AFRICA'S PROGRESS IN THE EDUCATION MDGS: ACCOUNTING FOR THE ROLE OF DEMOGRAPHIC AND ECONOMIC CHANGE

INTRODUCTION

The United Nations' commitment to expand access to schooling under the aegis of the Millennium Development Project presents a particularly formidable challenge for many African countries schooling (UN 2001). Given the disparity between Saharan Africa's large school-age population and budgetary allocations for education that on average amount to no more than 4–5% of Africa's gross domestic product (GDP), levels of expenditure per student are very small and make resource allocation a critical challenge for post-colonial states. These targets set for 2015 will likely be missed by many countries unless progress is accelerated, and this in turn depends on new infusion of budget resources, increased efficiency, or the kind of opportunistic boost that a demographic dividend could provide (Binder, 2009; Sahn & Stifel, 2003; UNDP, 2001; UNESCO, 2005). Future expansion in enrollments will also reflect improvements in the resources individual families are able to expend on schooling for children. This, in turn, depends on the number children living in high-SES household and the extent to which SES impacts enrollment.

This paper seeks to understand the socio-demographic drivers of recent trends in schooling attainment in sub-Saharan Africa. The analyses focus on the years 1991-2008, a time of rapid socio-demographic change in the region, and it covers 19 sub-Saharan countries that have experienced a wide variety of economic and demographic changes during this period. To investigate this issue, we integrate regression findings into a series of decomposition methods. This decomposition makes it possible to estimate the complementary contributions of demographic transitions, changes in the distribution of children across various SES groups, and broad-based national policy. More concretely, our expanded decomposition apportions countries' inter-survey changes in educational attainment into the effects of (1) changes in baseline educational opportunities, (2) in the education gradient associated with SES, (3) in the relative fertility change associated with each SES group and (4), the proportion of families in various SES groups.

Beyond this decomposition, the paper uses multi-level models to identify the national level social, economic and demographic characteristics of countries to explain why demographic change has produced more sizeable gains in enrollments in some countries but not others. We also investigate how these national trends shape the relative importance of family level SES.

DATA

Data for this study comes the Demographic Health Surveys. Over the last two decades, the DHS have conducted nationally representative and large surveys on a wide range of issues, including health, education, and nutritional status in over 75 countries mostly in sub-Saharan Africa, South and South East Asia, and Latin America. Interestingly for our purposes, the surveys have been repeated every few years (5 or so) in select countries. For this paper, we were able to examine 19 countries over a period from 1991 to 2008. Three countries (Ghana, Kenya,

Tanzania) provide four survey years, eleven countries (Benin, Burkina Faso, Cameroon, Madagascar, Mali, Malawi, Namibia, Namibia, Rwanda, Uganda, Zambia, Zimbabwe) provide three survey years, and five countries are surveyed twice (Ethiopia, Guinea, Mozambique, Niger, Nigeria). Information about the specific years of each survey is included in Appendix Table 1.

This data is further augmented with data from the World Bank's World Development Indicators. This database covers a wide range of development related variables spanning from 1960-2008. Specifically, we utilize several social (national educational expenditures, literacy rates), economic (GDP per capita) and demographic factors (age dependency ratios) variables. Because of the longitudinal nature of this data, we are able attain lagged data relevant for each specific DHS country-year.

METHODS

To investigate the drivers of national enrollment changes, we first use OLS regression to estimate the effect of socioeconomic status (coded 1 to 5, with 5 indicating the highest status group) on enrollment among children aged 10-21 for each country-year file. We then use the resulting parameters a, β and μ generated from the grouped regression, as well as data from the changes in the various SES group-specific fertility ratios (r) and group-specific size (n) to apportion the national change in enrollment in the effects of changes in baseline educational opportunities ($\Delta\alpha$), in the education gradient associated with SES ($\Delta\beta$), with the relative fertility change (Δm_i) and in the proportion of families in various SES groups (w_i). More details on the specifics of this decomposition approach can be found in Appendix Note 1.

The compare the drivers of progress across the countries and try to understand why some factors (including the impact of socioeconomic status and demographic change) may have had a bigger contribution we then use a multilevel regression modeling strategy. This analysis takes the results from the decomposition as dependent variables and regress them on national level characteristics of counties such as national educational expenditures, literacy rates, GDP per capita and age dependency ratios.

