Population Review

Volume 56, Number 1, 2017

Type: Article pp. 102-126

Intergenerational Transmission of Educational Disadvantage in the Context of the Decline of Family Size in Urban Africa

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Abstract

This paper investigates the potential consequences of falling fertility on the reproduction of social inequalities over time. We develop a framework to understand how the fertility decline should interfere on the intergenerational transmission of disadvantages and apply it in the context of Ouagadougou, the capital city of Burkina Faso. We use data from the Health and Demographic Surveillance System (HDSS) of Ouagadougou, which collected retrospective data over three generations (grandmothers, mothers and children). We then use structural equation modeling (SEM) to estimate the models, and finally we conduct a sensitivity analysis to assess the consistency of our results. The results confirm that family size decline has a significant leverage on the intergenerational transmission of educational disadvantages. First, family size of mothers is significantly patterned by their grandmother's characteristics, particularly education and socioeconomic status (SES). Second, mothers with reduced family size appear to invest more in the education of their children, which should enable them to maintain their educational advantages across generations with respect to poorer and non-educated families. These results remain robust after testing alternative assumptions about SES of grandmothers. Moreover, the findings also confirm that the relationship between educational investment and family size is changing over the course of socioeconomic development. While for recent generations (mothers and children) this relationship is strongly negative, for older generations (grandmothers and mothers) it is weak, albeit positive and statistically significant. This suggests that the meaning of the quantity of children and their participation in the labor force is shifting across generations in Ouagadougou, as in most urban areas in Africa.

Keywords

Educational disadvantages, intergenerational transmission, family size, Africa

Introduction

The intergenerational transmission of socioeconomic disadvantages – the fact that children of disadvantaged parents tend to be themselves disadvantaged as adults – has been documented in societies across the world. Nevertheless, how transition of family size affects intergenerational transmission of socioeconomic disadvantages is little known. The few studies on this issue indicate that richer and better educated families tend to reduce their fertility first, and that initially their children tend to benefit most from fertility decline in terms of schooling success, compared to those of poorer parents. If true, the onset of rapid fertility decline, recently observed in many large sub-Saharan African cities, may lead to a strengthening of socioeconomic differentials among members of the next generation. Thus, fertility limitation may accentuate the transmission of socioeconomic disparities, at least during the early stages of the fertility transition (Bloom et al. 2012; Hausmann and Székely 2001).

It is commonly thought that voluntary fertility decline can give rise to major economic returns (Becker and Lewis 1973; Bloom and Canning 2003). As fertility falls, resulting in fewer children in the household, more resources become available per child, allowing potentially higher investment in children's human capital. These benefits may, however, be unevenly spread out across society. Some researchers have argued that fertility reductions are initially concentrated among richer and well-educated families residing in urban areas (Gribble 2012; Haines 1989; Mueller 1984). It can, therefore, be expected that the rich will get richer and the poor will be left behind during the early phases of the demographic dividend period.

This paradoxical relationship should reinforce the intergenerational transmission of socioeconomic disadvantages and limit the social mobility of the poorest families over time. In a study of 17 Latin American countries, Haussman and Szekely (2001) argued that the fall in fertility acted to increase socioeconomic inequality. Bloom (2012) reported similar results for the short-term in several African countries, although the long-term findings are more ambiguous. For Asia, Mason (2001) argued that reduced fertility seems to have benefited both poorer and richer households in the long term.

We develop, in this paper, a framework to understand how the fertility decline should interfere on the intergenerational transmission of disadvantages and apply it in the context of Ouagadougou, the capital city of Burkina Faso. More precisely, we seek to understand how social origin shapes reproductive behavior and limits family size differently, and how these systematic fertility differentials influence educational investments in children in ways that may reinforce disparities over generations. From this perspective, the study aims to contribute to a better understanding of the potential consequences of falling fertility on the reproduction of social inequalities over time, and it sets out recommendations for fighting more effectively against poverty and social exclusion.

Theoretical background

Family size and the intergenerational transmission process

The number of children born to parents is thought to play a central role in the intergenerational transmission process by affecting the access of sons and daughters to education, and more broadly their acquisition of both human capital and family inheritance (Becker and Lewis 1973; Dherbécourt 2013). In a context of fertility decline, the reduction of family size should loosen the household budget constraint, acting to increase resource flows from parents to children, and perhaps also altering patterns of privilege and disadvantage both within (e.g. sons vs. daughters, first born vs. others) and across families (Allendorf 2012; Lachaud et al. 2014). Family size is thus a key element in the intergenerational transmission process.

Socioeconomic differentials in fertility decline: trends

In order to understand the potential effect of the fertility decline on the intergenerational transmission process, it is important to consider the socioeconomic differentials that are observed during the fertility decline (Haines 1989; Hausmann and Székely 2001; Livi-Bacci 1986). The fertility decline is not started and distributed identically within a population. Whether fertility decline is largely considered as a response to the secularization process, new life aspirations or market labor transformations, it appears evident that richer and well-educated families are the first ones to confront and accept such societal and economic shifts (Lesthaeghe 1983). Thus, rich, well-educated families are the ones that initiate or lead the fertility decline, while poor, less-educated families continue on with larger family size. This general trend has been observed in the past for almost all developed countries, including almost all European countries (Haines 1989; Hausmann and Székely 2001; Livi-Bacci 1986), and the trend is observed in most countries where the fertility transition is presently ongoing (Bloom et al. 2012; Hausmann and Székely 2001).

Moreover, the gap between the most and the least educated people remains over time, even after fertility decline is completely done (Skirbekk 2008). Skirbekk compared the fertility rates of the most educated people to the less educated ones for all world regions. He found that from the period 1750-1899 until 1990-2006, in Europe and in North America, the fertility rate of the most educated people has always been lower than the fertility rate of the least-educated people. From 1750-1899, the fertility rate for the most educated group was about 35.7% lower than the least educated group, and from 1990-2006, it was roughly17.8% lower. For Asian, African and Latino regions, the same trends have appeared since the period 1925-1940. The fertility rate was about 48.4% lower in the most educated group in comparison to the less educated group from 1925-1940, but fell to 33.3% 50 years later during the period 1990-2006.

Reproductive behavior and fertility: maintaining and reproducing socioeconomic status

The socioeconomic differentials observed in fertility decline are not a random process. Richer and well-educated families have developed several strategies to conserve and transmit their social status over time and over generations. One of these strategies centers on reproductive behavior. The social origin of women and associated family environment where girls are raised to adulthood is instrumental in shaping the reproductive decision-making and behavior of women (Allan, Morrison and Waite 1988; Haines 1989; Singh, Darroch and Frost 2001). Richer and well-educated parents tend to influence the reproductive behavior of their children (specifically young women) by promoting the delay of early initiation to reproductive and marital life. In general, early initiation to reproductive and marital life leads to an early school drop-out rate and downward social mobility. Young girls whose parents are richer and well-educated tend to use modern contraceptives, and in developing countries where modern contraceptive access remains low they have greater recourse to safe abortion, even where its legislation is very restricted (Guillaume 2005). Meanwhile, early pregnancy, which leads to a reproduction of poverty over generations, remains a major source of concern for young girls from poorer and less-educated families (Card and Wise 1978; Guillaume 2005; Singh, Darroch and Frost 2001).

