

Decentralization And Convergence Of Living Standards Between The Regions Of A Country: The Case Of Cameroon

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Abstract

Background: Decentralization was enshrined in the Constitution in 1996 and, with the 2004 Orientation Act, became the preferred means of promoting development, democracy and governance at local level. This process was formally completed with Law no. 2019/024 of December 24, 2019 on the general code for decentralized local authorities. Yet at the national and regional levels, differences in political, economic, and social aspects seem to persist among the populations.

Setting: Annual data covering the period 2001-2018 were used.

Aims: This study examines the influence of the decentralization process on the convergence of living standards in the regions of Cameroon.

Methods: The methodology used includes two stages. the first is the procedure for estimating regional GDP inspired by the Canadian Conference Board method and developed by the World Bank (2017). The second step is estimating the sigma convergence and the beta convergence. Finally, statistical tests made have enable us to assess the robustness of our results.

Results: There is a difference in the income levels evolution among the regions of Cameroon, making the hypothesis of non-convergence of living standards more plausible. In addition, the evolution of the standard deviations of regional GDP reveals a relative convergence on certain dates. For sigma convergence, the tests carried out validate the presence of a random trend supporting the significant differences in living standards between the regions of the Country. The beta convergence estimate suggested a regional convergence process but is not statistically significant.

Conclusion: Based on these findings, the document recommends developing a mechanism for transferring resources to the regions based on their level of development and factor endowments. Also, encourage local authorities to implement innovative mechanisms such as crowdfunding for mobilising resources to finance community projects and local infrastructures.

Contribution: The study is part of a field of research that has not yet been sufficiently explored in sub-Saharan Africa, namely the regional convergence of living standards within a country. It provides evidence that decentralisation does not necessarily lead to convergence in living standards between regions. It suggests that the decentralisation process should be accompanied by redistributive policies.

Key words: Beta Convergence, Sigma convergence, Living standards, Decentralization

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I. Introduction

The literature presents several definitions of the concept of decentralization. According to the UNDP (1977), decentralization refers to an organization of power so that there is a system of co-management and co-responsibility between governance institutions at the central, regional and local levels in the exercise of state functions. according to the principle of subsidiarity. In developing countries, decentralization is presented as one of the most important reforms to improve the participation of populations in the management of public policies, improve their access to basic social services, and the quality of public service and promote the reduction of poverty and inequality.

For several authors (Maro, P. S., 1990; Philippe J. P., 2003), decentralization promotes local development in the regions while for others (Owoundi F., 2009; Laffiteau & Edi, 2014), it would also be excellent, to make the latter converge by reducing the relative differences in living standards. Nzouankeu (1994) and Prud'homme (1995) reveal that decentralization could accentuate spatial disparities in a country because low-resource and poorer localities will remain dependent on central power and therefore without real autonomy. For Hayek (1948), decentralization by bringing the people closer to the authorities is a factor of economic growth and poverty reduction.

In Cameroon, decentralization was enshrined in the Constitution in 1996. Under the 2004 orientation law, decentralization has become the preferred mode of promoting development, democracy and governance at the local level. The completion of the said process appeared with Law No. 2019/024 of December 24, 2019, which establishes the general code of decentralized local authorities. Since 2004, when the first skills were transferred, the country has displayed relatively satisfactory overall performance over the period 2010-2019 with an average growth rate of 4.5%. However, several facts question the inclusive nature of this growth. According to the NIS (2014), income inequalities increased in Cameroon between 2007 and 2014; the Gini index rose from 39% in 2007 to 44%. Furthermore, over the same period, the poverty rate fell in urban areas (12.2% to 8.9%) while increasing in rural areas (55% to 56.8%). In addition, the phenomenon of poverty presents deep regional disparities, the three regions most affected are the Far North, the North and the North West.

Although in their speeches, politicians affirm that decentralisation is an effective management method for improving people's living conditions, the evidence shows that the efforts made by the central government to support this approach are still insufficient. In terms of public investment, the resources transferred to decentralised local authorities represent only 7.5% of capital expenditure in 2022. In their study of Cameroon, Gérard and Patrick (2020) share the observation that funding for the decentralisation process is low and that the budgets of the communes fall far short of what is needed to implement community development programmes.

Despite this situation, there are very few studies related to Cameroon that have examined the impact of decentralization on the convergence of regional living standards in Cameroon. It is in this context that this article aims to determine whether the decentralization process initiated in 2004 in Cameroon has favoured the convergence of living standards between the different regions of the country. This involves testing the hypothesis of sigma and beta convergence using the estimated gross domestic products of the different regions.

The remainder of the document is structured into five sections. Section 2 presents the stylized facts on decentralization and spatial inequalities in Cameroon. Section 3 presents the state of play on the link between decentralization and the convergence of living standards. In section 4, we present the methodology used and the data. Section 5 presents, on the one hand, the developments in estimated regional GDP, the validation tests of the estimated models and the results of the sigma and beta convergence estimations of the regions. Finally, section 6 concludes and gives the economic policy recommendations of the study.

II. Stylized Facts On Decentralization And Spatial Inequalities In Cameroon

The main results of the ECAM5 (INS, 2024) show that Cameroon is a resilient economy, which nevertheless still faces major challenges and persistent disparities that need to be resolved if we are to stay on course towards the vision of emergence by 2035. In 2022, 37.7% of the population was living below the national poverty line, estimated at 813 CFAF per person per day. This represents around ten million people out of a total population estimated at 27 million. Poverty is more widespread in rural areas (56.3%) than in urban areas (21.6%), and is concentrated in the Far North, North-West, North, Adamaoua and East regions. Consumption inequalities remain high, with the richest 20% of households consuming ten (10) times more than the poorest 20%.

In fact, the economic growth rate, averaging 2.6% over the period 2020 to 2023, remains low compared to the demographic growth rate of 2.5%. Added to this are distortions linked to the redistribution of wealth, various endogenous shocks (notably conflicts in the North-West and South-West regions) and exogenous factors such as fluctuations in the world prices of the main export and import products.

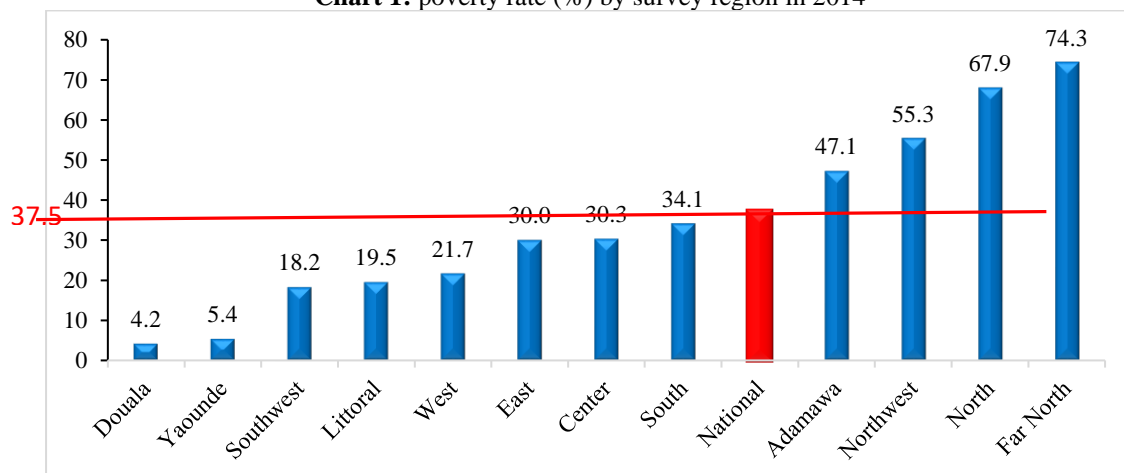
The trend observed of poverty is a situation already well known in the past. According to the INS report (2002), 40.2% of Cameroonians lived in poor households in 2001. Depending on the area of residence, urban households benefited more from the increase in income than those living in rural areas. Moreover, the increase was twice as great for urban households as for rural households. With more than 8 out of 10 poor people living

in rural areas, the poor benefited less from the increase in income than the non-poor. The coefficient of variation, an indicator of household income, shows a strong dispersion of expenditure per consumption unit, having risen from 1.043 in 1996 to 1.054 in 2001 (or 0.011 percentage points).

With regard to education, despite net enrolment rates of 80% and 70.6% for young children (6-14 years) and adults (15 years or older) respectively in 2007, 30% of individuals are still in a household whose head has not attended school (INS, 2007). Romuald Foueka's (2016) paper shows that the dynamics of student enrolment are not followed by a similar evolution of public expenditure on education in Cameroon. According to INS (2014), one of the main determinants of household welfare is the level of education of the head of household. Thus, the comparison between 2007 and 2014 shows that there is a greater proportion of household heads with secondary or higher levels of education. One would then expect that the improved human capital stock between 2007 and 2014 would have led to better incomes and promoted poverty reduction. But the "returns" to these levels of education have deteriorated. In other words, the contribution of educational attainment to improved living conditions was less in 2014 than in 2007. As evidence, the poverty rate in rural areas was 56.8% in 2014 compared to 55.7% in 2007, and these areas comprise nearly 90.4% of the country's poor population¹.

