



United Nations
Economic Commission for Africa

21st Intergovernmental Committee of Experts
Transformative Growth in Eastern Africa:
Catalysts and Constraints

Venue: Moroni, Union of Comoros
Dates: 7-9th November 2017.

The East African Monetary Union:
Ready or Not?

Draft Report

October 2017

Executive summary

EAC Partner States are in the implementation process of the protocol on the Establishment of the East African Community Monetary Union (EAMU) signed in November 2013, which will lead to the use of a common currency by 2024. However, the use of a common currency has benefits and costs. The main benefits of monetary union derive from the elimination of the transaction costs of exchanging currencies and the elimination of exchange-rate volatility while the main costs of monetary union are those attributable to the inability of monetary authorities of the individual countries to use country-specific monetary policies and the exchange rate as an instrument of macroeconomic adjustment in response to shocks. The benefits and costs arising from the establishment of monetary union depend on the structural characteristics of the economies concerned. While endogenous theory suggests that a common currency can promote trade and growth and that countries could become more similar in a currency union than before joining currency union, many recent studies show a much smaller trade impact of monetary union, particularly in developing countries. This reinforces the importance of meeting optimum currency criteria (OCA) as prerequisite for forming a currency union. The basic point of the OCA theory is that countries or regions exposed to symmetric shocks, or possessing mechanisms for the absorption of asymmetric shocks, may find it optimal to adopt a common currency.

The main objective of this paper was to investigate the readiness of East African Community countries for a monetary union by extending the period of study used by other researchers, to cover recent periods when progress was made in policy coordination and implementation of common market protocols.

The general conclusion is that despite some similarities in the structures of EAC economies, country-specific shocks have been prevalent, with economies in the EAC remaining susceptible to asymmetric shocks. Empirical analysis points to a partial convergence among different macro-economic variables used to assess the readiness of EAC countries for a monetary union. It may be advisable for the region, to fast track the full implementation of common market and customs union protocol, harmonize policies and increase inter regional trade before adopting a common currency. Adopting a common currency before reaching a good level of convergence may be more damaging to EAC countries. Partial convergence in inflation and exchange rates implies that the EAC countries need to align their monetary policies and allow a period of monetary policy coordination.

While drawing from experiences of other currency unions, it will be important that going forward, the EAC continues to direct efforts to designing and putting in place adequate mechanisms that can help member countries to adjust to future shocks once the common currency is adopted. This includes the usual measures to mitigate costs of common monetary policies such as labor and capital mobility, price, and wage flexibility, as well as various risk-sharing mechanisms, including fiscal policy.

This will require that EAC countries agree to explicit and binding convergence commitments as prerequisites and ongoing commitments for the viability of EAMU. To achieve this, there is need for the establishment of an institution or a strong mechanism for enforcement and ensuring compliance by all countries. Firm commitment, discipline

among members and reduction of the risk of bad policies are results of a more rule-based framework. These measures should be agreed among member countries before the introduction of the single currency, to reduce risks and signal early commitment to macroeconomic stability.

Despite the relatively large volume of trade among the EAC countries, significant challenges to monetary integration remain, including the following: (i) low per capita income levels, resulting in internal markets of limited sizes; (ii) the concentration on primary-commodity exports for most countries; (iii) limited transportation facilities and large distances between population centers; and, (iv) relatively-high shares of informal trade because of permeable borders. In the process of enhancing regional integration through the increase of inter-regional trade, it is important to fully implement the common market and customs union protocols.

As policy recommendation, to achieve greater intra-regional trade and structural similarity thus shock synchronization, barriers to trade within EAC need to be eliminated while common policies toward the outside of the EAC should be adopted. The region's trade agenda therefore has a wider scope than reducing intraregional tariff barriers. Its current primary focus is on removing structural – mostly non-trade – barriers to competitiveness and trade. Besides the traditional objectives of removing quotas and tariffs, EAC's trade policy now strives to strengthen the members' "soft" and "hard" infrastructure so as to enable them to leverage their relative comparative advantages. The focus on relative comparative advantages would also help diversify the EAC product mix and could enhance the scope for intraregional trade along the value chains.

. The measurement of convergence criteria is another important issue to be considered. This is because the criteria have to have a legal force, and should be used as a basis for admission to the monetary union or sanctioning member countries that fail to meet the criteria. A strong emphasis has to be placed on the quality and cross-country comparability of the statistics used to compile the indicators. Therefore, statistical standards aligned with international statistical reporting requirements are necessary and statistics must be transparent and suitable for a wide range of analyses and public purposes.

Statistical programs must therefore be strong and the infrastructure must be in place, well before a proposed monetary union is formally established. There is a strong need for the early development of statistical systems in the monetary union-building process.

The experience of EMU show that members manage a high degree of periodicity and timeliness for their statistics which enables rapid policy responses, and a degree of certainty among policymakers since they have a good understanding of current economic conditions. During the period of financial turmoil, when economic conditions are changing rapidly and there is wide uncertainty about the management of the economy and of the financial sector in particular, the availability of accurate, timely, and reliable economic data becomes critical.

I. Background

The formation of different monetary union blocs in Africa is explained by different factors including, the possibility of creating more solidarity among African countries (Cobham and Robson, 1994, p. 286; Masson and Pattillo, 2004, p. 10); the experience of the European monetary union that is perceived to have been successful in bringing benefits to its members (Masson and Pattillo, 2005, p. 34; Jefferis, 2007, p. 83); monetary union viewed as a way of achieving an efficient single market (Kenen and Meade, 2008, p. 4); and as a way to improve structures of the economies, to increase trade-integration and business-cycle correlation, and enhancing the credibility of macroeconomic policies (Frankel and Rose, 1998; Rose, 2000).

Studies on the readiness of countries to form monetary unions have been guided by the theory of optimum currency areas (OCA) which was developed by Mundell (1961), McKinnon (1963), and Kenen (1969) and became popular for analysis of the costs and benefits of monetary integration. The benefits are directly related to the elimination of transaction costs due to exchanging currencies and exchange rate volatilities. Costs in countries' bilateral trade while costs are related to the inability of the central bank in individual countries to use country specific monetary and exchange rate policy as an instrument of macro-economic adjustment. Thus, the benefits and costs arising from the establishment of monetary union depend on the structural characteristics of the economies concerned. The basic point of the OCA theory is that countries or regions exposed to symmetric shocks, or possessing mechanisms for the absorption of asymmetric shocks, may find it optimal to adopt a common currency.

Thus, OCA theory focuses more on asymmetric disturbances to output, trade linkages and the mobility of labor and considers that countries with intensive trade relations are likely to gain relatively more from the monetary integration. However, Frankel and Rose (1998) suggest that a common currency can promote trade and growth and that countries, could become more similar in a currency union than prior to the union. This suggests that it may not be crucial for members to meet OCA criteria before forming a currency union. However, recent studies show a much smaller trade impact of monetary union, particularly in developing countries. This reinforces the importance of meeting optimum currency criteria as prerequisite for forming a currency union.

East African Community member states signed the Protocol on the Establishment of the East African Community Monetary Union (EAMU) in November 2013 as the third stage of integration in the region, aiming at launching a single currency by 2024. Indeed, the treaty for the establishment of the East African Community (EAC) signed by the Heads of State of Kenya, Tanzania, and Uganda in November 1999, and entered into force in July 2000, defines four different stages of integration. These include a Customs Union, a Common Market, a Monetary Union, and a Political Federation. Burundi and Rwanda acceded to the EAC Treaty in June 2007, while South Sudan gained accession in April 2016. The key objective of the EAC is to broaden and deepen cooperation among Partner States in a wide range of areas, including economic, social, political, security, and judicial affairs.

The first stage entailed a Customs Union and came into effect in 2005. This enables Partner States to operate as a free trade area by reducing or eliminating taxes on goods traded within the community, while having a common tariff on goods imported from other countries. The EAC Common Market which entered into force on July 2010, is the second stage of integration. It provides free movement of goods, services, labour, and capital. Founding members of EAC (Uganda, Kenya and Tanzania) set common external tariffs (CET) in 2005, which were adopted by Rwanda and Burundi after joining the community. The purpose of CET was to protect industries of significance to those countries by allowing firms to take advantage of economies of scale in production, selling to a wider market and encourage foreign direct investment (FDI) in the region by allowing international firms free access to a larger market than that of the individual member countries.

Different tariff rates were set: 0% for raw material; 10% for intermediate inputs or semi-finished goods and 25% for finished goods. However, this classification (0-10-25) poses some challenges in its implementation. A number of goods that are subject to the 25% tariff line are classified as raw materials or intermediate inputs according to the UN Board Economic Categories (BEC) classification (TMEA, 2015), which is likely to harm some countries like Rwanda and Burundi, by placing high 25% tariffs on the input for their manufacturing.

In addition, sensitive items (SI) under CET that have tariff rates in excess of 25% have been constraining. Individual countries have repeatedly applied for exemptions in line with SOAs, which are exemptions¹ that individual EAC countries can request from the EAC council of ministers. If exemptions are agreed, the country will apply different rates for a period of one year.

East African Monetary Union (EAMU)

The stated objective of the EAMU is to “promote and maintain monetary and financial stability aimed at facilitating economic integration to attain sustainable growth and development of the community.” As pre-requisites for the EAMU, EAC countries ought to. (i) harmonize and coordinate fiscal, monetary and exchange rate policies; (ii) adopt common principles and rules for payments and settlements; (iii), harmonize policies and standards on statistical information; (iv) introduce bands and gradually fix their bilateral exchange rates; and (v) integrate their financial systems and adopt common principles and rules for the regulation and supervision of the financial system. Moreover, Partner States ought to phase out any outstanding national central bank lending to its government and public entities, while attaining and maintaining the pre-defined macroeconomic convergence criteria for at least three consecutive years before 2024.

Inherent to monetary union is the conduct of a single monetary and exchange rate policy in the interest of the single currency area as a whole. A system of central banks was adopted with a single regional central bank (The East African Central Banks, EACB) to replace the existing National Central Banks (NCBs), which could become its local arms. The primary objective of the monetary policy shall be to achieve and maintain price stability. Without prejudice to the primary objective, the monetary policy shall contribute to financial stability and economic growth and development. In addition, to equip the EACB to conduct its exchange rate policy and to give the EACB control over the use of foreign currency a system of pooled reserves was adopted. In that framework which consists of centralizing the holding and management of foreign reserves, the NCBs would transfer foreign reserve assets in addition to subscribing to and paying up the capital of the EACB.

¹ Many of these items are food staples. Increase in their prices as result of high tariffs affect poor households.

The monetary affairs committee (MAC) of EAC Central Bank Governors was created to harmonize monetary and exchange rate policy formulation and implementation as well as the regulatory frameworks of financial sectors in the region to ensure their stability and development. In their effort of coordinating and harmonizing monetary and exchange rate policies during the transition to the monetary union, EAC central banks' governors decided to adopt price based monetary policy framework by 2018 as money demand functions have become unstable and thus limiting the effectiveness of monetary policies in the region. To achieve that objective, clear measures were adopted to develop the interbank markets in all countries and harmonize monetary policy instruments. For example, an agreement to harmonize reserve requirement regimes in EAC countries by setting the reserve requirement ratio at 5% and the maintenance period to two weeks was reached.

Currently, the reserve requirement ratio is 5.25% in Kenya, 8% in Tanzania, 10% in Uganda, 5% in Rwanda and 3% in Burundi. Central banks also agreed to design and implement a Common exchange rate mechanism, continually assess exchange rate misalignments in the region, develop capacity in modeling and forecasting and adopt Forecasting and Policy Analysis System (FPAS) as well as a common monetary policy communication strategy. Governors meet twice a year to assess the progress done and take additional measures to accelerate the implementation of their decisions.

Important achievements are also recorded in payment system development and harmonization. They include, the integration of payment systems in the EAC region; harmonization of payment system standards for clearing and settlement systems; promotion of interconnectivity of payment cards switches; harmonization of payment systems legal, regulatory and institutional frameworks as well as cross border mobile money initiatives. On the financial system stability and development side, focus was put on integration of financial systems and adoption of common principles and rules for the regulation and supervision of the financial system; development and harmonization of criteria of the Basel Core Principles (BCPs); review, consolidation and harmonization of the existing financial stability assessment frameworks and establishment of working group on macro prudential analysis and stress testing (MAST).

However, the absence of any agreed rules and enforcement mechanism poses challenges to the implementation of decisions by the monetary affairs committee of EAC central banks' governors as well as decisions by other EAC committees.. Indeed, policy coordination and harmonization become problematic in the absence of a rule-based framework that creates discipline among members and reduces the risk of bad policies (Currie, Holtham, and Hughes, 1989). The recent euro zone debt crisis is a good example of weak enforced rules and inadequate policy coordination. In the case of EAC, the implementation of some decisions of EAC central banks' governors has delayed or decisions changed because they are not binding. For example, the decision of governors to set the reserve requirement ratio at 5% by 2018 was modified in 2017 because one central bank failed to manage liquidity in the banking sector and decided to maintain its reserve requirement ratio at high level for a period of four years. Some countries have also postponed the adoption of price based monetary policy to 2021 instead of 2018 initially agreed by EAC central banks' governors. The lack of firm commitment to implement decisions taken by different regional committees to fast-track the implementation of EAMU protocol due to more focus on relative national gains and sovereignty is one of big challenges in the journey towards full regional integration.