The social origin of parents also acts indirectly on family size in a more complex fashion. By determining their level of education or socioeconomic status, it contributes in formatting their life-quality aspirations through the development of social habits and preferences, and also by establishing social networks and facilitating integration in the labor market – all of which shape reproductive behavior and decision-making and impact family size.

Children's economic contributions

At the risk of overly simplifying the strategies and behaviors of people, we presume that the effect of fertility decline on the transmission of social disadvantages depends on children's potential contributions to the family economy. Richer and well-educated families can afford to take a longer view: the economic contribution of their children is not immediately essential for family well-being or to insure against uncertainty. In this case, child labor is unnecessary, and children are considered as a source of long-term investment and valued for their non-economic roles (e.g. love, and emotional support in old-age). Family size reduction could be seen as a strategy for a better transmission process or even a reinforcement of social status (education, wealth, etc.) over generations, and could be interpreted as a "quality-quantity tradeoff" in that having fewer children leads to higher investments in human capital. However, this process would be part of recent strategies, which started to appear with the decline in fertility.

In poorer families, children's economic contributions are important for family survival. In the poorest families or after an adverse shock (e.g. a breadwinner falling ill), young children must work and school fees may be viewed as an unaffordable luxury. Child labor in this situation encompasses not only "economic" activities but also often domestic work (especially for girls), at times freeing their mothers to seek employment outside the home. For these families, falling fertility often incurs economic costs and will not be so strongly linked with higher schooling attainment.

Family size, education and transmission of disadvantages: a contextual relationship

The linkage between family size and intergenerational transmission of educational disadvantages seems to be a more complex and non-static relationship. As explained by Mueller (1984) and Maralani (2008), the relationship between family size and formal education is not only a family matter but depends also on the socioeconomic context. Over time and across generations, this context is changing, and the meaning of the number of children and of education are constantly shifting too. In a context where the infant mortality risk is high and education is not valued as a good, the quantity of children seems more important for families than educational investment in children. The association between family size and education could here be non-existent or even positive. A negative causal relationship should materialize with the increase of schooling aspirations and the educational provision. This rise in educational aspirations results from changes in the market structure, which becomes more and more specialized, and from social changes, such as international legislation against child labor, which contributes to a decrease in the economic contribution of children to family income. Thus, the negative relationship between family size and educational investment observed for recent generations is not necessarily valid for older generations.

Methodology

Towards an empirical application

In this section, we present a framework for assessing the interaction of family size with the process of intergenerational transmission of disadvantages. Based on the classical intergenerational transmission model, three successive real generations – grandparents, parents and children – are taken into account. Two main pathways by which this transmission could be observed are defined: 1) transmission from grandparents to parents and then from parents to children, and 2) direct transmission from grandparents to grandchildren. Although we focus on the intergenerational transmission of education disadvantages, we consider socioeconomic status (SES) as a major confounding variable in the intergenerational transmission process.

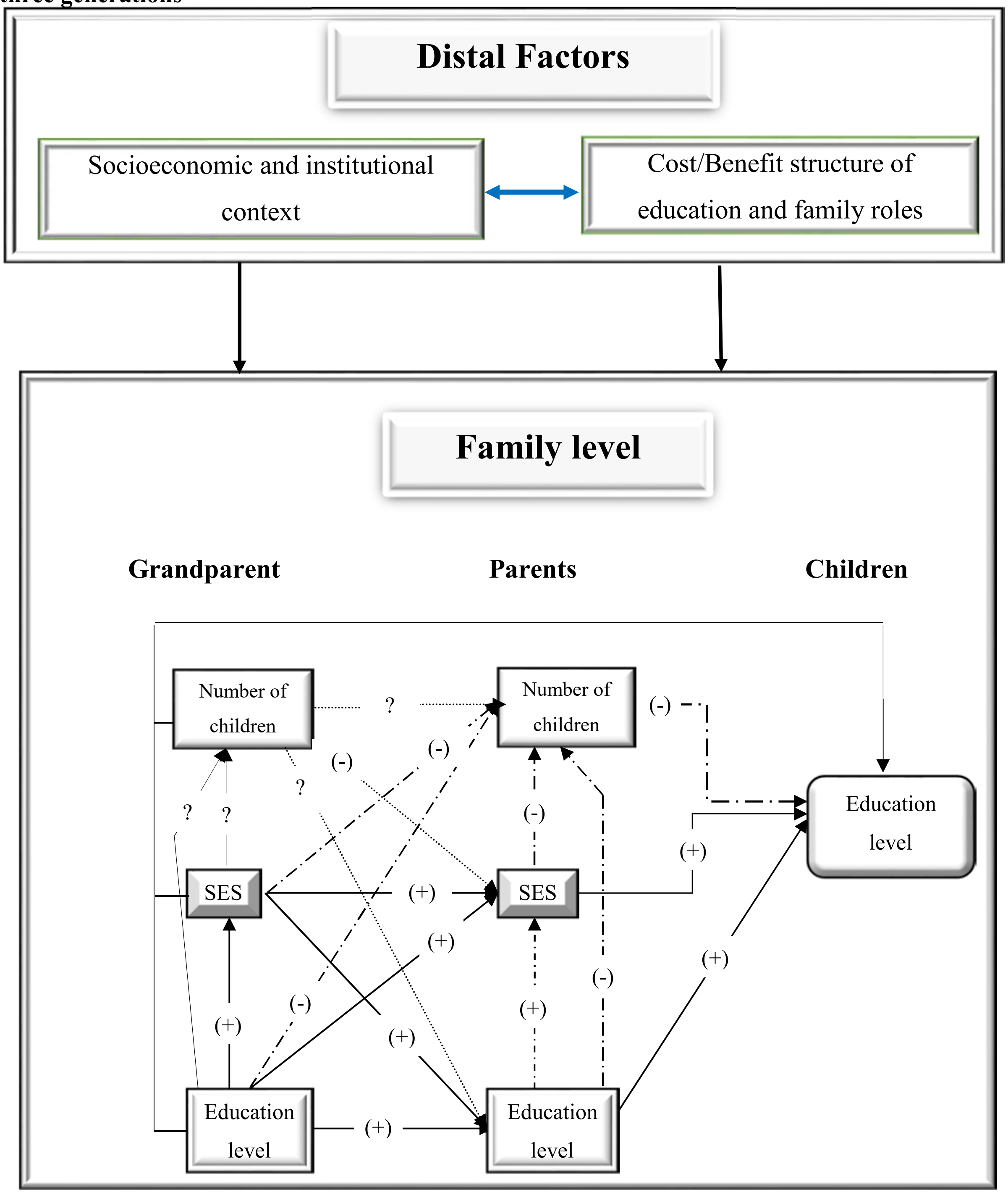
Figure 1 (next page) shows the potential pathways by which family size, defined as the number of children born, interacts with the intergenerational transmission process.

