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**Trade shocks and labour market Resilience in Sub-Saharan Africa: Does the franc zone Response Differently?**

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# Trade shocks and labour market Resilience in Sub-Saharan Africa: Does the franc zone Response Differently?

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## Abstract

The objective of this paper is to evaluate the impact of commodity terms of trade (CTOT) shocks on the labour market resilience of Sub-Saharan Africa (SSA) countries, comparing the franc zone countries on one hand, from the non-franc zone countries on the other hand. The results from the PVAR estimation indicate a positive impact of commodity terms of trade shocks on labour market resilience in SSA countries, a result that was replicated in both the franc zone and the non-franc zone countries. When robustness was checked through the PSTR, this positive relationship was established to be non-linear. The policy implications of the study invite the policy makers to diversify their economies to limit their heavy reliance of their economies on commodities.

*Keywords*: commodity terms of trade; resilience; franc zone; PVAR; PSTR

*JEL Codes*: F16, F14; C23

## 1. Introduction

The frequent fluctuations in the world prices make developing countries face the problem of terms-of-trade (TOT) volatility. This problem becomes acute in the presence of weak and inefficient domestic credit and capital markets and limited access to international financial markets (Alimi and Aflouk, 2017). This volatility in the TOT is most evident in developing economies firstly due to their export structure which is commodity dominated and secondly because of high set-up cost of investments that these countries incur compared to their developed counterparts (Razin et al., 2003). TOT shocks tend to have persistent and volatile effects on macroeconomic variables such as output growth, exchange rates, inflation, real income and savings (see Mendoza, 1995; Broda, 2004; Cashin and Pattillo, 2006; Kose and Riezman, 2013; Coudert et al., 2015; Avom et al., 2021). Such variability are not only liable to business cycle uncertainties, economic performances and growth can equally be greatly affected (Loayza and Raddatz, 2007; Mangadi and Sheen, 2017).

This is particularly interesting to see mainly because less developed and transition countries compete with each other for demand in developed economies, and these countries produce at higher labour intensity than developed countries. Moreover, developing economies are less capable of absorbing adverse shocks than developed countries, mostly attributed to their weaker social security systems, less accumulated wealth, lower savings rates, and more flexible and less formal labour markets (Nordman and Pasquier-Doumer, 2015; Egger et al., 2020). In Africa, particularly in Sub-Saharan Africa (SSA), the relationship between commodity prices and macroeconomic performance is paradoxical. This is seen in that when commodity prices increase at international markets, the economic performance of this region barely increases, whereas, when there is fall in commodity prices, their economic performances slowdown greatly (Sanya, 2020). This was seen recently as many of these economies went into recession after the 2014 fall in oil prices. Several empirical works exist on the relationship between TOT (and to a lesser extend commodity terms of trade) and macroeconomic performance (Deaton and Miller, 1995; Mendoza, 1995; Bleaney and Greenaway, 2001; Cashin et al., 2004; Aizenman et al., 2012; Addison et al., 2016; Idrisov et al., 2016; Chaudhuri and Biswas, 2016; Adler et al., 2018; Cacciatore et al., 2020). These studies however are mostly focused on the impact of TOT on other macroeconomic variables such as investment, exchange rate, economic growth, current account balance,… its impact on the labour market is not really exploited in literature,

whereas, employment and unemployment is the root cause of high poverty rate in SSA countries.

Employment to population ratio has been slightly stable though on a decline in SSA, between 2009 and 2014, annual employment growth increased to an average of 3.1 percent despite slower economic growth. But this figure was still 1.4 percentage points below average economic growth. Slow job growth has primarily affected women and youths (ages 15–24). The youthful population in Africa was estimated at 226 million in 2015, a figure projected to increase by 42 percent, to 321 million by 2030 (IMF, 2018). According to the 2018 African Development Dynamics, the Continent's growth trend is one of the most resilient but jobless growth. The continent's growth runs behind the continent's growing population. Between 2000 and 2014, employment expanded by less than 1.8% a year, far less than the annual 3% growth of the labour force. By 2030, some 30 million youths are expected to enter the African labour market annually. In SSA, about 18 million jobs are required to be created every year in order to absorb new entries in the labour market, only 3 million formal jobs are presently being created.

In the same regard, the growth necessary for these economies vary between the franc zone and the non-franc zone economies. Whereas, the franc zone benefit from relatively low inflation as a result of their fixed exchange rate parity, there is still debate whether inflation targeting is the best policy response to CTOT shock. For instance, Broda and Tille (2003) argued that countries with flexible exchange rates are more resistant to terms-of-trade shocks than countries with fixed exchange rates. Hove et al (2015) on their part, argued that CPI inflation targeting is a better policy option for economies that are more vulnerable to CTOT shocks. In fact, Ngouhouo and Nchofoung (2021 a) argued that most SSA countries are very fragile and that the franc zone economies have developed very few resilience policies compared to other SSA countries. This inter-country differences can be attributed to heterogeneity in both specialization patterns and inflation persistence, as real exchange rates always turn to revert to equilibrium in the franc zone while other SSA countries' adjustments is mostly driven by nominal exchange rates (Couharde et al., 2013). In this context, the objective of this paper is to empirically verify the impact of CTOT shocks on the labour market resilience in SSA countries, comparing the franc zone countries with the non-franc zone countries.

The contribution of this paper is at least three folds. Firstly, it tries to give an answer to one of the most interesting research questions on the structural problems of African economies with ever growing labour force and youth unemployment. Explicating the paradoxes on the trend of job-less economic growth observed in Africa over the recent decades. The closest study to this effects are that Nourzad (2005) who examine the effect of trade on wages and that of Cacciatore et al. (2020) who study labour margins following past recessions in the USA. This study augment these past studies by considering commodity terms of trade given the role of commodities in SSA trade structure and integrate the resilience of the labour market through changes in employment with respect to regional change. Secondly, this is the first study to establish a non-linear relationship between the two variables through the PSTR. Thirdly, the study carries out a comparative study between the countries found in the franc zone and that out of the franc zone. This is particularly important given that SSA is made up of the countries that were formal French colonies that are today using the franc CFA along with Equatorial Guinea as their main currency while the rest of these countries have independent Central Banks. There is therefore the need to verify if this heterogeneity affects the response of the labour markets to trade shocks.

In what follows, section 2 presents a brief literature review, the data and methodology are discussed in section 3, section 4 presents and discusses the results, section 5 examines the robustness analysis and section 6 concludes.

## 2. Brief literature on trade shocks and labour market relationship

The theoretical framework of this study is built on the Dutch disease hypothesis and refers to a situation where a resource (commodity) boom in an economy leads to a real exchange appreciation and to the crowding out of the tradable manufacturing sector. This is however only considered a disease if the manufacturing sector does not bounce-back after the commodity boom (Krugman, 1987). The underlying mechanism of the Dutch disease is that the real exchange rate of the resource-rich economy tends to appreciate strongly with the rise of the export revenues from the resource sector. This harms manufacturing exports leading to de-industrialisation in the long-run. The shrinking of the manufacturing sector leads to high unemployment rates within the economy. This has been observed recently in SSA as the 2014 commodity price shock led to a reduction in the commodity terms of trade of most SSA economies. Most of this countries especially Equatorial Guinea which is highly dependent on

oil exports saw most of its formal employments terminated. The trend was similar in other countries around the region.