The evidence of the facts, as a whole, reveals that poverty has continued to hamper the development of the regions of Cameroon despite the completion of the decentralization process through Bill 2019/024 laying down new provisions on decentralization. Whether it is a question of transferring technical, financial or non-human resources to decentralized territorial authorities, the perceived limitations in terms of the well-being of local populations have always remained within and between regions. Indeed, as shown in the graph below, the situation in the northern regions is all the more worrying because the phenomenon of poverty has persisted and seems to be worsening over time. Among other structural causes, the ECAM IV report cites a particularly harsh environment, remoteness from the southern part of the country, which aggravates the difficulties of obtaining certain products, etc.

Chart 1: poverty rate (%) by survey region in 2014



Source: ECAM4 data, INS Cameroon

While public policy efforts have had little impact on the education system over the period, Cameroon's health indicators have reportedly changed little. According to the World Bank (2013), although for the past two decades, about 16 more children per 1,000 have lived beyond the age of five in Cameroon, life expectancy in Cameroon has declined by about two years since 1990. At the regional level, it appears that under-five mortality has been greatly reduced, but with large regional variations. The largest reductions in infant mortality were observed in the East (90 deaths per 1,000 live births) and the South (50 deaths per 1,000 live births), while the rate remained virtually unchanged in Douala. However, infant mortality remains extremely high in the poorest regions of the country, such as the North and Far North, where nearly 20% of children do not reach the age of five².

According to a recent study (MINSANTE, 2020) the maternal mortality ratio in Cameroon has deteriorated from 430 deaths per 100,000 live births in 1998 to 669 in 2004 and 782 in 2011 (DHS-MICS 2011). In other words, maternal mortality almost doubled between 1998 and 2011, whereas the target set for 2015³ was

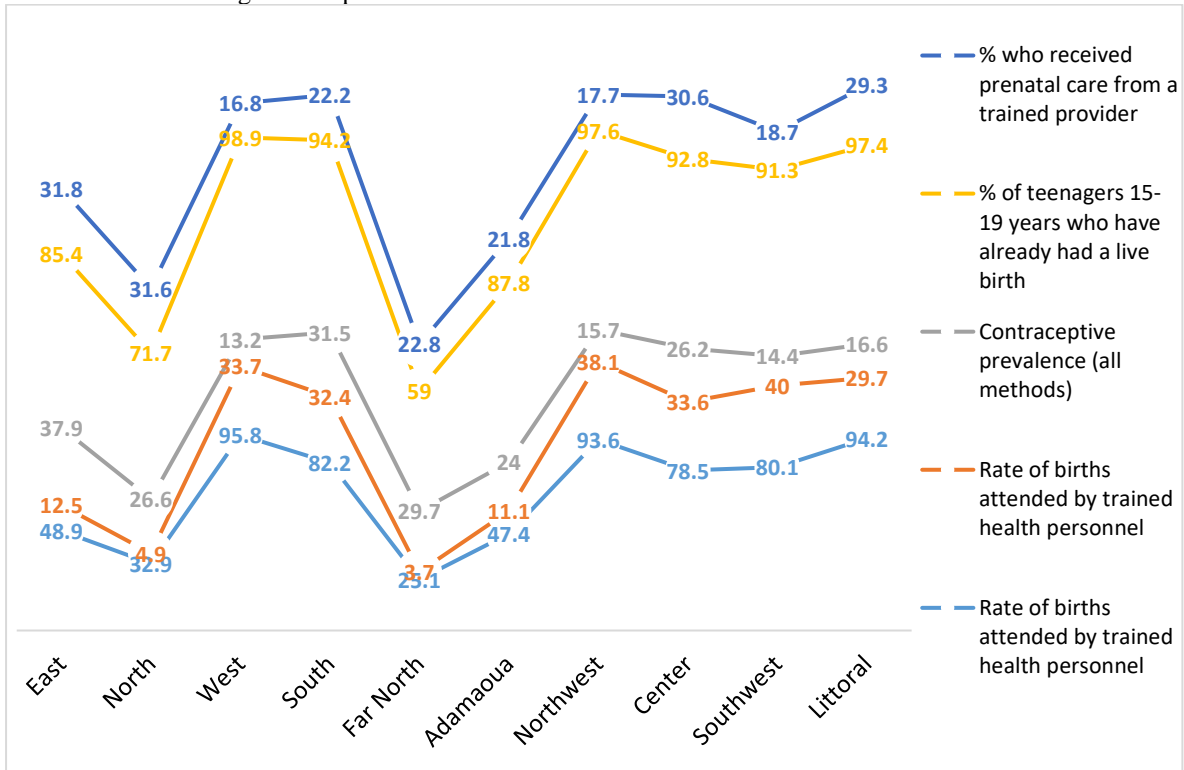
¹ In contrast, in urban areas, the poverty phenomenon seems to be decreasing, going from 12.2% in 2007 to 8.9% in 2014, which makes the disparities observed dependent on differences in access to income depending on the area in which the household lives.

² There were 191 and 168 deaths per 1,000 live births in the North and Far North, respectively.

³ Date set for the achievement of the Millennium Development Goals (MDGs).

350 deaths per 100,000 live births. Although the figures on maternal mortality ratios are not disaggregated by region, the proxy indicators (assisted delivery, cesarean section rates, etc.) show that the situation is particularly worrying in the northern regions as shown in Chart 2 below. Concerning to neonatal mortality, it has increased globally from 29 in 2004 to 31 deaths per 1000 live births in 2011. Currently, it represents 50% of infant mortality.

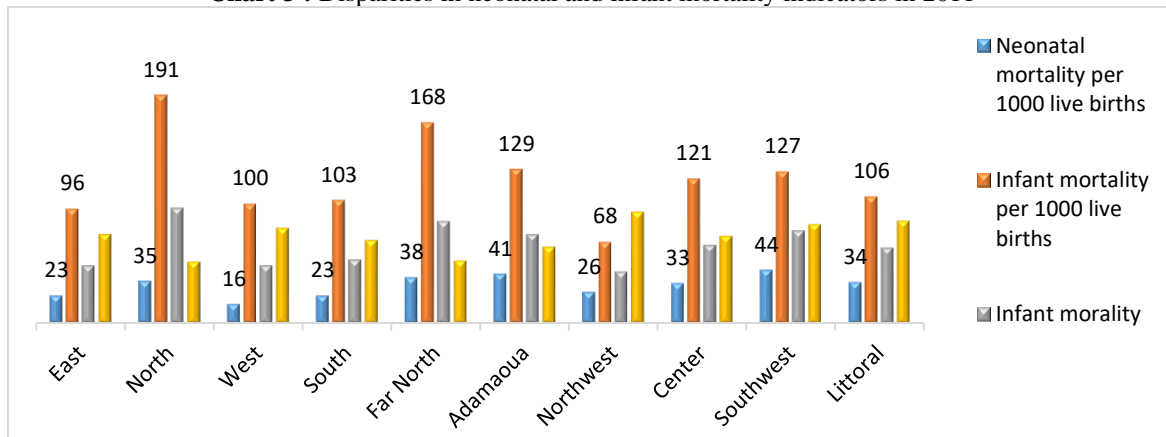
Chart 2: Regional disparities in maternal health indicators from 2014 to 2020 in Cameroon



Source: Authors' calculations with MINSANTE data (2020)

In 2013, the Ministry of Public Health conducted an analysis that ranked Cameroon's 10 regions according to their performance (MINSANTE, 2020). This showed that the need for maternal, neonatal and infant and child health interventions is much greater in five regions of Cameroon (Far North, Adamaoua, North, Centre and East) and the cities of Douala and Yaoundé, although this does not rule out the existence of pockets of similar need in some health districts in the other regions.

Chart 3: Disparities in neonatal and infant mortality indicators in 2011



Source: Authors' calculations with MINSANTE data (2020)

According to the MINSANTE study (2020), nearly 80% of maternal deaths are directly attributable to the following causes: haemorrhage, dystocia, postpartum infections, pre-eclampsia/eclampsia, complications of

abortions and ectopic pregnancies (CARMMA⁴ _2011-2013). Indirect causes of maternal deaths are mainly malaria, severe anaemia, HIV/AIDS-related conditions, and cardiopulmonary diseases. The advanced causes of neonatal mortality are complications arising during delivery, those related to prematurity and neonatal infections. Thus, according to the World Bank (2013), one remedy to reduce risk among particularly vulnerable populations would be to expand access to a health insurance policy. However, the data reveal many regional disparities in health coverage in Cameroon. Moreover, progress remains limited, with only one per cent of the population covered by an insurance policy in 2010.

In addition, the World Bank describes shortcomings in the medical follow-up of patients throughout the country due to the very low number of health personnel and doctors in certain regions, particularly in the English-speaking and northern regions. According to her, when public resources are allocated for health needs, they are not deployed where the needs are greatest. This is especially true since the budget allocated to the communes in Cameroon is lower than the financial resources requested by the development programs that should meet the needs of the community (Gérard T. & Patrick D. P., 2020). In the end, the apparent incompatibility between the financial needs of communal development programs and the budget allocations to communes creates disruptions in the effective implementation of the decentralization process, even though it has been completed to date.