Distal factors

Following Mueller (1984) and Caldwell (2004), we define "socioeconomic context" as the production mode and the labor market organization. This approach is critical in valuing education by defining the workforce qualification required for the production process. Thus, it determines the quantity, quality and diversification of educational opportunities and affects the associated cost-benefit. This not only raises educational aspirations of families but also urges them to adjust their reproductive behavior accordingly (Becker and Lewis, 1973; Becker and Tomes, 1976; Kuepie et al., 2011). It is worth noting that in this context the institutional framework refers to the social organization based on institutions that set out standards and norms for family behaviors (including reproductive behavior), while building cognitive and control mechanisms (Bourdieu and Passeron, 1964; Lounnas, 2004; Scott, 1995; Segalen, 1993).

These distal factors interact synergistically to create the environment within which families are called to live in and reproduce. They also define and redefine family roles through sociocultural and institutional norms within that environment (Caldwell 2004). However, these distal factors self-regulate over time. For example, with the urbanization process, the production mode becomes less and less agricultural, and then gets diversified to be more profitable and competitive. Therefore, the value of education adjusts accordingly to its profitability in the labor market (Becker, 1993; Boudon, 1974;

Figure 1. Path diagram representing intergenerational transmission of educational disadvantage over three generations



Legend:

Potential Intergenerational transition through family size

Potential Effect of family size of grandparents

Mueller, 1984). Similarly, sociocultural and institutional norms evolve and self-adjust to better reflect the evolution of the socioeconomic context (and vice versa), resulting in new aspirations and lifestyles (Bongaarts and Watkins, 1996; Mueller, 1984; Rosero Bixby and Casterline, 1992).

Moreover, this conceptual framework envisions the family unit as the key decision-making unit that is involved in the transmission of educational disadvantages across generations. We postulate that the choices that parents make about the education of their children are shaped by an intergenerational perspective.

Step-by-step transmission: explanations of transmission pathways

First, we assumed the existence of causal linkages between the social characteristics of two successive generations: grandparents to parents and parents to children (Breen and Jonsson 2005; Duncan and Brooks-Gunn 1999). Previous studies have presented evidence of the intergenerational transmission of parents' human capital, measured by schooling attainment, and family socioeconomic status in terms of economic resources, patrimony, income or occupation (Farkas 2003; Haveman, Wolfe and Wilson 1999; Mare 2011; Pebley and Rudkin 1999). Second, regarding the explanatory framework, we further postulate that social origin, measured through grandparents' characteristics, impacts directly the family size of parents by patterning their reproductive behavior, or indirectly, by influencing their education level or contributing to their socioeconomic status. In general, children from richer and well-educated families should be more likely to have smaller family sizes. And this family size reduction would be expected to support the increasing education of grandchildren, reinforcing the traditional pattern of intergenerational transmission.

The relationship between grandparents' family size and parents' education remains ambiguous. Indeed, across generations and over time, both education and family size do not appear to have the same importance. In the past, educational investment was not a priority for families, because in the socioeconomic context where they lived the return on educational investment was too low and children were more active participants in the family economy. Under these conditions, the expected relationship between family size and educational investment should be positive. With the evolution of educational aspirations of families for their children, due to economic and social mutations, we expect the link to shift from weak or positive for older generations (grandparents and parents) to a strong negative relationship for recent generations (parents and children).

Finally, we assume a non-reciprocal effect of SES on education level and SES of older generations (grandparents and parents) because of the aforementioned assumption that in the past the return on education was too low to incite adults to invest in their own education. This reciprocal effect might be valid for continuing education or training, but not if the classical education level was as low as it was likely to have been for older generations, especially in recently developed areas, such as urban Africa. Technically, that would require longitudinal data where both variables are measured (at the very least) at two different points in time.

Data presentation and empirical analysis

Direct transmission: explanations of transmission pathways

We hypothesize that there will be little impact of the family size of grandparents on their grandchildren's schooling, although it is possible that the family size of a grandparent affects the chance for this grandparent to live in the same household or to transfer funds or inheritance to a specific grandchild. Nevertheless, according to some scholars (Dherbécourt 2013; Johnson 2000), the family size of grandparents mainly influences their grandchildren's schooling by determining the size of their kinship group (aunts/uncles) – a group that can be seen as potential transmitters to grandchildren of various positive benefits (e.g. payment of school fees, receiving fostered children or social leveraging, among others). This aspect is not taken into consideration in our empirical model.

Evidence for the effect of family size on intergenerational transmission of educational disadvantage

The purpose of this section is to ascertain whether fertility decline leads to a widening of social and educational inequalities over generations in Ouagadougou. Three generations are considered in this study: women born between 1953 and 1977 (the middle unit), their mothers and their children.

Context

Burkina Faso, formerly the Republic of Upper Volta,[1] was colonized by France before its independence in 1960. Like almost all French colonies, Burkina Faso was administered by and for the mother country. Production mode was based on agriculture. The right to own property was reserved exclusively for settlers and some "wealthy" people who generally worked for the mother country (Conombo and Chajmowiez 2003; Madiéga and Nao 2003). Burkina Faso was granted the status of an autonomous republic in 1958, before finally taking its independence on 5 August 1960.

Located in the western sub-Saharan region, Burkina Faso is one the poorest countries in the world and one of the latest to maintain high fertility rates. At its independence in 1960, the schooling rate was 6.5%, and the total fertility rate in 1961 was 6.1 children per woman (Pilon 2007). Several crisis periods and political turmoil made it difficult to implement major political and social reforms until recently. From 1961 to 2006, schooling rates increased to about 57.8%, an increase of less than 1.2 points per year. According to the 2012 Demographic Health Survey (DHS), the fertility rate was 6.0 children per woman in 2010.

In contrast to the rest of the country, Ouagadougou was favored for development, as were other urban areas in the region. Since 1960, the city has experienced a huge expansion in total area. From 1,940 hectares in 1960, it expanded to roughly 6,860 hectares in 1984, 34,000 hectares in 2003, and reached

[1] The country was renamed Burkina Faso in 1984, which translates as "the land of upright people" or "upright land" from the Mossi language.

about 54,000 hectares in 2009 (Compaore and Nebie 2003; Ouattara 2006). This pattern of expansion and associated population movement can be seen as a result of the concentration of most governmental facilities, economic activities and public services, which facilitated greater access to services for the resident population, including reproductive health services, among others. As one consequence of this, according to the 2012 DHS data and research by Pilon, (2007), the fertility rate fell abruptly from 6.2 in 1985 to 4.1 in 1996, and declined further to 3.4 in 2010. Although we do not have data on socioeconomic differentials of this decline at the Ouagadougou level, national level data confirm the socioeconomic differentials of this decline. The richest and most educated women had average fertility rates of 3.1 and 3.7 children respectively, while the poorest and those with no education had average fertility rates of 6.6 and 7.1 children respectively (DHS 2012).