To ensure good preparation on the establishment of EAMU, Partner States agreed to create the East African Monetary Institute (EAMI), responsible for the preparatory work for the monetary union. It was also agreed to create the following institutions to support the monetary union: an institution responsible for financial services; an institution responsible for surveillance, compliance and enforcement and an institution responsible for statistics.

A few number of studies assessing the readiness of EAC countries to adopt a monetary union exists. Two main conclusions emerge from those studies. First, exchange rates in EAC countries mostly absorb real asymmetric shocks with the exception of Burundi, exchange rate shock being a source of disturbances to inflation and not to GDP (Paulo Drummond, et al. 2015). Second, there is not a clear evidence about synchronization of business cycles and macro-economic convergence, suggesting that there could be substantial costs for the member countries from a fast-tracked process (Buigut, 2011; Rusuhuzwa & Masson, 2012; Davoodi et al., 2013; Mafusire & Brixiova, 2013; Lepetit et al., 2014; Asongu, 2014bc; Buigui & Valev, 2005 ; Falagiarda, 2010; Kishor & Ssozi, 2011; Sheik et al., 2011).

The overall objective of this research is to re-assess the readiness of East African Community countries for a monetary union by extending the sample of study to cover the recent period when progress was made in policy coordination and implementation of common market protocol. In addition, this paper is a contribution to the existing literature on the assessment of the feasibility of different monetary blocks in Africa, using the case study of EAC.

The rest of the paper is structured as follows. In the section 2, we present a summary of literature review. In the section 3 we analyze how EAC countries have been achieving convergence criteria. In section 4, we evaluate additional indicators linked to OCA theory. In section 5, we conduct empirical analysis about the readiness of EAC countries to form a monetary union, and in the last section, we conclude the paper and propose policy recommendations.

II. Literature review

Theoretical literature review

Most of empirical studies on monetary unions have focused on the capacity of the countries concerned to satisfy optimum-currency-area (OCA) criteria considering that economies subjected to similar terms-of-trade shocks are more-suitable candidates for a monetary union. The reason is that exchange-rate adjustment between those economies will not be needed and this will permit the implementation of a common monetary policy (e.g. Mundell, McKinnon, 1963). The elimination of the transaction costs due to exchanging currencies and exchange-rate volatility are the two main benefits of monetary union (Robson, 1987, p. 140; Tavlas, 1993). Contrary, the main costs of monetary union are those attributable to the inability of monetary authorities of the individual countries to use country-specific monetary policies and the exchange rate as an instrument of macroeconomic adjustment in response to shocks.

This explains why the analysis of the gains and losses arising from the establishment of monetary union focuses on the structural characteristics of the candidates for a monetary union such as (1) analysis of the nature of shocks affecting the economies considered; (2) assessment of the degree

of correlations of movements of real exchange rates and/or the terms-of-trade among the economies; and, (3) analysis of co-movements in cyclical real growth rates among the economies. While earlier work on OCA focused on identifying the characteristics that an economy should satisfy prior to joining a monetary union (i.e., ex ante), the endogenous theory of OCA has focused on changes in economic structure and performance that may result from participation in a monetary union. In other words, the adoption of a common currency can improve the structural characteristics of the economies concerned, increasing trade-integration and business-cycle correlation, and enhancing the credibility of macroeconomic policies (Frankel and Rose, 1998; Rose, 2000). This implies that the participation in a currency area becomes more favorable after a country joins a currency union than before. Thus, the creation of a monetary union can itself create conditions that are favorable for the well-functioning of the union (De Grauwe, 2007, p. 27).

Endogenous OCA theory posits that a common currency can promote trade and growth. In addition to removing the costs of currency conversion, a single currency and a common monetary policy increases price transparency, facilitate foreign direct and portfolio investment and the building of long-term relationships. These outcomes would, promote reciprocal trade as a result, economic and financial integration, and the accumulation of knowledge. Countries could then become more similar in a currency union than before joining the union (Rose et.al, 2001; Mongelli, 2002).

Empirical literature review

Empirical research on feasibility of monetary union differ in terms of used empirical methodologies, countries considered and sample periods which makes the results from all these studies incomparable. Various methodologies were applied, including (i) analysis of correlations of real growth rates; exchange rates / terms-of trade ; (ii) correlations of shocks identified using statistical transformation of data or a Structural Vector Autogression (SVAR) models analysis and, (iii) a cointegration approach. Studies that report correlations of real per capita growth rates aim to provide information on underlying shocks, the idea being that, apart from the impact of trend, movements in output are driven mainly by shocks, considering that cyclical movements in output are the primary result of the shocks.

Karras (2007) calculated correlations of de-trended output growth of nine SADC countries using real GDP based on purchasing-power-parity real exchange rates. He applied the following three methods to estimate the cyclical component of output: (1) first differencing, (2) the Hodrick-Prescott (HP) filter, and (3) the Band-pass (BP) filter to remove the trend from output growth. Using the same approach, Bayoumi and Ostry (2007) calculated bilateral output correlations among country pairs contrary to Karras who estimated correlations of each country's cyclical output component against the SADC total.

Masson and Pattillo (2005) estimated correlations of per cent changes in the terms of trade for 14 SADC countries; Wang et al. (2006) calculated correlations of per cent changes in the terms of trade for Botswana and the four CMA economies; Jefferis (2007) calculated correlations of movements of bilateral nominal exchange rates of twelve SADC countries against the South African rand.

A limitation of this approach is that the techniques do not make a distinction between disturbances to output growth and the policy responses to the disturbances. In addition, the approach does not account for the situation where an identical shock may affect individual countries differently due to differences in key factors such as wage and price flexibility, tax structure, and trade responsiveness (Mélitz, 1991, p. 321; Tobin, 1993).

In order to deal with these limitations, some authors use econometric methods in order to extract the underlying disturbances from real output. Bayoumi and Ostry (1997), Yehoue (2005), and Wang et al. (2006) employed a three-step autoregressive estimation procedure. The growth of per capita GDP (measured as change in the logarithm of real GDP per capita) was regressed upon its own first and second lags. The residuals from this regression (or a measure of the residuals, such as the standard deviation of the residuals) were considered as underlying real output disturbances, and correlations among disturbances were calculated. While autoregressive approach helps separate the underlying shocks from the data, it does not separate demand and supply shocks.

To address this problem, different studies have used the Vector Auto regression (VAR) technique. Bayoumi and Eichengreen (1992) were among the first to identify the underlying structural shocks using the Vector Auto regression (VAR) technique developed by Blanchard and Quah (1989) and measured the incidence of asymmetric demand and supply shocks across members of the former European Community (EC) and compared them with the ones prevailing in the United States.

The idea is that asymmetric supply shocks are likely to continue after monetary unification while asymmetric demand shocks are likely to diminish (since they are partly policy induced). Thus, Countries that are confronted with relatively-large asymmetric supply shocks are not likely to be good candidates for monetary union.

Since then, a large literature including on optimum currency area, has applied this methodology or a related approach to different compositions of country groups in Europe (Bayoumi and Taylor 1995, Ramaswamy and Slok, 1998, Kouparitsas, 1999; Fidrmuc and Korhonen, 2001 and Frenkel and Nickel, 2002) and in East Asia (e.g. Yuen and Ling, 2001 and Zhang et al, 2004).

It is important to mention that the Blanchard-Quah technique involves limitations such as restraining any relationship among variables to be a linear and considering that there are only two kinds of shocks in the economy: a supply shock that is assumed to be permanent and a demand shock that is assumed to be temporary.

Grandes (2003) and Khamfula and Huizinga (2004) used cointegration approach for Botswana and the four CMA countries and tested for cointegration among bilateral real exchange rates, using the rand as the base currency. If the relationships were stationary, the author inferred that the real exchange rates exhibited common trends and that the countries had been subjected to symmetric shocks.

Multivariate cointegration analysis has been applied by a number of authors to test convergence especially for the European Monetary Union (EMU). Haug et al. (2000) used cointegration techniques to analyze which of the European Union (EU) countries would form a successful monetary union based on the nominal convergence criteria defined in the Maastricht treaty. Brada and Kutan (2002) compared the convergence of monetary policy of the Balkan and Mediterranean candidates for EU membership with those of Germany as a proxy for the European Central Bank (ECB).

Khamfula and Huizinga (2004) used a GARCH model to estimate correlations of unanticipated components of bilateral real exchange rates of nine SADC countries against the South African rand, using both monthly and quarterly data over the period 1980-96. The methodology is based on the following three steps.

- (1) Calculate bilateral real rates against the rand and seasonally adjust the change in each bilateral rate using seasonal dummies. Calculate two sets of residuals: one for the monthly data and the other for the quarterly data, used as estimates of unanticipated residuals;
- (2) Regress each of the residuals on its own lags (up to seven lags);
- (3) Squares of unanticipated residuals are used as measures of underlying shocks. In this approach, monthly and quarterly residuals characterize short-run and long-run shocks respectively.

Although there are a number of economic blocks considering monetary union in Africa like the two CFA regions: the West African Economic and Monetary Union (UEMOA) and the region of the Central Bank of central Africa (BEAC), the Southern African Development Community (SADC), and the East Africa Community (EAC), application of this methodology in Africa has been limited.

Fielding and Shields (2001) used the same methodology to compare economic shocks to different members of the two CFA monetary unions. Khamfula and Huizinga (2004) investigated the desirability of a monetary union among the SADC countries using Generalized Auto-Regressive Conditional Heteroscedasticity (GARCH) model to assess the share of the variation in real exchange rates vis-à-vis South Africa that can be explained by the divergence in monetary and fiscal policies.

Dutu and Sparks (2004) assessed the degree of convergence among fourteen SADC countries over the period 1995-98. The variables considered by those authors included annual bilateral exchange-rate changes against the South African rand, inflation rates, external debt-to-GDP ratios, and openness.

There is a few number of empirical studies on the feasibility of monetary union in EAC. Mkenda (2001) employs a Generalized Purchasing Power Parity (GPPP) model developed by Enders and Hurn (1994), this approach uses cointegration methods to find if the prospective countries' macroeconomic variables exhibit long-run relationships. Economies suitable for a monetary union experience symmetric shocks to their macroeconomic variables and thus on average 'move' together. GPPP postulates then that the real exchange rates between countries comprising an optimal currency area should be cointegrated. However, this approach does not distinguish disturbances from responses because movements in macroeconomic variables reflect the combined effects of shocks and responses (Angeloni and Dedola, 1999).

Buigut and Valev (2006) used a VAR analysis, adopting the identification scheme due to Blanchard and Quah (1989) to achieve this distinction in EAC. The study by Kigabo Rusuhuzwa and Paul Mason (2012) used different methodologies and data covering the period 1995-2013. First, the paper examined if EAC countries face correlated trend and cyclical components of their macroeconomic indicators such as GDP using Hodrick Prescott (1997) filter. The paper used a VAR to identify supply shocks, and furthermore, a cointegration approach to test if real effective exchange rates are cointegrated.

Buigut S (2011) applied multivariate cointegration to the case of EAC countries using quarterly data covering the period 1997Q4-2009Q1, considering several criteria (nominal exchange rates, real exchange rates, and inflation rates, monetary base and real output). The monetary base is included as an indicator of monetary policy convergence in absence of consistent long term interest rate data. The monetary aggregate is preferred over other broader aggregates because it is less diluted by intervention by other agents in the financial system, and better able to capture the central bank's policy stance.

Paulo Drummond, et.al (2015) uses different methodologies to identify the degree of susceptibility of the EAC economies to asymmetric shocks; assesses the value of the exchange rate as a shock absorber for these countries; and reviews adjustment mechanisms that would help ensure a successful experience under the monetary union.

The study concluded that despite some similarities in the structures of their economies, country-specific shocks have been prevalent in the last two decades, with EAC economies remaining susceptible to asymmetric shocks. While declining dispersion of growth rates across countries suggests gradual move toward economic convergence in the last decade, cluster analysis indicates that dissimilarities remain large.

III. Convergence criteria

Convergence criteria are rooted in the optimum currency theory stipulating that more convergent economies have greater benefits in being members of currency union. In general, convergence criteria have been defined either, in terms of countries having similar economic behavior, such as closed rates of inflation and economic growth, or in absolute terms, such as all countries candidates for or members of a monetary union to achieving an agreed low rate of inflation.

Convergence is seen as necessary to form monetary unions and various monetary blocs have adopted similar convergence criteria to those in the European Monetary Union (EMU), setting different targets on used macro-economic variables. Based on EMU experience, convergence criteria are obligatory for all countries seeking to join a monetary union or that are already members. In addition, economic conditions in all union member countries have to be similar so that a single monetary or exchange rate policy be effective.

As mentioned, the experience of the EMU has been perceived as successful in bringing benefits to its members. This explains why planned monetary unions have adopted convergence criteria similar to those in Europe and formally intend to converge like in Europe. However, in the case of Africa,, the ability of small, poor countries to meet strict criteria may be limited and one can expect to see planned monetary unions in Africa taking a bit longer to be established.

There is however real danger resulting from political pressures to pursue currency unions in Africa, before convergence criteria are met due to high expectations about the benefits of monetary union such as lower financial transactions costs, more stable monetary conditions, greater exchange rate stability, better price signals, financial market integration, and the objective of creating more solidarity among African countries. This is a challenge because monetary unions require strong signals of convergence resulting from efficient policies, institutions and regional infrastructures to facilitate trade among countries forming a monetary union.