III. Review Of Literature

Theoretical framework of the relationship between decentralization and convergence of living standards

The decentralisation movement arrived in developed countries to promote local, integrated and participatory development at all levels of political, economic and social life. However, the results obtained in terms of changes in the living standards of communities are mixed from one country to another or from one region to another. In developing countries, where the decentralisation process has been slow to evolve, the benefits still seem to be few and far between. Thus, the economic analysis of decentralisation and convergence makes it possible to distinguish between those arguments that are favourable and those that are not (Philippe J. P., 2003).

Economic arguments against decentralization

Challenges of macroeconomic stability and issues of regional convergence

According to several authors (Prud'Homme, 1995; Bardhan and Mookherjee, 2005; Adhikari, B., & Dhital, S., 2018), decentralisation can increase regional inequalities. Indeed, limited state capacity in developing countries and low allocations in poorer regions can lead to lower spending on building road and electricity infrastructure, schools and health facilities. In addition, richer regions can provide quality public goods at a lower average tax per resident than poorer regions, making poorer regions less attractive to business and investment. It can also be seen that authorities in poorer regions are more prone to the diversion of resources from the community by elites than authorities in richer regions. In addition, unlike central governments, sub-national governments are less focused on the macro-economic impact of their policies.

When a region initiates macroeconomic stabilisation policies, it is often the other regions that benefit the most, to the detriment of the initiating region. Consequently, it is usually up to central governments to maintain economic stability using an appropriate macroeconomic policy (such as an interregional transfer policy). Indeed, suppose a local authority decides to implement a redistribution policy that is more marked than those of the other regions, without consulting or coordinating with the latter. The possibility for economic agents to move freely between regions may then encourage the better-off among them to leave the local authority so as not to have to bear the burden of this egalitarian policy through additional tax levies.

On the other hand, poorer people from outside the region may be attracted by the redistribution policy and so flock to it. This leads to a vicious circle in which the redistribution budget increases while tax potential decreases. There is then a great risk that the local authority will go bankrupt, thereby cutting off the possibility of regional convergence. This argument argues in favour of greater coordination between the regions or the presence of a central institution capable of providing overall coordination. (Philippe J. P., 2003)

Challenges of resource allocation to economic agents

The neoclassical model of pure and perfect competition suggests that the decentralized equilibrium is optimal provided that the agents are rational and make optimal use of the information available to them. This optimistic vision can be called into question in the case of regional economies where numerous market failures may be present (Philippe J. P., 2003). First, there is the problem of economies of scale. Thus, the technical-economic dimension of the production of a public policy does not necessarily coincide with the political dimension of the (local) community. It would then be necessary to adjust the production area and the decision area. In other words, the effect of increasing returns to scale pushes for centralization, which is not without its problems of subsidization or co-decision of policies.

⁴ Campaign on Accelerated Reduction on Maternal Mortality in Africa (CARMMA)

Second, there are external effects or spillover effects. It is known that the presence of externalities causes the competitive equilibrium to be non-optimal and thus a misallocation of resources. Thus, the level of production of a collective service in a local community will be as soon as the marginal cost of the service becomes equal to its marginal value (utility) (for this community). But, if the benefits (costs) of producing this utility extend beyond the community, there is a misallocation of resources because the deciding community does not take into account the positive (negative) externalities for neighbouring communities. This leads to underproduction (overproduction). The solution is then to produce the collective service in a more centralized way by expanding the circle of decision-makers and payers to the circle of beneficiaries.

In addition, there is evidence of weak administrative or technical capacity at the local level, which can be explained by a lack of resources, as is the case in many poor developing economies. Thus, arguments in favour of centralization postulate that decentralization may lead to a decline in the efficiency and effectiveness of public service delivery (Prud'homme, 1995). An explanation provided by the theory of fiscal federalism justifies this by differences in the preferences and tastes of the populations residing in different regions. However, while decentralization of economic decisions may pose several problems, it may also provide ready-made solutions.

Economic arguments in favour of decentralization and necessary conditionalities for convergence between communities

According to Philippe J. P. (2003), there is no doubt that the local politician or administrator often has a better understanding of the wishes of his or her population, which in theory constitutes his or her electorate. Indeed, the latter have more opportunities to vote to express their preferences and have them dealt with more quickly than by a central administration. In doing so, the politician must specify his or her policy for the region. However, with national elections aimed at, for example, the production of a local public good such as a road, a politician can only say "local preferences should be favoured. Indeed, this is hardly binding on him and he could not say more, even though he knows the real expectations of the voters. In addition to the existing correlation between voter choice and the production of local public goods, decentralization guarantees better democratic control of public administrations (called proximity control).

Moreover, it appears that local public services are often demand-driven and not always supply-driven. The advantage of decentralization is then to be able to distinguish between "democratic control" linked to "the effort to offer a service that matches the demand of the electorate" and "administrative efficiency" linked to the effectiveness of the management of the production function of the local public good (Tiébout, 1956). In this sense, decentralization can allow for better protection of minorities and the different levels of government must cooperate. For example, if the first level is insensitive to consumer demand, consumers can put pressure on the second level, and so on. This is especially true with initiative and referendum systems.

Moreover, information exchange, imitation, experience, and local competition appear in theory to favour local production and generate better static and dynamic efficiency. Thus, if a local authority adopts a method that is more attractive to residents, that is cheaper, others will have to follow because of the pressure of voters who can compare. If the risk is realized, however, the damage is limited to one community. Moreover, when communities face the same problems, then there are as many different experiences. In other words, by exchanging information, by imitation, one can finally select the most efficient solution, which allows the process of convergence between communities (regions and municipalities) to move forward.

Some authors, such as Prud'homme (1995), have noted a close link between decentralization, corruption and the improvement of people's welfare relative to public initiatives by the central government. Indeed, if, as is likely⁵, corruption is more widespread at the local level than at the national level, then decentralization automatically increases the overall level of corruption. However, from a redistributive point of view, the benefits of decentralized corruption are probably better distributed than those of centralized corruption, notwithstanding the costs in terms of allocative efficiency associated with high "bribes".

In the end, the analysis of decentralization reveals elements that contribute to making it favourable or unfavourable for the convergence of subnational living standards. Thus, several empirical evidences exist and provide further information on the link between decentralization and the convergence of living standards of local populations.

Empirical framework of the relationship between decentralization and convergence of living standards

Most of the studies reviewed have gone into more depth in examining the qualitative consequences of decentralization in areas such as education, social welfare services, and its fiscal impact. However, while studies on decentralization and convergence of living standards abound at the supranational level, the subnational literature in Africa is still non-existent to our knowledge.

⁵ According to Prud'homme (1995), local bureaucrats face more pressing demands from local interest groups whose money and votes count in areas such as taxation or licensing.

Jiménez-Rubio, D. (2011) in a study of a set of OECD countries, entitled "The impact of fiscal decentralization on infant mortality rates: Evidence from OECD countries" used an error correction model (ECM) to re-examine an important hypothesis for economic development on a panel of 20 OECD countries ranging from 1970-2001 (thirty years). It examined whether changes toward greater decentralization would be accompanied by improvements in population health. The results of the analysis support economic convergence and show a significant and positive effect of fiscal decentralization on child mortality to the extent that a substantial degree of autonomy in revenue sources is devolved to local governments. The study uses an improved indicator of fiscal decentralization constructed by Stegarescu in 2005 that measures the share of local government taxes in total government. However, it only considers taxes for which local governments control the tax rate, the tax base or both.

Maro (1990) in a study of the 1972 decentralization reform in Tanzania showed the value of transferring to the population at the sub-national level the power to plan and implement projects that would mobilize local resources. These would reduce spatial inequalities, promoting rural development. The results argue that equitable allocations of development inputs and provision of social services to villages through decentralization lead to increased village participation in local agricultural planning and construction of social service facilities. In addition, it also contributes to increased spatial interactions through the hierarchical planning process and significantly increased access to social services. This is the case for health care, drinking water supply and primary education. All of these accelerate the dynamics of spatial convergence of living standards.

In Africa, Laffiteau and Edi (2014) conducted their study on convergence among the countries of the Central African Economic and Monetary Community (CEMAC) concerning the first (nominal) and second (real) rank criteria of the multilateral framework of the Stability and Convergence Pact. The method used is the measurement of sigma-convergence and beta-convergence for the first-tier criteria of the multilateral framework for the period 1990-2012 as well as for living standards. Their results tested the convergence hypothesis based on nominal criteria such as inflation rate, fiscal balance and debt ratio while the divergence trend prevails for real criteria such as gross domestic product per capita (GDPP) and gross national income per capita (GNIC). However, the study does not attribute the observed convergence to any decentralization process maintained by the CEMAC countries.

Sanogo (2019) in his study on the devolution of revenue collection responsibilities to municipalities in Côte d'Ivoire used a fixed-effects clustered approach combined with a two-stage least squares methodology. Standard errors are panel-corrected and clustered by the department to account for both time-varying heterogeneity and endogeneity of local revenues. To capture the effect of the measure on access to public services and the contribution to poverty reduction, he computed a multidimensional poverty index adjusted for access to public services and a per capita poverty index at the local level using the Household Living Standards Survey. The results show that increasing local income has a positive effect on access to public services and reduces poverty, although income decentralization has a more robust effect on access to public services than on poverty. On the other hand, he finds that municipalities are more likely to improve access to public services in less ethnically diverse localities and in urban areas, even though conflicts are not conducive to municipal convergence⁶.

