Demographic pressure and development: a focus on sub-Saharan countries

Draft, not to be quoted

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Abstract

High fertility and demographic pressure – combined with lack of gender equality and women's empowerment - may put in doubt development. The aim of our analysis is to study the role played by the demographic pressure and behavior on the Human Development Index (HDI) in the sub-Saharan Africa. After analyzing the territorial variability of HDI among and into some sub-Saharan countries at district level, we intend to understand if there is some form of association between Municipal Human Development Index and some indicators of socio-demographic structure.

The hypothesis we want to verify is that the higher the level of demographic pressure (expressed by dependency ratios) and worse socio-economic context, the lower the level of development, according the approach of "demographic window". The results of our analysis may be useful at political level too, considering that schooling and health (included in the MHDI) represent crucial variables in the governments' interventions.

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1. Introduction: theoretical background and aim of our paper

Recently a large debate on the socio-economic opportunities offered by "demographic window" opened. The term demographic window defines a time interval, more or less extended, in which the age structure of a population is such that the ratio between demographically dependent people (the sum of under-15s and over-65s aged persons) and the demographically independent people (15-64) is lower than the level that results in the other periods.

From a strictly demographic point of view, this period represents the "bridge" between a young and less developed population (high fertility and mortality which witness an old demographic regime, and also socio-economic backwardness) and an older and more developed population (low fertility and mortality) (Golini, 2004). In other words, demographic window or demographic dividend is the economic benefits that derive from demographic change due to the demographic transition. This process induces a population bulge in the working age category. It occurs when a falling birth rate changes the age distribution of a population so that fewer investments are needed to meet the necessities of the youngest age groups and resources are released for investment in economic development and family welfare. At this stage, there are relatively more adults in the population of the productive labor force. By demographic dividend, we mean a rise in the rate of economic growth due to an increase share of the working age population (Haghshenas et al., 2007; Saritha and Chandrashekara, 2014). It may occur only once during a demographic transition and lasts for just a few decades. Related to this concept, we define the demographic windows of opportunity as the period in a nation's demographic evolution when the proportion of population of working age group is particularly prominent (van der Ven and Smits, 2011). UN population department has defined the windows of opportunity as "*the period when the proportion of children and youth under 15 years falls below 30% and the proportion of the people 65 years and older is still below 15%"*. Typically, the demographic windows of opportunity last for 30-40 years depending upon the country (Roy and Roy, 2014).

The process that induces the opening of the demographic window is demographic transition. Demographic transition can be viewed as a cycle driven by declining mortality and fertility rates, resulting in a change in the overall age structure of a population. In the early phases, the transition is driven by declining mortality rates, which lead to an increase in the rate of population growth. Lower infant and child mortality rates lead to declining fertility and a corresponding decline in population growth rates (Livi Bacci, 2014). Ultimately, the share of the working age population (SWAP, defined as the share of the population aged 15–64 relative to the overall population) increases. Once the SWAP peaks, the economy faces an aging population, characterized by an increase in the number of retirees relative to the active population. The peak of the proportion, related to the minimum value of dependency ratio, describes the "demographic window", a period when is convenient to invest in schooling and valorization of human capital. The beginning of the transition may be considered as the point at which fertility starts to decline and the end of the transition as the point at which fertility either has fallen by a specific amount, or has reached replacement level.

Among the background factors leading to demographic transition, women's empowerment is one of the most relevant. Empowerment refers to policies and measures designed to increase the degree of autonomy and self-determination in the lives of people and in communities in order to (re-)enable them to represent their interests in a responsible and self-determined way, acting (again) on their own authority. Female empowerment refers both to the process of self-empowerment and to professional support of women, which enables them to overcome their sense of powerlessness and lack of influence, and to recognize and eventually use their resources and chances. Empowering women to participate fully in economic life across all sectors is essential to build stronger economies, achieve internationally agreed goals for development and sustainability, and improve the quality of life for women, men, families and communities. Women empowerment and economic development are closely related: in one direction, development alone can play a major role in driving down inequality between men and women; in the other direction, empowering women may benefit development. Does this imply that pushing just one of these two levers would set a virtuous circle in motion (Duflo, 2012)?

The aim of our research is twofold. Firstly, we intend to study the role played by the demographic pressure – measured in particular by the dependency ratios at the base of the definition of demographic window – on the Human Development Index (HDI) in the sub-Saharan Africa. After analyzing the territorial variability of HDI among and into some sub-Saharan countries, we intend to understand if there is some form of association between HDI and some indicators of demographic structure during the process of demographic transition. Secondly, we want to evaluate the role of gender inequality on the process of development, measuring women's empowerment under different

dimensions. Therefore, the core of our work is the analysis of the association between the structure of population (and consequently the demographic dividend), the gender variables and the development at a local level measured by Municipality Human Development Index (MHDI). The hypothesis we want to verify is that the higher the level of demographic pressure (for examples the level of dependency ratios), the lower the level of development, also considering the contextual variables. On the other side, we want to verify that the higher the level of female empowerment, the higher is the level of territorial development. In order to do this we used the Census data of sub-Saharan countries included in the database called IPUMS (https://international.ipums.org/international-action/users/login).