Data

The empirical analysis centers on data from the Demographic Trend (Demtrend) project, which has been extended by the Health and Demographic Surveillance System (HDSS) of Ouagadougou. Since 2008, the HDSS provides longitudinal coverage of a population of over 80,000 people from more than 18,000 households living in five "slum" neighborhoods in the capital city of Burkina Faso: Nonghin, Nioko 2, Polesgo, Kilwin and Tanghin. The slum neighborhoods were selected on the basis of their poverty and low development levels (for more detailed information on HDSS data collection, see Rossier et al. 2012). There is, therefore, a selectivity problem inherent in the sampling process. This issue limits the inferential capacity of the analysis and yields biased estimates (Solon, Barsky and Parker 1992).

The Demtrend project was designed as an in-depth study on "the consequences of women's fertility and household composition strategies for school enrolment and employment among children in an urban environment in Burkina Faso" and was focused exclusively on women aged 35 to 59 years old, with at least one child over three years of age, and living in the HDSS zone. The project encompassed a total of 2,952 women (for more details, see Kobiane et al. 2013). The Demtrend data were collected in 2012. Before each interview, a statement about the confidential research use of personal data was read to each interviewee and oral consent was obtained. The Demtrend survey was non-representative and non-inferential. Nevertheless, it did provide original and substantial data on the family of origin of these women, including information on their grandparents' schooling attainment, socioeconomic status and family composition. To limit memory bias, retrospective data were collected only for women whose mother survived until at least their 15th birthday: 2,821 women. It is important to note that an inability to recall data could have resulted in measurement error. Thus, a careless use of these data could generate substantial bias on intergeneration transmission of education disadvantages (this problem is addressed below).

For the comparison between generations, we considered only children aged 15 and older at the time of the survey: 6,832 children; 3,445 boys and 3,387 girls (see Table 1, next page).

Table 1. Composition of sample

	Sample
Women interviewed (parents or mothers)	2952
Women whose mother has survived until their 15th birthday	2821
Children	
Daughter	5399
Son	5377
Total	10776
Daughter 15 years or older	3445
Son 15 years or older	3387
Children with 15 years or older	6832

Sources: Calculated with data from Demtrend 2012.

Key variables

Education level is the main variable. It is defined as the years of schooling for all three generations. Although, the structure of cost-benefit for a year of schooling has greatly changed over our three generations, it appears as an objective variable for comparing education over time because it measures the time attendance, regardless of the length of school cycles or their contents. SES, the major confounding variable in our scheme, is computed as a wealth index based on data on economic resources, household durable goods and patrimony by using principal component analysis (Vyas and Kumaranayake 2006). Households are then classified into three categories: rich, middle and poor. However, this statistical technique seemed to be inadequate for grandmothers. On one hand, it was complicated (if not impossible) to collect data on all economic resources and patrimony of grandparents. Self-reporting by women about grandparents' patrimony would have led to serious recall bias. On the other hand, SES is a relative wealth index that compares a group of people that is living in an identical place or country at a given time using a principal components analysis. It involves collecting real data on economic resources and patrimony of grandparents, but such data would not be enough to compute the index. Therefore, the classification was based on a subjective evaluation by asking a women to compare the economic situation of her parents' household when she was 15 years of age with other family households that lived in the same area, ranking their economic situation as better, similar or worse. Although statistical tests show a high correlation between the distribution of this subjective SES with other indicators of living standards of grandparents (Kobiané, LeGrand and Pilon 2013), it remains a crude proxy of socioeconomic status of grandparents and, thus, leads to potential measurement error.

One major problem is the historical anachronism arising from ranking their family's status into three socioeconomic classes. As mentioned above, grandmothers in the sample experienced life during the colonial period (before 1960) – a time when the right to go to school and own property were limited. The production mode was mainly agricultural with no specialization and almost no division of labor. Even though this issue is no longer relevant in the present, studies published in the aftermath of the decolonisation period argued that prior to independence African societies were mostly egalitarian in terms of social life. Despite acknowledging traditional stratifications, it was claimed that socioeconomic gaps were small with no competing class interests (Friedland and Rosberg 1964; Geertz 1963; Mboya 1963). This perspective was criticized by several authors as an ideological and socialist point of view (Arrighi and Saul 1969; Cohen 1972; Neuberger 1971). They argued that traditional elites and forms of social stratification have always been components of lineages, warrior social units and tribes in Africa (Cohen 1972; Neuberger 1971). However, it now widely recognized that the middle class in Africa is mostly the result of the postcolonial conjecture and diversification/liberalisation of the economy (Alagoa 1964; Porter 1963). During the colonial period, villagers and peasants constituted the lower class while a small group of better-off peasants and some colonial servants formed a middle class. The upper class comprised mainly European entrepreneurs and senior colonial officers. If this upper class is excluded, what remains are colonial societies that are polarised into two socioeconomic classes: the lower class (the mass of villagers and peasants) and the better-off (Arrighi and Saul 1969). Below, sensitivity analysis is used to test these conjectures.

Family size is defined as the total number of children born to a woman. It covers the entire reproductive lifetime of a woman up to the moment of data collection, including deceased children, and thus their associated direct and indirect costs (Lachaud et al. 2014). In addition, some control variables have been integrated into our empirical estimation, such as children's age (a continuous measure) and gender (son/daughter). Mother's age is included as a categorical variable to measure the effect of the reproductive life cycle, and mother's birthplace is included as a dummy variable (Ouagadougou or another place). We also included the marital status of women (married or not) as a dummy variable because the status of married woman is largely dominant for women of 35 years or older in the African context. Additionally, ethnic group is included as a dummy variable (Mossi or not) because the Mossi ethnic group represents more than 85% of the population in the HDSS surveillance neighborhoods (and also of Ouagadougou).

Methods: structural equation modeling

After a correlation analysis, a structural equation modeling (SEM) of the interactions of family size with intergenerational transmission was carried out. The main dependent variable was the number of years of schooling of children. Three mediating variables were parents' characteristics (specifically, years of schooling), family size and SES of mothers. Family size and SES of grandmothers were two other endogenous variables. We estimated the model by using the method of Asymptotic Distribution-Free (ADF) because of the presence of SES, a categorical variable that is generally considered to be in violation of the normality assumption. We supposed that the categorical variable had an underlying continuous latent variable SES* and estimated the latent variable using polychoric correlations (Browne 1984; Finney and DiStefano 2006; Muthén 1993). This estimation method uses the technique of Generalized Least Squares (GLS) and minimizes the discrepancy between the empirical covariance matrix and a covariance matrix implied by the model. Nonetheless, the discrepancy function of ADF uses a weight matrix computed with the observed variables using functions of second- and fourth-order moments (Browne 1984; Fan and Sivo 2005; Hu and Bentler 1999; Kline 2011). Large sample size is, however, required to obtain asymptotically unbiased and efficient estimators (Kline 2011). ADF remains the most appropriate method in the presence of categorical variables (Browne 1984; Finney and

DiStefano 2006; Kline 2011). Moreover, regarding the distal factors of our conceptual scheme, a multilevel SEM would be a better fitted model specification. In general, however, data from Health and Demographic Surveillance Systems are not suitable. In our case, they followed over time some limited geographic areas. Given that the three generations under study were born and raised in very different socioeconomic and institutional contexts (i.e. colonial, post-colonial period with high political instability, and period of the democratization of basic education), these factors were analyzed from a historical perspective.