On the empirical front, Mendoza (1995) and Kose (2002) are the reference papers that support the argument that TOT is the main source of economic fluctuations in poor and developing countries. Mendoza (1995) observed actual movements in TOT and macroeconomic variables and compares them with theoretical predictions. TOT was found to explain majority of output fluctuations and exchange rates. He concluded that the response of economic aggregates to TOT shocks is different from that induced by other shocks. Kose (2002) extended Mendoza's work by incorporating a model that better captures developing countries. He found similar results to that of Mendoza (1995). Also, Kose and Riezman (2013) examine the effect of TOT on the SSA economy and conclude that trade shocks explain more than half of the output volatility in SSA. In addition, it is responsible for prolonged recessions through their impact on aggregate investment. Besides, Broda (2004) argues that TOT play a greater role in generating business cycle fluctuations in economies in fixed exchange rates than in countries with flexible exchange rates. Other studies including Lubik and Teo (2005) who argue that interest rate shocks explain business cycle fluctuations better than terms of trade shocks in the case of a small open economy. However, movements in commodity prices have played an important role in explaining business cycles since mid-1990s (Fernandez et al., 2015). In the same line, Zeev et al. (2017) argue that news-augmented CTOT shocks explain almost half of output variations in emerging economies.

Also, Friedman (1953) argued that flexible exchange rates would facilitate external adjustment. A flexible exchange rate is thus a buffer for external shocks. This is based on the argument that in the presence of price stickiness, the rate at which relative prices adjust is based on the exchange rate regime. Broda and Tille (2003) test Friedman's hypothesis on exchange rate regime and concluded that terms of trade shocks account for large portion in output variation. Cashin et al (2004) use time series data for 42 SSA countries to characterise the duration of the terms of trade shock. The results of the study showed that terms of trade shocks are short-lived in about half of the countries of study. On their part, Cashin and Mcdermott (2002) study the effect of TOT shocks on current account balance for five OECD countries by comparing two commodity-exporting countries with relatively small non-tradable sectors with three major industrial countries using the median unbiased estimator. The results of their analysis indicate that TOT accounts for a relatively large proportion of the

current account balance in commodity exporting countries while accounting for only a small share in the major industrial countries.

Jääskelä and Smith (2011) examined different types of TOT shocks and their propagation on the Australian economy. They concluded that higher term of trade shocks turn to be expansionary but not always inflationary. Aizenman et al. (2012) earlier analysed the way Latin America countries adjusted to commodity TOT shocks between 1970-2007 periods. Specifically, they investigate the degree to which the active management of international reserves and exchange rates impacted the transmission of international price shocks to real exchange rates. They find that active reserve management not only lowers the short run impact of CTOT shocks significantly, but also affects the long run adjustment of Real effect exchange rate (REER), effectively lowering its volatility. They also show that relatively small increases in the average holdings of reserves by Latin American economies (to levels still well below other emerging regions current averages) would provide a policy tool as effective as a fixed exchange rate regime in insulating the economy from CTOT shocks. Reserve management could be an effective alternative to fiscal or currency policies for relatively trade closed countries and economies with relatively poor institutions or high government debt. They further analyse the effects of active use of reserve accumulation aimed at smoothing REERs.

Looking at the labour market, Chaudhuri and Biswas (2016) show that developing countries possess an inherent shock-absorbing mechanism that stems from their peculiar institutional characteristics and can lessen the gravity of detrimental welfare consequence of international terms-of-trade disturbances in terms of a static two-sector, full-employment general equilibrium model with endogenous labour market distortion. They expressed the supply of foreign capital in the economy as a positive function of the return to capital. Subsequently, they verbally explained why the main result of the full-employment model would remain valid even in a two-sector specific-factor Harris-Todaro type model with urban unemployment. Before that, Nourzad (2005) through the VECM examined the macroeconomic and sectoral effects of international trade had supported that hypothesis whereby, trade has increased the gap between skilled and unskilled wages, lower employment and loss of productivity. Besides, increase in trade protection in Tunisia increase the elasticity of skilled labour (Mouelhi and Ghazali, 2013). Farther, Cacciatore et al. (2020) conduct a Bayesian inference on a quantitative business-cycle with search and matching frictions and a

neo-classical hours-supply decision. The model offers a structural explanation for the observed time-varying co movement between the labour margins, being either positive or negative, across post war U.S. recessions and recoveries. They further revealed that an intensive margin adjustments increases employment losses during recessions and delays employment recoveries. Recently, Ngouhouo and Nchofoung (2021 b) argue that trade openness along with domestic investments enhance employment in Cameroon in the long-run and that open economies should engage in trade openness through sectors that have spill over effects.

The highlighted literature focuses on the effect of terms of trade on macroeconomic outcomes and some determinants of labour markets outcomes. The effect of terms of trade on the labour market nexus is still under-exploited. This study thus add to literature in this context, comparing the franc zone on one hand and the non-franc zone on the other hand. The following section established the methodology in handling.

## 3. Data and Methodology

### 3.1. Model specification

Considering a standard Cobb-Douglass production function thus:

$$Q = A_0 e^{\lambda} K^{\alpha} L^{\beta} \qquad (1)$$

Where Q is productivity, K is capital stock, L is labour or employment levels, A0 is technological change. Gaining inspiration from the approach of McCombie and Roberts (2007) and that of Doran (2019), the natural logarithm and derivatives with respect to time is performed in (1).

$$q = \lambda + \alpha k + \beta l \qquad (2)$$

Where q is the differential of Q with respect to time (exponential growth rate of Q), and k and l are the exponential growth rates of labour and capital respectively.

Deriving inspiration from Verdon's law, we obtain the Verdon's type equation from (2) thus:

$$q + \beta q = \lambda + \alpha k + \beta l + \beta q \qquad (3)$$

To obtain the static form of this law, the differentials is not carried out after taking the natural logarithm on (1) and we obtain

$$lnQ + \beta lnQ = \lambda + \alpha lnK + \beta lnL + \beta lnQ \quad (4)$$

$$\beta lnQ = \lambda + \alpha K + \beta lnL + \beta lnQ - lnQ$$

$$\beta lnQ = \lambda + \alpha lnK + \beta lnL + (\beta - 1) lnQ$$

$$\beta lnQ - \beta lnL = \lambda + \alpha lnK + (\beta - 1) lnQ$$

$$lnQ - lnL = \frac{\lambda}{\beta} + \frac{\alpha}{\beta} lnK + \frac{(\beta - 1)}{\beta} Q$$

$$lnP = \frac{\lambda}{\beta} + \frac{\alpha}{\beta} lnK + \frac{(\beta - 1)}{\beta} Q \quad (5)$$

This specification could also be done by relating output with labour, instead of labour productivity (Doran, 2018). (4) Can thus be given as:

$$\beta lnQ - \beta lnL = \lambda + \alpha lnK + (\beta - 1) lnQ \quad (6)$$

$$-\beta lnL = \lambda + \alpha lnK - lnQ$$

$$lnL = -\frac{\lambda}{\beta} - \frac{\alpha}{\beta} lnK + \frac{1}{\beta} Q \quad (7)$$