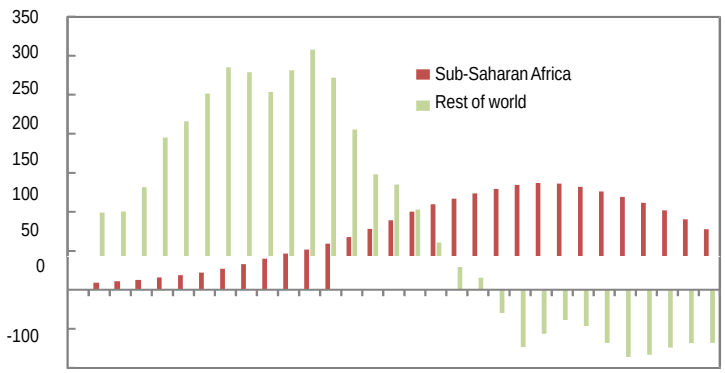
The results of our analysis may be useful at political level too, considering that schooling, health (included in the MHDI) and gender equalities represent crucial variables in the governments' interventions.

2. Demographic transition and demographic window in sub-Saharan countries

The demographic issue, and the multiple relationships between the rapid growth of the world population and development, have been at the center of international debate since World War II onwards. It was spreading a deep concern for the consequences of an unprecedented growth in the history of humankind. The lack of birth control produced too numerous generations, frustrating attempts to improve education; led into the labor market newcomers into unemployment; forced women in household activities; produced uncontrollable migration to the cities (Livi Bacci, 2014). In sum, high fertility and demographic pressure – combined with lack of gender equality and women's empowerment - may put in doubt development.

By 2035, the number of sub-Saharan Africans reaching working age (15–64) will exceed that of the rest of the world combined (Figure 1).

Figure 1 – Change in working age population. Sources: How Can Sub-Saharan Africa Harness the Demographic Dividend? Wakeman-Linn et al., in https://www.imf.org/external/pubs/ft/reo/2015/afr/eng/pdf/chap2.pdf.



For the region, the implications of current trends include a rapid increase in population and a delay in demographic transition and, consequently, a strong delay of the moment in which we will find the peak of the share of working age population identifying “demographic window” or “demographic dividend”.

For the last several decades, the global working age population has been expanding at a rapid pace, supporting higher global growth. Nevertheless, more recently, this trend has started to reverse. On current trends, the world’s working age population, excluding that of sub-Saharan Africa, will start to decline by 2050 or so. With aging populations elsewhere, sub-Saharan Africa could drive global population growth in the future (Wakeman-Linn et al., 2015).

Sub-Saharan Africa can benefit from a significant demographic dividend, the magnitude of which will depend on the speed of transition and policy choices. To maximize the dividend, sub-Saharan Africa will have to create high-productivity jobs at an average of about 18 million jobs per year until 2035—an extremely rapid and possibly unprecedented rate—to absorb the new entrants in the labor force. It will also require policies to be in place that encourage a gradual transition from the informal sector, which currently accounts for about 90 percent of the 400 million jobs in low-income sub-Saharan African countries, to non-agricultural formal sector employment. Failure to create sufficient jobs could result in severe economic and social problems. The overall magnitude of the dividend will depend on the speed of the transition, that is, how fast infant mortality and fertility rates decline. For some sub-Saharan African countries where fertility rates remain high, significant gains can be achieved by decreasing infant mortality and fertility rates. The more rapidly those rates decline, the greater and faster will the increase in the share of the working age population be. Failure to speed up the transition will delay the demographic dividend. Factors that matter for growth—for example, macroeconomic stability, trade openness, and strong institutions— also matter for harnessing a demographic dividend, but take on greater importance in the face of rapidly growing populations and increasing shares of working age population. Some policies, however, become relatively more important in the context of the demographic transition. Investments in human capital, including health care and education, are critical in the early phases of the transition, improve the productivity of the workforce, and increase the size of the potential dividend. Policies that promote flexible labor markets, facilitate the development of labor-intensive sectors that can compete globally, and liberalize trade are necessary to increase employment opportunities. Similarly, furthering financial sector development to effectively channel savings into investment can increase employment and growth. Many of these policies are interlinked, and exploiting their synergies is critical to increasing the dividend (Wakeman-Linn et al., 2015).