We estimated the models with and without SES for both grandmothers and mothers. To avoid over-interpretation of results of the statistical tests due to the large-size sample, which makes them less relevant, we mostly focused on higher significance parameters ($p<0.001$). In addition, model goodness of fit was assessed by using the following fit indicators[2]: (1) the lower and upper bound of the root mean squared error of approximation (RMSEA); (2) the standardized root mean squared residual correlation (SRMR); (3) the comparative fit index (CFI) and the stability index, to be sure that the condition of stability of the model is satisfied. Finally, to fully assess the effects of grandmothers' characteristics, a decomposition matrix was computed (Hu and Bentler 1999; Kline 2011). All of our analyses were conducted using Stata SE version 12.

Results

The data show a significant increase in years of schooling over the three generations, from 0.166 years for grandmothers to 1.57 years for mothers, and rising to 7.3 years for children. Meanwhile, for family size, we observed a decrease to 2.45 children per woman, with a decline from 6.83 to 4.38 children per woman from grandmothers to mothers (see Table 2, next page).

Table 3 (p.115) shows results of bivariate correlations in schooling attainment over the three generations. The bivariate correlation measures the association between the schooling levels between generations two by two. Grandmothers' and mothers' schooling are correlated at 0.27, and mothers' and children's schooling at 0.35; both are significantly different from 0 at the 0.01 level. That means that the intergenerational transmission of education appears to have increased for recent generations. We also note that grandmothers' schooling remained correlated significantly with their grandchildren's schooling at 0.11.

[2] Hu and Bentler (1999) established three combination rules to assess the good-fitness of a SEM: (1) CFI of .96 or higher and a SRMR of 0.09 or lower; (2) RMSEA of 0.06 or lower and a SRMR of 0.09 or lower; and (3) NNFI of 0.96 or higher and an SRMR of .09 or lower. However, these combination rules remain an open debate. Fan and Sivo (2005) showed that Monte Carlo simulation studies do not support these rules as well as other computational studies (Yuan 2005). It seems that "*the distributions of only some approximate fit indexes are known under ideal conditions. Whether such conditions hold in real studies is doubtful* (Kline, 2001, P. 207). Browne and Cudeck (1993) suggested that a RMSEA $\leq .05$ may indicate "good fit," although this rule cannot be generalized, mainly when distributional assumptions are in doubt. Other solutions have been proposed as analyzing both upper and lower bound of RMSEA or an analysis of the matrix of correlation residuals (Kline 2011).

Table 2. Data summary

Variable	Explanation	Mean	Std. Dev.	Min	Max
Children					
Years of schooling	continuous variable	7.299	4.125	0	18
Child' age	continuous variable	21.068	4.152	15	36
Daughter (vs son)	Dummy (Yes=1/No=0)	0.504	0.500	0	1
Parents (mother)					
Years of schooling	continuous variable	1.565	3.338	0	18
Socioeconomic status					
Poor (Ref. Category)	Dummy (Yes=1/No=0)	0.301	0.459	0	1
Middle	Dummy (Yes=1/No=0)	0.353	0.478	0	1
Rich	Dummy (Yes=1/No=0)	0.291	0.454	0	1
Family Size	continuous variable	4.380	1.751	0	10
Grandparents (grandmothers)					
Years of schooling	continuous variable	0.165	1.075	0	13
Literacy	Dummy (Yes=1/No=0)	0.052	0.223	0	1
Socioeconomic status					
Poor (Ref. Category)	Dummy (Yes=1/No=0)	0.230	0.421	0	1
Middle	Dummy (Yes=1/No=0)	0.584	0.493	0	1
Rich	Dummy (Yes=1/No=0)	0.186	0.389	0	1
Family Size	continuous variable	6.830	0.050	1	19
Control variables					
Mother's generation					
Mother's age					
35-44 (ref.)	Dummy (Yes=1/No=0)	0.600	0.490	0	1
45-59	Dummy (Yes=1/No=0)	0.400	0.490	0	1
Birthplace (Ouagadougou=Yes)	Dummy (Yes=1/No=0)	0.305	0.460	0	1
Household head	Dummy (Yes=1/No=0)	0.252	0.434	0	1
Married	Dummy (Yes=1/No=0)	0.843	0.364	0	1
Mossi	Dummy (Yes=1/No=0)	0.901	0.299	0	1

Sources: Calculated with Data from Demtrend 2012.

Table 4 (p.115) shows the average number of children of women according to their social origin or grandmothers' characteristics. We observe that women whose grandmothers were relatively well-educated had an average 3.2 children, while those whose grandmothers were non-educated had 4.4 children, a family size more than 38% higher. The association persists after controlling for women's age. The same trend appeared for socioeconomic status, although it was less pronounced. Women whose grandmother was relatively richer had an average 4.1 children, while those whose grandmother was poorer had 4.5 children.

Table 3. Coefficients of correlation of years schooling

	Children	Mother	Grandmother
Children	1		
Mother	0.32***	1	
Grandmother	0.11***	0.27***	1

Sources: Calculated with Data from Demtrend 2012
Significance: 0.01 (***), 0.05 (**) and 0.1 (*)

Table 4. Average number of children according to the social origin of women

Grandmothers' characteristics	Women		
Schooling years	All	35-44	45-59
No education	4.4	4.2	5.0
6 years or less	3.8	3.6	4.2
More than 6 years	3.2	3.1	3.7
SES			
Poor	4.5	4.3	5.0
Middle	4.4	4.2	5.0
Richer	4.1	3.9	4.7

Sources: Calculated with Data from Demtrend 2012.

