

REDUCING REAL HETEROGENEITIES IN THE ECONOMIC AND MONETARY COMMUNITY OF CENTRAL AFRICA (EMCCA): DOES POLICY-MIX MATTER?

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ABSTRACT

The aim is to analyse the effect of the policy mix on real heterogeneities in the EMCCA zone. Using a spatial model inspired by the work of Anselin (2002) and Combey (2014), we mobilise recent methodological developments, notably the estimation techniques of spatial-dynamic panel models. The results show that the expansive Policy-mix reduces the output gap, the unemployment rate, and increases manufacturing value added. This paper argues for an optimal coordination of the two cyclical policies, the development of infrastructure while improving monetary and financial conditions, and an increase in the productivity of all sectors of activity in order to improve the effective output among the EMCCA countries.

Keywords: Policy-mix, real heterogeneities, linear spatial model, GS2SLSAR, EMCCA

JEL Code : E61, E63, C21

1. Introduction

Since the devaluation of the Franc zone in 1994, the need to deepen the regional integration process resulted in the treaty's signing adopting the Economic and Monetary Community of Central Africa (EMCCA) on 16 March 1994 in Ndjamena, Chad. This additional cooperation effort aims to improve the performance of the EMCCA economies while correcting disparities between countries based on the convergence criteria (Kuikeu, 2017). The multilateral surveillance criteria aim to establish an environment conducive to the coordination of the

common monetary policy with the fiscal policies of the member countries of the Central African Monetary Union (CAMU).

One question that remains in this regard is whether policy coordination in EMCCA encourages real convergence of member countries economies and the safeguarding of macroeconomic stability. Indeed, implementing ambitious fiscal policies aimed at influencing growth exposes the countries of a monetary union to risks of fiscal slippage reflected in spillover effects and negative externalities in terms of swelling debts, public deficits constraining the implementation of the common monetary policy (Avom et al., 2015). In the long-run, economic conditions can be influenced by these two policies, which in turn can have positive effects on economic growth at two levels. On the one hand, by directly stimulating capital formation, innovation and employment, and on the other hand by acting on the decisions of economic agents.

Two main conditions must be met in order for these positive effects to be satisfied. First, from the perspective of liberal economists, fiscal policy cannot stimulate economic growth beyond the level determined by factors of production and technological progress in a long-run perspective, by providing a stable and predictable environment for the optimal functioning of the various markets on the one hand, and by maintaining a more production-friendly level of public expenditure on the other. Second, another condition based on the time inconsistency of economic policies established by Kydland and Prescott (1977), stipulates that, like monetary policy, fiscal policy is under the influence of time inconsistency and is subject to an inflationary bias.

This aspect can be linked to Hugon's (2003) problems of common goods in the context of regional integration. On the other hand, in the short term, the active use of fiscal policy in order to play its role of cyclical regulation can lead to important dysfunctions in terms of output volatility (Fatás and Mihov, 2003) and inflation (Rother, 2004). According to these authors, implementing discretionary fiscal policy has depressive effects on growth, while the welfare gains from limiting the power of public authorities could be significant (Barlevy, 2004). A necessary solution to the budgetary policy constraints linked to the problems of short-term macroeconomic stabilisation and long-term growth stimulation is to subject fiscal policy to rules, in order to provide private actors with good information and visibility on future policy changes and to provide an anchor for their expectations. In the context of a balanced Policy-mix in a monetary union, these rules make it possible to coordinate the common monetary policy and national budgetary policies.

The aim of this article is to analyse the effect of the Policy-mix on real heterogeneities in the EMCCA zone. Different models that capture the effects of the Policy-mix on real heterogeneities

are highlighted. The approach of Barro and Sala-i-Martin (1992) is the one that revives the debate on the convergence theory (Solow, 1956) and the basic hypothesis according to which the long-term growth rate is based on factors considered endogenous such as demographic growth, technological innovation and the effect of economic policies, under a regime of constant returns to scale. Thus, in an open economy and adding the hypothesis of free movement of capital and labour, this approach foresees a process of convergence of income levels and/or GDP per capita between the different regional entities. In the policy's implementation of catching up from the weakest to the strongest, many factors of real heterogeneity are considered, notably the output gap, manufacturing value added and the unemployment rate, which is a first to our knowledge.

The empirical results of this approach show that the expansive Policy-mix reduces the output gap and the unemployment rate. The result is the opposite for the manufacturing value added, where an expansive Policy-mix has a positive effect. This result resists well to the change of estimator. The importance of these results comes from the fact that they extend those obtained by Combey (2014) by showing mainly the appropriateness of the Policy-mix for the member countries of the Central African Monetary Union (CAMU).

The rest of the paper is structured as follows: a literature review on the effect of the Policy-mix on macroeconomic variables is presented in section 2; section 3 focuses on a fact-study analysis and section 4 is devoted to the development of the methodological strategy; section 5 presents and discusses the estimation results; the paper ends in section 6 with a conclusion.

2. Literature review

This section presents the theoretical understanding and empirical evidence of the link between the Policy-mix and real heterogeneities in EMCCA.

2.1 Theoretical issues

In order to highlight the theoretical underpinnings of the relationship between the Policy-mix and real heterogeneities, two approaches are considered, namely traditional and modern approach.

2.1.1 Traditional approach

In the traditional approach, the Policy-mix issue arises as a constraint related to the management of aggregate demand through stabilisation policies (Mundell, 1962). Thus, the aim is to identify the optimal mix of monetary and fiscal policies needed to stimulate not only economic activity but also to control inflation. The Keynesian model postulates that, since both macroeconomic

policy instruments flow through the same channel (aggregate demand), no optimal allocation of instruments to objectives can be isolated. It would therefore be indifferent to allocate monetary or fiscal policy to prices or activity. This is what the literature refers to as the Keynesian funnel or Tobin's "common funnel principle".