In Cameroon, Gérard and Patrick (2020) focused their research on "Financial decentralization: an effective determinant of local development in Cameroon. The authors use data aggregated from communal development plans and employ the *Data Environment Analysis* (DEA) model and the censored Tobit model. Overall, they show that financial decentralization is an economic indicator that can enhance local growth and development in Cameroon. In particular, a 1% increase in the budget allocated to decentralized local authorities leads to a 13-points increase in the realization of non-revenue-generating projects and an 11-points increase in revenue generating projects at the RLA's level. With a 10-point increase in the budget, there is a 130-point increase in non-revenue-generating projects and a 110-points increase in revenue-generating projects. In addition, the increase in financial resources at the level of the RLAs would create a reasonable increase in investments in socio-community projects and basic infrastructure. This would lead to a drastic decrease in the unemployment rate and the poverty level of the population. All of which would reduce the disparities in living standards within and between regions.

Our work will follow the same perspective as that of Laffiteau and Edi (2014) with an application to the regions of Cameroon. Indeed, the estimation of regional GDPs that has been carried out will allow us, after testing the convergence hypothesis, to analyse the impact of effective decentralization since the 2004 law⁷ in the process of catching up with regional living standards. The study does not use a particular indicator of decentralization,

⁶ According to the author, the conflicts exacerbated existing problems of access to public services, with no statistically significant effect on poverty.

⁷ This law allowed for the transfer of the 63 competencies provided for in the framework of decentralization with the related financial resources to the communes (DSCE, chapter on decentralization and local development p. 91).

but rather bases the analysis on the conclusions relating to the convergence hypothesis, given the effectiveness of the decentralization process since 2004.

IV. Methodological Approach For Estimating Convergence Of Living Standards And Data Used

This section seeks to achieve three major objectives, namely to present the methodology used to estimate regional GDP and convergence of living standards, and the data for the study.

Approach to estimating regional GDP in Cameroon

The study for Ghana carried out by the United Nations Economic Commission for Africa (UNECA, 2021), proposes techniques for estimating gross domestic product (GDP) at sub-national level. Among these, the recent method identified by Chen and Nordhaus (2011) uses luminosity (measurements of night lights visible from space) as a substitute for standard measures of output (gross domestic product).

According to these authors, luminosity has an informative value for countries with low-quality statistical systems, particularly for countries without recent demographic or economic censuses. However, these methods pose problems for estimating GDP at city level (Bhandari and Roychowdhury, 2011). In their view, since different countries have unique relationships with their use of light depending on their culture, using this method will give different results for each country.

Indeed, information derived solely from light sources is more applicable to developed countries where industry and the service sector account for 90% of the economy. In developing countries where agriculture is the predominant occupation, night-time images will record the light-emitting agricultural activities of cities, rather than the agricultural fields that occupy a significant proportion of the land use that often takes place during the day. In addition, the supply of light and energy is disrupted during periods of political unrest and civil disorder, making night-time light visibility a less reliable indicator of economic activity.

Cameroon is a country rich in arable land, on which agricultural activity occupies around 60% of the working population (INS, 2019). The country is facing an armed conflict that has lasted since 2016, maintaining a climate of blatant insecurity in two (02) of its ten (10) regions, namely the North-West and South-West. Given this context and the difficulties associated with the availability of quality data to measure regional GDPs, the method proposed by Chen and Nordhaus (2011) cannot be applied in this study.

The regional GDP calculation approach we use is practically derived from the methodological note used by Florent Baarsch in the report entitled "Climate Change and Disaster Risk Management in Cameroon: Diagnostic Report", by the World Bank (2017). It is an approach to calculating regional value added whose anchoring is close to the procedure for calculating regional GDP proposed by the Conference Board, the institution in charge of estimating the GDP of Canada's metropolitan regions.

We supplemented the procedure with the U.S. Bureau of Economic Analysis (BEA) methodological framework (Brian C. Moyer et al., 2017). The latter proposes to have, in addition to the estimated value added by sector or industry, the level of taxes levied by region before the final determination of GDP by state in real terms. This is the approach that we have used for the ten regions of Cameroon. We used the calculated regional added values and proposed a breakdown of the level of total national taxes net of subsidies by year among the ten regions of the country, since we do not have tax data by region. Finally, in order to recover the national GDP in current value as the sum of its regional disaggregation, we made further adjustments for the different years selected.

The calculation of aggregate gross domestic product (GDP) proposed here is based on the product approach because of the availability and use made of taxes less subsidies on products from the different sectors of activity (agriculture, industry, trade and services). According to this approach, GDP (and therefore GDP per capita) is equal to the sum of the value-added of the different sectors plus taxes minus subsidies on products (net taxes). However, it was necessary to take advantage of the ease of calculation by the income approach used by the reference institutions (the Conference Board in particular). This is why the value-added retained is the sum of income received by the factors of production (wages, mixed-income, Gross Operating Income) under the income approach proposed by the Conference Board.

$$GDP = \sum VA + NetTaxis$$

In the absence of being able to capture the other forms of remuneration, we have first aggregated for a given region the values of the labour productivity of industries in all sectors of activity (agriculture, industry, trade and services). It is assumed that in a region r and a sector s , the labour productivity in a firm is the same for all firms of the same type in the sector. In addition, the procedure takes into account a correction by the dependency ratio to take into account the number of inactive and unoccupied dependents per employed person in the region concerned.

In our procedure for estimating regional GDP per employed person (RGDP), the calculation protocol follows the World Bank (2017) approach for estimating value added per employed person at the regional level

(VABR). Throughout the following, the subscripts s, i, r, t denotes the sector of activity (agricultural, industry, trade, and service), country, region, and time, respectively.

Step 1: Determination of the regional gross value added per employed person

Consider the following definitions:

$Y_{s,i,t}$ - Sectoral value added (Y) at the national level (i) during a period (t)

$P_{s,i,t}$ - The employed population (P) at the sectoral (s) and national (i) level during a period (t)

The value added per employed person (\dot{Y}) in the sector (s) at the national level (i) during a period (t) is measured as follows:

$$\dot{Y}_{s,i,t} = Y_{s,i,t} / P_{s,i,t} \tag{1}$$

$D_{r,t}$ - The dependency ratio (D) at the regional level (r) for (t) - the dependency ratio⁸ being the number of inactive and unemployed persons (total population - employed population) divided by the number of employed persons in the region. The latter reflects the number of dependents per employed person in a given region.

$P_{s,r,t}$ - The employed population in a sector (s) at the regional level (r) for (t).

The regional gross value added per employed person, which represents a first measure of GDP at the regional level, is approximated as follows:

$$\left[\hat{Y}_{r,t} = \sum_{s=1}^3 (\dot{Y}_{s,i,t} * P_{s,r,t}) / (P_{r,t} * (1 + D_{r,t})) \right] \tag{2}$$

Four main parameters allow this approximation: 1- the sectoral labor productivity, 2- the share of the employed population in the different sectors, 3- the population of the region, and 4- the dependency ratio.

Let us first present the treatments and assumptions of interest related to the estimation of regional GDPs (RGDPs) and the observed values of some of the study's additional variables at the benchmarks:

First, the projections of the Central Bureau of Census and Population Studies in Cameroon (BUCREP) provided us with the regional distribution of the national population as of July 1, 2018, as well as the current value added of the National Institute of Statistics at different reference points. Then, the DHS-V 2018 report to provide the regional distribution by sex of the proportions of the unemployed and inactive population on the one hand and the employed labor force on the other. From this report, the unoccupied and inactive population corresponds to people who "are not currently working and have not worked in the 12 months preceding the survey. The employed population refers to those who "are currently working and have worked in the 12 months prior to the survey. By considering these proportions separately for each group (male, female), we judiciously applied the proportions to the populations by region to obtain the regional numbers of the unoccupied and inactive population as well as the employed labour force. In order to obtain the distribution for men and women taken together, we applied an arithmetic average of the calculated numbers of men and women for an activity situation by region⁹ by weighting by the demographic weights of men and women respectively by region.

When it comes to the distribution of wage-earning population by region and sector, the challenge of collecting data directly by sector has led to the following groupings inspired by the EDS-V 2018 report: Farmers and agricultural workers belong to the agriculture sector, skilled and unskilled manual jobs fall under industry, personal service workers for individuals, retailers, and salespersons are in the commerce sector, and executive/managerial and administrative employees belong to the services sector.

Subsequently, as this classification is given by region and by sex, the same principle of male-female aggregation for the proportions of the variables (provided by the DHS-V 2018) and the corresponding calculated numbers was deployed as before. The weighted arithmetic mean that was used for the aggregation is also the one that allows for the grouping (Yaoundé and Centre without Yaoundé in Centre; Douala and Littoral without Douala in Littoral) of observations at all reference points (2001, 2007, 2014 and 2018) with adjustments or calibration. In the following, we complete the implementation of the GDPR calculation procedure.