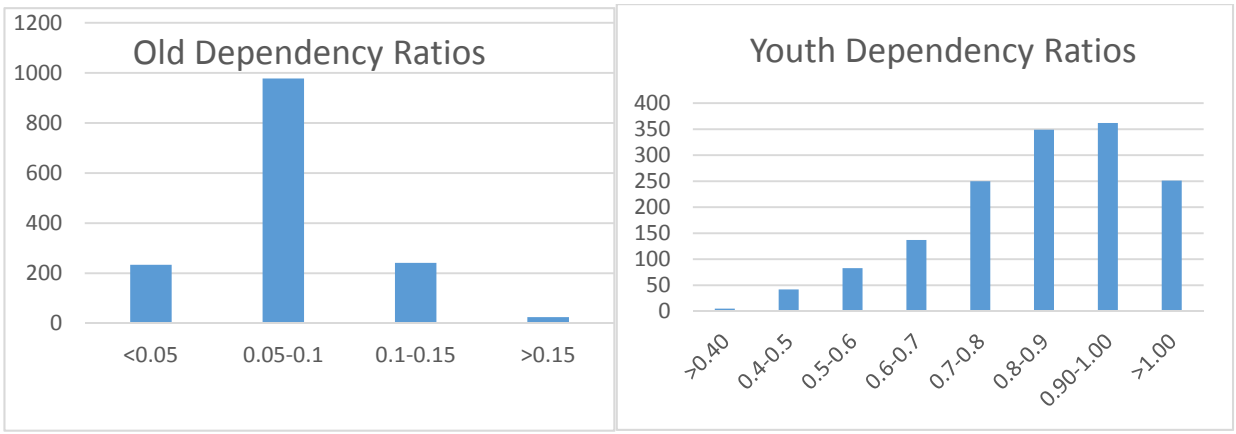
Together with a pre-transitional age structure in sub-Saharan Africa, we observe the highest level of social and economic hardship in the world. Since the seminal works of Sen, poverty is recognized as a multidimensional phenomenon. Recently, there is a renewed interest in this approach since relevant databases became available. Several methods of aggregation have been suggested to measure poverty. However, a suitable measure should satisfy some useful properties. Alkire and Foster (2007) propose a multidimensional poverty measure using a counting approach. Some researchers have applied this measure to estimate multidimensional poverty in fourteen Sub- Saharan African countries (Batana, 2013). Poverty identification is based on four dimensions (assets, health, schooling and empowerment) and may be related to the index that we used in this paper, that is MHDI, a HDI-like measure for small areas (typically municipalities or districts) through a weak modification of variables used in the building of HDI at state level.

The pace and path of the demographic transition varies greatly across sub-Saharan Africa. Three broad groups can be distinguished on the base of the evolution of their age structure: (1) advanced, where the transition is largely complete; (2) ongoing, where the transition is underway; and (3) nascent, where little or no transition has yet taken place. The first group includes the following countries: Mauritius, Seychelles, Cabo Verde, Botswana, South Africa. These countries started their transitions in the 1960s and have nearly completed the process, in roughly the same period as East Asia and Latin America. Their transitions were made feasible by fast declines in mortality and fertility rates. These countries experienced some of the highest GDP growth in sub-Saharan Africa during their transition, and passed to middle-income status.

The second group includes the largest part of sub-Saharan countries, i.e. Namibia, Swaziland, Equatorial Guinea, Kenya, Zimbabwe, Lesotho, Sao Tome, Ghana, Rwanda, Eritrea, Guinea Bissau, Burundi, Togo, Madagascar, Comoros, Gabon, Senegal, Sierra Leone, Benin, Cameroon, Central African Rep., Cote d'Ivoire, Ethiopia, Congo, and Burkina Faso. This group refers to the countries where the transition started during the 1980s, and where the peak share of the working age population will not be reached before 2050. The increase in the share of the working age population varies between 10 percentage points for countries such as Namibia and Swaziland, to marginally more than 2 percentage points for countries like Burkina Faso and Republic of Congo.

Conversely, we observe that in the 14 countries we examined (Ghana, Kenya, Liberia, Malawi, Mali, Morocco, Rwanda, Senegal, Sierra Leone, South Sudan, Sudan, Tanzania, Uganda and Zambia), the level of youth dependency ratios are very high while the old dependency ratios are very low. We report, in Figure 2, the distribution of districts of the considered countries according the level of dependency ratios.

Figure 2: Distribution of districts of the countries according to the level of dependency ratios.



Sources: our elaboration son IPUMS data.

