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♦ ARTIGO ORIGINAL

DEMOGRAPHIC DIVIDEND AND ECONOMIC GROWTH IN WEST AFRICAN ECONOMIC AND MONETARY UNION (WAEMU)

DIVIDENDO DEMOGRÁFICO E CRESCIMENTO ECONÓMICO NA UNIÃO ECONÓMICA E MONETÁRIA DA ÁFRICA OCIDENTAL (WAEMU)

DIVIDENDE DEMOGRAPHIQUE ET CROISSANCE ECONOMIQUE DANS L'UNION ECONOMIQUE ET MONÉTAIRE OUEST AFRICAINE (UEMOA)

Hamadoum Tamboura[1] , Pam Zahonogo[2]

[1] PhD, Centre Universitaire de Dori/ Université Thomas Sankara, Burkina Faso, [2] Unité de Formation et de Recherche en Sciences Economique et de Gestion (UFR/SEG), Université Ouaga II, Burkina Faso

Corresponding Author: tambourahamadoum65@yahoo.fr

ABSTRACT

West African Economic and Monetary Union (WAEMU) is characterized by a slow and irregular demographic transition process, associated with low levels of economic growth and economic support ratios. The delay in the development of WAEMU is attributed by several researches to the particularity of its demographic dynamics. The objective of this research is to analyze the relationship between demographic changes and economic growth in WAEMU.
The empirical model is based on the analytical framework developed by Bloom and Williamson (1997) and Bloom and al. (2010). This model is estimated with data from World Bank (2017), Heritage Foundation (2018) and the Fondation pour les Etudes et Recherches sur le Développement International (FERDI) (2016). The results of estimates with the Two Stage Least Squares on period 1995-2016 shows that the demographic dividend has a positive effect on economic growth in the WAEMU. This research concludes that demographic dividend, improvement of institutional environment and increasing in life expectancy at birth are the engines of economic growth in WAEMU. There is a need for fertility reduction and mortality reduction policies in WAEMU to begin a process of sustainable growth.
***Key words**:* demographic dividend, economic growth, WAEMU.

Resumo

A União Económica e Monetária da África Ocidental (UEMOA) é caracterizada por um processo de transição demográfica lento e irregular, associado a baixos níveis de crescimento económico e rácios de apoio económico. O atraso no desenvolvimento da UEMOA é atribuído por várias investigações à particularidade da sua dinâmica demográfica. O objectivo desta investigação é analisar a relação entre as mudanças demográficas e o crescimento económico na UEMOA.

O modelo empírico baseia-se no quadro analítico desenvolvido por Bloom e Williamson (1997) e Bloom e al. (2010). Este modelo é estimado com dados do Banco Mundial (2017), Fundação Heritage (2018) e Fondation pour les Etudes et Recherches sur le Développement International (FERDI) (2016). Os resultados das estimativas com os Dois Prazos Menos Difíceis no período 1995-2016 mostram que o dividendo demográfico tem um efeito positivo no crescimento económico da UEMOA. Esta investigação conclui que o dividendo demográfico, a melhoria do ambiente institucional e o aumento da esperança de vida à nascença são os motores do crescimento económico na UEMOA. Há necessidade de políticas de redução da fertilidade e da mortalidade na UEMOA para iniciar um processo de crescimento sustentável.

Palavras-chave: dividendo demográfico, crescimento económico, UEMOA.

1. *Introduction*

Vulnerability of developing countries has increased substantially in recent years (World Bank, 2019). Among these countries, Sub-Saharan Africa's have the lowest rates of economic growth. In fact, real GDP per capita growth was around 1.3% in 2016, while it is estimated at 5.1% in Central Asia and North Africa (World Bank, 2019). Trends in the population dynamics of Sub-Saharan Africa, including high levels of dependency ratios, have been identified as a main obstacle to achieving sustained economic growth in recent decades (Bloom and al.2016).

While Sub-Saharan African countries are experiencing low rates of economic growth, the majority of Asian and Latin American countries classified as "emerging countries" have experienced high enough economic growth rates in recent decades on the path of emergence through changes in the age structure of their population (Bloom and al., 2016). Ndulu and *al.* (2007) show also that three-quarters (¾) of the gap between the GDP growth rate of sub-Saharan Africa and that of other developing countries between 1960 and 2004 is due to changes in the age structure of the population. Similarly, Mason (2005) demonstrates that demographic dividends have had negative effects on economic growth in sub-Saharan Africa and positive effects on growth in East Asia and South-East Asia over the period 1970-2000. For Wei and Hao (2010), the decline in fertility and the increase in economic support ratios that accompanied it, positively affected China's economic growth over the period 1989-2004. Ghosh (2015)'s analysis concludes also that the rise in economic support ratios had positive effects on economic growth in the majority of the states of India over the period 1960-2011. In addition, the author's projections estimate these demographic dividends at more than 1.6% in 2030. For Bloom and Williamson (1997) much of the Asian miracle results from changes in the age structure of the population.