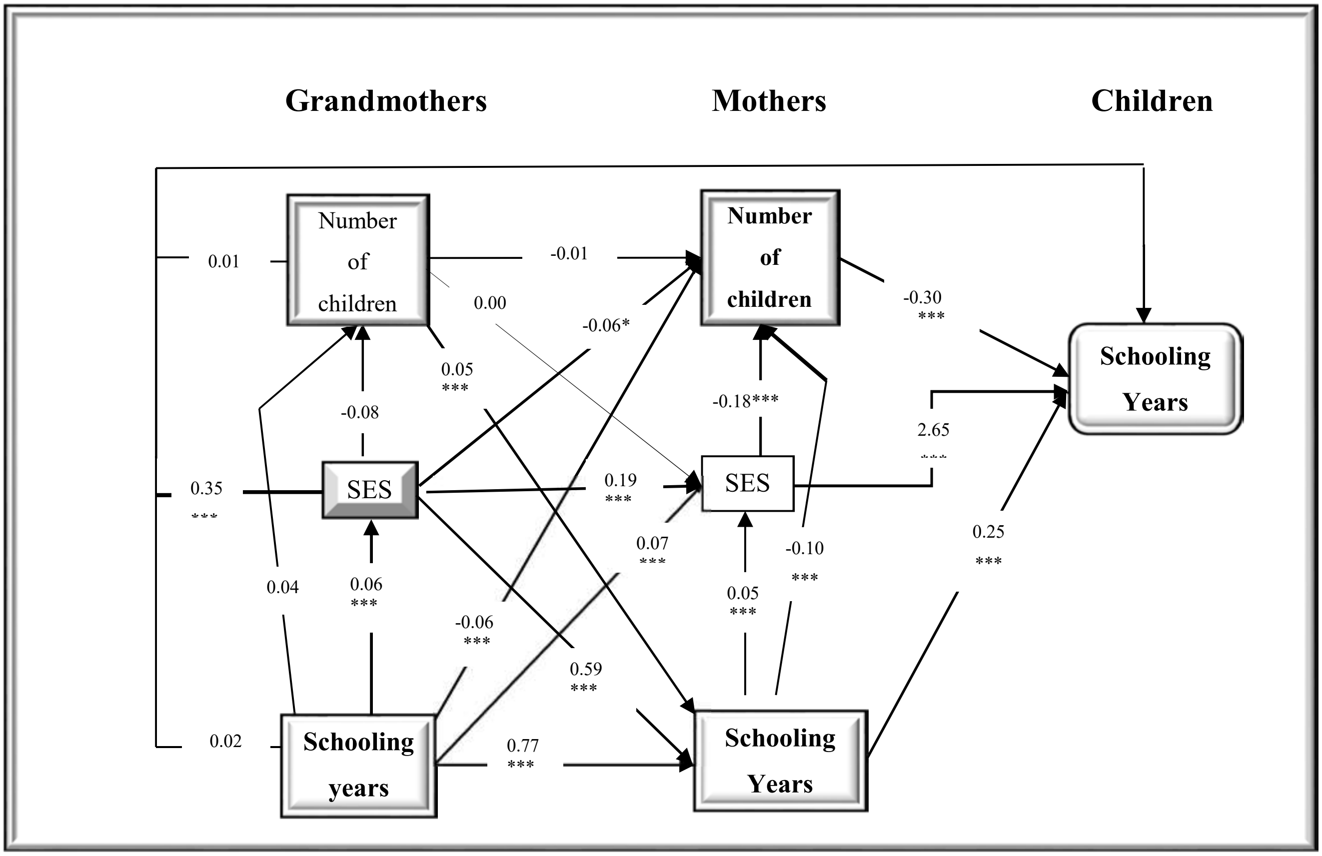
Multivariate analysis

Figure 2 (next page) shows model coefficients and significance levels for all pathways presented in the explanatory framework. Goodness-of-fit statistics showed that the model has a comparative fit index of 0.911. This value of CFI remains less than the 0.96 recommended by Hu and Bentler (1999). However, the SRMR (0.03) is less than 0.08 and the RMSEA=0.051 (<0.06), indicating a good fitted model (Hu and Bentler; 1999). In addition, the 95% lower bound (0.048<0.5) and upper bound (0.054<0.1) of the confidence intervals of the RMSEA (0.051), with Pclose =0.371 (>0.05), corroborate that the model is consistent with the data (Kline 2011).

Family size and intergenerational transmission

The results show that family size is likely to have a leverage effect on the intergenerational transmission process. While the direct effects of grandmother's schooling and SES on mother's family size seem low, respectively -0.06 and -0.06 (although statistically significant at level of 0.001), by decomposing their effects, these variables (Fig.3) appear to be correlated with the reduction of family size. Indeed, the indirect effect of each year of schooling of grandmothers decreases the family size of mothers significantly by 0.09 children or a total effect of 0.15 children less for each additional year of schooling of grandmother. Moreover, moving up one level of SES of grandmothers affects the family size of

Figure 2. Coefficient reported of Structural equations modeling



Fit indicators	
Discrepancy function value F (0)	0.087
CFI	0.911
SRMR	0.030
RMSEA	0.051
90% CI, lower bound	0.048
Upper Bound	0.054
Pclose	0.371
Stability Index	1.6E-05

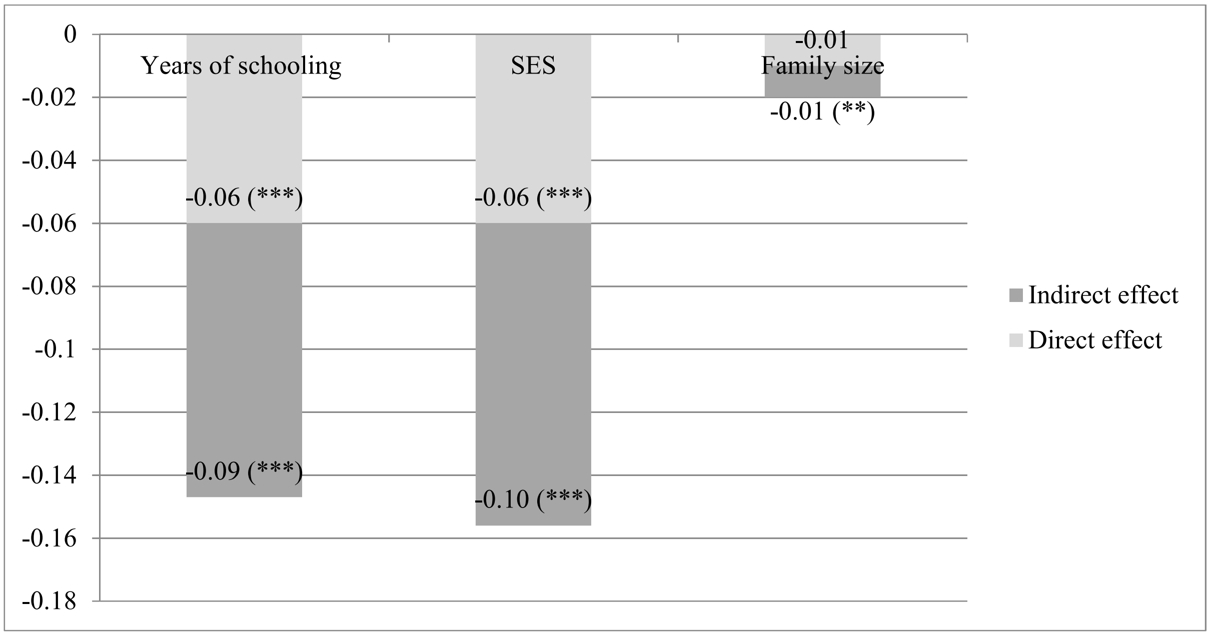
Sources: Calculated with Data from Demtresrnd 2012.

Significance: 0.001 (***), 0.01 (**) and 0.05 (*).

Note: Control variables are included.

mothers indirectly and negatively by 0.10 points more than the 0.06 of the direct effect. In other words, these results suggest that mothers descended from richer and well-educated grandmothers were likely to have had a smaller family size than those from poorer and non-educated ones, although the level of the incidence remains relatively low.

Figure 3. Decomposition of the effects of grandmother's characteristics on mother's family size



Furthermore, family size is correlated with children's education. In fact, each additional child is associated negatively with children's education by -0.30 schooling year, which suggests a trade-off between the quantity of children born and their quality in terms of schooling (Fig.2). Nevertheless, as mentioned previously, the decision to limit family size to invest more in children's education is more likely a family strategy. This is most present among the rich and well-educated part of the society and enables them to reinforce their educational advantages and social standing, and it leads to strengthening of socioeconomic and educational inequalities across generations.