The Dutch diseases literature highlights macroeconomic impact of both short term and long term changes in the terms of trade. Positive terms of trade shocks would enhance domestic investments and consequently economic growth (Mendoza, 1997) and vice versa. One of the potential dangers of the natural resources boom which accompanies a positive CTOT shock is that exchange rate appreciation renders the non-oil tradable sectors such as the manufacturing less competitive. Appreciation in exchange rates reduces the rates of inflation and monetary authorities could react through expansionary monetary policies. However, effective institutions reduce transaction and production costs such that effective gains from trade are realised, give opportunity to accumulate human capital for its workers through investment attraction and enhance economic growth (North, 1991;Acemoglu, 2008). From the highlighted studies, it is clear that economic growth or productivity (Q) is among others directly related to terms of trade, exchange rate, inflation and institutional quality. Replacing Q as a linear combination of these growth determinants, we obtain (8). When a shock occurs in an economy, the economy growth path undergoes spatial distribution of economic activity from a particular equilibrium configuration to another. It is thus imperative to interpret the parameters of our equation (7) as elasticities. However, for this to be effective, we must have an augmented model in its log-linear form. This is given as.

$$lnEMPG_{it} = \lambda_1 lnCTOT_{it} + \lambda_2 lnREER_{it} + \lambda_3 lnGFCF_{it} + \lambda_4 lnCBROAD\_MONEY_{it} + \lambda_5 lnINFLATION_{it} + \lambda_6 lnINSTIQUAL_{it} + E_{it} \quad (8)$$

Where the subscripts *i* and *t* stand for country and time period respectively, EMPG is the dependent variable that captures the labour market resilience, CTOT is the commodity terms of trade, REER is the real effective exchange rate, GFCF is domestic investment, INFLATION is the price inflation,INSTIQUALis the measure of both political and economic institutions, $BROAD\_MONEY$ is measure of monetary policy.

### 3.2. Justification of variables and Data

#### Dependent variable

Changes in regional employment has been used by most studies as a proxy for labour market resilience (see Fingleton et al., 2012; Giannakis and Bruggeman, 2017; Kitsos and Bishop, 2018). The choice of this variable is based basically on the fact that composite indexes are highly criticised in literature, basically due to methodological problems associated in building indicators and the subjectivity in selecting the variables associated. The employment growth rate is thus adopted with respect to the study of Ezcurra and Rios (2020) thus.

$$EMPG_{it} = \frac{\nabla L_i - \nabla L_{SSA}}{|\nabla L_{SSA}|} \quad (9)$$

Where $\nabla$L is the change in employment levels for country i or of the SSA sub-region

#### Independent variables

The first independent variable is CTOT. This variable is chosen in accordance with the work of Aizenman et al. (2012) who examine the effect of CTOT in Latin America. SSA countries have export structures dominated by commodities and as a result, their CTOT is almost a representation of their TOT within the economy, Jacquet et al. (2018) had earlier caution of the importance of CTOT to TOT in these economies. A positive shock in the CTOT is expected to enhance resilience while a negative shock is expected to have a negative effect on resilience. The next variable is the REER in accordance with Aizenman et al. (2012). The variable is expected to have a positive sign. GFCF is following the study of Njamen et al. (2020) and is expected to have a positive sign. Inflation is used in accordance to Hove et al. (2015) who argue that inflation targeting in the best policy options for handling negative

shocks. A positive sign is thus expected. Broad money is introduced in the model in accordance with the study of Asaleye et al., (2018) with an expected positive sign. Institutional quality is used following Chaudhuri and Biswas (2016) and equally Ezcurra and Rios (2020). A positive sign is expected on this variable.

The data for the studies are obtained from the WGI database 2019 for the institutional variable and is measured as the average of the six governance indices of Kaufmann (2010); REER is from the CEPII database 2019; CTOT is collected from the IMF database 2019 which is the indicator of CTOT developed by Gruss et al. (2019); the rest of the variables are from the WDI database 2019 and WGI database 2019.[1] The data runs from 1996-2017 covering 25 SSA countries (see appendix 2). Table 1 shows the unit root results for these variables. The results presented are for three (03) unit root tests (Im-Pesaran-Shin (2003); fisher tests and the Pesaran (2007) tests of unit roots). The first two test are first generation tests while the last test is a second generation unit root test that accounts for cross-sectional dependence that could result from economic integration. The tests are performed by taking into account the constant and trend. All the variables are thus presented to show trend stationarity as indicated in Table 1.

**(**Insert table 1)

The results of our unit root test indicate that all our variables under consideration are stationary at level. We thus proceed to our estimation.

### 3.3. Econometric technique

This work applies the panel VAR using the GMM style. This framework has been set up by of Abrigo and Love (2016) and used in several studies (Berdiev and Saunoris, 2016; Gnimassoun and Mignon, 2016; Topcu et *al.*, 2020; Miamo and Achuo, 2022). The panel VAR structurally contains two techniques, namely the impulse-response functions (IRF) and the forecast error variance decomposition (FEVD) analysis. The IRF describe the reaction of one variable to the shock in another variable within a system while holding all other shock equal to zero (Love and Zicchino, 2006). IRF are presented with the confidence intervals, generated by Monte Carlo simulations. The FEVD shows the percentage of the variation in one variable that is explained by the shock to another variable, accumulated over time (Love and Zicchino, 2006).

[1] The definition of the variables and their justifications are found in appendix 1

Consequently, the study adopts a PVAR model specification of equation (3) as follows:

$$EMPG_{it} = \omega_{1it} + \sum_{j=1}^{k+d} \alpha_{1it} EMPG_{it-j} + \sum_{j=1}^{k+d} \beta_{1it}\, CTOT_{it-j} + \sum_{j=1}^{k+d} \gamma_{1it}\, REER_{it-j} + \sum_{j=1}^{k+d} \delta_{1it}\, GFCF_{it-j} + \sum_{j=1}^{k+d} \mu_{1it}\, INFLATION_{it-j} + \sum_{j=1}^{k+d} \pi_{1it}\, BROAD\_MONEY_{it-j} + \sum_{J=1}^{K+D} \Omega_{1it}\, INSTIQUAL_{IT-J} + \varepsilon_{1it} \quad (10)$$

Where k is the optimal lag length; d is the maximal order of integration of the variables in the system; α, β, $\gamma, \delta$, μ, and π are matrices of slope coefficients; all other variables remain unchanged.

**4. Results and Discussions**

In this sub-section, the results of our PVAR model and the results of the post estimation tests. Our estimations use the Panel VAR method and correcting for endogeneity through the GMM style. Before this is done, the optimal lag selection to be included is carried out as presented in table 2.

(Insert table 2)

The maximum lag to be selected is that which minimises any of the criteria (MBIC, MAIC or MQIC). Table 2 shows that the optimal lag to be included is 1 from all the criteria. The PVAR estimation is carried out with a lag of 1 as indicated in table 3.

(Insert table 3)

The estimated coefficients of our model are reported in table 3. This result is stable as seen in figure 1 (all the Eigen values are found inside the unit circle). It is worth noting that these coefficients are not structural parameters. The estimated coefficients and functions of contemporaneous structural coefficients and cannot be used to evaluate the role of CTOT on employment changes without further restrictions. The most common way used in literature to identify structural shocks is the Cholesky decompositions of the variance-covariance matrix.

(Insert figure 1)

The Cholesky decomposition is a recursive decomposition that requires an ordering of the variables such that the contemporaneous correlation for any pair of variables is assigned to shocks in their order of appearance. Figure 2 presents the IRF. We only retained our independent variable of interest.