Demographic dividends have therefore been identified as the main cause in the divergence of development between emerging countries and other developing countries that are still in the trap of underdevelopment. For authors such as Bloom and *al.* (2001, 2014) and Lee and Mason (2006), changes in the age structure have positive effects on the economic growth of countries that have not completed their demographic transition. It is in this context that the acceleration of changes in the age structure of

the population is perceived today as an economic development strategy for the countries of Sub-Saharan Africa.

Given the economic stakes associated with changes in the age structure of the population in WAEMU, a series of studies were conducted on the theme by the French Development Agency (AFD) in the various WAEMU's countries between 2010-2011. However, these studies remain descriptive. In the synthesis of these researches, Guengant and Yarri (2011) estimate that the acceleration of the pace of the demographic transition allowed emerging countries to multiply their real GDP per capita by 20 to 40 times between 1960 and 2008. In addition, authors show that WAEMU's countries experienced deep resistance to demographic transition, and the best economic performance recorded in the zone over the same period was in Burkina Faso, whose per capita real GDP was multiplied by (02) two. Beaujeu *and al.* (2011) also estimate that one-third of the GDP growth of South-East Asian countries between 1970 and 2000 was due to the acceleration of the demographic transition. Vimard and Fassassi (2011) point out that population growth played a negative role on the economy in Sub-Saharan Africa until the early 1990s; which has led to lower economic growth in per capita income.

Today, WAEMU has a factor to begin its socio-economic development. It is the youth of its population. More than 30 percent of WAEMU's population is between 10 and 24 years old (United Nations, 2017). Far from being a burden on the economy, the current size of the young population is an opportunity for development for most developing countries in WAEMU's countries. The main challenge lies in the capacity and / or political will of countries to create the conditions to benefit from the development opportunities that these young people offer. Countries with large cohorts of adolescents and young people can benefit from a demographic dividend that can be used to boost development and enhance the sustainability of their economic growth.

The demographic dynamics of the WAEMU is therefore both a threat and an opportunity for development for the countries members. It is therefore necessary to analyze the effects of this dynamic on the economic performance of WAEMU. This analysis would help inform public opinion and decision-makers about the costly and controversial WAEMU development strategies. Indeed, in the majority of development strategies of WAEMU member countries, there are components focused on lowering fertility and changing the age structure of the population. In addition, WAEMU's

countries face challenges related to their geographic location, the rapid expansion of cities, and growing health and education problems. Growing food challenges and high spatial mobility of the population of the union require appropriate growth policies. In this context, the analysis of the effects of the demographic dividend on economic growth in WAEMU could help in the design of policies and programs that can reinforce and accelerate economic growth. It could also make it possible to find a balance between economic evolution and demographic evolution for a harmonious development of the union.

Is the window of the demographic dividend open for WAEMU? The answer to this question requires an analysis of the demographic changes that started in the 1995s effects on economic growth in this area.

The objective of this research is to analyze the effect of changes in age structure of the population on the economic growth in WAEMU.

The methodological approach used to conduct this analysis consisted to estimate an empirical growth model by Two Stages Least Squares using panel data from 1995 to 2016. The results of the analysis have provided a better understanding of the effect of demographic changes on economic growth in an economic and monetary union of developing countries. The results show that increasing in support ratios, improving in the institutional environment and increasing in life expectancy at birth are powerful levers to accelerate economic growth in WAEMU.

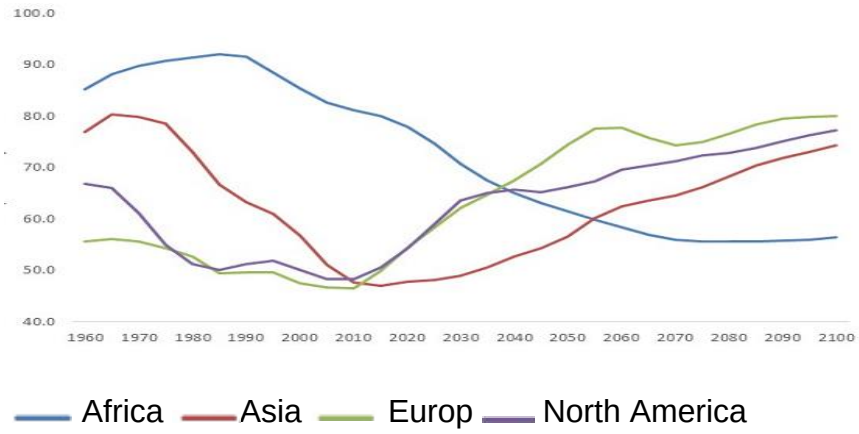
The rest of the paper is organized as follows. Section 2 presents some evidences between demographic dividend and economic growth in WAEMU. Section 3 presents the theoretical framework. Section 4 presents the empirical model. Section 5 presents the results and discussions. Section 6 concludes the paper.