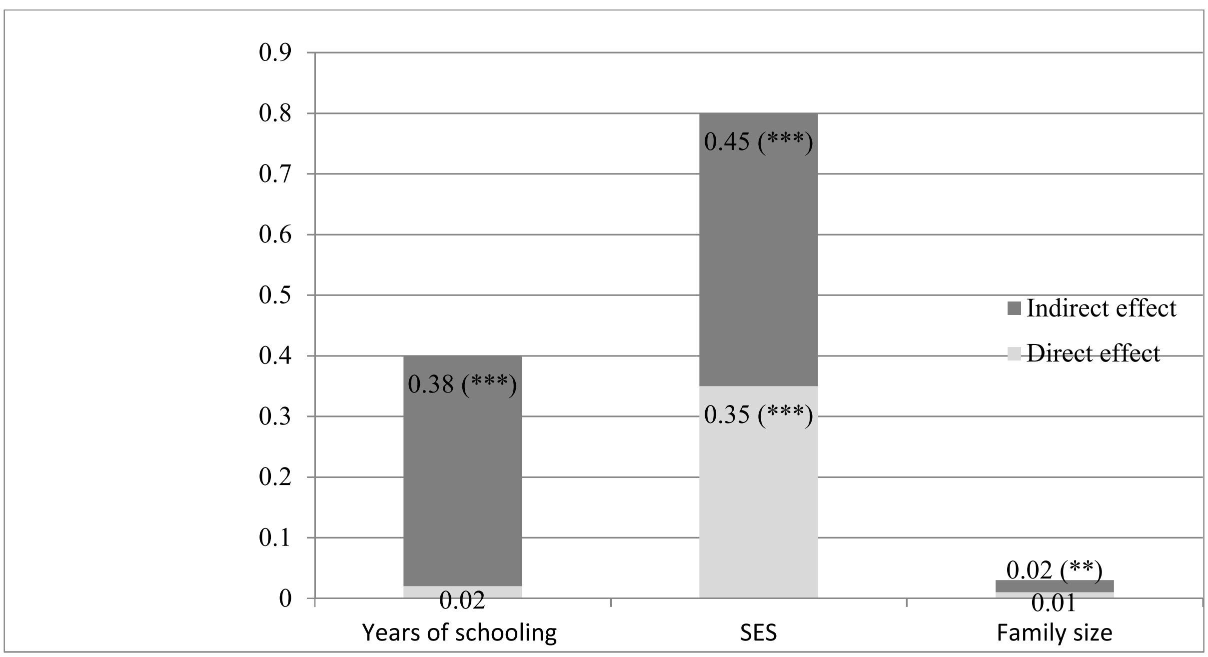
Relationship between family size and educational investment: the shift across generations

The results show a strong contrast between family size and educational investment across generations (Fig. 2). While the link between mother's family size and the educational attainment of their children is strongly negative (-0.30), it is positive and significant (although weak) between grandmothers and mothers (0.05). The results do not change substantially in the second model, which excludes the variable SES (see Fig. 5, p. 119). The estimate between mother's family size and the number of schooling years of their children is still negative (-0.33) and significant at a level of 1%, while it remains positive and significant between grandmothers and mothers (0.06). This shift could be explained by the fact that mothers born between 1953 and 1977 were raised in a context where education was not valued and the global level of education of the population was very low. The quantity of children was more valuable than their educational capital, mainly because mortality risks were very high and the contributions of children to family resources was important. Since then, the socioeconomic context has changed in Ouagadougou, as is the case in most urban areas in Africa. The increasing importance of education and the international treaties against child labor have resulted in falling participation of children in the labor force. These results corroborate the findings of Mueller, (1984) who analyzed several studies on Africa in different socioeconomic contexts, and also the findings of Maralani, (2008) on Indonesia, which showed a changing relationship between educational attainment and family due to socioeconomic development.

Direct and indirect transmission of schooling disadvantages

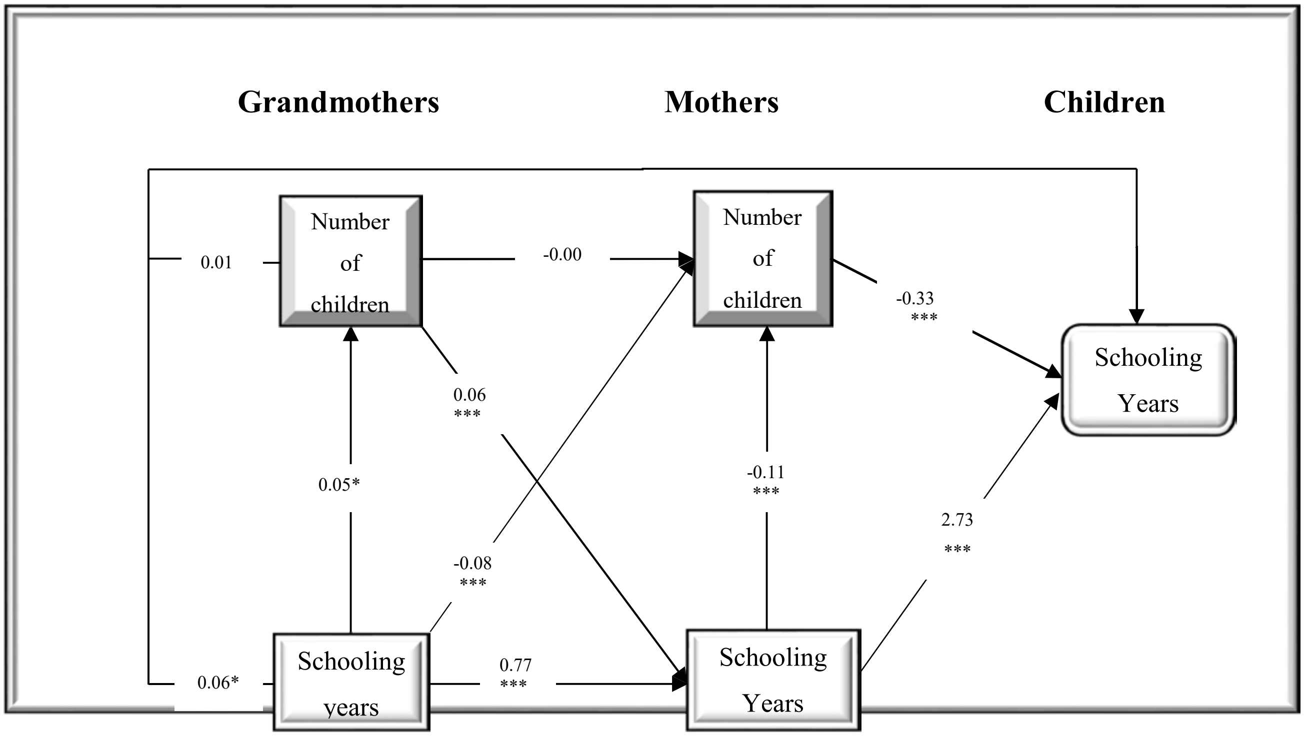
The results confirm previous findings that indicate that indirect intergenerational transmission is a key to understanding social disadvantages and mobility. Grandmothers' characteristics have strongly determined mothers' education and SES, and mothers' characteristics impact significantly on children's education. Indeed, on one hand, for each additional year of schooling of grandmother, mother's years of schooling increased significantly by more than three quarters of a schooling year, and each higher level of the grandmother's SES raised the mother's education by 0.6 years of schooling. On the other hand,

