	72	39	111	−87
Liberia	5	−28	11	22	165	188	−71
Zimbabwe	6	−113	−18	219	−37	182	49
Cote d'Ivoire	7	87	4	12	7	20	−11
South Africa	8	−589	288	−1346	842	−504	904
Niger	18	33	11	7	55	62	−6
DRC	95	9	8	13	74	87	−4
Total	100						

Source: Authors' construction

The BL data are given at a five-year interval, while WDI data are provided annually. There are two options for merging the two databases. The first is to select only WDI data corresponding to the end year of the 5-year period year, and the second is to compute five-year averages of the WDI data. We opt for the second approach and compute the corresponding

five-year averages.[6] Thus, the GDP used for 1965 is the average GDP of the years 1961 to 1965. The GDP used for the subsequent years (including 1985, 1990, 2005, and 2010) are computed as average GDP for the respective periods (1981–1985, 1986–1990, 2001–2005, and 2006–2010). The values used for the population and the age structure are computed similarly.

Findings

Table 3.2 summarizes the trends and drivers of GDP inequality between African countries. The first three columns focus on the trend. Results are presented for the full study period (1965–2010, first line) and for the selected two subperiods (1965–1985 and 1990–2015, next two lines below). Over the entire period, income inequality between African countries rose from 0.41 to 0.62, a 50 percent increase. However, the trend was not all linear. A 0.10-point rise between 1965 and 1985 gave way to a small drop (−0.01) between 1985 and 1990, and finally a substantial increase (0.12) during the last period. The general divergence observed here is consistent with earlier analyses (Kandiwa 2007).

The aim in this study, however, was to go beyond mere description and explain the observed trend in inequality. The remaining columns in the table thus describe how three broad sets of forces (population, education, and other economic) fueled this trend. The population and education components are further split into subcategories. Population, for instance, is subdivided into its total size and age composition. Education is likewise subdivided into the quality and quantity of education (proxied here by returns to education and level of educational attainment, respectively). In theory, the third broad category (other economic) also comprises multiple subcomponents, but their detail was not investigated, given the study's focus on education. These three components are discussed in turn.

Population

Over the entire period from 1965 to 2010, population variables, taken together, made a large contribution (+18 percent) to Africa's GDP divergence. However, its two components worked in opposite directions. Overall, the population size component contributed to reduce income

[6] We also carried out the analysis with the first approach (end-of-period data). Results (available upon request) are qualitatively similar.

Table 3.2 Decomposition results for the contributions of education and other factors to the changes in between country inequality (Africa*, 1965–2010)

	Inequality Levels			*Decomposition of Change*					
				Population		*Economic*			
			Change			*Education*			*Others*
Time Periods	*MLD 1*	*MLD 2*	*Δ MLD*	*Total Population*	*Age Structure*	*Quality*	*Quantity*	*Total Education*	
1965–2010	0.414	0.624	0.21	−19%	37%	−55%	104%	49%	33%
1965–1985	0.414	0.517	0.103	−20%	22%	−8%	45%	37%	61%
1990–2010	0.504	0.624	0.120	−10%	42%	−67%	75%	8%	60%

Source: Authors' construction

*These are 25 African Countries with data on education over the period covered by Barro and Lee (2013)

Total population: country's share of global population
Age Structure: share of country's population between the ages of 15–64
Education: total contribution of education, sums the effects of returns to education (quality) and level of education (quantity)
Quality: proxied by returns to schooling (effects of an additional year of education on the productivity of 15–64 population)
Quality: schooling levels (average years of schooling per adult)
Others: contribution of all other factors, except for education, to productivity (GDP per person aged 15–64 years old)

inequality (−19 percent). In other words, countries grew at different rates, with the richer and/or poorer countries growing more slowly than countries in the mid-income range, a pattern consistent with predictions from Easterlin's demand–supply theory (Easterlin 1975). In that framework, fertility demand is expected to be low in rich countries, but conversely, the supply of fertility is constrained by poor health and nutrition among the poorest countries. Historically, the contribution of population size on the economic divergence between African countries decreased over time. From −20 percent in the 1965–1985 period, it fell to −10 percent in the last period. In sum, rates of population growth became a little more similar across the study countries.

While trends in population size helped reduce inequality, those in age structure raised it. They accounted roughly for a third (37 percent) of the divergence in GDP observed among African countries between 1965 and 2010. Two observations are noteworthy. First, the contribution of age structure is higher (in absolute terms) than that of population size. This stands in contrast to the tendency, in much of the existing literature on international inequality, to focus on population size as the key demographic variable (see Eloundou-Enyegue et al. 2013). Our current findings, as well as the burgeoning literature on the demographic dividend (see Bloom et al. 2003), point to age structure as the more influential demographic trend. A second noteworthy fact is that the influence of age structure in fostering economic divergence grew over time: from 22 percent in the first period, it nearly doubled, reaching 42 percent during the last study period. This finding is unsurprising in light of the staggered onset of Africa's fertility transitions (Shapiro and Gebreselassie 2009; Bongaarts and Casterline 2013), as well as emerging national differences in the economic dividends generated as a result (Eloundou-Enyegue and Giroux 2013).

Other Factors

The residual group includes economic variables, such as total factor productivity and other variables, but these were not studied in detail here, given our intended focus on education. Although these factors are unspecified, they account for a large chunk (33 percent) of the total divergence observed. The magnitude of their influence remained similar across the

two study periods (61 percent in 1965/1985 versus 60 percent in 1990/2015).

Education

We finally turn to the contributions of education, looking at total contribution (shaded area) in Table 3.2, and specific contributions from the quantity and quality of education. For the entire study period, education accounted for a large share (49 percent) of the increase in inequality. This total effect was larger for the first study period (37 percent), compared to the second study period (8 percent). Our main interest was in comparing the influences of the quantity versus quality of education. In that area, three findings were noteworthy.