(Insert figure 2)

The results indicate that a shock (impulse) on CTOT positively impact employment change with very high precision (small confidence interval). Nourzad (2005) supported the hypothesis whereby, trade has increased the gap between skilled and unskilled wages, lower employment and loss of productivity. SSA countries have an economic structure where in, their export structure is dominated by commodity exports. This indicates that increase in commodity prices would lead to CTOT appreciation and vice-versa. An appreciation in CTOT would boost exports, as a result, positive account balance. This in turn boosts economic growth, consequently, positively impacting employment growth. Many studies have earlier established an impact of TOT shocks on current account (Santos-Paulino, 2010). Furthermore, an innovation on inflation negatively impacts employment growth. Hove et al (2015) argued that CPI inflation targeting is a better policy option for economies that are more vulnerable to commodity terms of trade shocks; this policy response can also reduce macroeconomic fluctuations and welfare losses. This is in line with the results of Assibey-Yeboah et al. (2016) who argue that inflation negatively impact output and consumption. A negative effect on output reduces employment growth and vice-versa.

Again, a shock on institutional quality negatively impact the labour market resilience. Chaudhuri and Biswas (2016) show that developing countries possess an inherent shock-absorbing mechanism that stems from their peculiar institutional characteristics and can lessen the gravity of detrimental welfare consequence of international terms-of-trade disturbances. A shock in the quality of institutions, for instance, sudden political instability, terrorist activities etc. renders the economic environment uncertain, this reduces investments (both domestic and foreign investments), as a result, long-term slowdown in the growth of employment.

Interpretations based on the impulsive response function can be confusing at times, and cannot take into account the forecast horizon. To see clearly the picture, it's better for the FEVD to be used. It is useful in decomposing the forecast error variance into proportions due to each type of shock including the forecast horizon as in table 4.

(Insert table 4)

The results indicate that a large variation for labour market resilience is as a result of its own innovations. At a one-year horizon, innovations in the employment explain by 100%

changes in employment growth. An innovation on the CTOT affects the growth rate of employment only from the second year's horizon with a magnitude of 2.9%. This contribution increases up to 7.9% by a 10 years' horizon. Apart from its own innovations, innovations in the CTOT explain changes in the employment growth than any other determinant. For instance, at a 10 years' horizon, innovations on REER impact employment growth by a magnitude of 0.01%, that on consumers' price inflation impacts by 0.02%, 0.04% by innovations on Monetary policy, 2.0% by innovations on institutional quality, while innovations in GFCF explains up to 2.4% of this variation.

The Granger causality test (see appendix 3) show that results are in line with previous results. This is a generalised result for SSA, whereas, SSA is peculiar in the fact that, it is made up of countries that have pegged currencies (franc zone) and other countries (non-franc zone). We thus precede with the analyses by comparing between these two groups of countries.

The results from Table 5 and figures 3 and 4 show that CTOT positively impact labour market resilience in both group of countries. As illustrated above, this is the same result obtained when the regression of SSA countries was done. Commodity export dominates the trade structure of the whole SSA sub-region and the choice of pegged currency has not modified this trend. Even in highly industrialised SSA economies like Nigeria, Oil still dominates its exports. This is a clear indication that negative shock on commodity prices and impact the employment market in this sub-region in the same direction and vice-versa. Hounsou (2017) earlier established that none of the two zones behaves better against the current account deficit of the balance of payments and that no zone is more competitive than the other. However, he argued that despite the similarity, terms of trade explains changes in current account better in the franc zone than non-franc zone countries. Coulibaly and Davis (2013) argue that the FCFA has been beneficial in terms of inflation while it has not resulted in any significant effect on growth.

(Insert figure 3)

(Insert figure 4)

**(Insert table 5)**

Again, REER negatively impact labour market resilience in both groups of countries, this negative impact is however significant only for the franc zone countries. Xiaofeng and Lizhen (2010) posits that REER affects employment through three channels namely export demand, resource allocation and efficiency channels, with export demand playing a vital role and that the export demand channel has a negative impact on employment through exchange rate revaluation. Exchange rate would influence the prices of exports commodities, this would influence demand and as result influencing investment decisions within firms and consequently changes labour demands. A depreciation in REER thus increases the competiveness of the countries' exports, as a result, increase in labour demand. It is true that on the other hand, depreciation could lead to an increase in intermediate inputs, hence increasing export prices, but this is justified in our case by the fact that commodities in SSA countries are mostly exported in raw form with little or no transformation done. The only inputs given in are thus labour and transportation. This negative impact is more noticeable in the franc zone, misalignment of real exchange rate associated to the weak exchange rate parity of the franc zone leads to lower economic growth. In essence, if the shock is permanent, real exchange rate appreciations should be entirely absorbed by nominal exchange rate appreciations in non-franc zone countries, without a change in the price level or the interest rate. The opposite may occur for franc zone countries, where the absorption in labour markets is made via quantity (employment). Moreover, if the external shock is temporary and if the monetary authority targets CPI inflation, then the monetary authority should lower the interest rate in response to the CPI inflation reduction induced by the nominal exchange rate appreciation.

A shock on the GFCF negatively impacts labour market resilience in both group of countries with the effect insignificant in the franc zone countries. Domestic investments are expected to provide employment opportunities for the local population. This is because its likely outcomes are increase in economic size, increase in per capita income and increase job opportunities (Emeka et al., 2017). However, for investments to yield the required results on the economy, it must be productive. Most investments especially in developing countries turn out to be white elephants. Njamen et al. (2020) earlier established that investments have no effect on economic growth in SSA countries, at the same time, domestic investments in this sub-region are mostly financed through external debts, whereas, the classical economists argue that external debts are likely to compromise the accumulation of capital, present and

future consumption.

Broad Money negatively impact EMPG in the non-franc zone countries, and this impact is however negative but non-significant in the franc zone countries. The franc zone economies have their currency pegged to the French franc (today Euros), at the same time, close to 50% of their currency reserves are stocked in the French treasury. They do not freely manage their monetary instrument. These countries cannot rely on monetary policy instruments to boost the economy. On the other hand, the non-franc zone countries have independent central banks who most often than not use monetary policy instruments in regulating economic activities. A shock on M2 (increase is monetary stock within the economy) increases inflationary rate within these economies, this increases the prices of intermediate inputs, reducing productivity and thus labour demand. The New Classical economists posit that unanticipated monetary policy would affect employment but an anticipated monetary policy would not affect employment due to systematic actions by economic agents towards the policy (Asaleye et al., 2018). This differences in significance of the results can be explained by the fact that unlike non-franc zone countries, franc zone countries do not freely use their monetary policy instruments especially the broad money. They can thus only freely use the interest rate in stimulating economic activities.

This established, it is worth examining the robustness of these results using an alternative regression method. In this light, there is a likelihood that a non-linear relationship occurs between CTOT and labour market resilience. This is the objective of the next section.

## 5. Robustness Analysis: the PSTR Modelling Technique

The analytical approach of the impact of CTOT shocks on employment changes highlights the existence of a threshold beyond which any increase CTOT would change the sense of variation between the relationships. The analysis of threshold effects is performed using the Panel Smooth Transition Regression Modelling (PSTR) proposed González et al. (2005) that avoids heterogeneity in a non-linear model specification. We are treating a subject that deals with the effect of CTOT on labour market resilience. There is therefore heterogeneity in the behaviour of CTOT across the countries as well as the resilience of the economies, as they are endowed with different types of natural resources as well as different response structures. The PSTR is thus the most appropriate model in taking into account this heterogeneity. The PSTR model is defined by the following relation (Njamen et al., 2019):

$$EMPG_{it} = \mu_i + \lambda_t + \beta_0' X_{it} + \beta_1' X_{it} g(q_{it};\ \gamma, c) + e_{it} \qquad (11)$$

Where i and t are the individual and the time dimensions of the panel respectively. $EMPG_{it}$ is the dependent variable (labour market resilience) and $X_{it}$ the vector of endogenous and exogenous variables. The variable $q_{it}$ is the threshold variable ($ctot^2$), while γ is the parameter associated with this threshold which divides the equation into two regimes with respective coefficients $\beta_0$ and $\beta_1.\mu_i$ $and$ $\lambda_t$represent the individual fixed effect and the time effect respectively, and $e_{it}$ the error term. Before the estimation of the PSTR model is carried out, there is need to establish non-linearity and determining the number regimes.

