Does socio-economic inequality hasten fertility decline in Sub-Saharan Africa?

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Background

Since 2000, sub-Saharan Africa as a whole has seen sustained growth in Gross Domestic Product (GDP) (UNCTA 2014), and while the share of people living in extreme poverty (on less than 1.25$ PPP a day) has been considerably reduced during the last two decades (World Bank 2013), job growth has not followed (Potts 2013) and the share of people having reached middle class status (more the $4 a day PPP) has not increased substantially (African Development Bank [ADB] 2011). Rather, poverty reduction in sub-Saharan Africa seems to have resulted mainly in the growth of a "floating" group (as designated by the ADB 2011): those who are out of extreme poverty, but who occupy a precarious economic position and are at risk of falling back into poverty.

Lower fertility is one of the fundamental characteristics of middles classes around the world (Banerjee and Duflo 2008) and sub-Saharan Africa is not an exception to this rule (Shapiro 2012). The lower fertility of middle class individuals in countries entering economic development / industrialization has generally been explained by the quality/quantity trade-off (Becker 1960), often specifically their desires to invest in the education of their children, to maintain or improve their social status. This phenomenon has been extensively studied by demographic historians who linked the fertility transition in 19th century Europe (Ariès 1980, Van Bavel 2005, Schneider & Schneider 1984).

Place of residence has long been associated with fertility. Women who are less educated and poor but live in urban areas generally have fewer children than their counterpart in rural areas, a difference usually explained not only by the costs of children being higher in urban areas but also by the greater availability of contraceptive services and social norms for smaller families in cities. The alternative or additional explanation that we want to pursue here is whether the degree of social inequality characterizing these different contexts also matter. For example, in rural areas, where nearly everyone is poor and the upper class quasi-absent (i.e. social inequalities are at their weakest), there may appear to be fewer pay-offs for investing in children's education. In other words, few examples of both upwards and downwards social mobility can inspire rural populations in operating the quality / quantity trade-off. On the other hand, couples living in more socially and economically diverse cities, particularly those in an intermediate social position, may have aspirations to emulate the practices of better-off families living around, including having smaller families, and may be more keen on taking these steps to avoid sliding back into poverty, of which they still have many examples around them.

In this paper, we ask whether in Sub-Saharan Africa, couples' fertility strategies vary not only according to their own social position, as is well known, but also according to the structure of socio-economic inequalities in their place of residence. In other words, we are interested in understanding fertility variations across regions and countries, as well as place of residence (urban / rural), that are not explained by the social composition of these populations by relating these variations to the degree of social inequality in these contexts. The definition and measurement of socioeconomic status is thus central to our study. Conceptually, we start with by defining three categories: 1) the upper/middle class (women who are educated *and* live in wealthier households, who make up 21% of the entire weighted sample and live primarily in urban areas); 2) the "floating" class (intermediate

group of women who are *either* more educated *or* live in wealthier household, who make up 37% in the sample and who live in urban areas (where they make up a large share of the so-called "urban poor") or in rural areas (where they are among the better-off)); and 3) the lower class (the group of women who are poorer *and* less educated, who make up 42% of the pooled sample and overwhelmingly live in rural areas). Note that size of the upper class remains very small on the African continent (ADB 2011), so that we do not study it separately; these few individuals are included in the middle class.

Using DHS surveys for 2005-2012 from 12 countries in East and West Africa, we found that upper/middle class women have on average a TFR of 3.2 children (Rossier, Corker, Schoumaker 2015) while pre-transitional fertility rates still characterize the lower-class group of women who have a TFR of 7.0 on average. The floating group has an intermediate fertility, with an estimated TFR of 5.4 children. While we find fertility rates generally vary in an expected manner according to socio-economic status and urban residence on the continent (i.e. the higher the status, the lower fertility), we ask here whether the fertility gradient across classes varies in respect to the overall level of social inequality. We hypothesize that, in addition to compositional effects, the degree of socio-economic inequality could explain additional differences in fertility levels and trends across countries. We will test this for urban and rural areas across the pooled sample, as well as by comparting and contrasting West African countries with East African countries to see if higher rates of inequality in East African cities explain in part the differences in fertility differentials between these two regions.