3. Woman status in sub-Saharan countries

The high fertility primarily reflects the universality and the earliness of the wedding (excluding southern Africa, in fact in all other countries people are all married often in young ages), although the age at first marriage is increasing in many countries, as a manifestation of the demographic transition process. The behaviors that affect the formation of the family and descendants are also affected by other phenomena typical of the region, including polygamy, still widespread particularly in the center-west, the mirror of a culture influenced by Islam and the traditional religions that lead to observe a patriarchal regime, which is accompanied by the subjugation of women. The high fertility goes together with a low utilization of health care during pregnancies and the previous deliveries, in addition to a marked presence of complications related to maternal reproductive health. The sub-Saharan Africa seems to be an exception to what is generally called a general process of convergence of fertility. A large number of children is economically rational in traditional African economies, where land is inherited through lineage and increasing dimension of the family is the best form of investment to control the land and its products. The recent trend of many young people to undertake non-farm work, not only for the progressive modernization but also for the reduction of arable land available, could explain the reduction in fertility. In fact, even when the children perform non-farm work, are still a resource for families in traditional societies, and therefore the high fertility increases the likelihood that resources reach even in sectors other than agriculture.

The cultural model that gives husbands the power of reproductive decisions but that puts every economic importance for the growth of children on mothers, has been defined as the priority factor of high fertility in sub-Saharan Africa. The prestige of the paternity, without a parallel economic importance for the growth of children, makes husbands push to have large families and the number of

desired children, even if declining, remains high (Tabutin and Schoumaker 2004). These cultural and economic factors act on the intermediate variables: the precocity of the first sexual intercourse, the first marriage, first pregnancy, all of which are caused by discrimination against women. Not surprisingly, countries with the highest TFT show even higher values in teenage fertility, a clear sign of both the precocity with which sexual relations begin and the causes are the lack of knowledge and use of family planning methods that remain very low in many African realities. The connection between teen pregnancies and lack of growth of the human capital of women, with the social and economic impact on the development of young women, is obvious if you look at the differences in schooling and education in some countries of the sub-Saharan Africa. In the region, large amounts of illiterate people are observed, especially for girls. These values lead to different dimensions of the human development total and by gender (HDI and GDI) that are very low.

In sub-Saharan Africa, there is a 10-percentage point gap between girls' and boys' primary school completion rates, and in only seven of the 54 countries in sub-Saharan Africa do girls have a greater than 50% chance of going to secondary school. Global Campaign for Education (in http://www.campaignforeducation.org/docs/reports/GCE_INTERIM_ Gender_Report.pdf) carried out a survey showing that gender stereotypes still prevail in schools, particularly around male and female attitudes. This perpetuates gender inequalities within the education system and society as a whole. It is hardly surprising, then, that nearly two-thirds of the world's illiterate people are women. True gender equality in education — and beyond — remains far from being achieved.

A very large number of scholars believe that empowering African women is essential to enabling African societies to achieve their potential. After a decade of unprecedented economic growth, African countries are generating more resources to invest in development. Sustained increases in prosperity appear within our grasp. To achieve this vision, however, Africa needs to make full use of the skills and talents of all its citizens — including its women — to transform its economies and societies. We know that women are more economically active in Africa — as farmers, workers and entrepreneurs — than anywhere else in the world. They are the key to the welfare of their families and the life prospects of their children. They are an important voice in the governance of their communities and their nations. Yet they face an array of barriers that prevent them from playing these roles to their full potential. These barriers to women's full participation are fundamentally unfair. But even more, they are constraints on Africa's achieving its development potential. Bridging the gender gap could yield profound and long-lasting economic returns (Africa Gender Equality Index 2015, in http://www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/African_Gender_Equality_Index_2015-EN.pdf).

On this basis, we put together some indicators of woman status in the models with the aims to understand the process of local development. In our approach, the two concepts, demographic window and female empowerment, go together to explain the picture underlined for sub-Saharan countries.

4. Data and Methods

a. Data and variables used in the analysis

Our analysis is based on harmonized census microdata samples from the Integrated Public Use Microdata Series (IPUMS) International database (Minnesota Population Center 2010) disseminated via the AICMD portal. IPUMS International is a census micro-data collection that offers data at the level of small areas, thus the census IPUMS data refer to health, fertility, infant mortality, characteristics of the household and dwelling, work status and migration status, municipality and region, etc. These data allow us to start from the individual census data to analyze the correlation between development and demographic variables placing them in a geographic context characterized by certain socio-economic and cultural aspects. Among the 258 censuses available in the database (corresponding to 79 countries), we focus on those relating to the sub-Saharan African region. After a preliminary examination of the data collected by the censuses, we selected 14 countries (Ghana, Kenya, Liberia, Malawi, Mali, Morocco, Rwanda, Senegal, Sierra Leone, South Sudan, Sudan, Tanzania, Uganda and Zambia) for a total of 21 censuses centered on 1990, 2000 and 2010. In fact, for some countries we have more than one census. Totally, we faced with 1479 geographical units at the local level (districs or departments).