2. *Stylized facts on relationship between demographic dividends and economic growth in WAEMU*

Although population aging is reported frequently, the majority of the world's population is under 30 years of age (UNFPA, 2014). Moreover, young people have never been so numerous and probably, the world will never have again such a potential for economic and social progress. Estimated at 1.8 billion people worldwide, 9 out of 10 young people (ages 10 to 24) live in the least developed countries (UNFPA, 2014).

Sub-Saharan Africa has more than ever an opportunity to begin its economic takeoff. It is this youth that could provide a demographic dividend estimated at $ 500 billion a year, about 1/3 of the region's GDP over a 30-year period (UNFPA, 2014). Africa could even become the engine of global economic growth in the coming decades. In fact, it has been declining in fertility since 1960. From 6.7 children per woman in 1960, fertility dropped to 6.0 children per woman in 1990 to reach 4.7 children per woman in 2015 (Bloom *and al.,* 2016). For these authors, fertility will stabilize in the second half of the 21st century at a level slightly above 2.1 children per woman, which is used as the replacement threshold. This will lead to a drop in dependency rates of around 80.1% in 2015, which is slightly less than those in Asia in 1965 (Bloom and *al.*, 2016). According to these authors, Asian, European or North American dependency rates will continue to rise while those of Africa will fall to be below the dependency ratios of Europe and North America by 2040. This trend will allow Africa to benefit from the demographic dividends while other continents will suffer as a result of the aging of their population.

Figure 1: evolution of dependency ratios in different regions of the world



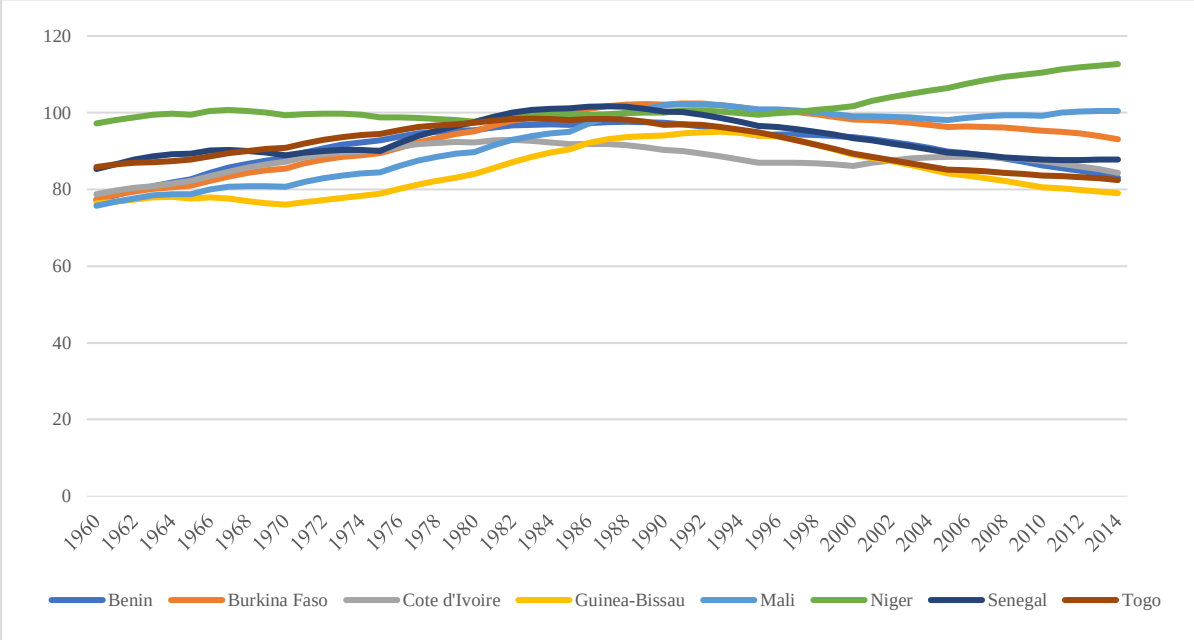
Source: Bloom and al. (2016)

The World Bank data (2017) show an overall downward trend in dependency ratios in WAEMU's countries since the early 1990s except in Mali and Niger. The latter experienced a downward trend in dependency ratios until the early 2000s; period from which the trend reversed. While ratios have stagnated in Mali, they have been rising in Niger since the late 1990s. In WAEMU, Côte d'Ivoire, Togo, Senegal and Guinea-Bissau have recorded a steady decline in dependency ratios, while Mali and Niger are

showing an upward trend in the evolution of their dependency ratio. As for Burkina Faso, it has decreased but less pronounced than that recorded by other countries.