Since the seminal works of Tinbergen (1952) and Mundell (1962), the economic literature has emphasised the crucial role of the coordination of monetary and fiscal policies, known as the "Policy-mix". Indeed, for Mundell (1963), the question of the Policy-mix is from the outset a problem of demand management in the sense of the optimal mix of monetary and fiscal policies from the point of view of activity or inflation objectives. For Tinbergen (1959), economic policy must have at least as many instruments as independent objectives to limit the contradiction. It is in this perspective that macroeconomic instability is a major problem for economic policy coordination. To overcome this difficulty, Mundell (1969) suggests that each instrument should be assigned to the aim that it influences most relatively. In the same vein, it should be pointed out that theoretical approaches are currently converging towards a broad consensus according to which monetary policy has more capacity to influence the general price level than all other economic policy instruments. The aim of monetary policy in the short, medium and long term is to maintain macroeconomic stability (low inflation and a zero-output gap).

Such a rule generates four types of imbalances of which only the situations of excess domestic demand and external surplus, then of excess domestic supply and external deficit, require the use of the accommodating Policy-mix. The latter is indifferent in the case of excess domestic demand and external deficit, then excess domestic supply and external surplus. However, in the presence of a liquidity trap, Keynes (1936) subordinated monetary policy to fiscal policy. Thus, such an accompanying policy avoids the crowding-out effect of the interest rate while maintaining the stimulating effect on activity. Although it is the reference for the Policy-mix doctrine, the Mundell-Fleming model no longer seems to be in line with several characteristics of contemporary economies in view of its sometimes circumscribed hypotheses. Indeed, in the face of the stagflation of the 1970s, the Keynesian Policy-mix was questioned not only by monetarists, but also by the New Classical Economy (Neoclassical). However, the essence of their recommendations was weakened by empirical evidence (Blinder, 1982); giving more resonance to the adoption of the Policy-mix as the authorities had doubts about the economy's ability to stabilise itself, as shown by its critics.

2.1.2 Modern approach

The conclusions drawn by traditional and classical theories do not cover all the contours of the problem of the optimality of a monetary zone. The assessment of the optimality of a monetary union is based on the solidarity of the member countries and that its sustainability depends on the welfare it generates for each country. If solidarity is a necessary and sufficient condition for optimality, the sustainability of a currency area depends on the gains resulting from the union in terms of welfare and its sharing among member countries.

The notion of solidarity refers to common responsibilities and interests and is expressed as the set of feelings that lead two or n countries that decide to form a monetary union and give up the exchange rate to adjust to shocks to assist each other. Thus, "it measures the ability of one country to accept the cost of managing another" (Ossa, 2000). This shows that countries form an optimal currency area if and only if the solidarity within the area they form is stronger than the solidarity that appears towards the outside. Conversely, monetary autonomy remains more advantageous. Therefore, the necessary condition of optimality will be fulfilled when the countries that form the union are in solidarity. From this solidarity (sufficient condition), optimality follows. The underlying idea is that the implementation of a single currency between two countries requires that the surpluses of one country can finance the deficits of the other. Thus, in the face of a positive shock affecting one country to the detriment of the other, solidarity makes up an automatic means of change in capital transfers.

2.2 Empirical assessments

Empirical assessments of the Policy-mix relationship and real heterogeneities factors are divided into positive and negative effects.

2.2.1 Policy-mix and real heterogeneities: positive effects

Poloz (2016) examines the importance of the monetary and fiscal policy mix for financial stability from 1970 to 2015, using counterfactual simulations of three major historical episodes with the Bank's main macroeconomic model, ToTEM (Terms-of-Trade Economic Model). This highlights the need for a coherent framework to assess the financial and macroeconomic consequences of public and private debt accumulation. It leads to the analysis that ex ante coordination of monetary and fiscal policies has potential benefits, and that in Canada's policy framework - in which the monetary and fiscal authorities jointly agree on an inflation target while enshrining the operational independence of the central bank - this represents an elegant coordination arrangement.

Kabamba and Kondolo (2021) focus their analysis on the effect of the policy mix on the stability of the general price level in the Democratic Republic of Congo from 1990 to 2019, starting from the observations that the combination of monetary and fiscal policies had negative effects on price stability during the 1990s, whereas this same combination allowed for the relative stabilisation of the general price level during the 2000s. By using the VAR model to consider the simultaneous effects of fiscal and monetary policy on the general price level, coupled with the simple correlation and statistical approach of the observations in order to identify the existence or not of the Policy-mix in the DRC, to assess the degree (weak or strong) of coordination of the Policy-mix and to see the impact of this Policy-mix on the general price level. These results, which corroborate the monetarist conception and the new classical school, show that a cross Policy-mix in the DRC context would facilitate the implementation of a good economic policy.

2.2.2 Policy-mix and real heterogeneities: negative effects

While most studies focus on the scope of a Policy-mix as a mechanism for stimulating economic activity within a monetary union, they overlook two major aspects of the problem. First, the effect of asymmetric shocks to countries in the definition of the Policy-mix that renders the scope of economic policy in a currency area ineffective (N'Diaye and Ahuja, 2012). In addition, the characterisation of the different Policy-mix regimes and their impact on economic variables is not sufficiently discussed (Houngbedji, 2017).

Nubukpo (2012) in his article on the Policy-mix of the West African Economic and Monetary Union (WAEMU) from 1962 to 2000, assessed the articulation between the common monetary policy, whose implementation is the responsibility of the Central Bank of West African States (CBWAS) in charge of the management of the CFA franc, and national budgetary policies, whose coordination is entrusted to the WAEMU. At the end of its findings, it found that the aim of economic growth had been sacrificed on the altar of the fight against inflation. In this respect, it would be useful to improve the WAEMU Policy-mix, in the sense of a more flexible FCFA/euro exchange rate regime and an economic government based on fiscal federalism to be promoted. It proposes that the WAEMU Policy-mix should be the subject of closer consultation and coordination with institutional aspects (respective roles of specialised institutions) and clear options in policy orientation.