Figure 4. Decomposition of the effects of grandmother's characteristics on years of schooling of children



each year of mother's schooling raised children's schooling by about one quarter of a year, and mother's SES status increased children's schooling attainment by 1.63 years for each level higher (Fig. 2). Our

Figure 5. Coefficient reported of structural equations modeling excluding SES



Fit indicators	
Discrepancy function value F (0)	0.038
CFI	0.862
SRMR	0.026
RMSEA	0.056
90% CI, lower bound	0.053
Upper Bound	0.059
Pclose	0.001
Stability Index	6.9E-07

Sources: Calculated with Data from Demtrend 2012.
Significance: 0.001 (***), 0.01 (**) and 0.05 (*).
Note: Control variables are included.

results suggest that along with changes in the education system to facilitate education for all, the intergenerational transmission process still remains strong and has even strengthened in more recent generations through the effect of the SES of the family.

From Figure 4 (p.118), we can see that the most important transmission from grandmothers to their grandchildren takes place indirectly through mothers. In fact, the effects of grandmothers' education on children's schooling disappear after controlling for mother's schooling and other factors. Nonetheless, the effects of grandmother' SES persist substantially and significantly, while the family size of grandmothers affects their children's schooling only indirectly and very weakly (0.02).

Although our findings show significant leverage effect of family size decline on intergenerational transmission of educational disadvantages, as argued by previous research (Bloom et al. 2012; Hausmann and Székely 2001), we still need to explore the robustness and validity of our estimates. In Table 5, we present the sensitivity analysis of our estimates regarding the conjectures leading to a mismeasurement of SES of grandmothers as discussed earlier. To undertake this analysis, we made two hypotheses. First, we hypothesized that the society where grandmothers lived and grew up in was socioeconomically classless (H1). Second, we hypothesized that the society was polarized into two socioeconomic classes: the better-off (namely richer one) and the others, including middle and lower classes (H2). The comparison of the three models reveals only slight differences. The signs and the signification levels remain the same. Therefore, this finding suggests that our previous results regarding the effect of the decline of family size on the intergenerational transmission process from the Demtrend data are robust in comparison to alternative assumptions about SES of grandmothers.

Table 5. Assessing the sensitivity of estimates to alternative assumptions about SES of grandmothers

	Full model	**Model 1**	**Model 2**
		H1: classlessness	H2: 2 Better-off and the others
Family size of mother (independent variable)			
Years of schooling grandmother	-0.061(0.0.14) ***	-0.062(0.015) ***	-0.057(0.014) ***
Years of schooling of children (independent variable			
Family size of mother	-0.296(0.030) ***	-0.298(0.029) ***	-0.311(0.029) ***
Years of schooling of mother	0.251(0.013) ***	0.260 (0.013) ***	0.265(0.013) ***
Number of years of schooling of mother (independent variable)			
Years of schooling of grandmother	0.752(0.490) ***	0.799(0.050) ***	0.757(0.049) ***

Summary and discussion

The most important finding of this study is that family size decline has a significant leverage on the intergenerational transmission of education disadvantages. This leverage effect is statistically significant on the reproduction of inequality over three real generations. Family size of mothers is significantly patterned by their grandmothers' characteristics, particularly education and SES. Mothers descended from more educated and richer grandmothers have a smaller family size. In addition, mothers with reduced family size appear to invest more in the education of their children, which should enable them to maintain their educational advantages across generations with respect to poorer and non-educated families. These results remain robust after testing alternative assumptions about SES of grandmothers and seem to corroborate the hypothesis that fertility decline strengthens social inequities over generations (Bloom et al. 2012; Hausmann and Székely 2001).

The findings also confirm that the relationship between educational investment and family size is changing over the course of socioeconomic development, as argued by Mueller, (1984) and Maralani, (2008). While for recent generations (mothers and children) this relationship is strongly negative, for older generations (grandmothers and mothers) it is weak but positive and statistically significant. This finding reflects social changes observed in Burkina Faso in general and in Ouagadougou specifically, despite the fact that some social heterogeneity within the country could have remained stable over time. As discussed earlier, Burkina Faso was a colonial exploitation of France before its independence in 1960, with limited (if any) access to schools, with no specialization and little (if any) division of labor. However, the postcolonial conjecture facilitated some diversification, the liberalization of the economy, universal school access (regardless SES, at least in Ouagadougou), and changes in life aspirations. Consequently, the meaning of the quantity of children and their participation in the labor force shifted across generations in Ouagadougou, as was the case in most urban areas in Africa. The mode of production and labor market rules are changing along with the educational aspirations of families for their children, and richer and higher educated mothers seem to be leading these social and demographic mutations.

The results of this study raise two important and intriguing questions regarding education and inequality policies. First, how can we mitigate the leverage effect of declining fertility on the reproduction of inequality? Second, how can the government address the unbalance of private generational transfers among families in the context of fertility decline in a way that does not perpetuate socioeconomic inequalities?

From a theoretical perspective, this study demonstrates the importance of reopening the debate on the relationship between fertility size decline and socioeconomic inequality. Basically, the findings show that differential fertility decline leads to an increase in educational inequality across generations over time. Children from more educated and richer families accumulate more years of schooling than those from less educated and poorer ones.

Nonetheless, the results of this study must be interpreted carefully and cautiously due to limitations. The first limitation comes from the nature of the data. As mentioned above, the data used were not designed to be extrapolated to the entire population at Ouagadougou. Grandmothers' generation is even less representative as the questionnaire module on grandmothers was addressed only to women whose mothers had survived until their 15th birthday. Thus, a disproportionate number of the poorest and least educated grandmothers were excluded because of early maternal mortality, which limited the generalization capacities of this study. Another concern is the use of an adjusted model, that is, the SEM. A multilevel SEM would have been a better choice to integrate the distal factors. The data used were not designed for an in-depth analysis of that magnitude. Another limitation centers on our methodological choice to focus the transmission on maternal lineage. Results might change when focusing on paternal or both conjoint lineages. Therefore, no *definitive* statement can be made over the leverage effect of the fertility decline on the generational transmission of educational disadvantages. Further research projects need to closely address these concerns.

Notwithstanding these limitations, our results – based on original data from three past and living generations during three different socioeconomic contexts – provide guidance for further investigations on the generational transmission in the context of fertility decline. Our results clearly indicate that the potential leverage effect of the fertility decline on the reproduction of inequality over the next decades could lead to a major public policy concern.

Acknowledgments

Financial support and the data used in this study came from the Demtrend Project, funded by the Hewlett Foundation and the Government of France (Agence inter-établissements de recherche pour le développement/AIRD). We thank Marc Pilon and Moussa Bougma for their comments and suggestions. We also thank the unknown reviewers for their insightful comments.

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