It is therefore critical to examine how countries are converging, before forming a monetary union or at least examine whether there is a clear evidence of structural similarities among monetary union members, free movement of labor, a high degree of economic openness, enabling business environment and diversification in the structure of the economies.

One key issue in proposed unions, is asymmetries in the size and strength of individual union members, the nature of shocks affecting those economies as well as the nature of policies used to deal with those shocks. In the case countries agree to establish a monetary union with limited convergence, the success may depend on the extent that the largest members may be willing to support smaller or weaker members until greater convergence can be achieved. About the nature of shocks, the literature distinguishes two shocks hitting the countries on path to become members of a monetary union namely symmetric and asymmetric shocks. Symmetric shocks affect all union member countries in similar ways. An example could be a sharp hike in food prices that affects all EAC countries. In the case of presence of symmetric shocks, a single monetary policy for the entire union is more likely to be successful. On the other side, asymmetric shocks hit union member countries distinctively. An example would be a hike in international oil prices that may differently affect economies of union countries that produce oil to those which are net importer of oil products. In that case, countries within unions cannot rely on traditional monetary policy and exchange rate, and therefore must rely on other policies available to them (such as taxation, public expenditure, market development, etc.) to deal with the shocks.

3.1. EAMU convergence criteria

In EAC, partners States agreed to monitor the following indicative convergence criteria (i.e. early warning indicators):

- a. Core inflation ceiling of 5 percent;
- b. Fiscal deficit (excluding grants) ceiling of 6 percent of gross domestic product (GDP); and
- c. Tax-to-GDP ratio of 25 percent.

However, macroeconomic convergence will be assessed on the following performance convergence criteria:

- a. Headline inflation ceiling of 8 percent;
- b. Fiscal deficit (including grants) ceiling of 3 percent of GDP;
- c. Gross public debt ceiling of 50 percent of GDP in net present value terms; and
- d. Reserve cover of 4.5 months of imports.

In this section, we analyze recent trends in the indicators pertaining to performance convergence criteria before we analyze other relevant factors as per the Optimum Currency Area (OCA) theory, such as economic structure, trade interdependence and business cycles.

An inspection of the EAC member countries' performance since 2000, relative to the convergence criteria, reveals disparities among countries despite some similarities in the structures of their economies. Each country's outcomes with respect to performance convergence criteria are reported in Table 1. In general, Partner States are on track of achieving the criteria on inflation. However, challenges remain in attaining the criteria on fiscal deficit and adequate level of foreign reserves.

3.2. *Criteria on inflation: Headline inflation ceiling of 8 percent*

Movements in prices in countries may be one of the indicators of convergence or divergence that can be easily assessed. One issue merits consideration. In different prospect monetary unions, countries set a maximum acceptable level of inflation, such as 8 percent in EAC. However, a lower level of inflation in any country could be an indicator of economic problem so that a deflationary bias in many countries would be a serious structural problem for a monetary union.

Two approaches have been used to assess how countries comply with the criteria on inflation. In addition to comparing countries' inflation rates to the convergence criteria, the standard deviation can be used to measure the dispersion between inflation rates. Increased integration between the member countries is likely to result in a reduction in the standard deviation over time. On the other side, widening of the spread can indicate that the real exchange rates of the economies are diverging and affecting the competitiveness of the economies.

In this section, we adopt two approaches to examine how inflation rates in EAC countries have been converging for the last seventeen years. In addition, some research on macroeconomic convergence use unit root tests on inflation differentials to establish whether two (or more) variables are in the process of converging, with large part of the gap between them depending on initial conditions. Stationarity tests, on the other hand, are the most appropriate tool to verify whether the series have converged, meaning that the difference between them tends to remain stable. For inflation differentials, the main interest is to test the hypothesis of absolute convergence; this means, testing whether or not inflation differentials were converging to zero (Fabio Busetti, 2006).

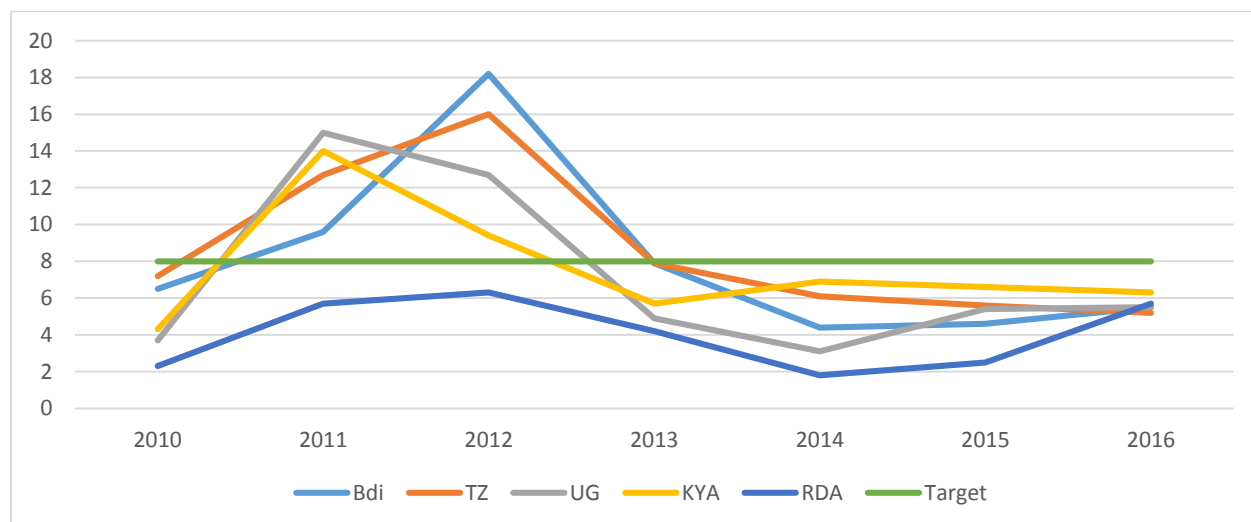
The assessment of the implication of inflation differential on monetary union depends on whether the expansionary effects associated with a real interest rate reduction or the contractionary ones induced by real exchange rate appreciation dominate. The answer to that question will depend on the magnitude of inflation differentials and on their persistence.

Persistent differences in inflation among members of a monetary union may lead to disparities in real interest rates, given that the common monetary policy leads to same nominal interest rates. A country where economic activity is relatively subdued is likely to experience a relatively high real interest rate, because inflationary pressures are less. This situation in turn could add further to the divergence of inflation in the union. However, in the case of absence of exchange rate flexibility, inflation differentials can serve as adjustment mechanism, for countries with higher productivity or lower wage growth than others. Those countries would experience a depreciation of the real exchange rate and thus a gain in trade competitiveness.

As shown in table 1, average inflation rate in each EAC country during the period 2010–16 was below double digits, however with disparities, varying from 4.1% in Rwanda to 8.7% in Tanzania. All countries complied with inflation criteria of keeping headline inflation not exceeding 8% between 2010 and 2016, except for some years. In the period under review, Burundi and Tanzania missed the target twice, Uganda and Kenya once. In addition, inflation was less volatile in Rwanda, with standard deviation (SD) of 1.7. It was more volatile in Burundi (SD=4.5), followed by Uganda (SD=4.3), Tanzania (SD=4.1) and Kenya (SD=3). The volatility in inflation rates is mainly due to supply shocks, particularly changes in food prices and also volatility in regional currencies' exchange rates due to external shocks and structure of economies (the split between the shares in GDP of the traded and non- traded sectors). Understanding the nature of shocks hitting EAC countries is important because of observed difference in volatility in inflation and the important role played by exchange rates as source of disturbances to inflation.

The graph below shows that inflation rates in EAC countries, except in Rwanda were higher in 2011 and 2012 due to high increase in food prices, but declined and remained lower than the target since 2013.

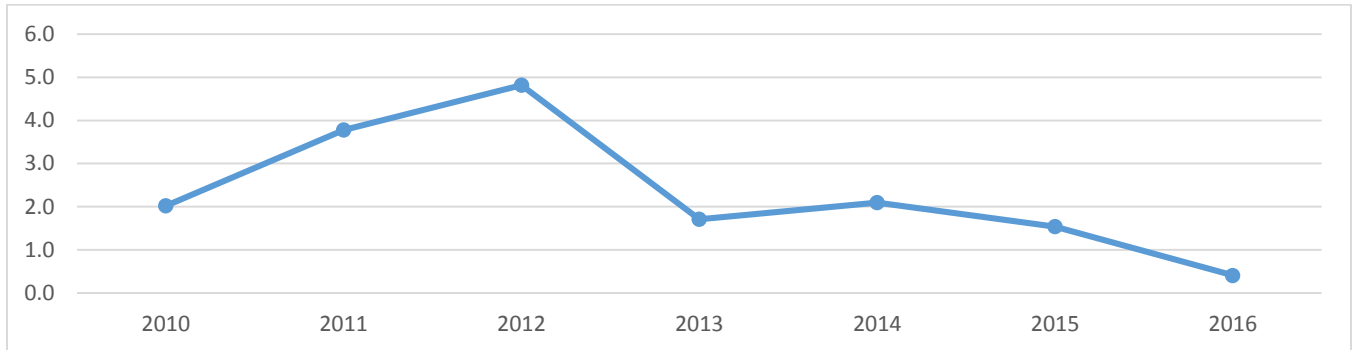
Figure 1: Inflation development in EAC



The cross-country standard deviation of EAC countries' inflation rates increased since 2010, reaching its maximum (4.8) in the 2012 before slowing down to 0.4 in 2016, indicating

convergence in inflation rates during the recent period. High standard deviation in 2010- 2012 is an indication of how the five countries were differently affected by food prices shocks and external shocks.

Figure 2: Inflation development in standard deviation of inflation rates



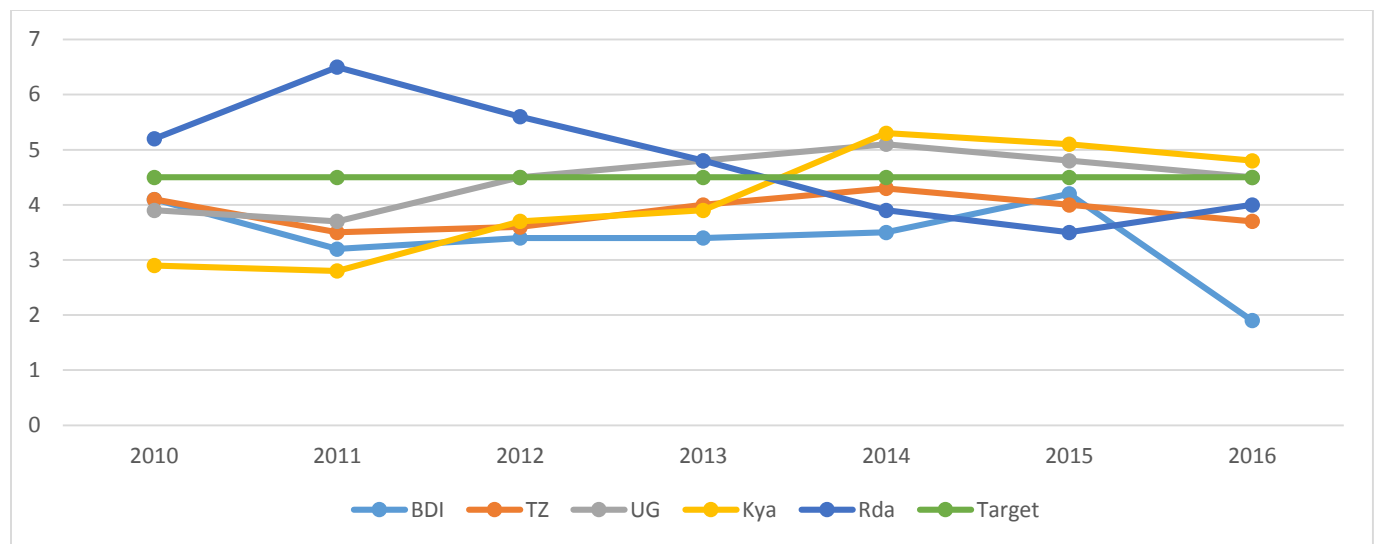
3.3 Reserve cover of 4.5 months of imports.

To be protected against external shocks, EAC countries decided to hold foreign-exchange reserves covering at least 4.5 months of imports. Countries with adequate reserves generally avoided large drops in output and consumption in case of external shocks such as trade shocks, volatile aid, foreign direct investment, and a decline remittance flows.. Foreign reserves in conjunction with sound policies and economic fundamentals can bring significant benefits for countries by reducing the likelihood of balance of payments problems and ensuring economic and financial stability. That is why a regular forward-looking discussion on reserve adequacy is important as it ensures that anticipated changes in baseline external vulnerabilities are taken into account.

According to the IMF definition, reserves are fundamentally an external liquidity buffer and external assets for a country, that are readily available to and controlled by monetary authorities for meeting balance of payments financing needs, for intervention in exchange markets to affect the currency exchange rate, and for other related purposes such as maintaining confidence in the currency and the economy, and serving as a basis for foreign borrowing (IMF, 2011).