The IPUMS data permit to calculate the MHDI, our dependent variable, a HDI-like measure for small areas (typically municipalities or districts) through a weak modification of variables used in the building of HDI at state level (Permanyer, Esteve-Palos, Garcia, and McCaa, 2014). The MHDI is a composite index with three components: health (H, proportion surviving of live-born children), education (E, a composite of literacy and primary education completion), and standard of living (W, amenities or assets, such as potable water, waste disposal and electricity).

In table 1, we report the mean value of MHDI, calculated at district level, for the sub-Saharan countries we focus in this paper. Generally, MHDI increases with time, but there is also a strong difference among countries. The more developed countries in the first decade of XXI century (with a mean value of MHDI higher than 0.6) are Ghana, Tanzania, Zambia, and obviously Morocco, the unique country in the Mediterranean region.

Table 1 – Mean and standard deviation values of MHDI for some sub-Saharan countries.

COUNTRY _ YEAR	N	Mean	Std. Dev.
GHANA_2000	111	.49412	.115509
GHANA_2010	171	.63067	.123847
KENYA_1989	42	.59086	.129507
LIBERIA_2008	48	.49344	.086574
MALAWI_1998	27	.50161	.071665
MALAWI_2008	32	.59281	.094598
MALI_2009	48	.43289	.075321
MAROCCO_2004	61	.69414	.098737
RWANDA_2002	13	.52237	.064164
SENEGAL_2002	35	.57833	.078641
SIERRA LEONE_2004	102	.38658	.109793
SOUTH SUDAN 2008	74	.35380	.084102
SUDAN 2008	130	.49768	.159108
TANZANIA 1988	114	.59272	.087482
TANZANIA 2002	130	.64479	.083924
UGANDA 1991	40	.47768	.102881
UGANDA 2002	57	.56210	.086652
ZAMBIA 1990	56	.55444	.125439
ZAMBIA_2000	73	.55340	.112965
ZAMBIA_2010	75	.63631	.094904

Source: Our elaboration on IPUMS data.

Our IPUMS data permit also to compute structural and gender variables, that are assumed to be associated to MHDI. Detailing the description of covariates, we use dependency ratio for measuring the structure of population and the demographic window. Then we calculated the ratio between women aged 15-29 with secondary and tertiary level of schooling and men with the same characteristics (GENEDU), the ratio between ever married women and total women aged 15-19 (CON1519), the ratio between the female-headed families and the total families (FHH) and a measure of employment, EMP1, that measures the female employment rate (EMP1), calculated as the ratio between women in employment aged 15-49 and total women aged 15-49. The different variables are then categorized and FHH and EMP1 elaborated to compute a single unified variable.

b. Methods

After a preliminary descriptive analysis on structural indicators, we conducted regression multivariate analyses that were used to assess the role-played by the demographic pressure and gender behavior on the HDI in the sub-Saharan Africa. MHDI will be our dependent variable, while structural, demographic and gender covariates will be our explanatory variables:

MHDI = f(ID,GENEDU, CON1519, FHH*EMP1)

The analyses presented here used simple least square regression models, while in the future we intend to adopt a multilevel approach that considers hierarchical contextual data (districts – first level – in the country – second level).

According to our hypotheses, the level of development measured by MHDI at district level is associated with the covariates in the following way (in the brackets the sign of the relationship):

ID: Youth dependency ratio (-);

GENEDU: Ratio between women aged 15-29 with secondary and tertiary level of schooling and men with the same characteristics (+);

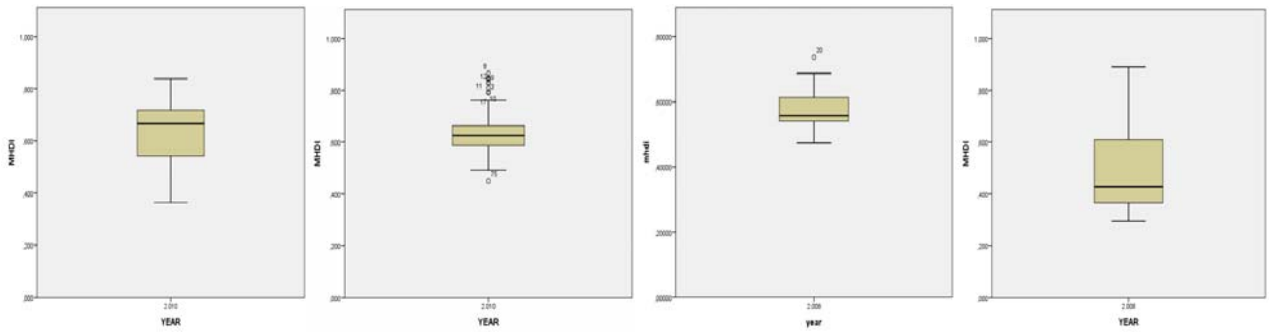
CON1519: Adolescent married, ratio between ever married women and total women aged 15-19(-);

FHH*EMP1, Female headed families interacted with EMP1, female employment rate (+).