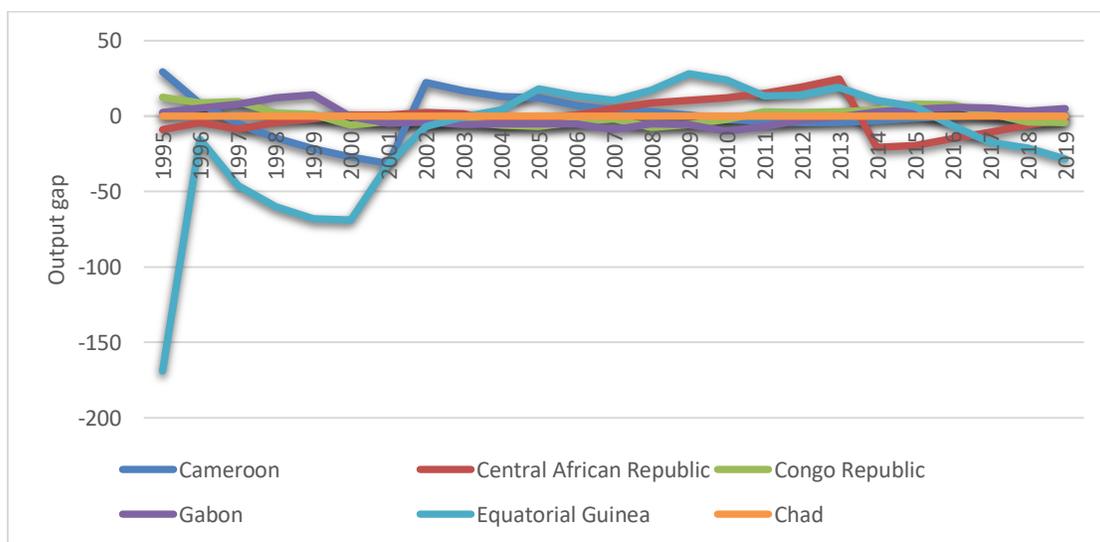
Combey (2014) conducted a study on the effect of the policy mix on domestic stability and economic growth in the WAEMU zone from 1995 to 2010. He constructs a Policy-mix index that aggregates into a single indicator the interactions of the monetary authorities' decisions on monetary, financial, and economic conditions in the zone. It uses spatial-dynamic panel model

estimation techniques that offer opportunities to consider the unobserved neighbourhood and heterogeneity effects of the member countries of the zone to analyse the effects of the Policy-mix on inflation, the output gap, and economic growth. The results provide empirical evidence that the monetary and fiscal policy mix, in its current state, only contributes to price stability without producing domestic stability effects to support long-term economic growth in the area.

3. Some stylised facts

Some elements of real heterogeneity sufficiently justify the existing disparities between the EMCCA countries. Among these elements, we distinguish the output gap, the manufacturing value added, and the unemployment rate.

Figure 1. Evolution of the output gap in the EMCCA (in US dollars)



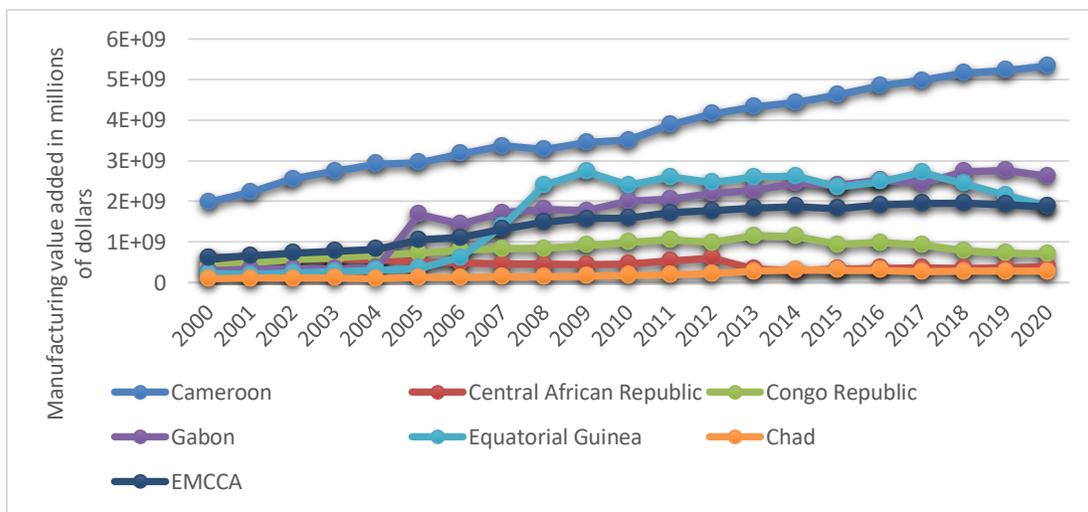
Source: Authors based on data from the World Development Indicators (WDI), 2020.

Figure 1 presents the evolution of the output gap in the EMCCA from 1995 to 2019. From this figure, the key information we can draw is the cyclical nature of *GDP* in the EMCCA. As is recognised in the economic literature, *GDP* is highly dependent on the weather and, of course, on the business cycle. The recent economic crises that have affected and continue to affect the EMCCA countries are clearly visible in the evolution of the Output Gap, which is generally negative and close to zero. The most marked evolution is that of Equatorial Guinea. In other words, the potential *GDP* of the EMCCA countries remains higher than the actual *GDP*. This

observation calls into question the macroeconomic and institutional management of the EMCCA countries.

Furthermore, one form of heterogeneity that results from a country’s economic base is indeed the importance of its manufacturing sector, which manifests the capacity to add value to the extraction and production of raw materials. Figure 2 shows the evolution of manufacturing value added in the EMCCA.

Figure 2. Evolution of manufacturing value added in the EMCCA (in millions of us dollars)



Source: Authors from WDI (2020).