Changes in the age structure of the population should be accompanied by human capital investment policies so that WAEMU's countries benefit from demographic dividends. These countries face enormous challenges related to the strong growth of population of schooling age. Preserving the environment, preventing and managing conflict, equipping and managing the growing emergence of urban economies are some of these issues. In addition, the population is very young and is characterized by early marriages, high fertility and significant mortality.

Figure 2: evolution of dependency ratios in *WAEMU's countries*



Source: Authors' construction with WDI (2017).

It therefore requires significant investment in human capital and appropriate employment policies so that the strong growth of the young population is a bonus for the WAEMU's countries. Indeed, the demographic transition should be accompanied by economic policies that can direct savings towards investments that promote economic growth, so that countries benefit from the second demographic dividend (Lee and Mason, 2006).

The challenges of achieving demographic dividends are reinforced by its demographic dynamics which is marked by an exponential growth of the young population. The

growth of this population will accelerate between 2020 and 2080 according to the projections of the United Nations, revision 2017. This requires more effort on the part of WAEMU's countries in the education and health of this youth. This youth is a threat if it is not well educated.

The threat is real because already the educational and sanitary infrastructures are outdated. Indeed, health problems persist, and education systems operate slowly. In addition, the number of job-seekers will increase from 6 million per year in 2010 to nearly 10 million per year in 2030 in West Africa (Beaujeu *and al*., 2011). Already a good part of this labor force is underemployed and / or unemployed. The high population growth requires also more investments to guarantee the same level of living to the population (Chesnais, 1985).

In addition, there is a negative correlation between level of life expectancy and proportion of young people aged 10 to 24 years (PNUD, 2014). In addition, United Nations Development Program (UNDP)'s report (2002) revealed a negative relationship between the size of the population of different countries and their degree of achievement of the Millennium Development Goals (MDGs) in 2015. In this report, UNDP noted that the 33 countries totaling more than a quarter of the population will not be able to reach even half of the MDGs in 2015 while the 55 countries accounting for less than a quarter of the world's population have a strong chance to reach three quarters of the MDGs. In addition, the 20 countries in sub-Saharan Africa that make up more than half of the region's population are poorer than in 1990. This has led to transform the development programs into poverty combat programs in WAEMU.

Although WAEMU hasn't a population policy, it is promoting national initiatives to control fertility. These initiatives to reduce fertility have been implemented since the year 2010. Indeed, in the new economic and social development plans of Burkina Faso, Togo, Senegal and Côte d'Ivoire, demographic dividend profiles have been integrated (UNFPA, 2018).

At the regional level, we have the initiative "Sahel Women's Empowerment and Demographic Dividend (SWEDD)" created in 2015 which includes Burkina Faso, Côte d'Ivoire, Mali, Niger, Mauritania and Chad thanks to the support from the World Bank and UNFPA (UNFPA, 2018). This project aims to accelerate the demographic transition to trigger the demographic dividend and reduce gender inequalities in the Sahel.

Thanks to advocacy by UNFPA and NGOs, countries such as Burkina Faso, Senegal, Niger and Togo have included in 2017 budget lines for the purchase of contraceptives to reduce fertility.

The government of Burkina Faso has decided to double its financial contribution to family planning, from 500 million CFA francs in 2008 to 1.3 billion in 2018 (UNFPA, 2018). In Benin, a demographic dividend observatory has been set up to take advantage of the transition in this country.

To capture the demographic dividends that accompany the gradual decline in fertility in WAEMU, initiatives have been taken at the highest level with the support of international and regional institutions (UNFPA, 2018).

Regional bodies have pledged to assist also governments in the implementation of population policies. For example, the population policy strategy of the African Development Bank, developed in 2000, focuses on the decline in fertility (Banque Africaine de Développement, 2000). Presidents of national parliamentarians from ECOWAS Member States, Mauritania and Chad also made a joint statement in Ouagadougou, Burkina Faso in 2017 (Assemblé National du Burkina Faso, 2017). In this declaration, parliamentarians pledge to work towards the adoption of population of the member states. These initiatives will allow the different countries to benefit from the demographic dividends to accelerate their economic growth.

3. Literature review on demographic dividend and economic growth

Between Malthusian and anti-Malthusian theories, we have the thesis of the demographic dividend. The demographic dividend thesis argues that the demographic dynamics of a region can have both positive and negative effects on the economy according to the age structure of the population. The dynamics of fertility and mortality that define demographic trends affect economic growth during the demographic transition by changing the age structure of the population. Changes in the age structure of the population have positive effects on several economies by increasing the share of the labor force in the total population. For countries that have not completed their demographic transition, changes in the age structure of the population can generate demographic dividends for these countries.