5. Preliminary results

We used data of the above listed 14 countries for 21 censuses centered on 1990, 2000, and 2010. As an example, Figure 2 presents the MHDI index of four sub-Saharan countries around 2010: Ghana, Zambia, Malawi and Sudan. It shows that the countries are differently characterized with respect either the level of index or the level of internal homogeneity. Other descriptive analyses show differences even in the temporal trend of MHDI for the same country: in some cases we observe an improvement (Zambia) and in others a stable situation (Ghana) (Figure 3).

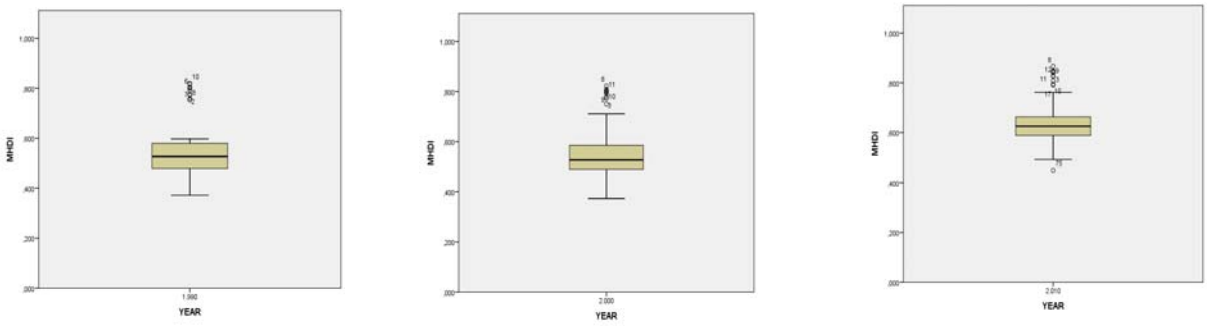
Fig.2. MHDI (level & internal variability) by country around 2010



Ghana 2010 Zambia 2010 Malawi 2008 Sudan 2008

Figure 3 – Temporal trend of MHDI (level & internal variability) by country, Zambia (1) and Ghana (2)

(1) Zambia



(2) Ghana

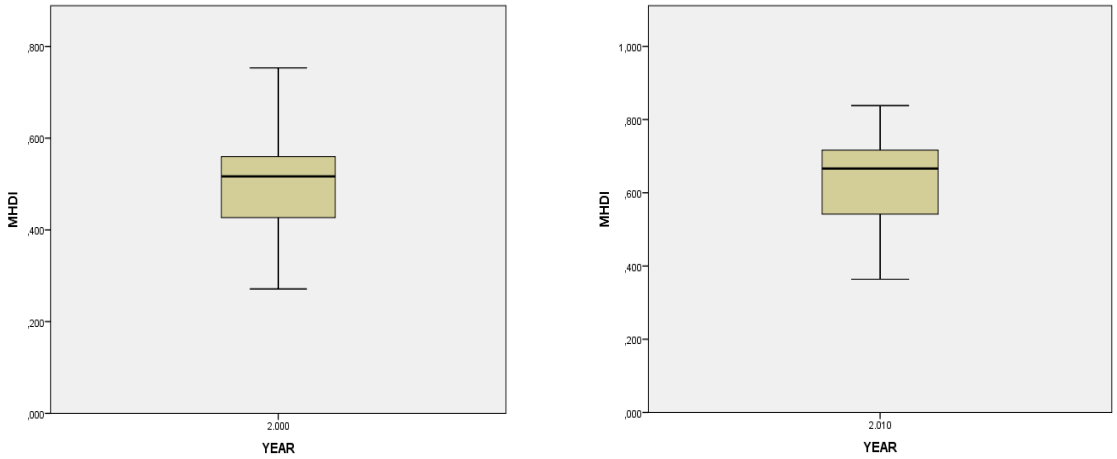


Table 2 presents the parameter estimates of a linear regression model aiming to analyze the association between MHDI and ID (mod.1), gender variables (mod. 2) and ID plus gender variables (mod.3). It is carried out on all districts (all countries and years) and shows (mod.1) that dependency ratio is negatively related with MHDI. The coefficients are highly significant and this result confirms the hypothesis of the demographic window: the higher the non-active aged people, the lower the development. Model 2 includes gender variables, and exactly the proportion of women aged 15-19 already married, the female head of families (categorized in quartiles) crossed with work condition (working, not working), and education, categorized and measured as the ratio between women aged 15-29 with secondary and tertiary level of schooling and men with the same characteristics. The interpretation of the effects of education by gender is very clear: the more educated women are with respect to men, the higher the level of development, meaning that investing in female education represents investing in socio-economic progress.