The figure below shows that in the period 2010 and 2016, only Uganda complies with the criteria with foreign reserves covering exactly 4.5 months of import on average since 2012. The average level of coverage was 4.1 months of import in Rwanda and Kenya and 3.9 and 3.4 months in Tanzania and Burundi respectively.

Figure 3: International reserves-months of import



Literature on the need of keeping foreign reserves shows that lower levels of reserves are only needed in countries with good institutions and policies (IMF, 2011).

Inability of keeping sufficient levels of foreign reserves is an indication of economic problems, including less diversified economic structure and balance of payments imbalances as well as how vulnerable are EAC countries to external shocks with negative impact on macroeconomic stability. Thus, EAC countries need to not only develop and diversify their economies to generate more foreign reserves but also ensure that they implement efficient policies and create sound institutions for better management of reserves, by clearly identifying responsibility and ensure accountability in the way reserves are effectively and efficiently managed to meet country's needs.

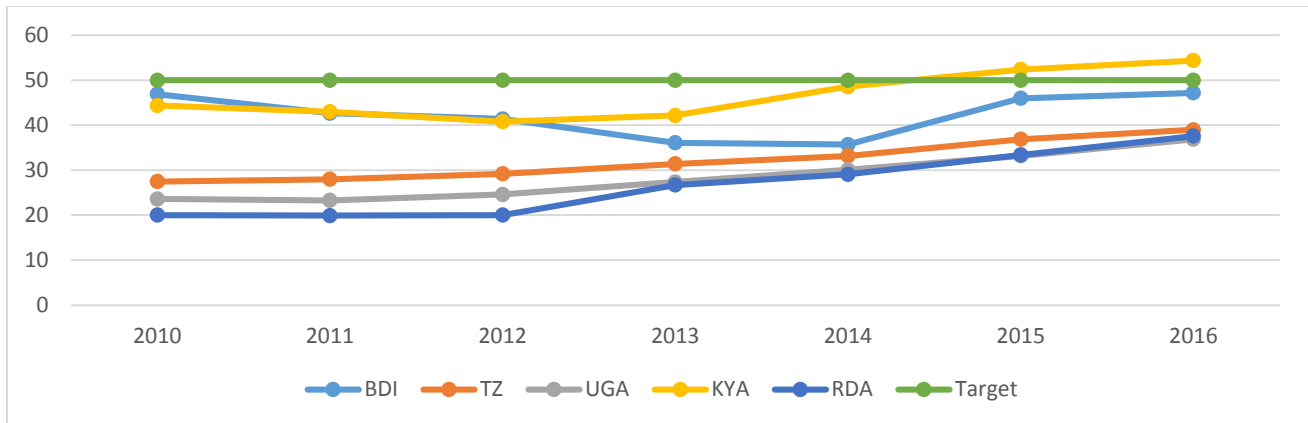
3.3. Government borrowing: Fiscal deficit (including grants) ceiling of 3 percent of GDP and Gross public debt ceiling of 50 percent of GDP in net present value terms; and

Convergence in fiscal policies is very important for the viability of monetary union, because after adoption of a single monetary policy, national fiscal policy will remain the main tool at the disposal of individual countries to respond to national economic shocks. However, fiscal policy stance may differ considerably from a country to another and this has different implications on the monetary union. A country that runs a big budget deficit and borrows heavily from other member countries to cover the deficit could prevent funding from productive investments to the disadvantage of the monetary union as a whole.

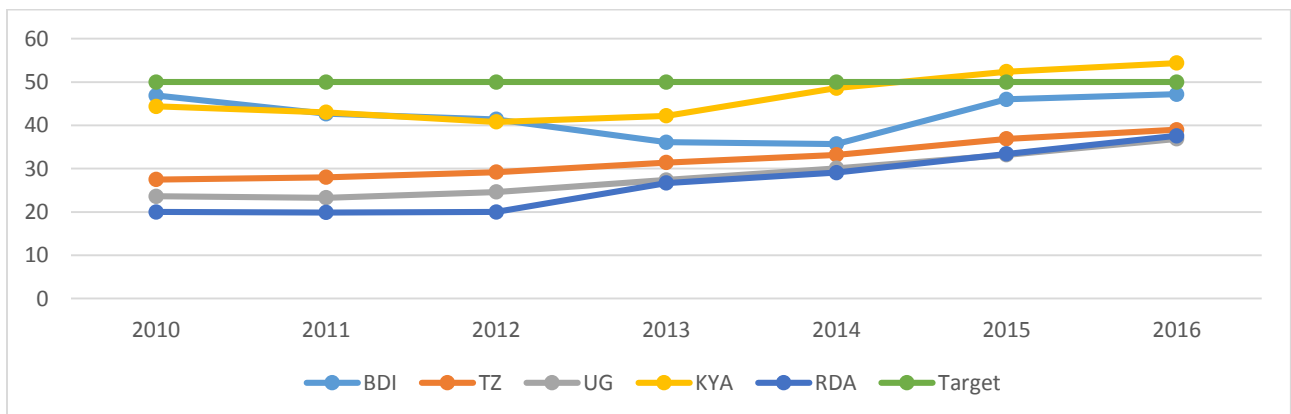
In addition, if many members of a monetary union highly borrow, this would be an indication of structural problems in the union that could tighten investment in private sectors and possibly damage the long-term health of the union. Furthermore, a wide difference of government deficits could indicate that certain economies were drawing in investment capital to the possible detriment on other union members. In summary, in a monetary union, domestic fiscal policies can cause negative spillover effects on other members of the union.

The ratio of government debt to GDP, which is a function of the size of the fiscal deficit is commonly used as convergence criteria in monetary unions as it can provide information on the long-term sustainability of fiscal positions of countries. Stable or declining ratios are considered desirable. High deficits can potentially cause unsustainable growth in the debt ratios, and thus the deficit and debt ratios must be monitored together.

In EAC countries, overall fiscal and external deficits are sizeable, mostly reflecting large infrastructure spending and associated capital goods imports. All EAC countries complied with the criteria of gross public debt ceiling of 50 percent of GDP, except the recent case in Kenya where the ratio increased to 52.4% and 54.4% in 2015 and 2016 respectively. Furthermore, gross public debt as percentage of GDP has been increasing trend is observed in all EAC countries during recent years showing pressures on government budgets leading to more deficit.

Figure 4: Budget deficit as percentage of GDP

About the fiscal deficit, including grants not to exceed 3% of GDP, only Rwanda consistently complied with that criterion between 2010 and 2016. Considering the indicative convergence criteria about fiscal deficit (excluding grants) not to exceed 6 percent of gross domestic product some countries such as Rwanda, Tanzania and Burundi have consistently found it difficult. Combining the two criteria about fiscal deficit including or excluding grants, it becomes apparent that EAC countries' capacity to generate their own revenue remains low compared to their financial demands. The high dependency on grants or aid for economic development is risky for any economy even more dangerous as nations ascend the union given that such donor support is not sustainable source of financing government expenditures.

Figure 4: Gross public debt (% of GDP)

As indicated, fiscal policy will be the main macroeconomic policy tool available to the countries after giving up independent national monetary policy. In addition, the above analysis has shown that fiscal convergence is an area where EAC countries still have considerable challenges.

To achieve this objective going forward, there is a need for EAC countries to agree to explicit and binding fiscal convergence commitments as prerequisites and ongoing commitments for the viability of EAMU.

Complying with fiscal convergence criteria is challenging considering the macroeconomic context of EAC countries, with significant need for investment and development spending. In addition, the countries face significant macroeconomic shocks, such as terms-of-trade shocks from international commodity prices and agricultural productivity shocks from weather as well as international aid shock. Thus, sufficient discretion in national fiscal policy would better enable individual countries to respond to national economic shocks. This calls for not only agreements on fiscal convergence criteria and commitment for fiscal discipline but also the establishment of institution or strong mechanism for enforcement and ensuring compliance by all countries.

Indeed, once the EAC establishes fiscal convergence criteria that best suit the needs of its members, an immediate challenge will be preserving those commitments. Thus, EAC should have an independent institution to oversee issues of fiscal surveillance, decision and enforcement. Independence involves the personnel selection process, the EAC enforcement agency's budget, and the enforcement mechanism avoiding any political pressure. In addition to the establishment of EAMI, it is urgent to fast track the establishment of the institution responsible for surveillance, compliance and enforcement as indicated in EAMU protocol.

History demonstrates that several approaches have widely been used to try ensuring fiscal discipline in monetary unions. These include centralized enforcement (e.g., EMU and WAEMU since 1999), surveillance and persuasion (e.g., ECCU and CEMAC), and decentralized enforcement (e.g., USA).

These approaches attempt to address the imperfect incentives facing the governments when deciding about fiscal policies in each country. For example, elected officials tend to have short time horizons and are tempted to increase borrowing to implement different projects and meet expectations of their constituencies. However, because in a monetary union the costs of borrowing are shared with other member states, elected officials in a member country are constrained to postpone hard choices.

One method is to legally, denounce bailouts although it is difficult in practice. If a state member of a monetary union is about to deny its debt, its creditors may be spread throughout the monetary union. Greece and Ireland are a case in point. Despite the Maastricht Treaty's "no-bailout" clause, 27 the two countries received bailouts because in a monetary union where countries are more integrated, costs of not bailing out a country may eventually exceed the costs of bailing out that country.

A second method is to create a firm and categorical rule banning deficits and debt beyond a certain level. To ban behavior, the sanctions applied to non-compliant countries must be prohibitive. This approach has advantages because violations are easy to identify and are uniformly punished. However, during periods of economic hardship, these rules are also difficult to implement in a monetary union. They can unwisely prevent sound economic policies to limit negative impact of economic problems affecting the population of the concerned country. Thus, such rule is likely to face political resistance. In addition, in an integrated monetary union, the costs of not increasing budget deficits may spill over and affect other member states. As such, the rule is likely to face severe political resistance.

A third method might be enforcement with a more flexible, multifactor balancing test. This rule would allow the judge of excessive deficits to consider a country's circumstances to determine the economic merits and demerits of a particular deficit. The big challenge related to this approach is that such rules rely heavily on the judge's subjective opinions and this can lead to disagreement among countries. The former East African Currency Board, which was in place from 1960 to 1966 and composed by Uganda, Kenya and Tanzania is a good case about challenges associated to this approach. By 1964 both Tanzania and Uganda had reached their borrowing limits and wanted to raise the limits to borrow more but after Kenya's approval. This situation contributed to dissolving the monetary union within six years of independence.

Table 1: EAC Macroeconomic convergence criteria

Country	Indicator	2010	2011	2012	2013	2014	2015	2016	Average	SD
Burundi	Headline inflation	6.5	9.6	18.2	7.9	4.4	4.6	5.5	8.1	4.5
	International Reserves (months of imports)	4.1	3.2	3.4	3.4	3.5	4.2	1.9	3.4	0.8
	Fiscal deficit, including grants (in % of GDP)	-3.6	-3.9	-3.7	-1.7	-3.4	-5.3	-6.2		
	Gross public debt (% of GDP)	46.9	42.7	41.4	36.1	35.7	46	47.2		
Tanzania	Headline inflation	7.2	12.7	16	7.9	6.1	5.6	5.2	8.7	4.1
	International Reserves (months of imports)	4.1	3.5	3.6	4	4.3	4	3.7	3.9	0.3
	Fiscal deficit, including grants (in % of GDP)	-4.8	-3.6	-4.1	-3.9	-3	-3.3	-3.8		
	Gross public debt (% of GDP)	27.5	28	29.2	31.4	33.2	36.9	39		
Uganda	Headline inflation	3.7	15	12.7	4.9	3.1	5.4	5.5	7.2	4.3
	International Reserves (months of imports)	3.9	3.7	4.5	4.8	5.1	4.8	4.5	4.5	0.5
	Fiscal deficit, including grants (in % of GDP)	-5.8	-2.6	-3	-3.9	-3.3	-2.7	-3.6		
	Gross public debt (% of GDP)	23.6	23.3	24.6	27.4	30.1	33.2	36.9		
Kenya	Headline inflation	4.3	14	9.4	5.7	6.9	6.6	6.3	7.6	3
	International Reserves (months of imports)	2.9	2.8	3.7	3.9	5.3	5.1	4.8	4.1	1.0
	Fiscal deficit, including grants (in % of GDP)	-4.4	-4.1	-5	-5.7	-7.4	-8.2	-7.3		
	Gross public debt (% of GDP)	44.4	43	40.8	42.2	48.6	52.4	54.4		
Rwanda	Headline inflation	2.3	5.7	6.3	4.2	1.8	2.5	5.7	4.1	1.7
	International Reserves (months of imports)	5.2	6.5	5.6	4.8	3.9	3.5	4	4.8	1.1
	Fiscal deficit, including grants (in % of GDP)	-0.7	-0.9	-2.5	-1.3	-4	-2.8	-2.4		
	Gross public debt (% of GDP)	20	19.9	20	26.7	29.1	33.4	37.6		

Source: MAC, August 2017

In addition to reviewing the union's regular convergence indicators, various other measures could be monitored. They include real exchange rates, change in terms of trade, economic structures and intraregional trade. Some of these indicators will be analyzed in section four. Real exchange rates within a currency union influence competition and cross-border trade, while competitiveness of each country in a monetary union is a function both of the union exchange rate and the prices in each country.