Demographic dividends have played an important role in the development of emerging countries and have been the subject of several studies in recent years. Thus, a

literature dominated by empirical analysis has been developed on the effects of the demographic transition on economic growth through the demographic dividend. The work of Bloom and Williamson from 1997 is a reference.

These authors started from the standard Ramsey model, the work of Barro and Sala-i-Martin (1995) and those of Bloom and Sachs (1998) to develop a growth model that takes into account the effects of demographic dividends on economic growth. They estimate this model using data from 78 Asian and non-Asian countries for the period 1965-1990 by the Two Stages Least Squares (TSLS). The authors find that the increase in the share of the labor force in the total population has a positive impact on GDP per capita growth rate, and that the Asian miracle is largely attributable to its population dynamics marked by faster labor force growth compared between that and the dependent population growth. In addition, differences in the economic growth rates between East Asian and South Asian countries are due to differences in the evolution of the age structure of the population.

Drawing on the work of Bloom and Williamson (1997), Bloom and al. (1999) modeled the effects of the evolution of the age structure of the population on the economic growth of Asia between 1965 and 1990 from the neoclassical growth model. The model is estimated using data from 70 countries from all parts of the world for the period 1965-90 by TSLS method. The results indicate that the rate of population growth had little effect on economic growth, but it is changes in life expectancy, age structure and population density that have had a significant impact on economic growth rate. In addition, much of the difference in economic success between East Asia and South Asia can be traced to demographic factors such as health status, dependency ratios, and population density. The work of Bloom *and al*. (2000) confirm the results of Bloom and al. (1999).

Within the framework of Bloom and al. (1999; 2000), Bloom *and al.* (2007) review the role of demographic changes in the economic growth of different regions of Asia over the period 1965-2005. The results of the estimates show that between 1965 and 2005, the increase in the share of the labor force in the total population and population growth contributed to 9% of economic growth in Japan, 26% in China and 29% in Republic of Korea. In Southeast Asia and South Asia, the contribution of demographic changes to economic growth was estimated at 40%. The differences in these two regions can be

attributed to the slowdown in the rise in the share of the labor force in recent years in East Asia.

Bloom and Finlay (2009) resumed the work of Bloom and al. (2000) by extending the period of analysis from 1960 to 2005. This analysis conclude that demographic changes have had positive effects on economic growth in this region. Indeed, the growth of the labor force and demographic factors contributed to 10% of Japan's economic growth, 16% in China, 36% in South Korea and 51% in Singapore. In South-East Asia, the contribution of demographic change to economic growth was even higher than in South Asia, where demographic transition only began later in several countries.

Analyzing the conditions for obtaining demographic dividends in sub-Saharan Africa, Bloom and al. (2007), estimates a convergence model using the instrumental variables method, integrating control variables such as the quality of institutions, ethnic division, education, life expectancy and two geographic variables over the period 1960 -2000. The structure of the working-age population and the growth of the labor force are the variables of interest. The results of this work reveal that the effect of the control variables on economic growth is more significant than that of the variables of interest. The hypothesis tests led the authors to conclude that obtaining the demographic dividend in Sub-Saharan Africa is conditioned by the quality of the institutions

From the model of Bloom *and al.* (2007), Bloom *and al.* (2010), distinguish between youth dependency and older age dependence to analyze the effects of age structure of the population on economic growth in Asia between 1960 and 2005. The authors estimate the effects of youth dependency and that at older ages on the economic growth by the TSLS by instrumenting the young dependence by its retarded level of 5 years and the dependence on the advanced ages by three (03) variables namely its level delayed by 5 years and the delayed levels of the fecundity and the mortality 5 years old. The analysis indicates that a shift in dependence on older adults has a negative effect on economic growth in the short term, but the effect is insignificant in the long run. The level (or change) of youth dependence has a negative effect on long-term economic performance.

Demographic changes therefore affect economic growth through the "demographic dividend" by changing the relative size of the dependent or active population (Bloom *and al*., 2001). The demographic dividend results from accounting effects and

behavioral effects (Bloom *and al.*, 2016). Accounting effects result from the increase in the labor force that directly follows the period of declining mortality and maintaining fertility at high levels. The accession of this working-age cohort and the previous decline in fertility lead to a drop in dependency ratios. This leads to an increase in savings and productive investments conducive to economic growth.

The behavioral effects result from three effects all beneficial to economic growth. Falling fertility promotes women's participation in the labor market; which reinforces the accounting effects. This decline also increases the opportunities for investment in human capital per child both at the household level and at the government level. There will also be an increase in savings that results from longer retirement period prospects as life expectancy at birth increases.