FINDINGS

Initial findings are reported in Appendix Table 1. As is clear, national enrollment levels vary rather widely across countries from .49[1] in Mali 1996 to a high of 1.98 in Zimbabwe 1992. Between surveys, about 75% of countries experienced growth in educational attainment, though there is evidence of quite a few reversals as well (DeRose and Kravdal 2007). Results from the initial (basic) composition reveal that the significance of behavioral effects versus compositional effects varies as well. While behavioral change (increased attainments across socioeconomic groups)

[1] Enrollment is coded here as 0=No schooling, 1=Incomplete primary, 2=Complete primary, 3=Incomplete secondary, 4=Complete Secondary, 5=Higher. This scale was chosen over actual years of schooling in order to address cross county variation in how years of schooling translate into various certificates.

undoubtedly accounted for the lions share of gains in enrollments, compositional shifts in the population contributed to more than 20% of changes in enrollments in 22 of the 37 time periods. The economic decomposition further reveals significant variation in the behavioral component itself. In some countries, change was driven largely by changes in baseline educational opportunities while in other countries changes in the relative importance of SES was more critical. Further analysis will decompose the composition component and will include the multilevel regression using World Bank data.

APPENDIX NOTE 1

This decomposition proceeds in three distinct steps:

(1a) $$E = \sum w_i * e_i$$

(1b) $$\Delta E = \sum \bar{w}_i \, \Delta e_i + \sum \bar{e}_i \Delta w_i$$

A B

where w_i represents the percentage of children within socioeconomic group i and e_i represents the group specific enrollment for each socioeconomic group.

As shown in formula 1a national enrollments are a function of the percentage of children in each socioeconomic group multiples by that group specific enrollment rate. The first decomposition (1b) apportions changes in enrollments into two terms: (A) those due to changes in group-specific enrollment rates and (B) those due to a change in the distribution of children across socioeconomic status groups.

However, these components can each be further broken down. The first term, changes in group-specific enrollment rates, can be decomposed into three separate components.

(2) $$\Delta E = \sum \bar{w}_i \, \Delta\alpha + \sum \bar{w}_i \, \Delta\beta * SES_i + \sum \bar{w}_i \, \Delta\mu + \sum \bar{e}_i \Delta w_i$$

A1 A2 A3 B

where w_i represents the percentage of children within socioeconomic group i and e_i represents the group specific enrollment for each socioeconomic group. The alpha (a), beta (β) and residual (μ) terms are all generated from the grouped regression of socio-economic status on educational attainment.

This decomposition thus apportions changes in group-specific enrollment rates into those due to changes in baseline educational opportunities (A1), changes in the effect of income (A2), and changes in all other effects outside of socioeconomic status (A3). As is clear in the formula, the composition component (B) remains the same.

While this first decomposition provides insight into the changing relevance of family SES (A2) as opposed to other factors (A1, A3) we are also interested in understanding how changes in levels of fertility by class might also contribute to changes in enrollments. To address this issue, we can decompose the composition component (B) into two terms:

$$(3)\ \Delta E = \sum \bar{w}_i\,\Delta\alpha + \sum \bar{w}_i\,\Delta\beta * SES_i + \sum \bar{w}_i\,\Delta\mu + \sum \bar{e}_i\bar{n}_i * \Delta r + \sum \bar{e}_i\bar{r}_i * \Delta n$$

A1 A2 A3 B1 B2

where w_i represents the percentage of children within socioeconomic group i and e_i represents the group specific enrollment for each socioeconomic group. The alpha (a), beta (β) and residual (μ) terms are all generated from the grouped regression of socio-economic status on educational attainment. The m_i term represents the proportion of mothers in socio-economic status group i and the r_i term represents the relative fertility of socioeconomic group i.