A country with higher inflation relative to other union members will become externally less competitive as its real exchange rate rises. In a monetary union, changes in real exchange rates due to variations in prices may lead countries members to have large differences in their external trade patterns in terms of origins, destinations and composition of trade. This can create situations where the common monetary and exchange rate policies are inappropriate for some member countries. Terms of trade shifts can affect competitiveness and current account positions between monetary union members and can create political conflicts between members because gains of one member come at a cost to other members.

The level of economic diversification is also important in a monetary union because the more diversified economies are; the more likely that those economies will be affected by similar shocks. In addition, more diversified economies have greater flexibility to adjust to shocks and to buffer shifts in demand. Two opposite effects of entry in monetary union on industrial concentration have been hypothesized in the literature. First, monetary union will cause greater inter-industry specialization because firms exploit their comparative advantages within larger markets, which reduces trade diversification. Second, increased inter-industry specialization results as suppliers link up with industrial customers throughout the union, which will increase trade diversification.

3.4. Other convergence indicators

Economic growth in EAC countries

Overall macroeconomic performance in EAC countries is mixed and economic structures are generally diverse in terms of economic growth and industrial structures. Kenya is the largest economy accounting for an average of 38.4% per cent of total EAC GDP between 2000 and 2016, followed by Tanzania (34.1%), Uganda (20.1%), Rwanda (4.8%) and Burundi (2.4%). Kenya is also relatively industrialized and diversified while most of the other economies are small and relying on a narrow range of commodity exports. Kenya is the regional trade hub and its private enterprises lead the intraregional investment. For example, Kenyan banks operate across the region, with subsidiaries in the rest of EAC countries.

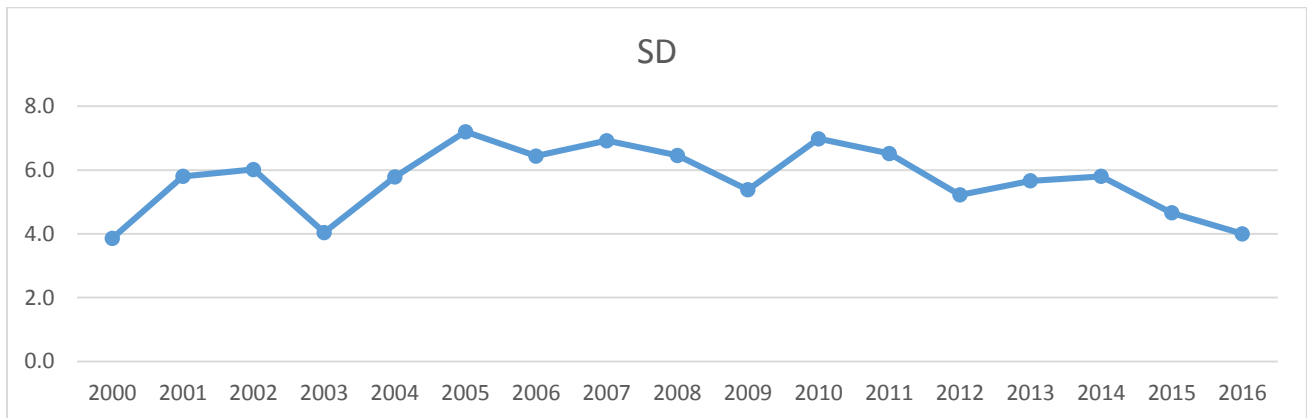
The real economic growth rates were diverse, ranging from an average of 3.1% in Burundi and 7.9% in Rwanda between 2010 and 2016 (Table 2). During the last five years (2012-2016), real economic growth was not only low but very volatile in Burundi, averaging 2% with a standard deviation of 4.3. Average GDP growth rates remain higher in Rwanda (7.2%) followed by Tanzania (6.7%), Kenya (5.4%) and Uganda (4.1%). During that period, economic growth was less volatile in Kenya (SD=0.5) and Tanzania (SD=0.9).

Table 2: real GDP growth

	Burundi	Kenya	Rwanda	Tanzania	Uganda
2000	1.8	0.3	8.4	4.9	3.9
2001	1.7	4.0	8.5	6.0	8.8
2002	2.4	0.5	13.2	6.9	7.1
2003	2.5	2.9	2.2	6.4	6.2
2004	3.8	4.6	7.5	7.2	5.8
2005	4.4	5.7	9.4	6.5	10.0
2006	5.4	5.9	9.2	4.7	7.0
2007	3.5	6.9	7.6	8.5	8.1
2008	4.9	0.2	11.2	5.6	10.4
2009	3.8	3.3	6.3	5.4	8.1
2010	5.1	8.4	7.3	6.4	7.7
2011	4.0	6.1	7.8	7.9	6.8
2012	4.4	4.6	8.8	5.1	3.2
2013	5.9	5.7	4.7	7.3	4.7
2014	4.5	5.3	7.6	7.0	4.6
2015	-4.0	5.7	8.9	7.0	5.7
2016	-1.0	5.8	5.9	7.0	2.3
Average	3.1	4.5	7.9	6.4	6.5
SD	2.5	2.3	2.4	1.1	2.3
AV5	2.0	5.4	7.2	6.7	4.1
SD5	4.3	0.5	1.8	0.9	1.3

Additionally, declining dispersion of growth rates across countries in the last years suggests only a gradual move toward economic convergence and indicates differences in real GDP growth.

Figure 4: Real GDP-Standard deviation development



Furhermore, the more similar the economic structures of the potential candidates for a monetary union are, so is the effects of the impact of sector-specific shocks on their economies, and less national monetary policies are needed. In all EAC countries, the ratio of the agricultural sector to GDP remains high but has been declining overtime in all the five countries as the share of services in GDP was increasing. That is an indication of progressive diversification in EAC economies. The share of services in GDP increased from 28.5% to 38.3% between 1990/5 and 2012/6 in Burundi. It increased from 36.08% to 47.6; from 40.48% to 44% and from 35.88% to 50% in Rwanda, Tanzania and Uganda respectively in the same period; while remaining stable in Kenya slightly declining from 49.58% to 49.3%. However, the industry sector share in GDP remain low in all countries. This limits intra-regional trade of industrial products and increases the dependence of the region to the rest of the world in terms of trade.

Table3: GDP by economic activities (%)

		1990-1995	1996-2001	2002-2006	2012-2016
Agriculture	Burundi	50.82	46.35	38.8	36.1
	Kenya	30.09	31.68	27.9	22.3
	Rwanda	42.72	43.55	42.02	28.4
	Tanzania	44.80	44.06	44.3	24.6
	Uganda	50.09	38.57	32.01	22.9
Industry	Burundi	20.70	17.44	19.2	15.6
	Kenya	20.34	17.60	17.9	19
	Rwanda	21.20	19.04	19.97	16.9
	Tanzania	14.72	14.83	16.2	21.8
	Uganda	14.03	19.45	21.5	19
Services	Burundi	28.48	36.21	42.0	38.3
	Kenya	49.58	50.72	54.3	49.3
	Rwanda	36.08	37.40	38.0	47.6
	Tanzania	40.48	41.11	39.5	44
	Uganda	35.88	41.99	46.52	50

The differences in structure of economies in EAC explain why growth correlations are low, except between Kenya and Tanzania. In addition, negative correlations indicate lack of synchronization of shocks between some countries.

Table4: Simple correlation of GDP growth

	Uganda	Kenya	Tanzania	Rwanda	Burundi
Uganda	1				
Kenya	-0.5	1			
Tanzania	-0.5	0.8	1		
Rwanda	0.2	-0.2	-0.3	1.0	
Burundi	0.03	-0.1	-0.1	-0.1	1

The implication in terms of the adoption of common currency is that the differences in structure of economies call for a sufficient period of preparation before the establishment of EAMU. A fast track process would lead to considerable costs for EAC countries.

The euro area's success, which has stimulated interest in monetary unions in other regions, took many years to establish EMU, despite less fiscal problems and credible institutions with competent bureaucracies that cooperate closely for more than 50 years. Building of effective institutions for enforcing fiscal discipline and enabling macroeconomic surveillance, structural reforms, development of necessary regional infrastructures and policy harmonization that would enhance business cycle management are essential in EAC before the adoption of a common currency.

Unfortunately, the establishment of institutions to support the implementation of EAMU protocol has delayed due to lack of clear commitment by partner states. The East African Monetary Institute (EAMI) was supposed to be established in 2015, but end 2017 the bill for its establishment is not yet enacted by competent authorities. The experience of European Monetary Union show that the European Monetary Institution (EMI) played a crucial role in the establishment of the monetary union by spearheading the harmonisation of policies, monitoring convergence criteria, standardisation of the statistical procedures and conducting relevant studies. Therefore, there is need to fast track the establishment of the East African monetary Institute (EAMI) so as to benefit from the crucial role it would play.

3.4.1. Intra-regional trade

According to the OCA theory, countries with intense trade linkages among themselves could in principle benefit from the introduction of a common currency.

Table 5 shows the extent of intra-regional trade among the EAC countries. Trade linkages (the proportion of imports and exports to EAC countries as a share of total imports and exports of individual member countries) between EAC countries has been increasing overtime due to the implementation of common market protocol, but remain low.

Total intra EAC trade increased by 151.7%, from USD 2137.34 million in 2006 to USD 5380.31 million in 2015, but with significant disparities among EAC countries. Kenya accounts for 35.6% of total inter EAC trade (61.4% of exports and 14.9% of imports) followed by Uganda which accounts for 28.1% (13.1% of exports and 19.6% of imports), Tanzania accounting for 19.9% (22% of exports and 31.8% of imports), Rwanda accounting for 12.5% (3% of exports and 25.2% of imports) and Burundi accounting for only 3.9% (0.5% of exports and 8.4% of imports).

Table 5: Intra EAC trade (imports and exports, in USD million)

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Average
Burundi	66.4	85.1	91.3	135.1	102	291.5	163.2	378.9	178.2	174.6	166.63
Tanzania	333.3	316	464.9	640.4	689.7	794.8	1198.4	1517	1310.9	1281.6	854.7
Uganda	637.9	802.3	1095.6	1077.1	1144.1	1373.4	1437.4	1429.9	1523.2	1583.8	1210.47
Kenya	821.5	1137.1	1375.7	1329.4	1535.5	1847.6	1961.5	1785.4	1847.7	1700.8	1534.22
Rwanda	278.24	361.2	507.35	496.99	567.51	550.43	648.15	639.33	689.25	639.51	537.796
Total	2137.34	2701.7	3534.85	3678.99	4038.81	4857.73	5408.65	5750.53	5549.25	5380.31	4303.816

Between 2006 and 2015, total trade with other EAC countries as percentage of total trade in Burundi averaged 22.5%. It was 30.5% in Rwanda and only 6.1%; 8.4% and 17.4% in Tanzania, Kenya and Uganda respectively. The three countries recorded more exports than imports in EAC leading to an overall intra-regional trade surplus balance while Rwanda and Burundi recorded overall intra trade deficit, as they import more from the EAC than they export.

Rwanda and Burundi have had consistent trade balance deficit within EAC, amounting to USD 139.2 million and USD 375.6 million respectively on average, between 2006 and 2015. The coverage of imports from EAC by exports to EAC was only 8.9 and 17.2 for Burundi and Rwanda respectively in the period under review. Kenya has the largest trade surplus balance with EAC, amounting USD 993.8 million between 2006 and 2015, followed by Tanzania with USD 143.5 million and Uganda with USD 60 million in the period under review. During the same period, the total exports from the intra EAC trade amounted to US 2,493.2.6 million while the total imports amounted to US 1,810.6.5 million, giving an intra-regional trade surplus of US 682.5 million.

In summary, data on intra EAC trade show that Kenya plays an important role in EAC trade as confirmed by its high shares in Burundian, Rwandan and Ugandan trade. For these three countries, Kenya's markets represent an important import source. In addition, imports of Kenya from the other EAC members are negligible. Furthermore, Kenyan exports depend significantly on the other EAC countries (36.61% of her total exports).

On the other side, Tanzanian trade with the other EAC members is quite low. This can be explained by the lack of adequate infrastructures between Tanzania and the other EAC members and the fact

that Tanzanian trading relations are carried out mostly by sea and with SADC countries. The trade links of Burundi and Rwanda (and to some extent those of Uganda) with the other EAC members, is quite high, both in terms of exports and imports and this is explained by the fact that these countries are small and landlocked. The introduction of a common currency today would probably be beneficial to EAC, except for Tanzania, which seems to be relatively isolated from other EAC members.

Despite the relatively large volume of trade among the EAC countries, significant challenges to monetary integration remain, including the following: (i) low per capita income levels, resulting in internal markets of limited sizes; (ii) the concentration of most countries on primary-commodity exports; (iii) limited transportation facilities and large distances between population centers; and, (iv) relatively-high shares of informal trade because of permeable borders.