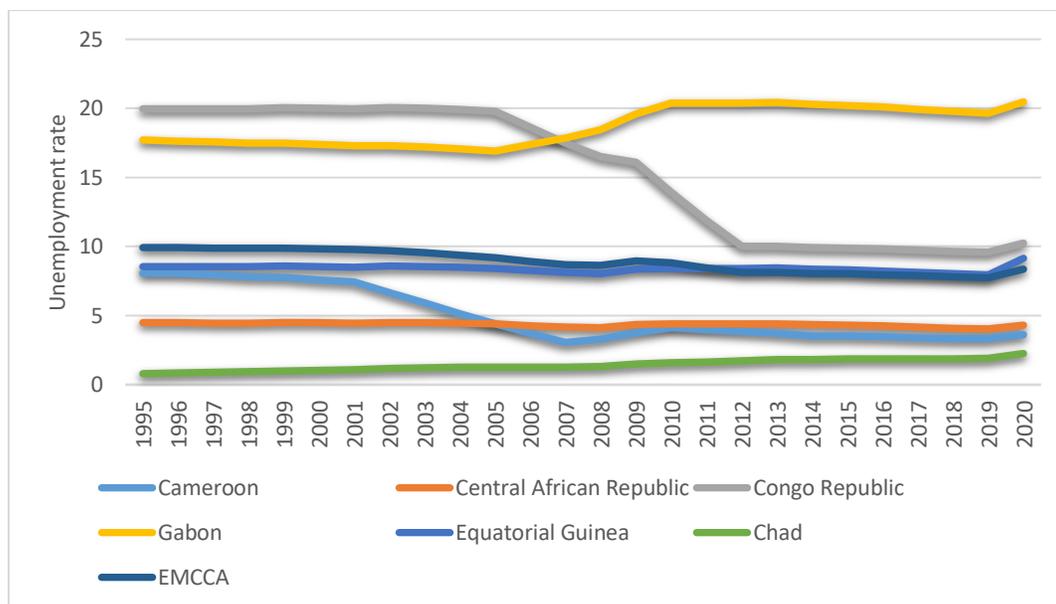
Manufacturing value added captures the production capacity of the manufacturing industry in the case of the six EMCCA countries. It shows that manufacturing value added is very high in Cameroon, Gabon and Equatorial Guinea. It is important to mention that the level of this manufacturing value added is mainly explained by the dynamics of the extractive industries. Countries such as Chad, the Republic of Congo and the Central African Republic remain countries where economic activity in processing is very low. This situation sufficiently justifies the heterogeneity of industrial production activity in the EMCCA.

Finally, the labour market is quite special in that it also allows us to grasp the phenomenon of real heterogeneities. In fact, the employment situation also makes it possible to better capture the macroeconomic functioning and management of the countries in the sub-region. Indeed, the employment situation provides information on the equilibrium situation in the labour market.

Unemployment thus makes it possible to conclude on the existence of an imbalance in the labour market. In periods of growth, the level of unemployment decreases, all other things being equal, and vice versa in periods of recession.

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Figure 3. Evolution of the unemployment rate in the EMCCA



Source: Authors from WDI (2020).

4. Empirical strategy

The empirical development of the relationship between Policy-mix and real heterogeneities in the EMCCA requires a methodological strategy that will lead to relevant results. To this end, we begin this section by setting up an empirical model. Subsequently, we look at the estimation technique in order to highlight the weight of the relationships between the pooled variables.

Finally, we conclude with the presentation of the data and their sources and the preliminary tests on these data.

4.1 Specification and justification of the econometric model

The importance of analyses of the effects of the coordinated use of the two economic policies (Policy-mix) on the factors making up real heterogeneities is of great interest for the analysis of convergence in a monetary union. The equation that allows the Policy-mix to be related to the real heterogeneities of the economies according to a spatial analysis is:

$$Y_{it} = \gamma WY_{it} + \delta IPolicymix_{it} + \varphi X_{it} + \varepsilon_{it} \tag{1}$$

where Y_{it} is the output gap, $IPolicymix_{it}$ is the Policy-mix index. W is an $n \times n$ spatial weight matrix, γ is the autoregressive coefficient. WY is the weighted spatial average of the value of Y in neighbouring locations, or the spatial lag. X_{it} is the vector of control variables composed of the relevant items from the empirical literature. These are the share of total government expenditure in GDP (Depgov); the share of service in value added (Service_VA); international trade instability (Instouv); the level of inflation (Inflation); financial development, measured by the ratio of domestic credit to the economy to GDP (Credit). Furthermore, ε_{it} is an idiosyncratic random deviation assumed to be identically and independently distributed with i the individual component and t the time component. W is a row-normalized spatial weight matrix with a typical element w_{ij} (Appendix 1)

$$W = \begin{pmatrix} 0 & w_{12} & \dots w_{1n} \\ w_{21} & 0 & \dots w_{2n} \\ \vdots & \ddots & \vdots \\ w_{n1} & w_{n2} & \dots 0 \end{pmatrix}$$

We use a log-linear specification. Indeed, it has the advantage of giving a reduced form for the estimation, where the coefficients represent the elasticity. Compared to a linear specification, the log-linear specification is more appropriate for models involving spatial interactions (Huang, 2019).

To estimate the panel generalized spatial autoregressive model, we used a generalized spatial two stage least squares (GS2SLS) method (Shehata, 2012) :

$$\ln Y_{it} = \gamma_i \ln WY_{it} + \delta IPolycymix_{it} + \varphi_i \sum_{k_1=1}^{K_1} \ln(X_{it}) + \varepsilon_{it} \quad (2)$$

The above equation will be subject to econometric estimation in order to assess the relevance of the impact of the explanatory variables on the real heterogeneity factors using appropriate and clearly justified techniques.