Step 2: Calculation of the weights useful for calculating regional taxes

After calculating regional gross value added per worker (GVAW), the annual determination (initially for the 2001, 2007, 2014, and 2018 data points) of regional GDP per worker (RGDP) is done by disaggregating the national values of taxes net of annual subsidies on products according to the economic weight of the region. Unlike the study of economic convergence¹⁰ in the CEMAC zone (Laffiteau & Edi, 2014), which proposes country GDPs as weights in the calculation of sigma convergence, we determine these weights for each of the four survey data points considered as the ratio of regional population (active, idle, and occupied) to national

⁸ See <https://www150.statcan.gc.ca/n1/pub/82-229-x/2009001/demo/dep-fra.htm>.

⁹ These are the unoccupied and inactive population on the one hand, and the employed population on the other.

¹⁰ The authors define it as Nguyen (1996) does: economic convergence can be defined as the reduction of gaps between sets of indicators for several countries.

population for the year. This calculation is inspired by economic theory where the population of a region can reflect its level of demand for goods and services; and we know from household surveys in Cameroon that consumer spending accounts for a large share of the national gross domestic product.

Step 3: Calculating net taxes on products and GDP by region

Subsequently, the taxes net of subsidies on products at the regional level are thus obtained by multiplying the regional weight by the national value of taxes net of subsidies¹¹. Note that our four data points that are national surveys are considered as reference values in the estimation process and yet play the same role as censuses in the methodology proposed by the U.S. Bureau of Economic Analysis (Brian C. Moyer et al., 2017). Thus, not all other years are base years for generating the projections. Estimates for a year other than the reference year result from the projection method presented below assumed conserved change in GDP per employed person estimated at each of the linked reference dates. Finally, to obtain regional GDP per employee (expressed in billions of CFA francs), it was sufficient to sum the value added with taxes (expressed in billions of CFA francs) broken down by region and for each of the four years.

Step 4: Closing the estimates

In order to calibrate for each data point used the total regional GDP per worker to the real national total provided in the national accounts of Cameroon at those dates, a simple closure rule (rule of three) was used. In effect, in a given year and for a given region, the GDP per worker corresponding to the national real total is determined by multiplying the former regional value by the latter, and then by the total per worker calculated for the region. Recall that the national real total used here corresponds to GDP per person employed (in constant 2017 dollars - purchasing power parity). In addition, an adjustment of the employed population was made to obtain the breakdown of the regional sectoral workforce¹² of the populations of the reference years (ECAM 3 in particular) taking into account the undeclared workers present in the data. In addition to these treatments, the GDPR projections were adjusted according to the real totals for each year (except for the reference years) provided by the national accounts.

Step 5: Projection of GDPR over all periods between 2001 and 2018, and constitution of annual series

Once the calibration was done on the regional GDP per employed person (GDPR), it was a question of constructing for each region a series of GDPR for the period 2001-2018 with regard to the structures already established from the ECAM survey data (2, 3, 4 and EDS-V 2018). We then consider that GDPR follow a geometric progression according to the following formula:

$$GDPR_t = GDPR_p * (1 + r)^{t-p+1} \tag{3}$$

Where r is the regional average annual growth rate calculated between the consecutive reference data points at dates t and p ($t > p$), $n = t - p + 1$ is the number of years counted between the reference data points. Careful developments of the previous relationship yield the regional average annual growth rate of GDPR, r .

$$\ln(1 + r) = \ln \left(\left(\frac{GDPR_t}{GDPR_p} \right)^{\frac{1}{t-p+1}} \right) \Rightarrow \left[r = \left(\frac{GDPR_t}{GDPR_p} \right)^{\frac{1}{t-p+1}} - 1 \right] \tag{4}$$

Then, this growth rate essentially determined over the pairs of consecutive reference periods (2001-2007, 2007-2014, 2014-2018) is used in the following relationship to project the RGDPs of the years between the reference pairs from 2001 onwards:

$$\boxed{GDPR_t = GDPR_{t-1} * (1 + r)} \tag{5}$$

The choice of the three growth rates used for the projection is motivated by the unavailability of data on growth rates of GDP per worker at the regional level in Cameroon. Appendix 1 provides a summary of regional GDP per employee estimates.

Methodology for estimating convergence of living standards

The literature on economic convergence distinguishes two traditional measures: beta convergence and sigma convergence. We present each of these methods, which are inspired by the pioneering work of Barro and Sala-i-Martin (1992).

The sigma convergence

Sigma convergence is a measure of convergence that makes it possible to measure the degree of convergence, over time, between several individuals (economies), with regard to one or more indicators or

¹¹Obtained from the national accounts produced by the National Institute of Statistics of Cameroon (INS).

¹²Breakdown into primary or agriculture, secondary or industry, trade and services.

criteria. It thus provides information on whether the economies of a zone are converging. In practice, we often observe the evolution of the dispersion of the series under consideration. Note that there is convergence of the whole sample with respect to a chosen indicator if this dispersion decreases; otherwise, there is divergence. The graphical analysis of the sigma convergence is therefore such that the evolution of the variance (standard deviation) will show a convergence process if and only if its trend is downward. Moreover, for a fixed standard, convergence will be effective if, on average, the variable evolves around (towards) the fixed standard (as in the case of the standards on debt and inflation in the CEMAC zone).

As a statistical indicator of dispersion, we usually consider the variance or standard deviation of the indicator(s). In our case, this is the standard deviation of the GDP. The formulas are therefore given as follows:

$\forall X_{it}$ (value of variable X (GDP) for region i at time t, with $i = 1, \dots, 10$ and $t = 1$ (2001), ..., 18 (2018)), the variance of X_{it} , denoted as "*Var(Xit) ou $\delta^2 X_{it}$* ", is written:

$$\text{var}(X_{it}) = \delta_{X_{it}}^2 = \frac{1}{n} \sum_{i=1}^n (X_{it} - u)^2 \tag{6}$$

With $u = \frac{1}{n} \sum_{i=1}^n X_{it}$

And the standard deviation is calculated as follows: $\delta_{X_{it}} = \sqrt{\delta_{X_{it}}^2}$ (7)

We will speak of "*perverse convergence*" as opposed to the term "*good convergence*" to designate the situation where the rich catch up with the poor in terms of living standards, for example (the case of real convergence): we will observe graphically a decrease in the standard deviation due to the drop in GDP per capita from the initially richer regions to the poorer ones. The latter will also occur when, for example, the economies of the richest countries converge towards the poorest. It is therefore prudent to generally couple the measure of sigma convergence with that of beta convergence.

Finally, we analyze the significance of the sigma convergence results using a non-parametric decreasing trend test to see if the variance distribution (standard deviation) has a strictly decreasing trend or not. Thus, if there is the presence of a decreasing trend, then we cannot reject the hypothesis that there is sigma convergence of the Cameroon regions.

The beta convergence

Beta convergence is a process of adjustment, over time, of individuals (countries, regions, etc.) towards the same growth path or the same reference value. It is a question of knowing whether an economy or a region is tending towards a reference value or a stationary state. This approach to testing convergence consisted in adjusting the growth rate of GDP per capita of countries (or regions) to the initial or reference rate (y_{i0}) while controlling for differences in the steady state that constitute the variable " X_{it} ". These differences can be related to the preferences of the populations, the regional distribution of the working population, the production technologies in each region, the population growth rate, etc.

In practice, the economies converge if and only if the expected values of the differences in per capita income of a region in year t to the average value in t of the income of all regions ($y_{it} - \bar{y}_t$) (where \bar{y}_t is the average income) are stationary¹³ for all countries (with μ_1 constant). Thus, the convergence test is conventionally achieved by simply applying ordinary least squares (OLS) on the following relationship on panel data.

$$\frac{\Delta Y_{it}}{Y_{i,t-1}} = \frac{Y_{it} - Y_{i,t-1}}{Y_{i,t-1}} = \alpha + \beta * \log(Y_{i0}) + \gamma X_{it} + \varepsilon_{it} \tag{8}$$

The conclusions of the convergence thus result in the following discussions:

- If $\gamma = 0$ (*statistically insignificant*): we talk about absolute real convergence¹⁴, with $\beta \neq 0$ ($\beta < 0$) et $0 < |\beta| < 1$;
- If $\gamma \neq 0$ (*statistically significant*): we talk about conditional or relative real convergence, with $\beta \neq 0$ ($\beta < 0$) et $0 < |\beta| < 1$.

Subsequently, standard inference techniques were used to test the negativity of the coefficient on the initial level of GDP per capita. However, these analyses were based on the assumption that all economies are similar and that growth dynamics are uniform. A weakness of these techniques is that they focus on explaining

¹³ $(\lim_{p \rightarrow \infty} E_t(y_{it+p} - \bar{y}_{t+p})) = \mu_1$

¹⁴ If $\gamma = 0$, it also means that the variables that make up " X_{it} " are the same for all regions; otherwise ($\gamma \neq 0$), the " X_{it} " differ across regions.

the average growth rate without taking into account the deterioration in the performance of countries (regions) over time.