Table 6: Export to and import from EAC, as percentage of total exports and imports

	Burundi		Tanzania		Uganda		Rwanda		Kenya	
	Export	Import	Export	Import	Export	Import	Export	Import	Export	Import
2006	9.2	13.8	7.9	4.5	22.3	16.8	25.6	44.6	21.3	1.1
2007	9.7	25.7	10.3	1.9	22.6	13.5	25.5	42.9	23.2	2.1
2008	9.5	21.0	8.3	3.0	26.4	12.7	17.2	40.7	23.6	1.6
2009	8.8	32.1	10.8	4.9	25.3	12.7	24.6	36.6	26.2	1.6
2010	12.4	17.6	9.9	3.7	28.3	12.1	21.3	37.1	24.7	2.1
2011	19.7	35.3	8.7	3.4	25.8	12.7	20.8	24.8	26.8	2.0
2012	11.9	19.6	9.7	5.8	27.1	11.1	23.9	24.2	26.1	2.2
2013	17.2	38.0	21.6	3.2	27.7	11.0	21.5	23.0	24.9	2.0
2014	10.9	21.4	10.5	5.6	29.8	11.8	23.8	22.9	23.4	2.3
2015	11.8	19.3	12.7	2.7	34.1	12.1	21.5	22.5	21.8	2.5

Table 7: Export to and import from EAC in USD million

	BURUNDI			Tanzania			Uganda			Kenya			Rwanda		
	E	I	Total	E	I	Total	E	I	Total	E	I	Total	E	I	Total
2006	5.5	60.9	66.4	158	176	333.3	265	373	637.9	740.9	80.6	821.5	37	276	313
2007	5.5	79.6	85.1	206	110	316	402	401	802.3	945.6	192	1137.1	45	246	291
2008	6.6	84.7	91.3	260	205	464.9	582	513	1096	1193	182	1375.7	142	384	526
2009	6	129	135.1	324	317	640.4	589	489	1077	1167	162	1329.4	48	437	485
2010	12.6	89.4	102	394	296	689.7	613	531	1144	1279	257	1535.5	55	341	396
2011	24.4	267	291.5	417	379	795.4	650	724	1373	1545	303	1847.6	81	385	466

2012	16	147	163.2	520	679	1198	761	676	1437	1596	365	1961.5	344	448	791
2013	32.6	346	378.9	1.120.0	397	397	783	647	1430	1451	335	1785.4	123	413	536
2014	14.3	164	178.2	601	710	1311	798	725	1523	1431	417	1847.7	142	546	688
2015	13.9	161	174.6	992	289	1282	910	674	1584	1291	410	1700.8	120	519	639

Before empirically assessing the readiness of EAC countries for monetary union, we focus on the measurement of convergence criteria. Because these criteria have to have a legal force and used as a basis for admission to the monetary union or sanctioning member countries that fail to meet the criteria, a strong emphasis has to be placed on the quality and cross-country comparability of the statistics used to compile the indicators. Therefore, statistical standards aligned with international statistical reporting requirements are essential and statistics must be transparent and suitable for a wide range of analyses and public purposes.

Thus, statistical programs must be strong and the infrastructure must be in place well before a proposed monetary union can be formally established. There is a strong need for an early development of statistical systems in the monetary union-building process.

The experience of EMU show that members of the Euro Area manage a high degree of periodicity and timeliness for their statistics enabling rapid policy responses, and a degree of certainty among policymakers since they have a good understanding of current economic conditions. During the period of financial turmoil, when economic conditions are changing rapidly, and there is wide uncertainty about the management of the economy and of the financial sector in particular, the availability of accurate, timely, and reliable economic data becomes critical.

The IMF launched a number of data initiatives as part of its new emphasis on designing, implementing, and monitoring observance of a range of standards and codes. The SDDS and GDDS were launched and prescribe levels of timeliness, coverage, and periodicity for a wide range of macroeconomic indicators, including those covered in the convergence criteria.

With the support of IMF, EAC countries have achieved significant progress in ensuring good quality of data, particular monetary and financial data. But challenges remain on the periodicity and availability of data as well as on the quality of economic and fiscal data.

In their last meeting, held in September 2017, EAC central banks' Governors noted that measurement of some indicators used to assess convergence criteria need to be harmonized for comparability purpose (MAC, 2017). The ongoing process of harmonization and standardization of measurement, standards and laws relating to production, analysis and dissemination of statistics need to be fast tracked by the Sectoral Council of Fiscal and economic affairs.

IV. Empirical analysis

In this paper, the empirical analysis of the readiness of EAC countries for monetary union is based on two different methodologies. First, analyze correlations of shocks identified using a three step auto regressive estimation procedure on one side, and Vector Auto Regressive (VAR) models on the other side. Second, we use multivariate cointegration techniques to assess the existence of long-term relationship among for key variable across countries such as inflation rates, exchange rates and interest rates.

4.1.Three Step Auto Regressive procedure

Following Bayoumi and Ostry (1997), we use a three-step autoregressive estimation procedure as follow. First, we regress the growth of change in the logarithm of real GDP upon its own first and second lags. Second, we consider the residuals from this regression as underlying real output disturbances. Third, we calculate correlations of real output disturbances among EAC countries.

The table 8 shows that underlying real output disturbances are negative in general showing non-synchronization of shocks, except between Kenya and Tanzania and between Tanzania and Uganda, though the coefficient are very small. Correlations reported in the table 8 do not support the assumption that EAC is an optimum currency area.

Table 8: Correlations of EAC real output disturbances

	EB	EK	ER	ET	EU
EB	1				
EK	-0.04	1			
ER	-0.15	-0.01	1		
ET	-0.05	0.72	-0.190	1	
EU	0.10	0.02	-0.004	0.13	1

4.2 Vector Auto regressive (VAR) models

We estimate a bivariate vector-autoregressive (VAR) model using the log of real GDP and inflation, adopting the identification scheme due to Blanchard and Quah (1989) to separate supply and demand shocks in EAC countries. In this scheme, permanent shocks are interpreted as aggregate supply shocks, and transitory shocks as aggregate demand shocks.

The model is set up as follows:

$$\text{Let } y_t = (\Delta y_{1t}, y_{2t})' \quad (1)$$

Where y_{1t} is the log of real GDP and hence Δy_{1t} is the growth rate of output, and y_{2t} is the Inflation, which is calculated as change in the of prices . The structural model to reflect the dynamics from period $t-1$ to t is specified as follows:

$$\beta y_t = \gamma_0 + \Gamma_1 y_{t-1} + \varepsilon_t; \varepsilon \rightarrow i.i.d.(0, \sigma^2) \quad (2)$$

Where $\varepsilon_t = (\varepsilon_{dt}, \varepsilon_{st})'$; ε_{dt} are demand shocks and ε_{st} are supply shocks, and they are orthogonal.

The reduced form vector autoregressive (VAR) of equation (1) can be represented as follows:

$$y_t = a_0 + A_1 y_{t-1} + u_t \quad (3)$$

Where $a_0 = B^{-1}\gamma_0$; $A_1 = B^{-1}\Gamma^{-1}$; $u_t = B^{-1}\varepsilon_t$ and A_1 represents the impulse response functions of the shocks to the growth of real GDP and inflation. In order to generate the impulse response functions, we apply the Wold Decomposition Theorem on equation (3) and derive the structural moving average representation of y_t which becomes:

$$y_t = \mu + \theta(L)\varepsilon_t \quad (4)$$

where μ is a vector of constants and L is a lag operator. Equation (4) is an infinite series.

In matrix form equation (4) can be expanded as follows:

$$\begin{bmatrix} \Delta y_{1t} \\ y_{2t} \end{bmatrix} = \begin{bmatrix} \mu_1 \\ \mu_2 \end{bmatrix} + \begin{bmatrix} \theta^{(0)}_{11} & \theta^{(0)}_{12} \\ \theta^{(0)}_{21} & \theta^{(0)}_{22} \end{bmatrix} \begin{bmatrix} \varepsilon_{dt} \\ \varepsilon_{st} \end{bmatrix} + \dots \quad (5)$$

Hence the impulse response functions are derived as:

$$\theta_{11}^{(s)} = \left[\frac{\partial \Delta y_{1t+s}}{\partial \varepsilon_{dt}} \right]; \theta_{12}^{(s)} = \left[\frac{\partial \Delta y_{1t+s}}{\partial \varepsilon_{st}} \right]; \theta_{21}^{(s)} = \left[\frac{\partial y_{2t+s}}{\partial \varepsilon_{dt}} \right]; \theta_{22}^{(s)} = \left[\frac{\partial y_{2t+s}}{\partial \varepsilon_{st}} \right] \quad (6)$$

Considering that demand shocks do not affect the level of output in the long-run, while both shocks may affect the price level, this implies that the cumulative effect of demand shocks on real GDP

is zero. That is $\theta_{11}(1) = \sum_{s=0}^{\infty} \theta_{11}^{(s)} = 0$

Thus, the long-run impact matrix which is used to identify the B matrix in a structural VAR is as follows:

$$\theta(1) = \begin{bmatrix} 0 & \theta_{12}(1) \\ \theta_{21}(1) & \theta_{22}(1) \end{bmatrix} \quad (7)$$

Combining equations (4) and (7), we express output and inflation as a function of the demand and supply shocks.

$$\varepsilon_t = (y_t - \mu)\theta(1)^{-1} \quad (8)$$

In order to extract the structural shocks we estimated the VAR for each country. The number of lags to be used is determined based on the AIC and BIC lag length criteria. Unit root tests were carried out on the log of real GDP and CPI using the Augmented Dickey-Fuller. Both log of real GDP and log of CPI are found to be I(1). As inflation is I(0) in each country, the log of real GDP was therefore first-differenced before it could be used in a VAR model.

A structural VAR was estimated with the long-run restriction that demand shocks have no effect on the level of real GDP.

Before using the estimated models to separate demand and supply shocks, we have analyzed the quality of those VAR models. First, all VAR models satisfy the stability condition as no root lies outside the unit circle. Second, residuals from VAR models are homoscedastic and are normally distributed, except in the case of Rwanda and Burundi. However, in the two cases, the normality is violated due to excess kurtosis rather than skewness and this is not expected to much impact our results (Gonzalo, 1994).

As mentioned, the long-run impact matrix which is used to identify the B matrix in a structural VAR as defined in equation (7) was estimated for each country as follow. The table below indicates the estimated matrix

$$\theta(1) = \begin{pmatrix} 0 & C(2) \\ C(1) & C(3) \end{pmatrix}$$

Table 9: Estimated coefficients C(i)

	Rwanda			
	Coefficient	Std. Error	z-Statistic	Prob.
C(1)	9.509491	1.037571	9.165151	0.0000
C(2)	0.012268	0.001339	9.165151	0.0000
C(3)	1.299261	1.474178	0.881346	0.3781
Uganda				
C(1)	8.229049	0.908746	9.055385	0.0000
C(2)	0.008418	0.000930	9.055385	0.0000
C(3)	-0.864880	1.288706	-0.671123	0.5021
Kenya				
C(1)	3.962957	0.437635	9.055385	0.0000
C(2)	0.008011	0.000885	9.055385	0.0000
C(3)	-4.492425	0.793202	-5.663656	0.0000
Tanzania				
C(1)	8.608991	0.939318	9.165151	0.0000
C(2)	0.018398	0.002007	9.165151	0.0000
Burundi				
C(3)	-2.450953	1.355046	-1.808760	0.0705
C(1)	18.51640	1.996675	9.273618	0.0000
C(2)	0.023941	0.002582	9.273618	0.0000
C(3)	12.57107	3.132252	4.013430	0.0001

A structural VAR was estimated with the long-run restriction that demand shocks have no effect on the level of real GDP. In other words, we estimate VAR models for each country, taking into consideration the estimated matrix $\theta(1)$ which allows us to separate demand and supply shocks. All estimations were done using EViews version 8.

As shown in the table 9, demand shocks correlations are all not statistically significant. In addition, the results indicate that the correlations are positive except correlations between Kenya and Burundi, Kenya and Rwanda and Tanzania and Burundi.

Table 9: Correlations of demand shocks

Correlations							
			Burundi	Kenya	Uganda	Tanzania	Rwanda
Kendall's tau_b	Burundi	Correlation Coefficient	1.000				
	Kenya	Correlation Coefficient	-0.022	1.000			
	Uganda	Correlation Coefficient	0.166	0.100	1.000		
	Tanzania	Correlation Coefficient	-0.010	0.173	0.059	1.000	
	Rwanda	Correlation Coefficient	-0.131	-0.117	0.037	0.051	1.000

Contrary to demand shocks, supply shocks correlations are positives and statistically significant, though small, except correlations between Burundi and Tanzania; Burundi and Uganda; Uganda and Tanzania and Uganda Rwanda. In other words, supply shocks in Kenya are positively and significantly correlated with shocks in all other EAC countries; Supply shocks in Rwanda are positively and significantly correlated with supply shocks in Burundi and Tanzania

Table 10: Correlations of supply shocks

Correlations							
			Burundi	Kenya	Uganda	Tanzania	Rwanda
	Burundi	Correlation Coefficient	1.000				
	Kenya	Correlation Coefficient	0.241*	1.000			
	Uganda	Correlation Coefficient	0.195	0.393**	1.000		
	Tanzania	Correlation Coefficient	0.168	0.405**	0.212	1.000	
	Rwanda	Correlation Coefficient	0.373**	0.217*	0.171	0.315**	1.000
*. Correlation is significant at the 0.05 level (2-tailed).							
**. Correlation is significant at the 0.01 level (2-tailed).							

4.3 Multivariate Cointegration framework

A multivariate cointegration framework (Johansen, 1994; Johansen, 1995) is used to test the existence of long-run relationships that tie together variables in each criterion across the EAC countries. Because convergence implies co-movements of specific variables over time, the cointegration approach is well-suited to assess the feasibility of the proposed EAC monetary union. Based on a separate VECM set up for each variable(inflations, exchange rates and lending rates),

convergence would be complete if there are $(n-1)$ cointegrating equations or shared common trends, with n being the number of variables included in the VAR model.