In testing for linearity, the null hypothesis of $\gamma\gamma$=0 is assumed. That is the null hypothesis assumes the linear model, whereas, the alternative hypothesis assumes the non-linear model. The result of the Fisher's test of linearity as well as that of the number of regimes are presented in appendixes 4 and 5 respectively. The results reject the null hypothesis for linearity. It further reveals that our model presents a single regime switch.

(Insert table 6)

(Insert table 7)

The results on tables 6 and 7 are similar to our initial results. It indicates a positive impact of CTOT on labour market resilience. Moreover, $ctot^2$ is negative and significant indicating the existence of a non-linear relationship between CTOT and employment growth up to a bearable threshold where this effect is negative. Table 7 indicates that this threshold is 131.2600, 153.925 and 128.2870 for SSA, the franc zone and the non-franc zone countries respectively. This indicates that increase in the ratio of export prices to imports prices of commodities increases the growth of employment up to 131.2600% where the effect becomes negative for SSA and 153.925% and 128.2870% where the effect becomes negative for the franc zone and the non-franc zone countries respectively. The non-linearity of the CTOT noticed here can be traced to heterogeneities of countries in their respective economic structure and nonlinearities in real exchange rates of respective countries in relation to various factors. Couharde et al. ( 2013) earlier argue that there is heterogeneity within the SSA economies in both specialization patterns and inflation persistence, as real exchange rates always turn to revert to equilibrium in the franc zone while other SSA countries' adjustments is mostly driven by nominal exchange rates.

## 6. Conclusion

The objective of this paper was to evaluate the impact of CTOT on the labour market resilience of SSA countries, comparing the franc zone countries on one hand, from the non-franc zone countries on the other hand. To achieve this objective, a linear model was established with the employment growth as dependent variable and CTOT, REER, inflation, Broad money, institutional quality, GFCF, as independent variables. The results from the PVAR estimation after controlling for endogeneity through the GMM style indicate a positive impact of terms of trade shocks on labour market resilience in SSA countries, a result that was replicated in both the franc zone and the non-franc zone countries. When robustness was checked through the PSTR, $CTOT^2$ was negative and significant indicating the existence of a non-linear relationship between CTOT and employment growth. Moreover, the threshold was found to be 131.26, 153.925 and 128.29 for SSA the franc zone and the non-franc zone countries respectively. This indicates that increase in the ratio of export prices to import prices of commodities increases the growth of employment up to 131.26% where the effect becomes negative for SSA and 153.92% and 128.29% where the effect becomes negative for the franc zone and the non-franc zone countries respectively.

With this result obtained, it is evident that CTOT has a great impact on the employment growth path of SSA economies just like REER and institutions. Given the importance of commodities on the trade structure of these economies, there is thus the need to diversify the economies of this sub-region. To achieve this, there is urgent need for an industrialisation plan to be put into place such that most commodities are transformed before being exported. Moreover, there is need for the improvements on the quality of institutions in this sub-region, which has proven to be a determining factor of employment growth. This can be done at first place, through conflict resolutions that has been the order of the day in this sub-region and putting in place of anti-corruption laws with proper follow-up for implementation.

This study is however, not conclusive, future studies on the topic could use other suitable methodologies like the local projection approach. Equally, countries specific studies could be carried out for more oriented policies.

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Appendix

**Appendix 1: Definition and justification of variables used**

| Variable | Symbol | Definition | justification | Source |
|---|---|---|---|---|
| Employment growth | EMPG | It is the difference between the employment of a period and that of the initial period with respect to changes in regional employment levels. | Kitsos and Bishop (2018) | Authors from ILO data 2019 |
| Commodity terms of trade | CTOT | it is the net barter terms of trade index and is calculated as the percentage ratio of the export unit value indexes to the import unit value indexes, measured relative to the base year 2000 | Jacquet et al. (2018) | IMF 2019 |
| Real effective exchange rate | REER | The real effective exchange rate is the weighted average of a country's currency in relation to an index or basket of other major currencies | Aizenman et al., 2012 | CEPII 2019 |
| Domestic investment | GFCF | It is the acquisition of produced assets (including the purchases of second-handed assets), including the production of such assets by producers for their own use, minus disposals. It is measured as a percentage of GDP | Njamen et al. (2020) | WDI 2019 |
| Consumers price inflation | INFLATION | It measures the average change in prices over time that consumers pay for a basket of goods and services measured as the 2010 base year | Hove et al (2015) | WDI 2019 |
| Monetary policy (M2) | $BROAD\_MON$ | is the sum of currency outside banks; demand deposits other than those of the central government; the time, savings, and foreign currency deposits of resident sectors other than the central government; bank and traveller's checks; and other securities such as certificates of deposit and commercial paper as a percentage of GDP | Asaleye et al., 2018 | WDI 2019 |
| Institutional quality | $INSTIQUAL$ | It is the manner in which power is exercised in the management of a country's economic and social resources for development. It is measured as the average of the six governance indexes of Kaufmann (2010) | Chaudhuri and Biswas (2016) | WGI 2019 |

**Appendix 2: List of Countries under study**

Angola, Benin, Burkina Faso, Burundi, Cameroon, Chad, Comoros, Republic of Congo, Gabon, Guinea Bissau, Kenya, Madagascar, Mali, Mauritania, Mauritius, Namibia, Nigeria, Rwanda, Senegal, Sierra Leonne, South Africa, Sudan, Tanzania, Togo, Uganda.

**Appendix 3: Granger causality test**

| Equation/ | excluded | Chi2 | df | Prob>Chi2 |
|---|---|---|---|---|
| EMPG | | | | |
| | CTOT | 36.167 | 1 | 0.000 |
| | REER | 0.265 | 1 | 0.606 |
| | GFCF | 6.365 | 1 | 0.012 |
| | Inflation | 4.730 | 1 | 0.030 |
| | Broad_money | 0.632 | 1 | 0.427 |
| | instiqual | 9.297 | 1 | 0.002 |
| | All | 116.932 | 6 | 0.000 |

Appendix 4. Fisher LM test for Linearity

| Regime Variable | P-Value |
|---|---|
| CTOT | 0.000 |

Appendix 5. Test of number of regimes

| Model | Threshold | Prob |
|---|---|---|
| CTOT | Single | 0.0033 |
| | Double | 0.4367 |