APPENDIX TABLE 1. Initial Results from Basic & Economic Decompositions

				Basic Decomposition		Economic Decomposition			
				Behavior	Composition	Behavior			Composition
Country	Year	National Educational Attainment	Change in NEA			Baseline	SES	Residuals	
BENIN	1996	0.72	...	...	...	...	...	...	...
	2001	0.97	0.26	93%	7%	54%	38%	1%	7%
	2006	1.27	0.30	109%	-9%	81%	28%	0%	-5%
BURKINA FASO	1993	0.81	...	...	...	...	...	...	...
	1999	0.61	-0.20	44%	56%	-9%	60%	-7%	49%
	2003	0.69	0.08	194%	-94%	108%	94%	-8%	-81%
CAMEROON	1991	1.55	...	...	...	...	...	...	...
	1998	1.60	0.05	100%	0%	-2%	106%	-4%	6%
	2004	1.65	0.05	293%	-193%	296%	-13%	10%	-86%
ETHIOPIA	2000	0.77	...	...	...	...	...	...	...
	2005	0.99	0.21	107%	-7%	87%	30%	-10%	-10%
GHANA	1993	1.37	...	...	...	...	...	...	...
	1998	1.67	0.29	115%	-15%	-3%	122%	-4%	-12%
	2003	1.59	-0.08	81%	19%	236%	-150%	-5%	13%
	2008	1.81	0.22	109%	-9%	143%	-34%	0%	-5%
GUINEA	1999	0.68	...	...	...	...	...	...	...
	2005	0.88	0.20	118%	-18%	52%	67%	-1%	-11%
KENYA	1993	1.39	...	...	...	...	...	...	...
	1998	1.34	-0.04	85%	15%	444%	-364%	5%	-26%
	2003	1.34	-0.01	380%	-280%	5008%	-4611%	-17%	259%
	2009	1.45	0.12	151%	-51%	132%	20%	-1%	-37%
MADAGASCAR	1997	1.21	...	...	...	...	...	...	...
	2004	1.55	0.34	46%	54%	6%	45%	-4%	42%
	2009	1.46	-0.09	-141%	241%	-131%	-14%	4%	192%
MALI	1996	0.49	...	...	...	...	...	...	...
	2001	0.56	0.07	145%	-45%	127%	14%	4%	-44%
	2006	0.77	0.21	104%	-4%	89%	16%	-1%	-4%
MALAWI	1992	0.98	...	...	...	...	...	...	...
	2000	1.19	0.21	116%	-16%	143%	-28%	2%	-4%
	2004	1.23	0.04	162%	-62%	-169%	331%	1%	-8%
MOZAMBIQUE	1997	0.89	...	...	...	...	...	...	...
	2003	1.08	0.19	92%	8%	27%	62%	3%	6%
NAMIBIA	1992	1.38	...	...	...	...	...	...	...
	2000	1.65	0.27	80%	20%	9%	72%	-1%	11%
	2007	1.82	0.17	138%	-38%	136%	0%	2%	-12%
NIGERIA	1990	1.51	...	...	...	...	...	...	...
	2003	1.71	0.20	154%	-54%	75%	80%	-1%	-24%
	2008	1.71	-0.01	-1526%	1626%	4230%	-5603%	-152%	1275%
NIGER	1998	0.62	...	...	...	...	...	...	...
	2006	0.70	0.09	63%	37%	68%	-8%	3%	31%
RWANDA	1992	1.05	...	...	...	...	...	...	...
	2000	1.12	0.07	154%	-54%	75%	80%	-1%	-24%
	2005	1.07	-0.05	-1526%	1626%	4230%	-5603%	-152%	1275%
TANZANIA	1996	1.14	...	...	...	...	...	...	...
	1999	1.17	0.03	21%	79%	68%	-48%	1%	-33%
	2005	1.22	0.05	188%	-88%	-278%	474%	-8%	24%
	2008	1.36	0.14	87%	13%	137%	-51%	1%	7%
UGANDA	1995	1.23	...	...	...	...	...	...	...
	2001	1.38	0.15	98%	2%	52%	48%	-2%	5%
	2006	1.30	-0.07	-27%	127%	72%	-99%	0%	54%
ZAMBIA	1996	1.33	...	...	...	...	...	...	...
	2002	1.35	0.03	103%	-3%	-279%	387%	-4%	2%
	2007	1.55	0.19	62%	38%	68%	-5%	-1%	31%
ZIMBABWE	1994	1.77	...	...	...	...	...	...	...
	1999	1.98	0.20	118%	-18%	9%	110%	-1%	-14%
	2006	1.93	-0.05	208%	-108%	67%	146%	-4%	-46%