Table 2 - Models 1, 2 and 3: parameters estimates of least square regression models (dependent variable: MHDI - covariates: ID and gender variables)[1]

	Mod.1			Mod.2			Mod.3		
Variables	Parameter Estimate	Standard Error	Pr > |t|	Parameter Estimate	Standard Error	Pr > |t|	Parameter Estimate	Standard Error	Pr > |t|
Intercept	0.70595	0.00938	<.0001	0.54851	0.00879	<.0001	0.62265	0.00987	<.0001
ID7090	-0.11092	0.01113	<.0001				-0.09888	0.00943	<.0001
ID90+	-0.21072	0.01022	<.0001				-0.14825	0.00956	<.0001
CON1519q23				-0.07784	0.00678	<.0001	-0.04590	0.00665	<.0001
CON1519q34				-0.12918	0.00749	<.0001	-0.09138	0.00742	<.0001
FHHQ01_e2				-0.10803	0.01293	<.0001	-0.07656	0.01214	<.0001
FHHQ12_e1				-0.00340	0.00932	0.7151	0.03026	0.00889	0.0007
FHHQ12_e2				-0.05676	0.01116	<.0001	-0.01372	0.01069	0.1997
FHHQ23_e1				-0.01215	0.01108	0.2731	0.01929	0.01046	0.0652
FHHQ23_e2				-0.00639	0.00930	0.4916	0.03346	0.00900	0.0002
FHHQ34_e1				-0.00252	0.01300	0.8461	0.01361	0.01208	0.2600
FHHQ34_e2				-0.01005	0.00886	0.2568	0.03397	0.00870	<.0001
GENEDUQ12				0.06079	0.00795	<.0001	0.06381	0.00736	<.0001
GENEDUQ23				0.09090	0.00840	<.0001	0.08511	0.00778	<.0001
GENEDUQ34				0.12393	0.00840	<.0001	0.10912	0.00783	<.0001
R-squared	0.2589			0.4568			0.5354		
N. cases (districts of all countries)	1479			1479			1479		

[1] Legend:
ID7090: 0.70< ID<0.90; ID90+: ID>0.90 (reference: ID<0.70)
CON1519q23: Q2(0.24)<CON1519<Q3(0.35); CON1519q34: CON1519>Q3(0.35) (reference: CON1519<Q2(0.24) -
FHHQ01_e2: FHH<Q1(0.11) & EMP1>Q2(0.58); FHHQ12_e1: Q1(0.11)<FHH<Q2(0.17) & EMP1<Q2(0.58); FHHQ12_e2: Q1(0.11)<FHH<Q2(0.17) & EMP1>Q2(0.58); FHHQ23_e1: Q2(0.17)<FHH<Q3(0.24) & EMP1<Q2(0.58); FHHQ23_e2: Q2(0.17)<FHH<Q3(0.24) & EMP1>Q2(0.58); FHHQ34_e1: Q3(0.24)<FHH & EMP1<Q2(0.58); FHHQ34_e2: Q3(0.24)<FHH & EMP1>Q2(0.58) (reference: FHH<Q1 & EMP1<Q2)
GENEDU12: Q1(0.48)<GENEDU<Q2(0.66); GENEDU2: Q2(0.66)<GENEDU<Q3(0.86); GENEDU34: GENEDU>Q3 (reference: GENEDU<Q1)

On the contrary, the higher the proportion of married young women, the lower development is. The sign of the relationship of the compounded variable joining female-headed families and women's labor market participation with MHDI is always negative, but for understanding the link, a little more complex than the other ones, we must look at the model 3, that include both the factors, dependency ratios and gender variables. The sign of the coefficients change passing from a low proportion of female-headed families to a medium and high value. Initially, the sign is negative, expressing that in a context characterized from a few families headed by women and high proportion working women (with respect to reference category low proportion) the level of development tends to decrease. At a later stage, the sign becomes positive, both for working and for not working women over the median value. We interpret this result underlining how the dominant variable is the female-headed proportion of families, joined with the difficult meaning of work in developing countries (Diamond-Smith et al., 2015).