In time series econometrics the assumption of stationary data needs to be fulfilled in order that estimation properties hold. As the variables we consider here are generally assumed to be integrated of first order, a cointegration approach is not only appropriate but also allows to find out if common stochastic trends drive the different variables over the long run. If that is the case, linear combinations of considered variables will appear stationary as the stochastic properties cancel out. These combinations represent long run relationships in the data and indicate the level of convergence that exists among the variable. Let us assume we have $p=5$ variables such as monthly inflation data of Burundi, Kenya, Rwanda, Tanzania and Uganda and r is the number of cointegrating vectors. Assuming that there is no cointegration relationship ($r=0$), this indicates that all variables are driven by individual stochastic trends, hence the whole system is driven by $p-r=5$ “common” trends. In that case, no convergence is found and countries may not be good candidates for a monetary union.

If we find $r=4$ thus $p-r=1$, would mean that all variables are driven by the same stochastic trend and maximum convergence among the variables is achieved. Suppose $r=3$, thus variables are driven by 2 ($p-r=2$) common trends and in that case, we have partial convergence. In the next section we outline the procedure how the number of cointegrating relationships can be identified.

4.3.1. Model specification

First, we have set up a well-specified vector autoregressive (VAR) model for each group of variables, as we are interested in the stage of convergence among inflation rates, exchange rates and lending rates in the EAC countries. In the analysis, we present various models where a vector consists of the same variable across the different countries. Thus, a model is specified for each type of variables. To be used in the analysis, the specification of each model must ensure that residuals are neither autocorrelated nor violate the normality assumption. Thus, each model requires a sufficient but parsimonious number of lags, k , to account for the dynamics in the variables. Moreover, certain time dummies need to be specified such that large outliers do not affect the result.

The specified autoregressive model can be presented in form of a multivariate vector error correction model (VECM):

$$\Delta x_t = \delta + \gamma * t + \pi x_{t-1} + \sum_{i=1}^{k-1} \theta_i \Delta x_{t-i} + \vartheta D_t + \varepsilon_t \quad (9)$$

where ε_t represents a vector of iid error terms and θ_i are coefficient matrices. The vector D_t includes dummies for observations where the absolute residual is larger than 3.5 standard deviations to ensure valid statistical inference. The matrix π is of our most interest, as it includes the stationary relationships in vector x_t . If π has reduced rank, such that $0 < r < p$, π can be decomposed into $\pi = \alpha\beta'$ where both α and β are matrices of dimension $p*r$. The reduced rank r indicates how many stationary relationships exist in the model. Since our variables are integrated of order one², all first difference components in the regressions (9) are $I(0)$ and so are the r stationary linear combinations in $\beta'x_{t-1}$. Thus, the crucial stationary assumption in time series econometrics is restored. The α matrix depicts the adjustment coefficient matrix. It indicates how much a variable responds to a disequilibrium in the r long run relationships. Johansen (1988) developed the so-called trace test, a likelihood ratio test, that allows to identify the reduced rank r , ie. the number of cointegration relationships. The test compares different restricted models, let us call these $H(r)$, to the unrestricted VAR model with full rank, $H(p)$. The p-value of the test shows if a certain rank restriction is allowed or rejected.

If $H(0)$ is not rejected, this indicates that a stationary relationship has been excluded and the assumption of no cointegration relationship is rejected. In that case, the second step will be to test $H(1)$ vs $H(p)$. Only when the test is accepted at a large enough p-value, we can be sure that no extra stationary relationship is left out and corresponding rank is imposed on π .

4.3.2 Restriction in alpha and beta

Once the right rank is found and imposed, we can continue to identify the relationships by imposing and testing restrictions on the two matrices alpha and beta. A likelihood ratio test allows to test restrictions on the β matrix and see which variables can be excluded from a cointegration relationship (see Johansen & Juselius, 1992). If a restriction is rejected it indicates that it significantly degrades the stationarity assumption of that relationship.

² Inflation rates in EAC, extended to a long sample are tested to $I(1)$

Likewise restrictions on the α can be tested. If an entire row in the α matrix can be restricted to only include zeros, we can interpret it in a way that this variable does not error correct / adjust to a disequilibrium in any cointegration relationships. Instead, it is only considered as “pushing” variable which drives the system and is not affected by it.

4.3.3 Long run impact of shocks from the Moving Average (MA) representation

A model with reduced rank can be inverted into its moving average representation. This is helpful as it shows us which stochastic trends drive the system. Thus, we can identify what effect a shock to a certain variable in one country has on the same variable in another country. Specifically, we are interested how a shock to Kenya, the strongest economy in the sample, affects the other member states.

4.3.4 Analysis of convergence among inflation rates in EAC countries

Monthly data on the national price level index between 2005-01 and 2017-06 has been provided by the national central banks. We have extended the sample from January 2000 to June 2017 by using additional data from the International Monetary Funds IMF). Monthly year-on-year inflation rates from 2000-01 until 2017-06 are depicted in Figure 4 below.

Figure 4: Development in EAC inflation rates



First, we analyse convergence only among the Kenya, Tanzania and Uganda, the founders of EAC. In this case, $p=3$. The Akaike criteria suggests 6 inflation lags in the VAR model, which the likelihood ratio test for the lag structure confirms.

Moreover, 10 blip dummies are required to eliminate large outliers (The rank test, cointegration relationships, and restrictions are robust to lag length chosen and full exclusion of dummies). Both, the time trend and seasonal dummies are insignificant and are removed from the analysis. Moreover, the constant in the VECM is restricted to only appear in the cointegration space, such that it does not accumulate over time.

Table 11: Trace tests for cointegration

```
I(1) ANALYSIS using the simulated asymptotic distribution:
p-r  r  Eigenvalue  Trace  Trace^  Crit*5%  p-value*  p-value*^
  3   0   0.1972    58.23   53.98    34.23   [0.000]   [0.000]
  2   1   0.0412    13.41   12.93    20.24   [0.330]   [0.366]
  1   2   0.0234     4.84    4.51     9.59   [0.305]   [0.342]
Crit*5% and p-value* are from the simulation.
p-value*^ incorporates the Bartlett small sample correction.
```

The asymptotic distribution of the trace test has been simulated to account for included dummy variables. Trace test indicates that the null hypothesis of no cointegration relationship among the variable is clearly rejected, while imposing a rank of $r=1$ on the π matrix appears correct. The existence of one cointegrating relationship among the three countries is an indication that there is partial convergence in inflation rates, because we have two common trends ($p-r=2$).

The matrices α and β are thus of dimension 3×1 and their estimated coefficients are as follows.

Table 12: Estimated matrices alfa and beta

```
beta', the normalized cointegrating vectors:
          Ken_1    Uga_1    Tan_1    Constant
CVec(1)    0.14    -0.937    1    -0.0209
{t-value}  {1.6}   {-11.1}   { }   {-2.8}

alpha, the loadings on the cointegrating vectors:
          alpha[][0]
DKen     0.0327
          {0.9}
DUga     0.19
          {6.1}
DTan    -0.0634
{t-value} {-2.8}
```

The adjustment coefficient to inflation in Kenya seems to be not significant, while inflation in Uganda and Tanzania do adjust to disequilibria in the cointegration relationship. A corresponding restriction to Kenya's alpha coefficient is accepted at a p-value of 0.39:

Table 13: Estimated matrices alfa and beta, with restriction on Kenyan inflation

```
beta', the normalized cointegrating vectors:
      Ken_1      Uga_1      Tan_1      Constant
CVec(1)  -0.167      1      -1.07      0.0242
{t-value}  {-2.1}           {-8.6}      {2.5}

alpha, the loadings on the cointegrating vectors:
      alpha[][0]
DKen      0

DUga      -0.174
           {-6.1}

DTan      0.0626
{t-value}  {2.9}
```

Further restrictions are not possible. As Kenya is largest economy with substantial share of its exports going to other EAC members while the import share is only limited, its weak exogeneity to the relationship seems reasonable. Tanzania might show less adjustment due to its limited trade relationship with the EAC as indicated in the analysis of intra-regional trade.

Furthermore, the unrestricted moving average representation confirms Kenya's dominant position:

Table 14: Moving average representation and decomposition of trend

```

THE MA-REPRESENTATION AND DECOMPOSITION OF THE TREND
alpha_ort', alpha orthogonal (transposed):
      Ken      Uga      Tan
CT1      1      -0.172      0
      {-0.9}
CT2      0      0.334      1
      {2.4}
beta_ort_tilde, the loadings on the common trends:
      CT1      CT2
Ken      1.11      0.21
      {10.9}      {0.8}
Uga      0.288      1.05
      {3.7}      {5.5}
Tan      0.114      0.956
      {1.8}      {5.9}
C, the long-run impact matrix:
      Ken      Uga      Tan
Ken      1.11      -0.121      0.21
      {10.9}      {-0.7}      {0.8}
Uga      0.288      0.301      1.05
      {3.7}      {2.3}      {5.5}
Tan      0.114      0.299      0.956
      {1.8}      {2.7}      {5.9}

```

The first common trend is strongly affected by shocks to Kenya's inflation rate. The other countries especially, Uganda seems to be affected by it. The other common trend is a combination of shocks to inflation in Uganda and Tanzania, only those two countries are driven by these shocks. We can conclude that there is indication of convergence among these three inflation rates. However, as indicated, for full convergence 2 relationships would have been required.

Next, we extend the our sample to cover all the five EAC countries in the analysis ($k=5$), leaving the deterministic specification as specified before. The summary of results on residual terms from the estimated VAR models are presented in the table 15 below. They indicate that there is not autocorrelation within the residuals. The test for normality and no-ARCH effects are violated, while former is substantially cause by excess kurtosis, rather than skewness. Gonzalo (1994) shows that cointegration results are reasonably robust to both, ARCH and excess kurtosis. Thus, this should not be of concern. The trace correlation, a summary statistic of the overall fit, is reasonable at 0.51.

Table 15: VAR Residual tests

```

log(|Omega|)                =   -45.78407
Information criteria: SC     =   -26.25049
                        HQ     =   -28.23606
                        AIC     =   -29.58488
Trace correlation           =    0.5132458

Tests for autocorrelation
LM(1):                     Chi^2(25) =   27.138 [0.3490]
LM(2):                     Chi^2(25) =   27.069 [0.3525]

Test for normality:        Chi^2(10) =   52.086 [0.0000]**

Tests for ARCH:
LM(1):                     Chi^2(225)=  273.85 [0.0144]*
LM(2):                     Chi^2(450)=  537.69 [0.0028]**

Univariate statistics of residuals

```

	Mean	Std.dev.	Minimum	Maximum	R^2
DBur	0.00000	0.022595	-0.065370	0.086235	0.38939
DKen	0.00000	0.011415	-0.037271	0.044271	0.68400
DRwa	0.00000	0.0081313	-0.019443	0.024718	0.52201
DTan	0.00000	0.0067876	-0.019965	0.024153	0.43921
DUga	0.00000	0.0093807	-0.025616	0.027254	0.61941

	ARCH(2)	p-value	Normality	p-value	Skewness	Kurtosis
DBur	15.250	[0.000]	11.988	[0.002]	0.31130	4.2203
DKen	10.074	[0.006]	25.837	[0.000]	0.29508	5.0338
DRwa	0.80854	[0.667]	1.4506	[0.484]	0.17682	2.7886
DTan	14.269	[0.001]	21.046	[0.000]	-0.011114	4.6598
DUga	4.6148	[0.100]	0.039986	[0.980]	-0.020025	2.9287

We follow the same procedure as in the case of the three founders of EAC countries presented above. The trace test for cointegration from a simulated asymptotic distribution are presented below

Table 16: VAR Residual tests

```

I(1) ANALYSIS using the simulated asymptic distribution:
p-r  r  Eigenvalue  Trace  Trace^  Crit*5%  p-value*  p-value^
  5  0   0.2517   131.11  114.41   76.51   [0.000]   [0.000]
  4  1   0.1493   71.98   64.65   53.45   [0.000]   [0.003]
  3  2   0.1070   38.99   35.79   34.00   [0.012]   [0.030]
  2  3   0.0510   15.91   15.02   19.71   [0.163]   [0.209]
  1  4   0.0253    5.23    4.84    8.93   [0.250]   [0.290]

```

Crit*5% and p-value* are from the simulation.
p-value*^ incorporates the Bartlett small sample correction.