4.2 Estimation technique

The research work takes place within the framework of the Economic and Monetary Community of Central Africa, where some member countries share land borders with individual fiscal policies, a common monetary policy, and a single currency. It becomes under equation (2) to capture the spatial interactions that exist in EMCCA to highlight the importance of the coordination phenomenon in achieving common macroeconomic objectives for the entire community. Therefore, to estimate the panel generalized spatial autoregressive model, we used a Generalized Spatial Panel Autoregressive Two Stage Least Squares regression (GS2SLSAR) (Shehata, 2012). This estimation technique has the merit of controlling for some form of unobserved heterogeneity and of capturing spatial dependence effects based on interaction where appropriate. The spatial interaction is thus considered by specifying a spatial autoregressive process in the errors. Some authors use a modelling approach involving a simultaneous spatial autoregressive process of the dependent variable and the error term (SARAR), with separate spatial weights for each process. This method provides results that are more robust to heteroscedasticity (Lee and Yu, 2010; Ertur and Musolesi, 2014). However, a prior test is of paramount importance. Therefore, we test the spatial correlation of the optimal coordination of the two cyclical policies and the Output Gap, using Moran's I value (Moran, 1948).

4.3 Data

Our research focuses on the six EMCCA countries. We base our empirical analyses on the data from the period 1995 - 2018. The choice of the time horizon is justified by two facts. The first fact concerns the economic history of EMCCA where 1995 is the year following the devaluation in 1994 and 2018 marks the period in which governments and the Bank of Central African States (BCAS) are striving to emerge from the crisis (linked to the fall in oil prices and political instability in the Central African Republic) through many reforms. The relationships highlighted

in the empirical model depend on the relevance of the chosen variables. This choice is justified on the basis of well-documented literature. To this end, the variables selected meet a certain number of theoretical and empirical postulates.

Our dependent variable is the Output Gap, which is the difference between actual output and potential output over potential output. As actual output, we use the Gross Domestic Product at constant prices of the year 2010. Since the potential output of an economy is an unobservable variable, it must be estimated from observed data using various methods. These include statistical filtering methods, models with unobservable components, and the production function model. Statistical filtering tools, such as the Hodrick-Prescott filter and the Kalman filter can be used to extract a smoothed trend from an output series. If the trend is close to the path of potential output, then the output gap can be measured as the difference between the trend and the actual level of output. Potential output can also be obtained based on assumptions about the potential level of factors of production such as capital and labour, as well as total factor productivity - the efficiency with which factors of production are used to produce output (Casey, 2018). This study used two approaches, namely the Hodrick-Prescott filtering and the production function approach, to estimate the potential output of the EMCCA countries' economy. In this study, we use statistical filtering tools, in particular the Hodrick-Prescott (1997) filter, since total factor productivity (TFP) and the level of capital cannot be obtained for all six countries in the sub-region. Two other variables are used, namely manufacturing value added as a percentage of *GDP* and the unemployment rate of the active population.

Our variable of interest is an index that captures the policy mix in EMCCA. This index is inspired by the work of L'Angevin and Montagné (2006); Aubert (2003); Combey (2014). This variable incorporates both monetary and fiscal policy impulses in order to better capture their effects on real heterogeneities. However, we change some elements of the formula for the monetary and financial conditions index. The formula used for the policy-mix index as carried out in the work of Combey (2014) and is:

$$IPolicymix = \Delta ICM - \chi \Delta SBB \quad (3)$$

The different interpretations given to this index remain the same, as do the extreme values taken by this variable. *SBB* is the basic budget balance (excluding grants). This variable captures the state of public finances of the States and de facto the type of fiscal policy pursued. The monetary conditions index (ICM) is a very important variable for the conduct of monetary policy in the Economic and Monetary Community of Central Africa (EMCCA) where it provides a sign of the direction of monetary conditions in the zone. The ICM aims to assess the expansionary or

restrictive degree of monetary policy in a country or a monetary zone through a synthetic index. This indicator is also used to measure the contribution of the monetary stance to the dynamics of economic activity and inflation. In EMCCA, this index was started in 2020 and inspired mainly by the work of Cakir and Miranda (2019); Bentouir and Bendob (2020), the construction of the ICM-EMCCA is inevitably hampered by the shallowness of some variables overtime. However, the method has been changed by integrating available variables that better reflect the monetary situation of the states. The new monetary and financial conditions index is presented as follows:

$$ICM = c(1)*TIAO + c(2)*sprcredit + c(3)*TCER + c(4)*EV \quad (4)$$

with $c(j)$, $j = \{1,2,3,4\}$ positive et $c(1)$ négatif, EV The uncertainty of the international environment. The method for calculating the ICM-EMCCA is based on two major steps:

- Construction of a composite index of uncertainty in the main international markets, based on indicators of the main international financial and stock markets.
- Construction of the ICM-EMCCA and country, based on the composite indicator of uncertainty of the international environment (EV), the REER and the credit market interest rate spreads. TIAO is the tender interest rate, sprcredit is the credit market interest rate spread.

The weights and aggregations of the composite indices (regional and country) are determined with Principal Component Analysis (PCA).

First, to capture macroeconomic stability, we use two variables to capture the level of macroeconomic stability. These are inflation (Inflation) and government expenditure (Depgov). Both are important determinants of real heterogeneities, especially since they also condition the economic performance of a country or a community of countries (Woodford, 2011). Second, we use the instability of trade openness, which is captured by the gap between trade openness and its long-run trend. Third, we use as variables the share of service value in value added (Service_VA) and financial development measured by domestic credit to the private sector as a percentage of GDP (Credit). The interest of the first variable reflects the importance of services in the production of wealth, i.e., its capacity to pull the first two sectors of activity (primary and secondary) towards growth. The second captures the importance of the banking system in financing productive activities through credit. Finally, to capture the quality of institutions, we use the political regime score (Polity2). This measure captures the level of democracy. The logic

of this variable is that an improvement in the quality of institutions facilitates the optimal allocation and better use of resources, which tends to increase effective *GDP*.