List of tables

***Table 1: Panel unit root test for SSA***

| Variable | IPS test | Fisher type | Pesaran (2007) | Level of integration |
|---|---|---|---|---|
| | First Generation | | Second generation | |
| | At level with trend | At level with trend | At level with trend | |
| EMPG | -18.0481 (0.0000) | 151.6457 (0.0000) | -2.954 (0.0002) | I(0) |
| CTOT | -2.7167 (0.0033) | 5.6819 (0.0000) | -4.885 (0.0000) | I(0) |
| REER | -4.0337 (0.0000) | 2.6800 (0.0037) | -3.939 (0.0000) | I(0) |
| GFCF | -3.2506 (0.0006) | 2.1976 (0.0140) | -3.139 (0.0000) | I(0) |
| INSTIQUAL | -3.5211 (0.0002) | 1.7996 (0.0360) | -6.231 (0.0000) | I(0) |
| INFLATION_CPI | -10.3340 (0.0000) | 43.7515 (0.0000) | -8.272 (0.0000) | I(0) |
| BROAD_MONEY | -4.1701 (0.0000) | 3.9002 (0.0000) | -1.496 (0.067) | I(0) |

Source: Author's Computation

Table 2: Optimal lag selection criteria

| lag | CD | J | Jpvalue | MBIC | MAIC | MQIC |
|---|---|---|---|---|---|---|
| 1 | .9999999 | 117.0855 | .2589039 | -528.086 | -98.91453 | -268.9897 |
| 2 | .9999999 | 60.66009 | .8272549 | -369.4542 | -83.33991 | -196.7233 |
| 3 | .9998901 | 14.33026 | .9995273 | -200.7269 | -57.66974 | -114.3615 |

Source: Author's computation

***Table 3: Panel VAR estimation for Sub-Saharan Africa***

| 1. | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| VARIABLES | Empg | Ctot | reer | GFCF | inflation_cpi | broad_money | instiqual |
| L.empg | 0.00588 | 0.0793 | 0.472*** | -0.00637 | 0.0166 | 0.0132 | -0.000756** |
| | (0.00414) | (0.0815) | (0.137) | (0.00654) | (0.0301) | (0.0118) | (0.000319) |
| L.ctot | 0.0103*** | 0.920*** | 0.0208 | 0.0209*** | -0.0413*** | 0.00169 | 0.000394*** |
| | (0.00171) | (0.0257) | (0.0165) | (0.00663) | (0.0133) | (0.00586) | (0.000120) |
| L.reer | 0.000700 | -0.109*** | 0.812*** | -0.0283*** | -0.100*** | -0.00889** | 0.000471*** |
| | (0.00136) | (0.0196) | (0.0172) | (0.00344) | (0.0122) | (0.00415) | (0.000105) |
| L.GFCF | -0.0297** | 0.365** | -0.601*** | 0.665*** | 0.341*** | -0.250*** | 0.00337*** |
| | (0.0118) | (0.164) | (0.112) | (0.0382) | (0.0794) | (0.0285) | (0.000837) |
| L.inflation_cpi | -0.00281** | -0.100*** | 0.0501*** | 0.0149*** | 0.345*** | 0.0280*** | 6.55e-07 |
| | (0.00129) | (0.00904) | (0.00701) | (0.00210) | (0.00894) | (0.00204) | (4.96e-05) |
| L.broad_money | -0.00639 | -0.0363 | 0.220*** | -0.0594** | -0.0727 | 1.012*** | -0.00237*** |
| | (0.00804) | (0.112) | (0.0641) | (0.0240) | (0.0570) | (0.0245) | (0.000545) |
| L.instiqual | -0.955*** | -14.13*** | 31.70*** | 4.006*** | -25.06*** | 9.576*** | 0.752*** |
| | (0.313) | (4.357) | (3.902) | (1.199) | (3.048) | (1.256) | (0.0301) |
| Observations | 460 | 460 | 460 | 460 | 460 | 460 | 460 |
| Hansen's_pval | 0.109 | 0.109 | 0.109 | 0.109 | 0.109 | 0.109 | 0.109 |

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Source: Author's computation

**Table 4: FEVD for SSA for the response of EMPG**

| | Impulse variables | | | | | | |
|---|---|---|---|---|---|---|---|
| Forecast Horizon | Empg | Ctot | Reer | GFCF | inflation_cpi | broad_money | instiqual |
| empg | | | | | | | |
| 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 0.9514948 | 0.0291557 | 0.0003005 | 0.0141701 | 0.0002182 | 0.0000643 | 0.0045964 |
| 3 | 0.9233682 | 0.0470111 | 0.0004755 | 0.0196272 | 0.0005108 | 0.0000729 | 0.0089343 |
| 4 | 0.9055954 | 0.0585161 | 0.0005179 | 0.0219533 | 0.0007961 | 0.0002056 | 0.0124157 |
| 5 | 0.8936937 | 0.0661478 | 0.0005115 | 0.0230308 | 0.0010607 | 0.0005205 | 0.0150349 |
| 6 | 0.8853704 | 0.0712683 | 0.0005255 | 0.0235653 | 0.0013073 | 0.001023 | 0.0169402 |
| 7 | 0.879329 | 0.0747022 | 0.0005915 | 0.0238488 | 0.0015391 | 0.0016963 | 0.0182932 |
| 8 | 0.8747919 | 0.0769818 | 0.0007113 | 0.0240118 | 0.0017582 | 0.0025152 | 0.01923 |
| 9 | 0.8712727 | 0.0784652 | 0.0008705 | 0.024116 | 0.0019657 | 0.0034527 | 0.0198573 |
| 10 | 0.8684574 | 0.0793996 | 0.0010491 | 0.024192 | 0.0021619 | 0.0044834 | 0.0202566 |

Source: Author's computation

**Table 5: Comparing the Franc Zone and the Non-Franc zone countries**

**Franc Zone countries**

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| VARIABLES | Empg | Ctot | Reer | GFCF | inflation_cpi | broad_money | instiqual |
| L.empg | 0.00348 | 0.541** | 0.114 | 0.0285 | 0.255*** | 0.0760** | -0.00162 |
| | (0.00989) | (0.271) | (0.0778) | (0.0509) | (0.0681) | (0.0368) | (0.00132) |
| L.ctot | 0.00553** | 0.676*** | 0.0309* | 0.00811 | 0.0459*** | 0.0208** | -4.72e-05 |
| | (0.00239) | (0.0655) | (0.0188) | (0.0123) | (0.0165) | (0.00889) | (0.000319) |
| L.reer | -0.0209** | 0.674** | 0.642*** | 0.0463 | -0.207*** | 0.0857** | -0.00119 |
| | (0.0102) | (0.280) | (0.0803) | (0.0526) | (0.0703) | (0.0380) | (0.00137) |
| L.GFCF | -0.0223 | -0.398 | -0.000505 | 0.321*** | -0.0298 | 0.0544 | 0.00128 |
| | (0.0142) | (0.388) | (0.111) | (0.0729) | (0.0975) | (0.0527) | (0.00189) |
| L.inflation_cpi | -0.00964 | -0.0606 | 0.0621 | 0.172*** | 0.116 | 0.00590 | -0.00159 |
| | (0.0115) | (0.316) | (0.0908) | (0.0594) | (0.0795) | (0.0429) | (0.00154) |
| L.broad_money | 0.00594 | 0.527* | -0.128 | 0.199*** | -0.145** | 0.841*** | -0.00268* |
| | (0.0104) | (0.284) | (0.0814) | (0.0533) | (0.0713) | (0.0385) | (0.00138) |
| L.instiqual | 0.581 | 7.374 | -0.169 | 7.833*** | -0.232 | -7.277*** | 0.619*** |
| | (0.516) | (14.13) | (4.056) | (2.656) | (3.552) | (1.918) | (0.0690) |
| Observations | 211 | 211 | 211 | 211 | 211 | 211 | 211 |
| J_pval | 0.1604 | 0.1604 | 0.1604 | 0.1604 | 0.1604 | 0.1604 | 0.1604 |