Later, Evans and Karras (1996) showed that the convergence process takes place when income deviations from the mean level approach a constant related to each country as time tends to infinity¹⁵. These authors thus characterize the process as absolute (if these values are all zero) or conditional (if they are not) based on individual effects. As advantages of such a process, on the one hand, unlike cross-sectional studies, all differences between economies are entirely controlled by individual effects α_i . The¹⁶ approach developed by these authors has the particularity of preserving the general framework for testing the convergence hypothesis in panel data. They will thus apply four steps to the following relationship in order to characterize the convergence process.

$$\Delta(y_{it} - y_t) = \alpha_i + \rho_i(y_{it-1} - y_{t-1}) + \sum_{j=1}^p \gamma_{ij}\Delta(y_{it-j} - y_{t-j}) + \varepsilon_{it} \tag{9}$$

All parameters ρ_i are negative when all N economies converge and zero when they diverge, and the roots of the polynomial $\sum_{j=1}^{p_i} \gamma_{ij}L^j$ are outside the unit circle. We consider the optimal delay $p_i = 2$. The parameters α_i denote individual effects, and the residuals ε_{it} are assumed individually asymptotically uncorrelated¹⁷. The test procedure consists of four steps: the first three test for convergence, while the last one characterizes the convergence process.

Step 1: Estimate the relationship (3.2.4) by OLS and recover the standard error $\hat{\sigma}_i$ for each country. Generate the series $\hat{z}_i = (y_{it} - \bar{y}_t) / \hat{\sigma}_i$ for each country. We thus obtain a normalized model with a panel structure.

Step 2: The normalized model is :

$$\Delta\hat{z}_{it} = \delta_i + \rho\hat{z}_{it-1} + \sum_{j=1}^{p_i} \gamma_{ij}\Delta\hat{z}_{t-j} + \lambda x_{it} + \mu_{it} \tag{10}$$

With $\delta_i = \frac{\alpha_i}{\hat{\sigma}_i}$ and $\mu_{it} = \frac{\varepsilon_{it}}{\hat{\sigma}_i}$

Unlike equation (9), the parameter ρ is common to all countries, while the parameters associated with lagged differences remain country-specific. x_{it} is the vector of control variables (as seen above). Evans and Karras show that the test of $\rho_i = 0$ vs $\rho_i < 0$ in model (9) is equivalent to the test of $\rho < 0$ in model (10) with panel structure. Model (10) is then estimated by the generalized method of moments, GMM (Roodman, D., 2009).

Step 3: Compare the t-statistic $t_{\hat{\rho}}$ associated with $\hat{\rho}$ to the critical values obtained by the student statistic. If $t_{\hat{\rho}}$ is greater than the critical value for a level of significance, then the null hypothesis $\rho = \rho_i = 0$ is rejected in favour of the alternative $\rho_i < 0$ (\forall_i). If H_0 is rejected, we conclude that there is convergence without being able to characterize it as absolute or conditional. However, the rejection of H_0 , with the resulting acceptance of the convergence hypothesis, does not necessarily mean that all economies are convergent¹⁸.

Step 4: We will characterize absolutely or conditionally the convergence of the regions of Cameroon by checking the statistical nullity (or not) of the coefficient associated with the vectors of the control variables.

¹⁵ ($\lambda_i(L)(y_{it} - \bar{y}_t) = \alpha_i + \varepsilon_{it}$)

¹⁶ It is itself based on a modification of the panel data stationarity test of Levin and Lin (1992).

¹⁷Regarding the choice of the order of lags, Perron (1996) (cited in Gaulier et al. 1999 and Nguetse et al. 2013) shows that this significantly affects the power of stationarity tests. In practice, the number of lags does not exceed 2.

¹⁸As Evans and Karras (1996) point out, some economies may converge while others diverge.

Data used to estimate regional GDP

For the estimation of GDPR, the calculation method used is based on the knowledge of sectoral value added (current value - billions of CFAF) and real national GDP for the four reference data points. In addition, the values of GDP per person employed (in constant 2017 dollars - purchasing power parity) and the breakdowns for the selected years of the active population according to activity status were then used. The data sources for sectoral value added and real national GDP for the reference points and projection years are from the national accounts of Cameroon produced by the INS. The values of GDP per person employed (in constant 2017 dollars - purchasing power parity) and labour force breakdowns are from the World Development Indicator (WDI, 2020) and Cameroon Household Surveys (ECAM 2, 3, 4 and the DHS-V 2018), respectively. In particular, the ECAM and the DHS provided information on both the dynamics of the evolution of living conditions in Cameroon and the structure of the Cameroonian population. For the estimation of sigma and beta convergence, the only source of data is the calculated GDPR and the water access variable. Moreover, the GDPR0 variable represents the GDP achieved in 2001 for each region. Indeed, based on the neoclassical model, this variable is supposed to dictate the dynamics of the region's economic activity over time.

Finally, the lack of available data at the regional level leads us to limit our projections to the 2001-2018 interval.

V. Results Of The Estimations And Discussions

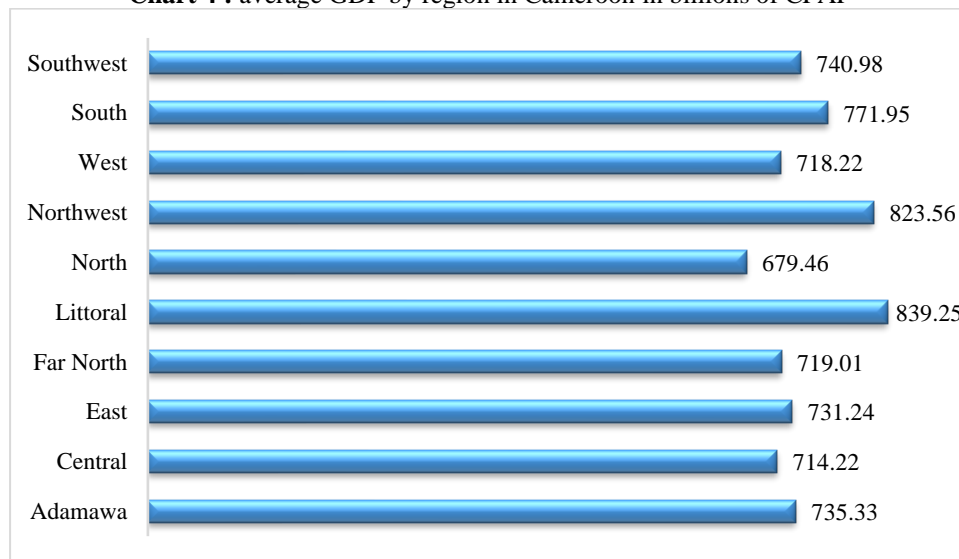
Facts about the evolution of regional GDPs estimated from 2001 to 2018 and the decentralization process underway in Cameroon

The Constitution of January 18, 1996 makes the Central State the guarantor of the inclusive development of the Regional and Local Authorities (RLAs) in Cameroon through the principles of subsidiarity, progressiveness and complementarity. The following facts provide information on the socio-economic situation of the regions and the effectiveness of Cameroon's public policies at the level of the RLAs since 2001.

Overall, over the period 2001 - 2018 (See appendix 2), the economic activity of a given region (measured by regional GDP) averages around CFAF 747.323 billion. On the other hand, the infrastructure endowment (with access to drinking water as a proxy here) is 49.6% for any given region; that is, in a given region, generally speaking, the available infrastructure allows only 49 out of 100 people to have access to drinking water.

On the other hand, a more disaggregated view (see chart 4) shows that economic activity is much more dynamic in the Littoral region, with a GDP of 839.255, well above the regional average mentioned above. Furthermore, the least economically dynamic region is the North region, over the entire study period. Indeed, since 2013-2014¹⁹ the Northern region and the Far North in general have had to deal with attacks by the terrorist sect Boko Haram and internally displaced persons, which have created a climate of insecurity and precariousness of living conditions aggravated by the tragedies of climate change on the production and income of the population. The relative weakness of the impact of the decentralization process on the development of the regions over the period is therefore caused by economic backwardness and socioeconomic vulnerabilities.

Chart 4 : average GDP by region in Cameroon in billions of CFAF



Source: Our calculations based on the data used for the study

¹⁹ <https://www.crisisgroup.org/fr/africa/central-africa/cameroon/cameroon-confronting-boko-haram>

Furthermore, an assessment of the link between the level of economic activity and infrastructure endowment reveals that the more infrastructure a region has, the more dynamic the economic activity in the region (See appendix 3.).

Furthermore, it appears that the infrastructure endowment strengthens the pace of economic activity in all regions except the South and Adamaoua regions. This finding could be explained to a lesser extent by the relatively lower level of infrastructure provisioning compared to the other regions. Indeed, the South and Adamaoua are respectively 7^{ème} and 5^{ème} in the ranking of regions in terms of infrastructure endowment (see Chart in the Annex 4.2), while in terms of GDP, these regions are respectively 3^{ème} and 5^{ème} as shown in Chart 4 above. Thus, infrastructure endowment seems to better justify the inverse relationship between economic activity and infrastructure endowment in these two regions.