The importance of reviewing the characteristics of the data as a prelude to econometric analyses is paramount. The evolution and some intrinsic characteristics of the data in our sample are presented in Table 1. It can be seen from this table that the variable *IPolicymix* has a relatively higher standard deviation than the other variables. This suggests that there is relative heterogeneity in the distribution of this variable across the countries of the sub-region. Moreover, the EMCCA countries present the two extreme forms of political regimes, namely the dictatorial regime (-6) and the democratic regime (6).

Table 1. Descriptive statistics

	Observations	Mean	Std-Dev	Min	Max
Output gap	73	1.495	1.181	-3.325	3.336
Vam_Manuf	119	2.142	0.897	-1.458	3.248
Chômage	144	1.882	1.0525	-0.331	3.0325
IPolicymix	62	-1.345	14.204	-68.967	28.112
Depgouv	144	2.301	0.517	1.007	3.232
Service_VA	144	3.479	0.3574	2.71	3.972
Instouv	66	1.676	1.229	-2.789	3.990
Inflation	129	1.106	1.128	-3.305	3.615
Crédit	144	1.955	0.559	0.741	3.089
Polity2	144	5.76	4.43	-6	6

Notes: *IPolicymix* = Policy Mix Index, *Depgouv* = Public expenditure as a percentage of *GDP*

Service_VA = the share of service in value added, *Instouv*= instability of trade openness

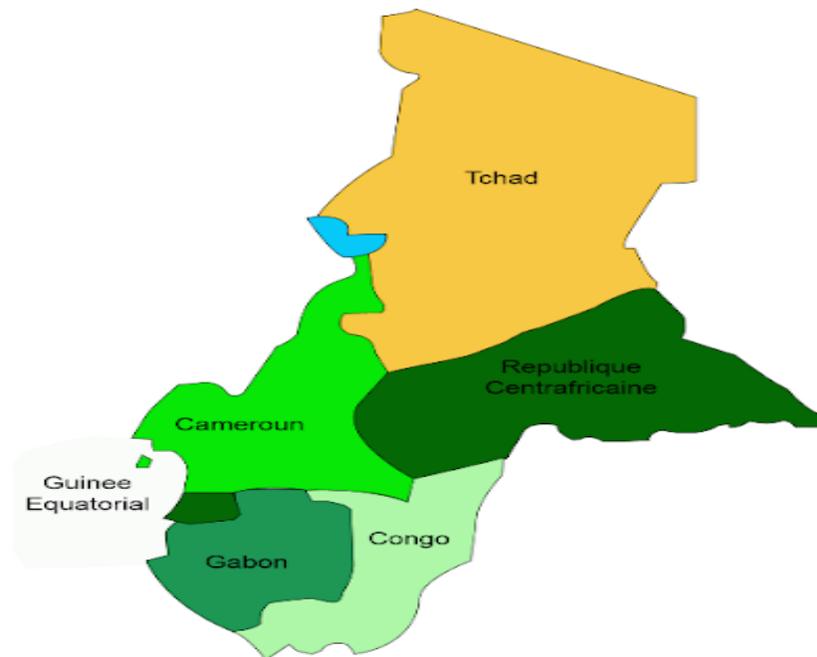
Crédit = domestic credit to the private sector as a percentage of *GDP*.

Source : Authors

The geographical area of this study covers the six EMCCA countries, namely Cameroon, Central African Republic, Republic of Congo, Gabon, Equatorial Guinea, and Chad. Figure 4 shows the geo-referenced map of EMCCA. From this map, we have derived a set of elements that capture the different spatial relationships between countries. Spatial connectivity graphs establish the links between one country and the others based on border sharing (see Appendix 2). Thus, it can be seen that only Cameroon is linked to the other EMCCA countries. Furthermore, the Central African Republic is linked to four other EMCCA countries, while Equatorial Guinea and Chad

are linked to only two countries. This result shows that spatially, the activity of other EMCCA countries could be correlated with that of Cameroon, particularly in terms of foreign trade and development.

Figure 4. Geo-referenced map of EMCCA.



Source: Authors from map data.

5. Findings and Discussion

This section highlights the relationship between the Policy-mix and real heterogeneities measured here by the output gap, manufacturing value added, and the unemployment rate in EMCCA. We use the Generalized Spatial Autoregressive Two Stage Least Square Regression (G2SLSAR) method. For robustness, we use the generalized method of moments in dynamic spatial panel data. Both techniques provide directly interpretable robustness results of the spatial relationship between the policy mix and the real heterogeneities between the EMCCA countries.

5.1 Analysis and discussion of basic results

The statistical and even econometric validation of the results is based on the Moran (1948) spatial autocorrelation test. Table 2 presents the results of the I Moran (1948) tests performed on

all the results of our different specifications. The results show that the statistics of the order of 0.0892, 0.0724, 0.0693, positive and significant at 10%, 5% and 1%. These results suggest the existence of a strong positive spatial autocorrelation between the output gap of a EMCCA member country and that of its neighbour on all dependent variables. In other words, high values of the output gap, manufacturing value added, and the unemployment rate are correlated with high values of the same variables for the other EMCCA member countries and vice versa for the low values.

Table 2. Results of Moran's I test for spatial correlation

	Test I Moran	P-Value
Output-gap	0.0892	0.0423
Va-Manuf	0.0724	0.0317
unemployment rate	0.0693	0.0017

Table 3 presents the results from the estimation of the GS2SLSAR model. Three economic analyses can be made based on these basic results before moving on to the robustness analysis. First, the values of the coefficient of the spatial term for the output gap, manufacturing value added and the unemployment rate in the three specifications are positive and significant, i.e., 0.0151, 0.0634 and 0.066 (10% and 1%). This means that the level of output gap, manufacturing value added, and unemployment rate observed in the neighbouring countries affected the level of these variables for the observed country. These results confirm the importance and necessity of introducing spatial correlation in production models, especially as economic shocks in the neighbouring country imply adjustments in terms of production in the other member countries.