Lastly, some comments regarding the dummy variables indicating the countries (table 3). With reference to Ghana 2000, we see that – apart some not significant coefficients, often related to the weak number of territorial units dividing countries – almost all the coefficients are positive, meaning that the global situation of development of the countries is better than the Ghana 2000 one. This is the case, for example, of Tanzania, Uganda e Zambia, with increasing effects in the time. Sierra Leone and Sudan are an exception, and the negative coefficient is expressing a worse socio-economic situation with respect to Ghana 2000.

Table 3 – Model 4: Parameter estimates of a least square regression model (dependent variable MHDI, Covariates ID, Gender variables and Countries dummies). Nb. of observations 1479. R-squared=0.7170 (1)

Variables	Parameter Estimate	Standard Error	Pr > |t|	Variable	Parameter Estimate	Standard Error	Pr > |t|
Intercept	0.61045	0.01420	<.0001				
ID7090	-0.11370	0.00813	<.0001	Ghana_2010	0.07239	0.00966	<.0001
ID90_	-0.17753	0.00850	<.0001	Kenya_1989	0.08947	0.01435	<.0001
CON1519q23	-0.04748	0.00564	<.0001	Liberia_2008	0.02629	0.01433	0.0668
CON1519q34	-0.08324	0.00686	<.0001	Malawi_1998	0.07898	0.01727	<.0001
FHHQ01_e2	-0.04541	0.01301	0.0005	Malawi_2008	0.11963	0.01613	<.0001
FHHQ12_e1	0.01374	0.00865	0.1125	Mali_2009	0.04199	0.01634	0.0103
FHHQ12_e2	-0.01641	0.01100	0.1358	Morocco_1994	0.00461	0.01499	0.7585
FHHQ23_e1	0.02931	0.00998	0.0034	Morocco_2004	0.03799	0.01600	0.0177
FHHQ23_e2	0.02979	0.01088	0.0062	Rwanda_2002	-0.04396	0.02322	0.0585
FHHQ34_e1	0.02166	0.01177	0.0659	Senegal_2002	0.14570	0.01805	<.0001
FHHQ34_e2	0.03759	0.01081	0.0005	SierraL_200404	-0.03021	0.01215	0.0130
GENEDUQ12	0.03508	0.00614	<.0001	S.Sudan_2008	-0.11019	0.01209	<.0001
GENEDUQ23	0.05373	0.00668	<.0001	Sudan_2008	-0.00238	0.01247	0.8488
GENEDUQ34	0.08746	0.00711	<.0001	Tanzania_1988	0.11603	0.01043	<.0001
				Tanzania_2002	0.09024	0.01072	<.0001
				Uganda_1991	0.08060	0.01540	<.0001
				Uganda_2002	0.11644	0.01379	<.0001
				Zambia_1990	0.06366	0.01448	<.0001
				Zambia_2000	0.12385	0.01311	<.0001
				Zambia_2010	0.13240	0.01315	<.0001

6. Discussion

The demographic window of opportunity that some of the developing countries of our world are currently entering offers a unique chance for economic growth. For a restricted number of years, the size of the working age population is at its maximum compared to the size of the dependent population and hence a high productive capacity goes together with low caring costs for the young and the old. To make optimal use of this “demographic dividend” it is important to gain insight into

the circumstances under which this favorable demographic situation is associated with the largest economic growth. However, almost all studies in developing countries, and especially in sub-Saharan area, focus on economic growth at the national level, whereas economic growth is a regional phenomenon with often-huge variation in growth rate between different areas of a country. During the period of demographic window of opportunity some conditions must therefore occur, in particular investment on human capital and women's empowerment.

This study enriches the literature by exploring the effect of the demographic window of opportunity on economic growth at district level within some sub-Saharan countries, in relationship with some indicators of gender equality as proxy of women's empowerment. Our results demonstrate a negative effect on development of the dependent population (young and old people) and a positive effect of indices of women's empowerment, such as gender difference in education, proportion of girls married in young age and female-headed families, with women that are working or not.

In the model explaining the relation between development at local level, dependency ratios and gender variables, the inclusion of the dummies of the countries does not change the effects of the covariates but describes the ranking of the countries-time variables with respect to the country of reference, Ghana 2000. We show the increase of the coefficients of the countries in the time, such as the case of Malawi, Uganda or Zambia, but also a decrease for Tanzania. The large part of countries present positive coefficient, showing a better overall situation than Ghana's one in 2000. Sierra Leone, Sudan and Rwanda have negative coefficient, meaning that their level of development is worse than the reference country.

Our reflections conclude stressing the importance of demographic dividend, if there are policy interventions at local level. The valorization of human capital and in particular the diffusion of education of girls that lead to a delay in age at marriage and consequently in the age at first birth appears as the main road to development in those countries that are still living demographic transition. The relationship between female empowerment, decrease of fertility, demographic transition and demographic window is the core of the development process.

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