The statistics presented above seem to confirm the presence of glaring inequalities, partly the source of the existing gaps between the country's regions. Moreover, it seems to reveal a still pressing need for an effective public policy capable of effectively leading the different regions and the decentralized territorial communities in particular, towards proven economic, demographic and socio-political autonomy.

Validity tests of the sigma and beta convergence of the regions of Cameroon

Two types of tests are implemented to statistically verify the true nature of the observed trend characteristic of sigma convergence. The first is called the sign test which is a non-parametric test that tests whether the distribution of estimated standard deviations of GDP is random (H0) against a monotonically increasing or decreasing trend (H1). This type of test provides statistically, contrary to parametric tests, the sign of the observed trend and the possibility of freeing oneself from the requirement that the parameter or the pivotal function associated with the process generating the data follows an a priori law (centred normal reduced in general). However, this normal distribution is generally only a theoretical but not a practical assumption. In addition, we apply the augmented Dickey Fuller unit root test (parametric test) on the series of estimated GDP standard deviations to support the conclusions of the non-parametric test on the statistical existence of a linear trend in the evolution of standard deviations.

Validity tests of the sigma convergence of the regions of Cameroon: result of the sign test and result of the parametric test (ADF)

To implement the sign test, the null hypothesis is the random distribution against the decreasing trend (alternative hypothesis). We find that the associated p-value is 0.1166, above the 5% significance level. Thus, the null hypothesis that the distribution of the standard deviation of estimated GDP is random cannot be rejected. Thus, the evidence provided by the data does not allow us to conclude that the distribution of the standard deviation of GDPs is decreasing, a result that invalidates any convergence of living standards between the regions of Cameroon in the sense of estimated regional GDP.

For the implementation of the Dickey Fuller Augment test (ADF, table in Appendix 5), the number of lags that whitens the residuals is 0, which corresponds to the simple DF test. The results of the estimation of model 1 (without constant or linear trend) show that $\tau_{1obs} = -2.2042 < -1.95$ (simulated critical point of the Fisher statistic at the 5% threshold), indicating that the series of standard deviations of the GDP is not stationary in level and has a non-linear trend. This result allows us to conclude with the sign test that there is a random trend in the series of standard deviations, which invalidates the hypothesis of convergence of living standards between the regions of Cameroon.

Tests of the validity of the convergence beta of the regions of Cameroon: test of stationarity of RGDP and of the difference between RGDP and average GDP in each year

The procedure prescribed in 3.2), suggests checking the stationarity of the difference of RGDP to average GDP in each year before using it to estimate the convergence beta.

The conclusion of the unit root tests on panel data according to Pedroni can be obtained directly through the conclusion of the test of Im, Pesaran and Shin (2003) which has an advantage to heterogeneity. Also, via the combination of different test methods (e.g. Levin, Lin and Chu (2002) and Breitung t-stat) which offers a majority conclusion. For each method, the null hypothesis of unit root (H0) is tested against the alternative of no unit root or stationarity (H1). It is found that the series of GDP and the series of differences in GDP from the regional average in each year are not stationary. However, by differentiating them at order 1, and by eliminating the trend and the constant, we arrive at stationary series. It therefore becomes possible to use them in the estimation of the models formulated in 3.2) to extract a regional series of estimated standard deviations. the tests are summarized in table 1 below and detailed in appendix 6.

Table 1: unit root test on differences in annual average GDPR (on panel)

Variables (levels and differentiated)	Im, Pesaran and Shin (2003)	Levin, Lin and Chu (2002)	Breitung t-stat	PP - Fisher Chi-square	ADF - Fisher Chi-square	CONCLUSION
y_{it}	Non-stationary	Non-stationary	Non-stationary	Non-stationary	Non-stationary	Non-stationary
Δy_{it}	//	Stationary	//	Stationary	Non-stationary	Stationary
$y_{it} - \bar{y}_t$	Non-stationary	Non-stationary	Non-stationary	Non-stationary	Non-stationary	Non-stationary
$\Delta(y_{it} - \bar{y}_t)$	//	Stationary	//	Stationary	Non-stationary	Stationary

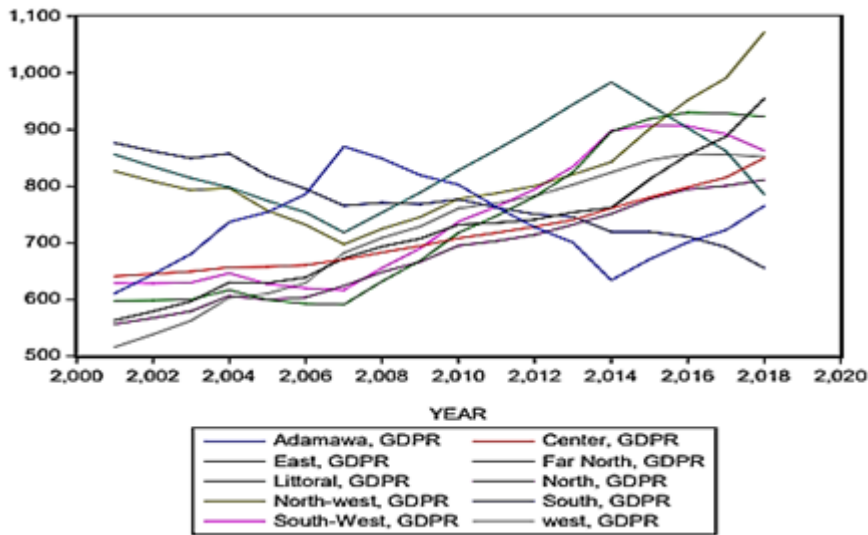
Source Our calculations based on the data used for the study

Results of sigma and beta convergence estimates for Cameroon regions

Results of sigma convergence estimates for the regions of Cameroon

As shown in Chart 5 below, and in accordance with the tests conducted previously, there is a difference in the evolution of income levels between the regions of Cameroon, which makes the hypothesis of non-convergence of living standards between the regions of Cameroon more plausible.

Chart 5 : income trends by region in Cameroon

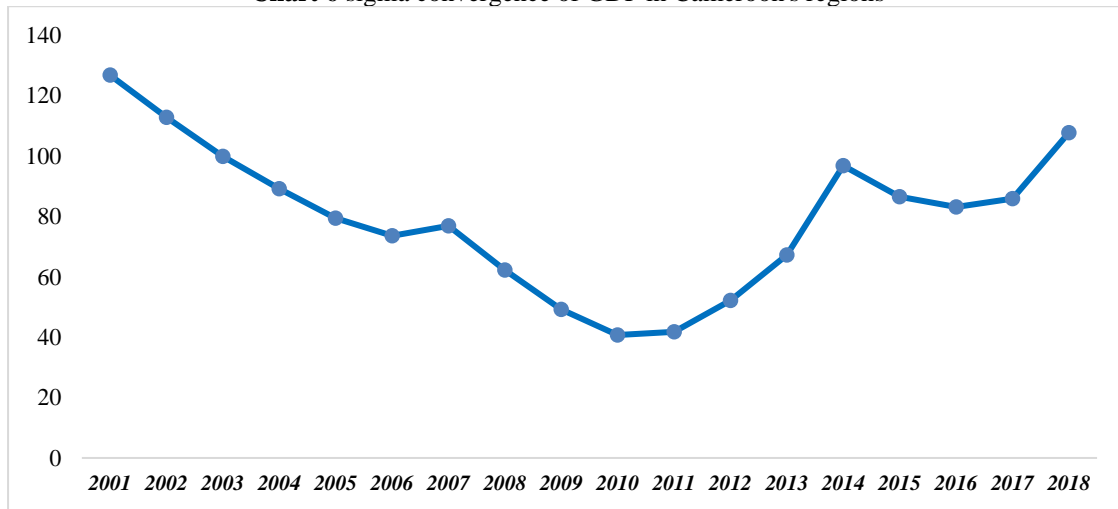


Source: Our estimates based on the data used for the study

Moreover, Chart 5 below provides more evidence to support the fact of non-convergence of living standards between regions; indeed, this series of regional GDP gaps is not strictly decreasing as the sign test revealed.

However, Chart 6 shows that up until 2010, decentralization efforts in Cameroon, including the first transfers to the RLAs in 2004, were already bearing fruit. What happened after 2010? The answer seems to lie in the implementation of the policy of "Major Achievements" through structuring projects, which began in 2010 as part of the Growth and Employment Strategy Paper (GESP). Indeed, it is possible that the implementation of structuring projects in certain regions has helped to reduce the gap between the country's regions. In addition, the hope that seemed to be on the horizon from 2014 onwards immediately disappeared. Indeed, from 2016 onwards, the disparity between the regions has increased, probably due to the so-called "anglophone" crisis, which has hampered the development of the northwest and southwest regions and caused numerous internal displacements, which have also affected living standards in the other regions of the country. Indeed, the many displaced persons from these two regions generally become homeless in the destination regions and generally work in the informal sector.