Data and Methods

This analysis includes all countries from West and East Africa that have had four DHS carried out from survey rounds III to VI that collected data on both household wealth/assets *and* education. This allows us to analyze fertility trends over approximately 17 years using the same sub-set of countries. Three countries that meet these criteria –Nigeria, Guinea and Benin– were excluded because of concerns over data quality for one or more of their DHS. We examine fertility levels and trends across our three defined social strata using data from four periods 1990-1995, 1996-2000, 2001-2005, and from 2006 on.

Our socio-economic groups are defined by combining two variables widely used to indicate SES: women's education and estimates of household wealth. Education is a binary variable for well educated (secondary education or higher)/less educated (completed primary school or less, including uneducated). Household wealth is approximated with an index measured by a principal component analysis (PCA) of ownership of consumer goods, household flooring material and adequate sanitation. The three household assets included in our PCA are television, refrigerator and car/truck. Our adequate housing category distinguishes between those houses with only dirt flooring and those with non-dirt flooring. Our PCA here borrows in part from Rutstein & Staveteig (2014)'s Comparative Wealth Index approach, namely in combining safe water and improved toilets in one variable for "sanitation" and by including only assets that increase monotonically with wealth (unlike ownership of radios or motorcycles, which may initially increase but subsequently decrease with rising levels of wealth across and within countries).

We created our wealth index to be an objective measure across time periods and countries: the index is computed with a set of household items that are standard across all surveys, and the index is calculated for the entire pooled sample of surveys. We thus pooled respondents from all periods and

samples, and then distinguish two groups across the entire pooled sample: those that fall into the upper half of the wealth divide and those who fall below it. We then define the “middle class and up” socio-economic group as the sub-group of individuals having reached secondary education *and* whose household has higher approximated wealth. The "floating" (i.e. intermediate) group of individuals consists of those who either have attained a higher level of schooling (but live in poorer households) *or* who live in a wealthier household (but did not benefit from much schooling). Our "low" socio-economic group consists of women who have less than a secondary school education and fall into the "poorer" household wealth category. We analyze these three social strata separately for rural and urban areas. Practically all women with secondary and higher education are in the "middle class and up" group, so that our "floating" category almost exclusively captures less educated individuals living in wealthier households.

We first calculate TFR for each social strata in urban and rural areas for the pooled sample and then separately for East and West Africa to examine fertility differentials among the social strata and the rates of decline over time. We then use a basic population decomposition approach to estimate the extent to which the overall decline in the TFR (and for each region and place of residence) is due to declining fertility within each social strata compared to changes in relative size (composition) of these three groups over time. This helps determine whether any fertility decline we observe at the regional level is primarily a factor of the shifting composition of the population that accompanies increases in wealth and education or whether there are discernable declines in fertility *within* each social strata that would lead to regional-level fertility declines in the absence of any changes in the compositional make-up of the population.

This population decomposition can compare only two populations at a time, so here we compare the earliest and latest periods (and break down the change (decrease) in overall TFR between periods 1 and 4 into two components: 1) a component that is the change in social strata composition (i.e. the percentage distribution - *C*) weighted by each group's TFR for the first period (contribution of social strata composition) and 2) a component that is the difference in TFR over the two periods weighted by the average social strata composition (contribution of differences of fertility - *F*) (Kitagawa 1955, Preston *et al.* 2001). Together, these two components account for all of the difference in TFR between the first and fourth period.