**Non Franc zone countries**

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| VARIABLES | Empg | Ctot | reer | GFCF | inflation_cpi | broad_money | instiqual |
| L.empg | 0.0106 | 0.0326 | 0.228 | -0.0239 | 0.0246 | -0.00938 | -0.000451 |
| | (0.00932) | (0.165) | (0.171) | (0.0349) | (0.0602) | (0.0267) | (0.000540) |
| L.ctot | 0.0131*** | 0.991*** | 0.0194 | 0.0284* | -0.0540* | 0.0224* | 0.000192 |
| | (0.00443) | (0.0782) | (0.0813) | (0.0166) | (0.0286) | (0.0127) | (0.000256) |
| L.reer | -0.00530 | -0.111* | 0.828*** | -0.0162 | -0.0361 | -0.00789 | 0.000386* |
| | (0.00382) | (0.0675) | (0.0702) | (0.0143) | (0.0247) | (0.0110) | (0.000221) |
| L.GFCF | -0.0649** | -0.392 | -0.402 | 0.690*** | 0.0640 | -0.105 | 0.00280 |
| | (0.0316) | (0.559) | (0.581) | (0.118) | (0.204) | (0.0907) | (0.00183) |
| L.inflation_cpi | -0.00533 | -0.0363 | 0.00940 | -0.00187 | 0.439*** | -0.0114 | 0.000152 |
| | (0.00416) | (0.0735) | (0.0764) | (0.0156) | (0.0269) | (0.0119) | (0.000241) |
| L.broad_money | -0.0700*** | -0.687* | 0.0237 | -0.166* | 0.0382 | 0.820*** | 0.000183 |
| | (0.0230) | (0.406) | (0.422) | (0.0860) | (0.148) | (0.0659) | (0.00133) |
| L.instiqual | 1.395 | 15.65 | 11.30 | -0.223 | 1.066 | 1.551 | 0.735*** |
| | (1.173) | (20.71) | (21.54) | (4.385) | (7.572) | (3.361) | (0.0679) |
| Observations | 249 | 249 | 249 | 249 | 249 | 249 | 249 |
| J_pval | 0.1111 | 0.1111 | 0.1111 | 0.1111 | 0.1111 | 0.1111 | 0.1111 |

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: Author's computation

***Table 6: PSTR estimation***

| VARIABLES | SSA<br>Empg | Franc zone<br>empg | Non Franc zone<br>empg |
|---|---|---|---|
| L.empg | 0.000660 | -0.000232 | 0.000872 |
| | (0.00117) | (0.00127) | (0.00167) |
| Ctot | 0.00267** | 0.00276* | 0.00271 |
| | (0.00132) | (0.00146) | (0.00184) |
| $ctot^2$ | -1.20e-05** | -1.06e-05* | -1.13e-05* |
| | (4.68e-06) | (5.39e-06) | (6.45e-06) |
| Reer | 0.000425 | -0.000544 | 0.000121 |
| | (0.000476) | (0.00132) | (0.000580) |
| GFCF | -0.00105 | 0.00248 | -0.00236 |
| | (0.00153) | (0.00177) | (0.00210) |
| inflation_cpi | -0.000650 | -0.000781 | -0.000746 |
| | (0.000540) | (0.00203) | (0.000660) |
| broad_money | -0.00270* | 0.000595 | -0.00631** |
| | (0.00146) | (0.00115) | (0.00260) |
| Instiqual | -0.0458 | -0.134** | -0.0473 |
| | (0.0555) | (0.0572) | (0.0804) |
| 0b._cat#c.regime | 0.0101*** | 0.00781*** | 0.0105*** |
| | (0.000157) | (0.000107) | (0.000217) |
| 1._cat#c.regime | 0.00533*** | 0.00519*** | 0.00519*** |
| | (6.78e-05) | (0.000114) | (8.90e-05) |
| Constant | -0.112 | -0.277* | 0.0577 |
| | (0.105) | (0.160) | (0.156) |
| Observations | 550 | 242 | 308 |
| Number of id | 25 | 11 | 14 |
| R-squared Within | 0.9569 | 0.9725 | 0.9580 |
| F-statistic | 1143 | 781.24 | 649.29 |
| Prob > F | 0.0000 | 0.0000 | 0.0000 |
| R-sq within / between | F test that all u_i=0:<br>F(24, 515) = 1.87<br>Prob > F = 0.0079 | F test that all u_i=0:<br>F(10, 221) = 8.44<br>Prob > F = 0.0000 | F test that all u_i=0:<br>F(13, 284) = 1.90<br>Prob > F = 0.0297 |

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: Author's computation

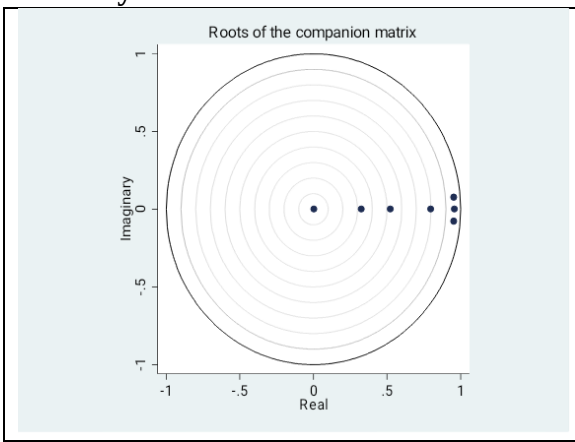
***Table 7: Threshold estimator (level = 95)***

| | Model | Threshold | Lower | Upper |
|---|---|---|---|---|
| | SSA | 131.2600 | 130.7915 | 131.3650 |
| Th-1 | Franc zone | 153.9250 | 146.9715 | 154.6830 |
| in % | Non franc zone | 128.2870 | 125.7395 | 129.4320 |