Chart 6 sigma convergence of GDP in Cameroon's regions



Source: Our estimates based on the data used for the study

Results of the estimation of the convergence beta of the regions of Cameroon: estimation by the generalized method of moments (GMM)

First, we apply ordinary least squares (naive OLS) on the relationship of model 9. Then, once the series of standard deviations estimated by region has been calculated, we will use it to construct the relationship of model 10 on which the generalized method of moments will be applied, taking into account the country fixed effects. It should also be noted that a diagnosis carried out on the variables by the "Nakamura Nakamura" algorithm has statistically confirmed the endogeneity of the regressor sum per country of the differences in lagged deviations from the mean ($\sum_{j=1}^{p_i} \gamma_{ij} \Delta \hat{z}_{t-j}$) in model 10. Indeed, the procedure consisted in testing one variable at a time. To do this, three steps were followed: (i) The variable to be tested is regressed on the other explanatory variables of the study; (ii) The residuals from the previous regression are extracted and put into a variable; (iii) The residuals variable extracted previously is introduced into the initial model in place of the explanatory variable being tested and the regression is carried out. If the residuals variable is significant²⁰, then the tested variable is endogenous; otherwise, the variable is exogenous.

We then estimated model 10 by the generalized method of moments, taking into account the country fixed effects following the application of OLS to model 9. The estimation of relation 10 allows, according to Evans and Karras (1996) to verify the convergence hypothesis, and consequently its absolute or conditional character. Thus, the results obtained by the GMM with and without a vector of control variables are presented.

Table 2 : absolute convergence result: GMM in system

DZi	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Lzi	-.021	.039	-0.55	.598	-.11	.067	
SDLZi	.054	.018	3.04	.014	.014	.095	**
Constant	-.063	.112	-0.56	.591	-.316	.191	
F test (p-value)	105,2 (0,000)		AR(1) (p-value)		-2,57(0,01)		
Number of instruments	17		AR(2) (p-value)		0,09(0,927)		
Hansen (p-value)	7,17(0,928)						
*** $p < .01$, ** $p < .05$, * $p < .1$							

Source: Our estimates based on the data used for the study

In accordance with the decision criteria seen in 4.2, the table above allows us to conclude that there is no absolute convergence of living standards between regions in Cameroon. However, most of the studies conducted, such as those by Gérard and Patrick (2020) for Cameroon, are unanimous on the impact of the decentralization process in reducing regional differences in living standards.

With the initial levels of regional GDP and infrastructure endowment taken into account as a vector of control variables, it appears that there is a process of conditional convergence (value of Lzi < 0), but it remains

²⁰ A variable is said to be significant when the null hypothesis is rejected for a fixed significance level.

insignificant (p-value $Lzi=0.945>5\%$). Thus, the hypothesis of convergence (conditional this time) of living standards between the regions of Cameroon remains invalid.

Table 3 : results obtained by the generalized method of moments (GMM) with the control variable and robustness

Variables	GMM in system			DMC			Sig
	Coef	St.Err.	p-value	Coef	St.Err.	p-value	
Lzi	-.028	.399	.945	-.009	.023	.691	
SDLZi	-.191	.457	.686	.05	.026	.056	**
GDPR0	-.054	.051	.314	-.001	.002	.725	
Acceaup	.157	.136	.278	.00015	.011	.989	
Constant	28.478	27.334	.325	.432	.871	.62	
p-value of the F-test		0.043		p-value of the Chi2 test		0.000	
AR(1)	0.963			R square			42,26%
AR(2)	0.363						
Hansen	0.598						
Number of instruments	11						

*** $p<0,01$; ** $p<0,05$; * $p<0,1$

Source: Our estimates based on the data used for the study.

Furthermore, the estimates of the GMM in the system are tested using the Double Least Squares (DLS) method, which is a competing method (from the family of instrumental variable methods). In view of the signs and significance of the various coefficients by this method, it appears that the previous estimates are robust; we can conclude that there is no convergence of living standards between the regions of Cameroon. In other words, the historical process of decentralization that began in 2004 (and in the texts since 1996) does not yet seem to have borne the expected fruit over the period. However, it appears that the dynamics of economic activity in each region are likely to contribute to the harmonization of living standards between regions. Thus, a balanced development of the different regions should be promoted.

In the end, if in the descriptive facts illustrated above, there seems to be a phenomenon of convergence at certain specific dates linked to the decentralization process that has effectively begun in Cameroon, convergence between the regions would have followed little or no real progress. As it stands, despite the many results of decentralization praised in the literature, in Cameroon and elsewhere, the apparent changes observed are much more related to the institutional aspect than to an effective and perceptible reality in the form of significant changes in the living conditions of the populations within the regions. Moreover, the youthfulness of the outcome of this process is of interest, given the recent completion of its implementation by Law No. 2019/024 of December 24, 2019 voted and adopted unanimously by the National Assembly and the Senate. Moreover, although the institutional advances coincided with the progress of decentralization (laws of July 22, 2004), the DSCE recalled the slowness of its effective implementation, thereby reinforcing the disparities maintained (UNDP, 2019; INS 2001, 2007, 2014).

Another example is the intensification of attacks by the Islamic sect Boko Haram in the Far North and surrounding areas in May 2014, which led to the collapse of activities in some major regional production centres that were plagued by insecurity. The second tensions are related to the crises that started in 2016 in the English-speaking regions (North-West and South-West) and continue to this day, having paralyzed socio-economic development in these regions in particular. In addition to these last crises, there is the Covid crisis in 2019, which adds to the bottlenecks in the dynamics of the transfer of resources, techniques and skills expected with the completion of the decentralization process in 2019.

VI. Conclusion And Recommendations

In summary, this study aimed to examine the role of decentralization in the evolution of regional disparities in Cameroon within a logic of convergence of living standards. To this end, we first drew on the contributions of economic theory, particularly public and institutional economics, to the phenomenon of decentralization and its possible contributions to the process of convergence of the regions of Cameroon. Then, we undertook a reflection inspired by empirical work to propose a methodology for estimating regional GDP that has already been carried out in countries (Europe, Canada and the United States) that have experimented with the implementation of the decentralization process with relative success. It has been noted that these countries have managed to promote the development (particularly economic) of their regions through adequate transfers to decentralized local authorities.

The findings of our empirical work do not support the positive impact of the historical process of decentralization and its effective implementation to date on the convergence of living standards among the regions of Cameroon. These findings invalidate the study's hypotheses about the convergence facilitated by the decentralization process. Indeed, the results obtained are unanimous in invalidating the convergence hypothesis. With the sigma convergence, the descriptive evaluation supported by the tests performed (sign and ADF) validates the presence of regional differences in living standards in Cameroon. On the other hand, the conclusions about real convergence are absolutely invalidated by the beta convergence estimate. The latter estimate offers the possibility of an apparent process of regional convergence but is not statistically proven (even conditionally) when taking into account regional levels of GDP per employed person and access to water by the population. Given these results, it seems plausible to assert that there is no real process of convergence of living standards in Cameroon.

Thus, as already noted by the National Human Development Report (UNDP, 2019), supporting and capitalizing on effective and efficient sharing of growth gains would benefit all regions of Cameroon. We know that three organs of the state have constitutional competencies in the area of decentralization (Guimdo D., B.-R., 1998). Roughly speaking, we can distinguish two central organs, namely the Parliament and the President of the Republic, and one decentralized organ, namely the Delegate, who is the representative of the State in the Region. The State could therefore increase the availability of resources (human, material and financial) to the regions by more than 15% of public revenue as provided for in the texts on decentralization in Cameroon. Subsequently, while putting in place measures to increase the efficiency of resources transferred to regional and local authorities, the Central State must put in place a mechanism to better target the most disadvantaged localities.

However, there is no doubt that decentralization, through the changes it implies (positive or negative), modifies the functioning of the economy and the behaviour of agents. We can then expect that these changes, if the positive constraints are maximized in favour of the regions, may reverse the trends toward real regional convergence in the long run. Moreover, the theoretical review we have gone through has shown that, in addition to the problem of transfers through decentralization, the problem of land use planning is a serious one in many regional localities. However, the advances made by geographic economics show that the location of activities in space is also likely to influence the dynamics of economies (Philippe J. P., 2003). From this point of view, the role of communities in land use planning should not be neglected, especially in the most disadvantaged and landlocked regions, such as the north and the English-speaking regions, which is plagued by armed and political conflicts.

Finally, the study could have provided more refined results, except that it came up against real shortcomings in terms of regional data that are real constraints for our environment. This seems more so given that the completion of the decentralization process has only recently taken place. However, the study would be among the first of its kind conducted in Africa, particularly regarding the estimation of regional gross domestic product (GDP) data. In doing so, as noted, the availability of data on macroeconomic aggregates (final consumption expenditure, investment, etc.) at the regional level could have improved the disaggregation of national annual net taxes and the overall results obtained.

Finally, we recommend:

- (i) drawing up a national decentralisation strategy highlighting regional disparities and the mechanisms needed to correct these spatial disparities in order to promote a more inclusive growth;
- (ii) boosting the collection of the socio-economic data needed to assess changes in regional and local disparities. To this end, it will be important to strengthen statistical systems in decentralised local authorities;
- (iii) developing a mechanism for transferring resources to the RLA's based on their level of development and factor endowments;
- (iv) Encouraging local authorities to settle innovative mechanisms such as crowdfunding and local taxation for mobilising resources to finance community projects and local infrastructures.