Beyond these effects of the demographic transition on economic growth, this demographic transition leads to a decline in the size of the population and therefore livelihood needs following the decline in fertility. At the macroeconomic level, this can lead to a decline in consumer spending in favor of savings and productive investments that are conducive to economic growth. Added to this is the presence of abundant, young, well-trained labor at a lower cost in the labor market.

Increase in the share of the active population in the total population following the acceleration of the demographic transition makes it possible to release additional resources for both the State and the households. This increases the opportunities for investment in human capital to accelerate economic growth, but also in physical capital, research and development as well as infrastructure to increase youth employment opportunities. The increase in human capital attracts foreign direct investment, helps to absorb and adapt imported technologies, facilitates innovation from these technologies, but also allows the export of labor (Pilon, 2006).

The demographic dividend period is estimated at no more than 50 years (Lee and Mason, 2006). However, it is possible to benefit from a second demographic dividend. Indeed, in a series of recent articles, a framework for analyzing the demographic dividend where the modification of the age structure of the population makes it possible to have two demographic dividends according to the different stages of the demographic transition has been developed. Lee and Mason (2006, 2011), Mason *and al.* (2016), Mason (2003, 2005) are the precursors. The first demographic dividend occurs because of the growth of the labor force in the total population to the detriment

of the dependent population. Indeed, the decline in fertility that follows the decline in mortality, at the first stage of the demographic transition, reduces the size of the dependent population. The active population is growing faster than the dependent population.

However, the continued decline in fertility lowers the rate of growth of the labor force and the decline in mortality will lead to an increase in the size of the elderly population and the difference in rates becomes negative from a certain threshold. This is the end of the first demographic dividend. The second demographic dividend comes at the end of the first demographic dividend that increased the capacity to save and accumulate capital. The second demographic dividend results from the orientation of increased savings during the demographic transition towards investments in human and physical capital as well as in technological innovation. The second demographic dividend is based on life cycle theory. Individuals trying to smooth their consumption throughout their lives increase their savings and invest more in their human capital (Mason and Lee, 2007).

4. Empirical model and estimation method

The empirical model of our analysis is inspired by the work of Bloom and Williamson (1997), Bloom and al. (1999), Bloom and al. (2007), Bloom and Finlay (2009) and Bloom and al. (2010). The empirical model is expressed as:

$$g_{y_{it}} = \alpha_0 + \alpha_1 Lsup_{it} + \alpha_2 Lesp_{it} \ \alpha_3 Lpib_{it-1} + \alpha_4 Ldens_{it} + \alpha_5 Lse_{it} + \alpha_6 gl_{it} + \alpha_7 gp_{it} + \alpha_8 LCp_{it} + \alpha_9 Ouv_{it} + \alpha_{10} Inf_{it} + \alpha_{11} Inst_{it} + \varepsilon_{it}$$

In this model, L designates the logarithm; sup the support ratio; esp life expectancy; pib the growth rate of real GDP per capita; dens the density of the population; se the high school enrollment rate; gl and gp the growth rates of the labor force and the total population; Cp and Ouv respectively private final consumption in % of GDP and trade openness; Inf the inflation rate and Inst the quality of the institutions. α_i are parameters to estimate and ε_{it} error term. In this model α_1 represents the demographic dividend. This is the effect of changes in the age structure of the population on economic growth. This model is estimated on stata 14.

Since the analysis is based on panel data, it is first necessary to test the homogeneity or otherwise of the specification of the data generating process (Greene, 2002). The results of the various specification tests are summarized in the table 1. Fisher's test

reveals that the fixed effects are significant as described in the table 1 . On the other hand, the Breusch and Pagan test rejects the significance of the random effects. These results are supported by the Hausman test, which confirms the significance of the fixed country effects orthogonal to the explanatory variables of the model.

Table 1: Summary of the results of the model specification tests

Test		**Statistic**	**P-value**	**Conclusion of test**
Fisher test:		F(7, 121) = 7,30	Prob > F = 0,00	Yes for country fixed effects
Breusch and Pagan LM-test:		chibar2(01) =0,00	Prob > chibar2 =1	No random effects
Hausman test :		chi2(12) = 52,83	Prob>chi2 = 0,00	Fixed effects more than random effects
Breusch and Pagan 's Heteroscedasticity test		F(12, 128) =48,05	Prob>F=0,00	Yes heteroscedasticity
Durbin-Wu – Hausman test :	Lsup	F(1,122) = 1,46	Prob>F=0,22	No endogenous
	gl gp	F(2,120) = 2,90	Prob>F=0,00	Yes endogenous

Source: Authors

However, including individual fixed effects in the estimation of an ordinary least squares lagged predictor model using a panel gives biased estimators (Nickell, 1981). Like Bloom and al (1999, 2000), we will introduce two variables dummies to capture individual specificities. The variable (Sea) is a binary variable that captures the country's access to the sea.