Source: Author's computation

## List of figures

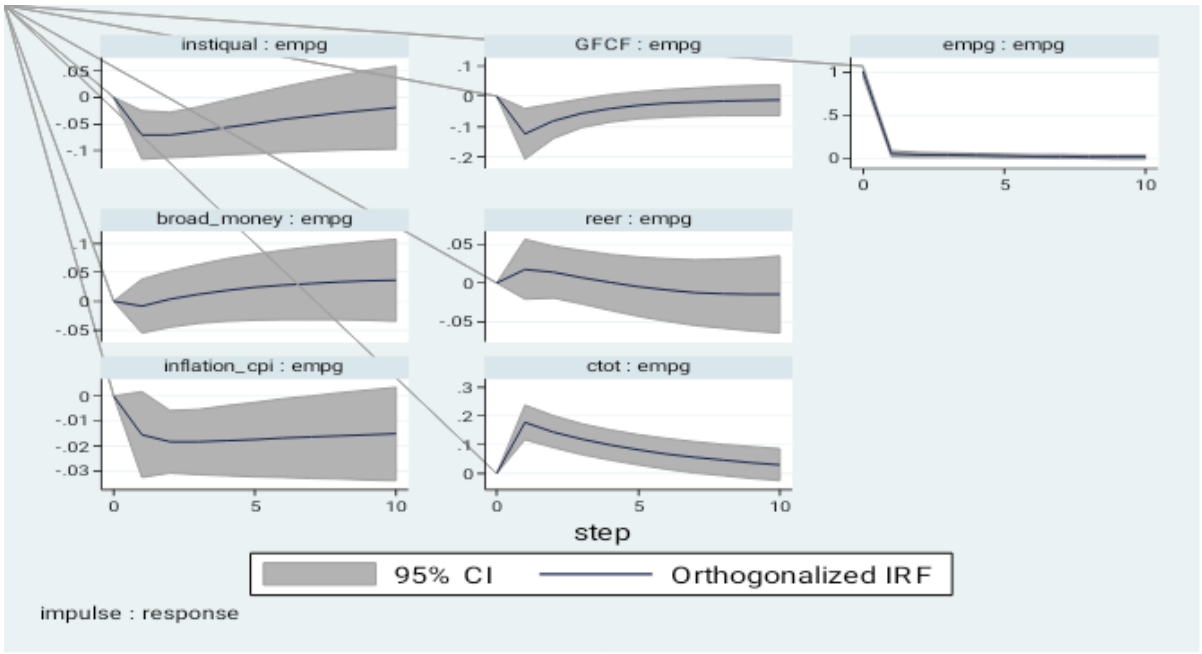
**Figure 1. Stability test**




| Eigenvalue | | |
|---|---|---|
| Real | Imaginary | Modulus |
| 0.9583019 | 0 | 0.9583019 |
| 0.9531596 | 0.0772252 | 0.9562829 |
| 0.9531596 | 0.0772252 | 0.9562829 |
| 0.7967982 | 0 | 0.7967982 |
| 0.5224397 | 0 | 0.5224397 |
| 0.3253564 | 0 | 0.3253564 |
| 0.0037606 | 0 | 0.0037606 |

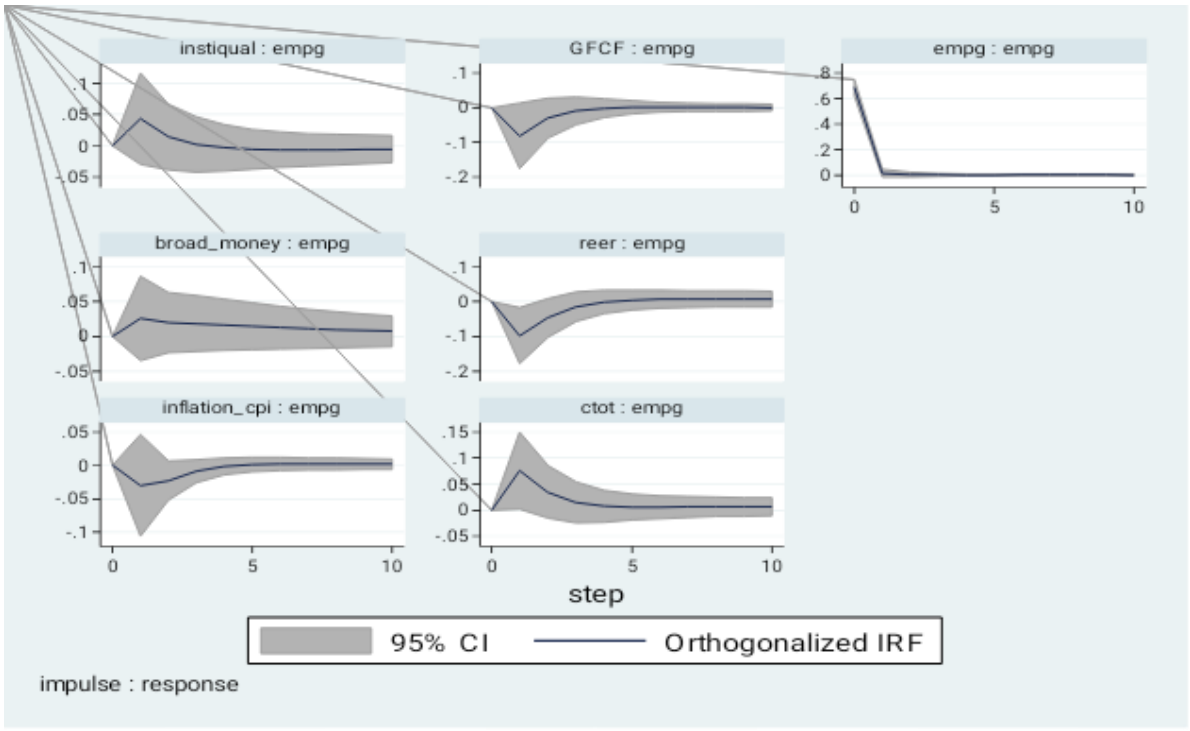
Source: Author's computation

***Figure 2: IRF OF EMPG FOR SSA COUNTRIES***



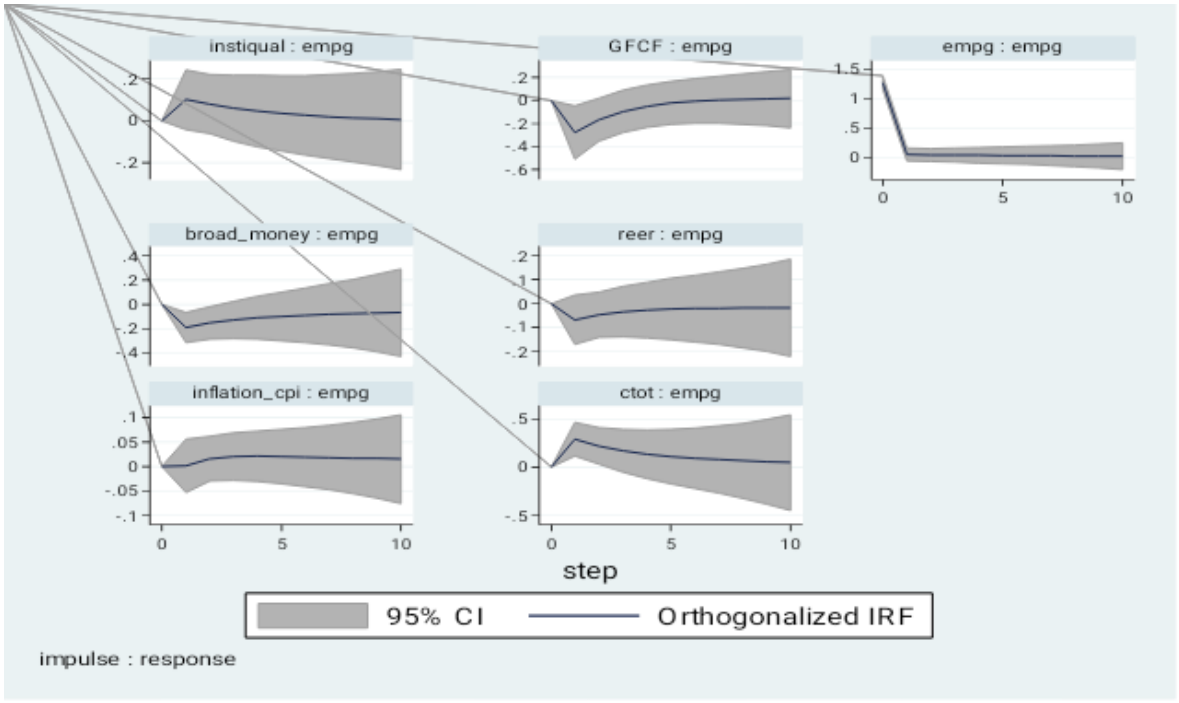

Source: Author's computation

**Figure 3: IRF of EMPG for the Franc Zone**




Source: Author's computation

**Figure 4: IRF of EMPG for Non-Franc Zone**




Source: Author's Computation