Third, the coefficients associated with the *IPolicymix* variable are positive and significant at the 10 and 5% level. Indeed, an expansive policy mix leads to a reduction in the level of the output gap and the unemployment rate by 0.026 and 0.0302, respectively. Indeed, monetary and financial conditions not only allow fiscal policy to play its role as a stabiliser of the economy in the EMCCA region, but also to support economic activity by boosting supply, demand and employment levels. Monetary policy and fiscal policy in perfect coordination make it possible to fight against the increase in effective *GDP* and the reduction of the output gap. Furthermore, an expansive policy mix increases manufacturing value added by 0.0267. This result shows that monetary and financial conditions aligned with fiscal control favour the development of infrastructure necessary for the increase of inventories, the decrease of production costs and an increase of research and development expenditures by firms. It's therefore clear that, on the one

hand, the policy mix reduces the level of real heterogeneity factors between the various countries; through the concerted efforts necessary for exiting the crisis, particularly in the case of the Coronavirus with the second-generation programmes with the International Monetary Fund (IMF). On the other hand, the problem related to the asymmetry of shocks, which would be caused by the economic disparities between member states will be reduced by the policy mix (Twinoburyo and Odhiambo, 2018).

Regarding the control variables, three important observations stand out. First, government spending significantly reduces the level of the output gap and the unemployment rate in the EMCCA (Holm-Hadulla et al., 2012). Although these coefficients are small, this suggests that the hypothesis of economic recovery through government spending is verified (in the case of government spending on final consumer goods). Second, domestic credit to the private sector as a percentage of *GDP* significantly reduces the level of the output gap and the unemployment rate. However, an expansive Policy-mix increases manufacturing value added. This result supports the importance of credit as a factor in improving monetary and financial conditions in financing the economy by supporting production, innovation, and employment. Third, the share of services in value added is positively and significantly related to manufacturing value added, negatively and positively to the unemployment rate. This result suggests that the development of services such as telecommunications, internet and catering facilitate the optimal use of productive resources, which increases effective production and job creation. The same is true of inflation, which is negatively and significantly related to manufacturing value added and positively and significantly related to the unemployment rate. Thus, the presence of inflation allows for an increase in the value of assets which in effect allows for an increase in the level of profits of entrepreneurs and to a certain extent nominal wages whose aim is the increase in the overall productivity of the economy and the increase in effective *GDP*, de facto a decrease in manufacturing value added and a rationing of the level of employment. Regarding the instability of international trade, there is a positive and significant relationship between the output gap and the unemployment rate, and a negative and significant relationship with manufacturing value added in the EMCCA. Indeed, a change in the structure of international trade through the fall in commodity prices on the international markets, which modifies export revenues downwards, difficulties in renewing stocks and a fall in effective *GDP* and therefore an increase in the output gap.

Table 3. Effect of Policy-Mix on real heterogeneity factors in the EMCCA.

	GS2SLSAR		
	(1)	(2)	(3)
	Output-gap	Va-Manuf	Taux de chômage
Wy	0.0151* (0.0173)	0.0634*** (0.0201)	0.066*** (0.01912)
IPolicymix	-0.026* (0.0163)	0.0267** (0.02958)	-0.0302** (0.01229)
Depgouv	-0,0101** (0.1022)	-0.0104 (0.1454)	-0.02501** (0.0250)
Service-VA	0.087 (0.0445)	0.053** (0.0842)	-0.035* (0.1433)
Instouv	0.015* (0.0310)	-0.046* (0.0279)	0.053** (0.08143)
Inflation	0.0792 (0.0602)	-0,0624** (0.0678)	0.0203* (0.0674)
Credit	-0.0193* (0.125)	0.0419** (0.1851)	-0.0115** (0.1809)
Polity2	-0.591*** (0.0913)	0.579913 (0.08832)	-0.5751*** (0.08713)
Constance	1.798* (0.1928)	0.313 (0.2928)	0.2015 (0.25302)
Nombre d'observations	144	144	144
Global model validity test			
Wald test	136.5651***	779.2586***	825.4373***
Adjusted R ²	0.6831	0.7116	0.6034

Notes: GS2SLSAR = Generalized Spatial Panel Autoregressive Two Stage Least Squares regression, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Fourth, the quality of institutions variable is negatively and significantly related to the output gap and the unemployment rate in EMCCA. Indeed, democracy improves the optimal allocation of productive resources in the economy, improves productivity by making it easier for workers to be fulfilled. The quality of institutions thus creates an emulation that increases productivity, raises effective *GDP*, and reduces the output gap (Grigoli et al., 2015).

5. 2 Robustness check

The robustness analyses carried out in this heuristic work concern the change of estimator. Indeed, the Arellano-Bond (1991) estimator in spatial panel data allows to control the simultaneity and endogeneity bias compared to the Shehata (2012) estimator. The statistical analysis shows well that the coefficient tests associated with the spatial autocorrelation test of the Moran I model are positive and significant. For this purpose, the estimator of Arellano and Bond (1991) is adequate. The results in Table 4 show that the coefficients of the lagged variable in all specifications are positive and significant. This result reflects the persistence of the memory effect in the output gap models. From this perspective, the level of today's output gap determines the level of tomorrow's output gap. In other words, a very large output gap this year influences the level of the output gap, which will be considerable. This also shows the existence of rigidities in output adjustment.

The expansive Policy-mix is negatively and significantly related to the output gap, positively and significantly to manufacturing value added. Thus, an expansive policy mix increases manufacturing value added in the EMCCA. Monetary policy, one of the objectives of which is to improve monetary and financial conditions, should support fiscal policy, i.e., the creation of conditions for the production of infrastructure to increase productivity and the increase in effective output to reduce the output gap. The control variables provide expected information including government expenditure, the share of services in value added, inflation, credit and the quality of institutions reduce the output gap in EMCCA, while international trade instability increases the output gap.