$$\Delta\, TFR = TFR^{p4} - \ TFR^{p1} = \ \sum\left(C_i^{p4} - \ C_i^{p1}\right) \cdot \left[\frac{F_i^{p4} + F_i^{p1}}{2}\right] + \ \sum\left(F_i^{p4} - \ F_i^{p1}\right) \cdot \left[\frac{C_i^{p4} + C_i^{p1}}{2}\right]$$

$$= (\Delta C * \bar{F}) + (\Delta F * \bar{C})$$

$$= \text{difference in social strata composition } \cdot [\text{weighted by average fertility (TFR)}] \ + \ \text{differences in fertility (TFR)} \cdot [\text{weighted by average age composition}]$$

$$= \text{contribution of social strata compositional differences} + \text{contribution of rate schedule differences}$$

In a last stage of the analysis, in order to investigate the association of localized socio-economic inequality with overall fertility rates and fertility differentials, we will incorporate two measures of inequality. Given that inequality tends to be higher in urban areas, and to better capture local levels of inequality, we computer our inequality indexes for urban and rural areas separately. Both measures here look only at wealth distribution (not education) and are used to categorize geographic areas by levels of inequality. First, we create an index of inequality for the pooled sample separately for each time period, using our "objective" wealth measurement. This will allow us to identify both inequality within a time period and also examine changes in inequality among periods with a

constant and comparable measure. Second, as both a test of robustness for our objective inequality measure and to create a more refined local measure of inequality, for each country (and at each period) we use the DHS-provided wealth index, stratified for urban and rural areas, and calculate an inequality index for the rural and urban areas in each survey. Each survey respondent is then categorized as living in an area of high or low inequality for both the objective measure of inequality from the pooled sample and then a more detailed division of relative inequality within each country. We perform a logistic regression to estimate the odds of a birth in the previous year, controlling for age (and age squared), social strata (education and wealth combined), residence (urban/rural), country, time period, inequality (run separately for the objective and relative inequality measures) and proportion of the country that is urban.

Preliminary Results

Results show a clear gradient in TFR across socio-economic groups (lowest fertility among the highest groups), with a general pattern of lower fertility among urban dwellers and among women living in East compared to West Africa. TFR has generally declined for all groups over the 17 years covered by the surveys, although less among the lowest socio-economic groups.

TABLE 1: TFR in three socioeconomic groups, East and West Africa, urban and rural areas, DHS

		Period 1	Period 2	Period 3	Period 4
West Africa		**TFR**	**TFR**	**TFR**	**TFR**
Urban	Better off	3.17	2.93	2.76	2.84
	Floating	5.41	5.18	4.96	4.94
	Lower	6.80	6.70	6.55	6.03
Rural	Better off	4.31	4.35	4.29	3.68
	Floating	6.64	6.52	6.44	6.36
	Lower	7.50	7.59	7.34	7.51
East Africa					
Urban	Better off	3.85	3.27	2.85	2.92
	Floating	4.93	4.33	4.15	4.11
	Lower	5.86	5.18	5.61	5.66
Rural	Better off	4.32	4.02	3.92	3.81
	Floating	5.72	5.37	5.37	5.32
	Lower	6.90	6.78	6.78	6.76

Note: Elite= w sec. school *and* hh more assets, intermediate= w sec school *or* hh more assets, lowest= none of the two

Our decomposition analysis attributes 66% of the overall decline in TFR (between periods 1 and periods 4) to changes in the social strata composition and 33% to chances in the fertility rates within social strata. For both regions, a greater proportion of declines in fertility *within* social strata is found for urban areas, with social strata compositional changes explaining a larger share of the decline in rural areas. Most notably, in East Africa 71.5% of the decline in urban fertility is attributable to declines in fertility rates within the social strata groups (compared to only 43.8% for West African cities), suggesting there are drivers to changes to fertility in East Africa cities exclusive of any changes in the population composition. This finding, coupled with the fact that East African cities have some of the highest rates of wealth inequality in the region, will be the basis of the last stage of our analysis (logisitic regression), in which we include measures of local wealth inequality and examine whether differences in localized inequality area associated with fertility differentials and rates of decline and then contrast results from East and West Africa.