In addition, we introduced temporal dummy variables to control the presence of temporal fixed effects. This method is preferred to the study of the stationery of the variables because one could wrongly accept the hypothesis of non-stationary in the generating process of the data. In fact, unit root tests are based on asymptotic properties whereas the temporal dimension of our panel is limited to 21 years. This

period is relatively short to study the long-term properties of a series according to Cristina (2012). The Durbin-Wu-Hausman endogeneity test show that lsup is exogenous, unlike the work of Bloom and al. (1999) Bloom and al. (2007), Bloom and Finlay (2009) and Bloom and al. (2010) who assume that this variable is endogenous. On the other hand, the test reveals that the growth rates of the active and total population are endogenous. The Two Stage Least Squares method seems to be the most appropriate for estimating this analysis model. This method solves the endogeneity problems and allow to have efficient estimators. It has been used authors such Bloom and al. (1999) Bloom and al. (2007), Bloom and Finlay (2009) and Bloom and al. (2010) in the analysis of the demographic dividend.

The model is estimated by the Two Stage Least Square method (TSLS). Temporal dummies have been introduced into the estimates. The growth rates of the labor force (gd) and of the total population (gp) are measured by the lagging labor force growth rate of one period (L1.gl), the value added of agriculture and GDP per worker (taken in logarithm). Heteroscedasticity is corrected by the method of White. To analyze the robustness of the results, we estimated the model using the Generalized Method of Moments (GMM) in Blundell and Bond (1998). This system estimator yields unbiased and efficient estimators of dynamic panels and endogenous explanatory variable static models. If our results are robust, the results of the TSLS should not be too different from the results of the GMM estimates. The data used come from World Development Indicator (WDI) -2017 database of World Bank, the Human Asset Index (HAI)-2016 database of FERDI and the Index of Economic Freedom (IEF)-2018 database of Heritage Foundation.

1. Results and discussion

The Wald test shows that the results of the TSLS estimate is globally significant. The Sargan test confirms the validity of the instruments used in both estimates. In addition, 41.51% of the variation in economic growth in WAEMU is explained by the explanatory variables of the model. The results of the TSLS estimate and those obtained by the GMM are not different. The results of the estimates are therefore stable. The results of the estimates also show that the demographic dividend has a positive and significant effect on economic growth in WAEMU. Indeed, the increase in economic support ratios has a positive and significant effect on WAEMU's economic growth. If the economic

support ratio increases by 1%, economic growth increases by 39.12 percentage points. The contribution of the demographic dividend to the economic growth is about 0.3913% of economic growth rates in WAEMU.

The increase in the share of the active population in the total population therefore positively affects the economic growth of WAEMU. This positive effect could be explained by the fact that the increase in the share of the active population is accompanied by an increase in productive capacities, from a fall in consumption to the benefit of investments favorable to economic growth in WAEMU.

Raising economic support ratios increases investment opportunities in human capital and physical capital for both governments and households. It also reduces the time spent on inactive people for productive activities. The combination of these factors is conducive to economic growth. This result corroborates those of Guengant and Yarri (2011) who showed that an increase in the share of the active population is favorable to economic growth in the WAEMU. The results of our analyzes corroborate also those of authors such as Bloom and Williamson (1997) who concluded that much of the Asian miracle results from changes in the age structure of the population following the acceleration of the demographic transition.

The results of our estimates corroborate also those of Bloom and al. (2007). Indeed, analyzing the demographic dividend in 85 countries, including 19 in sub-Saharan Africa over the period 1960-2000 using a convergence model, Boom and al. (2007) find that dependency ratios have positive effects on economic growth in the study area.

Contrary to our results, Mason (2005) found that demographic dividends had negative effects on economic growth in sub-Saharan Africa over the period 1970-2000. Unlike the results of our analysis, Bloom and al. (2007) found that the growth rate of the labor force has a positive and significant effect on economic growth. Indeed, the results of our estimates show that the growth rates of the total population and the active population do not significantly influence economic growth in WAEMU. The demographic dividends in WAEMU are very high compared to other developing regions. Changes in the age structure of the population may increase per capita real income growth rates in WAEMU by about 0.39%. These dividends could increase if the share of the active population in the total population increases by 1% in WAEMU.

The real GDP per capita delayed has also a negative and significant effect on economic growth in WAEMU. The convergence hypothesis is therefore confirmed in

the dynamics of the WAEMU economies. The least developed economies therefore experience the highest rates of economic growth. As for the density of the population, it has a negative effect on economic growth. The increase in population density therefore reduces the area of arable land per asset and this may have a negative effect on economic growth in WAEMU.