Finally, including dynamics in the unemployment's framework rate comes from the fact that the mobility of workers, which is generally the basis of the theory of Optimal Monetary Zones, also sheds light on one of the real heterogeneities. The results show that the validity tests of the spatial models are significant and positive, thus justifying the relevance of these models. This makes the economic analysis meaningful. The Policy-mix is negatively and significantly related to the unemployment rate (as a percentage of the active population). The coordination of the two conjunctural policies thus makes it possible to reduce unemployment with important spatial effects where any alignment of the conjunctural policies facilitates the fight against unemployment through programmes militating for the improvement of the working conditions, the development of the infrastructures making it possible to increase the productivity and the increase of the effective *GDP* and the reduction of the production gap.

Table 4. Policy-mix effect on real heterogeneity factors in the EMCCA according to the spatial linear dynamic estimator of Arellano and Bond (1991).

	Arellano-Bond Linear spatial Dynamic Panel Data		
	(4)	(5)	(6)
	Output-gap	Va-Manuf	Taux de chômage
Y _{t-1}	0.764** (0.0547)	0.542* (0.0732)	0.632*** (0.0322)
Wy	0.066*** (0.01912)	0.064712** (0.0615)	0.01075* (0.0215)
IPolicymix	-0.0302** (0.0123)	0.02958** (0.04173)	-0.01418** (0.2108)
Depgouv	-0.02501** (0.0250)	-0,1548* (0.1988)	-0.0418* (0.04126)
Service-VA	-0.045* (0.1433)	-0.0103* (0.0765)	-0.02149* (0.05149)
Instouv	0.0527** (0.08143)	0.0319 (0.0525)	0.02314** (0.01426)
Inflation	0.0903* (0.0602)	-0.3457** (0.105)	0,1174* (0.12049)
Credit	-0,415** (0.181)	0.4781* (0.2719)	-0.3012** (0.057)
Polity2	-0.575*** (0.087)	-0,674 (0.614)	-0.02945** (0.3312)
Constance	0.0315* (0.253)	0.2104** (0.959)	1.2014* (0.03215)
Nombre d'observations	144	144	144
Global model validity test			
Wald test	825.4373***	1324,124**	1120.012***
Adjusted R ²	0,7034	0,7841	0.7425
Global Moran I	0.0693***	0.0802***	0,080214*

Notes:*** p<0.01, ** p<0.05, * p<0.1.

6. Conclusion

In sum, based on a spatial model composed of the six EMCCA countries over the period 1995-2018, we empirically tested a linear relationship between the Policy-mix and real heterogeneities.

Our results are part of the reflections on the relevance of the fiscal and monetary union. This spatial linear relationship was highlighted using two techniques, notably G2SLSAR. Thus, the spatial autocorrelation showed that an expansive policy mix in the EMCCA zone will cause a reduction of the output gap, the unemployment rate and an increase in manufacturing value added in the member countries. This result is robust to the change in the estimator.

Finally, our results reiterate the importance of coordinating the two economic policies optimally. This is even more interesting as it allows for the smoothing of income linked to production activities; the development of infrastructure while improving monetary and financial conditions; and the increase in productivity of all sectors of activity and de facto effective production.

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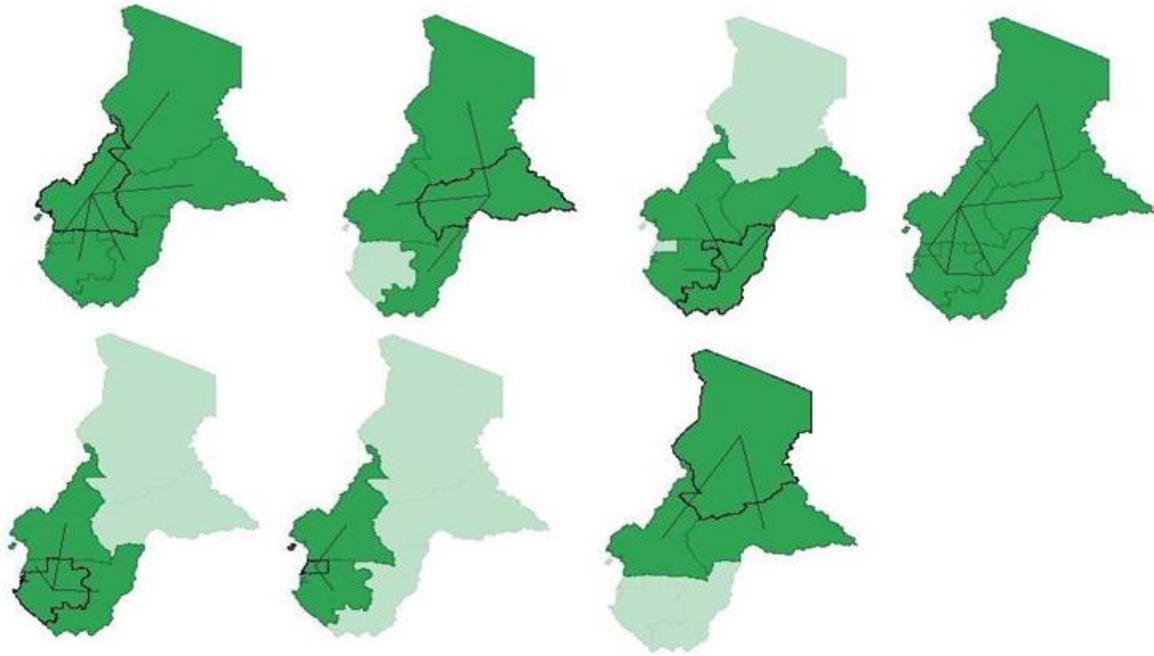
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Appendix

Appendix 1 : Contiguity matrix

	CMR	RCA	Congo	Gabon	GE	Tchad
CMR	0	1	1	1	1	1
RCA	1	0	1	0	0	1
Congo	1	1	0	1	0	0
Gabon	1	0	1	0	1	0
GE	1	0	0	1	0	0
Tchad	1	1	0	0	0	0

Appendix 2. Spatial connectivity graph in the EMCCA.



Source: Authors from GeoDa software