First, the two components of education worked in opposite directions, with the trends in quantity helping to raise GDP inequality, while trends in quality reduced it. That these two contributions are in opposite directions warrants some attention to quality alongside quantity of education. This is especially important, given the suggestion that convergence in quality had been a substantial force for convergence, accounting for −55 percent of the trend: had this trend in quality not occurred, the divergence in GDP in the region would have been even more severe.

Second, the historical changes in education quantity did promote divergence of African countries (104 percent). This seems counterintuitive, especially in light of the result (Fig. 3.1) showing a tapering off of educational inequality in the last two decades. However, as Table 3.2 shows, this mostly reflects the influence of a few large countries that had relatively low schooling levels (the Democratic Republic of the Congo [DRC] and Niger) and that also experienced subpar progress in education. The influence of the quantitative aspect of education increased over time, from 45 percent to 75 percent. Of all factors in this analysis, the quantity of education was the single largest contributor to the trend in GDP inequality. This was true whether one focused on the full study period, or the second subperiod considered in the analysis. Clearly, the expansion of mass education is an important factor in shaping the region's trend in inequality, but in this case, it did not contribute to the reduction of GDP inequality in the region, in spite of the relative convergence in schooling levels noted, especially during the period from 1965 to 1985.

On the other hand, trends in school quality appeared to foster some convergence in GDP per capita among the countries in the region. Again,

had the differences in school quality remained as they stood at the start of this study period, the levels of GDP inequality would have been 55 percent higher than was ultimately observed in 2010. The role of school quality in fostering economic convergence increased over time. While it only reduced GDP inequality by 8 percent over the first study subperiod, the trend in schooling inequality contributed to a 67 percent reduction in inequality over the second subperiod. Clearly, differences in school quality are an important factor in debating the role of education as an economic equalizer between countries. Although the quantity of education wields the larger influence in absolute terms, the quality of education appears to have been the more influential force, if the required direction is a reduction in GDP inequality.

Which countries were most influential in this process? Beyond identifying the most important substantive forces, decomposition analyses can also reveal countries that were most influential in shaping the trend in GDP inequality. Indeed, the analysis can combine the two pieces of information to show, for each country, how much of the national contribution was tied to the country's educational performance, whether in quantity or quality of schooling. The results from this analysis are found in Table 3.1. The largest contributors to economic divergence over the study period include the DRC (95 percent), Niger (18 percent), South Africa (8 percent), and Côte d'Ivoire (7 percent). Countries can contribute to divergence in two ways: the first is when a relatively affluent country experiences above average growth during the period (this seems to have been the case for South Africa) or when a relatively poor country (on a per capita basis) achieves subpar growth (as was presumably the case for Niger and the DRC). At the opposite end of the process, countries fostering convergence include Algeria (−21 percent) and Botswana (−6 percent), two relatively prosperous countries in the mid-1960s that achieved subpar growth over the study period. One can explore, in greater detail, how these influential countries made their contributions, and the results are also found in Table 3.1. Although the results are given for all countries, they tend to be unreliable for countries making relatively small contributions, because decomposition in that case attempts to slice very small numbers. These less reliable findings are shaded in Table 3.1. As the table indicates, the DRC's contribution to divergence is largely explained by its subpar performance in the education sector (87 percent overall, with 74 percent for schooling level and the balance, 13 percent, from school quality). Niger's underperformance in education is similarly the driving factor

for this country lagging further behind and its contribution to the expansion of inequality in the region. On the other hand, South Africa did not owe its contribution to education. The country's disproportionately strong economic performance (which fueled inequality) reflects other factors not included in this analysis (904 percent), as well as changes in age structure (288 percent), a fact consistent with the documented record of this country being at the forefront of the demographic transition (Swartz 2002) and being among the first to see the signs of a demographic dividend, including in the education sector (Eloundou-Enyegue and Giroux 2013). At the other end of the list, Algeria was the most influential country in buffering the trend toward divergence. It did so primarily though "other economic factors" not studied in detail here, although the leveling off of its education also played a role.

Conclusion

This study explored the salience of education as a factor in shaping trends in economic inequality between countries. The core hypothesis—that countries should converge economically if they begin to converge educationally—had not been often examined in sufficient detail or in African settings. Some of the detail lacking concerned the relative magnitude of education effects, and the most relevant dimension of education. Compared to other forces, how large is the influence of education in shaping economic convergence among countries? And is quality as important as quantity in this process? Our analyses of recent patterns in Africa do confirm education as a very influential force, which accounted for nearly half of the trends in inequality occurring during the study period. In adjudicating between quantity and quality, the study generates mixed findings. On the one hand, the quantity of schooling is a more influential force, in absolute terms. On the other hand, trends in the quality of education were found to work in the direction of containing inequality. One could say that, as far as *reducing* GDP inequality among African countries over this study period, schooling levels were more important quantitatively (total effect), but school quality was more so qualitatively (direction of effect).

Two important caveats must be recalled when appraising these results. First, the analyses rest on a relatively small subset of African countries, owing to missing data on some of the key variables. Second, the decomposition methods used in this chapter do not establish a causal relationship. They simply show, in accounting perspective, how much of the

change in inequality is associated with concurrent changes in a range of components that constitute inequality. Nonetheless, the study does signal the potential contributions of education to economic convergence of African countries. At the same time, it highlights the importance of quality alongside quantity of schooling. If education is to work as an international equalizer in the region, convergence is needed in both the quality and quantity of schooling. Although quantity appeared to wield the larger influence during the study period, convergence in the quality of schooling brought nations in the right direction, if one of the goals of educational expansion is to reduce economic inequality across countries of this region.

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