Human capital variables also have overall positive effects on economic growth in WAEMU.

In fact, the increase in life expectancy at birth of 1% leads to an increase in the economic growth rate of 6.69 percentage points, an increase of 0.07%. The increase in life expectancy at birth reflects an improvement in the health status of the population. This reduces morbidity to increase the working time of the population. There will be an increase in labor productivity and time spent on production. The population would be more motivated to invest in human capital whose accumulation is conducive to economic growth. As people live longer, they will be more motivated to save and this increases the opportunities for investment in physical capital. These factors constitute the channels of transmission of the improvement of life expectancy to economic growth and justify the positive effect of life expectancy on economic growth in WAEMU. However, the effect of education on economic growth is not significant.

In line with the expected results, the quality of institutions has a positive and significant effect on economic growth in WAEMU. This could be explained by the fact that the improvement of the institutional environment attracts foreign direct investment and thus stimulates the economic growth of the WAEMU.

Inflation also has a positive and significant effect on economic growth in WAEMU. This positive effect could be explained by the effects of inflation on prices.

Access to the sea also has a positive and significant effect on WAEMU's economic growth. As for trade opening and private final consumption, they have negative and significant effects on economic growth in WAEMU. Openness hinders the economic growth of WAEMU and this could be explained by the low competitiveness of its various economies.

Table 2: Results of estimations

	TSLS	GMM
VARIABLES	Real GDP per capita rate growth	Real GDP per capita rate growth
Labor force growth rate	-1,18	0,40
	(2,19)	(1,64)
Growth rate of total population	-0,76	-1,27
	(1,80)	(0,985)
Support ratio (log)	39,13**	32,47*
	(18,57)	(17,46)
Life expectancy at birth (in log)	6,69*	5,17*
	(3,76)	(2,87)
Real GDP per capita delayed (in log)	-5,06***	-4,50***
	(1,49)	(1,01)
Density of the population (in log)	-1,62**	-1,58***
	(0,78)	(0,49)
High school enrollment rate	0,00	0,00
	(0,02)	(0,01)
Commercial opening	-0,04**	-0,03*
	(0,02)	(0,01)
Inflation rate	0,06***	0,05**
	(0,02)	(0,02)
Private final consumption (in log)	-9,88**	-12,74***
	(4,33)	(3,82)
Quality of institutions	0,21***	0,16***
	(0,05)	(0,03)
Access to the sea	2,20*	2,16***
	(1,27)	(0,73)
Constant	-71,97	-36,56
	(65,97)	(73,52)
Number of Observations	128	134
Number of countries	8	8
R-squared	0.415	

Sargan test	Prob> chi2(1) = 0.72	Prob>chi2(118) = 0.70

Source: Data from BM (2017), FERDI (2016) and Heritage Foundation (2018)

NB: the standard deviations are in parentheses. The symbols *, ** and *** indicate levels of significance respectively at 10%, 5% and 1%.

1. Conclusion and implications

Since the late 1960s, there has been consensus that changes in the age structure of the population can accelerate the economic growth in countries experiencing delays in their demographic transition. Several authors argue that the demographic transition played an important role in the development differences between emerging countries and sub-Saharan African countries in the 1970s.

While emerging countries have been able to boost their economic development by accelerating demographic changes through the demographic transition, sub-Saharan Africa has experienced a different demo economic dynamic. Until the early 1970s, the governments of WAEMU's countries considered the evolution of their population and the level of fertility as satisfactory and not requiring interventions.

However, the experience gained from the emerging country development process has raised great hope for developing countries. It is recognized that changes in the age structure of the population may therefore have positive effects on the economic growth of countries that have not yet completed their demographic transition. It is to test this hypothesis in WAEMU that this research is devoted to the analysis of the demographic dividend in WAEMU. It aims to analyze the economic consequences of changes in the age structure of the population in WAEMU.

The empirical model is based on the analytical framework developed by Bloom and Williamson (1997) and Bloom and al. (2010). This model is estimated with data from the World Bank (2017), the Heritage Foundation (2018) and the FERDI database (2016) for the period 1995-2016.

The results come from estimates by the TSLS. It appears that the increase in the share of the active population in the total population, the improvement of the institutional environment and the increase in life expectancy at birth are the engines of economic growth in WAEMU. This analysis therefore informs policy makers on the economic

issues of population policies in WAEMU. Like the currently emerging countries, policies to accelerate changes in the age structure of the population in WAEMU are a lever for economic development for the union. There is a need for fertility reduction and mortality reduction policies in WAEMU to begin a process of sustainable growth.

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