At the 5% significance level, the results identify $r=3$ cointegration relationships. As indicated, this show also a partial convergence among inflation rates in EAC countries as full convergence will require 4 cointegration relationship, or equivalently one common trend driving the system. Imposing this rank gives following coefficient estimates in α and β :

Table 16: Estimated matrices alfa and beta

beta', the normalized cointegrating vectors:						
	Bur_1	Ken_1	Rwa_1	Tan_1	Uga_1	Constant
CVec(1)	0.0858	-0.141	0.319	1	-0.973	-0.0198
CVec(2)	-0.088	1	-0.968	0.184	-0.34	-0.0128
CVec(3)	-0.758	0.327	0.0326	1	-0.211	-0.0214

alpha, the loadings on the cointegrating vectors:			
	alpha[][0]	alpha[][1]	alpha[][2]
DBur	-0.0956	-0.0616	0.192
	{-1.4}	{-0.9}	{4.7}
DKen	0.0262	-0.0372	0.0217
	{0.8}	{-1.1}	{1.0}
DRwa	-0.00542	0.129	0.016
	{-0.2}	{5.2}	{1.1}
DTan	-0.0764	0.0248	-0.00602
	{-3.8}	{1.2}	{-0.5}
DUga	0.167	0.0377	0.0202
{t-value}	{6.0}	{1.3}	{1.2}

As the cointegration relationships are ordered according to their degree of stationarity, we see that the first relationship seems to present the previously identified relationship between the three core countries. The second relationship seems to include at least Kenya and Rwanda, while the third suggest a relationship between Burundi and Tanzania, possibly also Kenya. Last relationship is the weakest though. Similar to before, adjustment by Kenya's inflation seems to be low, while all other countries have at least one significant alpha coefficient. The next table presents some general test results:

Table 17: Tests of restrictions

```

TESTS OF RESTRICTIONS
Tests of variable exclusion:
  Test of Bur_1:      Chi^2(3) = 11.391 [0.0098]**
  Test of Ken_1:      Chi^2(3) = 18.610 [0.0003]**
  Test of Rwa_1:      Chi^2(3) = 24.634 [0.0000]**
  Test of Tan_1:      Chi^2(3) = 27.346 [0.0000]**
  Test of Uga_1:      Chi^2(3) = 44.917 [0.0000]**
  Test of Constant:  Chi^2(3) = 5.3362 [0.1488]
Tests of variable stationarity (keeping other restricted variables):
  Test of Bur_1:      Chi^2(2) = 7.3111 [0.0258]*
  Test of Ken_1:      Chi^2(2) = 16.257 [0.0003]**
  Test of Rwa_1:      Chi^2(2) = 16.483 [0.0003]**
  Test of Tan_1:      Chi^2(2) = 13.632 [0.0011]**
  Test of Uga_1:      Chi^2(2) = 15.220 [0.0005]**
Tests of long-run weak exogeneity:
  Test of DBur:       Chi^2(3) = 13.186 [0.0043]**
  Test of DKen:       Chi^2(3) = 2.3009 [0.5124]
  Test of DRwa:       Chi^2(3) = 20.809 [0.0001]**
  Test of DTan:       Chi^2(3) = 12.478 [0.0059]**
  Test of DUga:       Chi^2(3) = 29.013 [0.0000]**
Tests of unit vector in alpha:
  Test of alpha[][0]: Chi^2(2) = 0.91505 [0.6328]
  Test of alpha[][1]: Chi^2(2) = 17.748 [0.0001]**
  Test of alpha[][2]: Chi^2(2) = 3.0783 [0.2146]
  Test of alpha[][3]: Chi^2(2) = 10.816 [0.0045]**
  Test of alpha[][4]: Chi^2(2) = 11.362 [0.0034]**

```

The results indicate that all variables appear in at least one relationships, as no column in β' can be restricted to only zeros. Moreover, stationary of any individual inflation rate is rejected. In line with what we concluded from the alpha matrix, Kenyan inflation does not seem to adjust to any divergence in the existing relationship, as all alpha coefficients can jointly be restricted to 0. Testing the restriction of a unit vector in alpha considers if this variable is the only one adjusting to a disequilibrium in one of the relationships. This test cannot be rejected for Burundi and Rwanda. At the same time this means that neither shocks to inflation in Burundi or Rwanda are affecting inflation rates in other EAC member states. Following restrictions on alpha and beta could be imposed at a p-value of 0.4

Table 18: Estimated matrices alfa and beta, with restrictions

beta', the normalized cointegrating vectors:						
	Bur_1	Ken_1	Rwa_1	Tan_1	Uga_1	Constant
CVec(1)	0	-0.163 {-2.2}	0	-1.05 {-9.4}	1	0.0214 {2.5}
CVec(2)	0	-0.723 {-8.0}	1	0	0	0.00391 {0.4}
CVec(3)	1	-0.375 {-1.3}	0	0	-0.796 {-2.8}	-0.00199 {-0.1}
{t-value}						
alpha, the loadings on the cointegrating vectors:						
	alpha[][0]	alpha[][1]	alpha[][2]			
DBur	0	0	-0.146 {-5.0}			
DKen	0	0	0			
DRwa	0	-0.132 {-5.4}	0			
DTan	0.0762 {3.7}	0	0			
DUga	-0.165 {-6.0}	0	0			
{t-value}						

The first relationship is quite identical to the core country case, where only Tanzania and Uganda are error correcting. As anticipated the second relationship identifies a relation between the Rwandan and Kenyan inflation. Rwanda's inflation seems to respond to changes in Kenya inflation. The final relationship is similar to the previous, just for Burundi. The country seems to respond specifically to changes in Uganda and Kenya. Striking is that each relationship seems to be reflecting trade relationships.

The Moving Average (MA) representation looks as follows:

Table 19: Moving average representation

```

alpha_ort', alpha orthogonal (transposed):
      Bur      Ken      Rwa      Tan      Uga
CT1   0         1         0      -0.419  -0.194
CT2   0      0.509      0         1      0.462

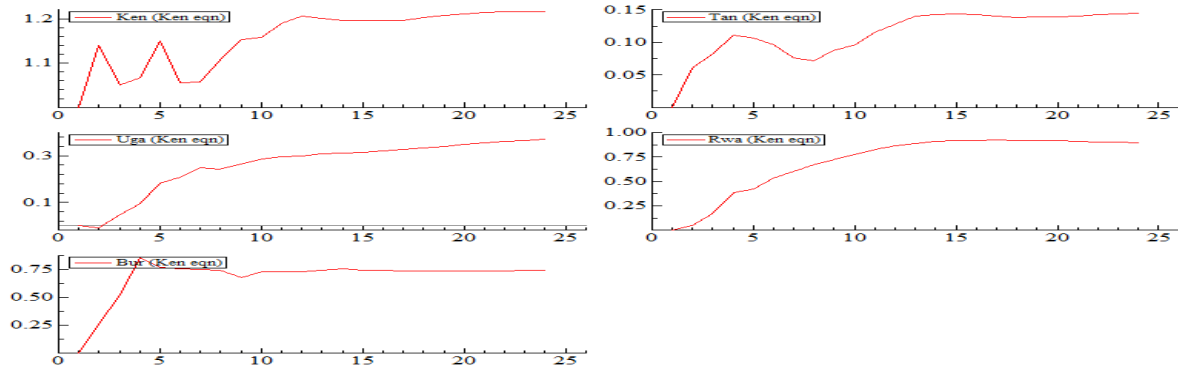
beta_ort_tilde, the loadings on the common trends:
      CT1      CT2
Bur   0.3      0.832
Ken   0.967    0.449
Rwa   0.699    0.324
Tan  -0.226    0.724
Uga  -0.0794   0.834

C, the long-run impact matrix:
      Bur      Ken      Rwa      Tan      Uga
Bur   0      0.723      0      0.707    0.326
      {0.0}    {5.2}    {0.0}    {2.8}    {2.0}
Ken   0      1.19      0      0.0436   0.0201
      {0.0}    {7.3}    {0.0}    {0.1}    {0.1}
Rwa   0      0.864      0      0.0315   0.0145
      {0.0}    {7.3}    {0.0}    {0.1}    {0.1}
Tan   0      0.143      0      0.819    0.378
      {0.0}    {1.5}    {0.0}    {4.9}    {3.4}
Uga   0      0.345      0      0.867    0.4
{t-value} {0.0}    {3.0}    {0.0}    {4.2}    {2.9}

```

The conclusion from the MA representation concerning the convergence among inflation rates in EAC is that inflation rate in all countries are positively affected by a shock to Kenyan inflation, while shocks to Rwandan and Burundian inflation are only transitory. As expected from weak exogeneity analysis of Kenyan inflation, it is not pushed by any other shock than its own. Tanzania and Uganda seem to affect each other. The responses of inflation in the EAC members after a unit shock to Kenyan inflation look as follows:

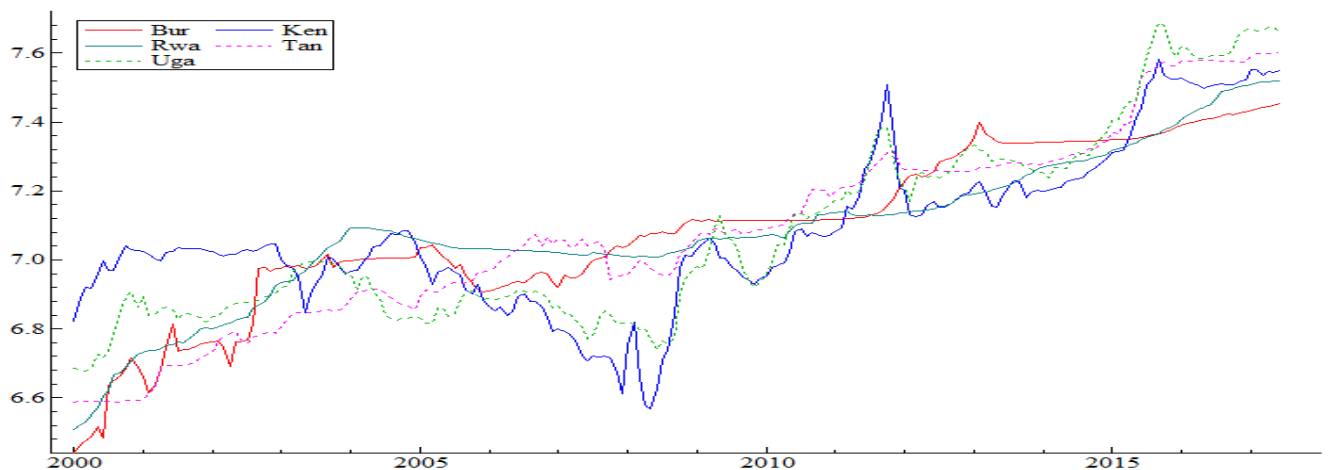
Figure 5: Responses of inflation in the EAC members to a unit shock to Kenyan inflation



4.3.5. Analysis - Exchange rate (Local Currency Units/USD)

In this paragraph, we analyse convergence among nominal exchange rates in EAC countries. Exchange rate in this study is defined as local currency units by one USD. Data are from regional central banks and the International Monetary Fund , and they cover the period from January 2000 to 2017 June. Logs of the exchange rate are presented in the figure below. As the series are matched by means and ranges, the value on the left scale has no significance. Such presentations only help to spot common movements.

Figure 6: Development in nominal exchange rates in EAC



We specify a model for all $p=5$ countries of the EAC. The Akaike criteria suggests $k=2$ lags in the VAR model, which the likelihood ratio test for the lag structure confirms. Moreover, seasonal dummies are included to eliminate large outliers and have been tested significant as their removal is highly rejected in a likelihood ratio test. However, in the VECM the trend is restricted to only appear in the cointegration space, such that it does not accumulate to a quadratic trend over time. It is only to appear in the cointegration space to account for potential different deterministic trends. The test summary is given by:

Table 19: Residual analysis

```

RESIDUAL ANALYSIS
Residual correlations and standard errors:
      DBur      DKen      DRwa      DTan      DUga
DBur      1
DKen      0.0457      1
DRwa      0.04      0.0837      1
DTan      0.0209      0.0825      0.0618      1
DUga      0.0629      0.315      -0.00324      0.192      1
S.E.      0.0111      0.0118      0.00398      0.00997      0.0159

log(|Omega|) = -46.59463
Information criteria: SC = -27.40130
                    HQ = -29.26506
                    AIC = -30.53025
Trace correlation = 0.5986894

Tests for autocorrelation
LM(1): Chi^2(25) = 32.469 [0.1449]
LM(2): Chi^2(25) = 25.490 [0.4352]

Test for normality: Chi^2(10) = 126.53 [0.0000]**

Tests for ARCH:
LM(1): Chi^2(225) = 260.05 [0.0543]
LM(2): Chi^2(450) = 577.85 [0.0000]**

Univariate statistics of residuals
      Mean      Std.dev.      Minimum      Maximum      R^2
DBur      0.00000      0.011137      -0.038303      0.042528      0.74352
DKen      0.00000      0.011753      -0.034306      0.039062      0.62010
DRwa      0.00000      0.0039813      -0.015116      0.015321      0.59652
DTan      0.00000      0.0099674      -0.027212      0.037802      0.57959
DUga      0.00000      0.015899      -0.049778      0.057233      0.54570

      ARCH(2) p-value      Normality p-value      Skewness      Kurtosis
DBur      18.987 [0.000]      48.602 [0.000]      -0.14653      5.9323
DKen      13.913 [0.001]      17.260 [0.000]      0.29240      4.5412
DRwa      7.2730 [0.026]      38.752 [0.000]      0.31364      5.6551
DTan      3.1441 [0.208]      10.408 [0.005]      0.46473      4.0881
DUga      1.8819 [0.390]      10.174 [0.006]      -0.095677      4.0301

```

The asymptotic distribution of the trace test has been simulated to account for included dummy variables. The test indicates the existence of one cointegration relationship, hence a rank of $r=1$. The matrices α and β are thus of dimension 5×1 and their coefficient estimates are as follows.

Table 20: Estimated matrices alfa and beta, with restrictions

```

beta', the normalized cointegrating vectors:
      CVec(1)   Bur_1   Ken_1   Rwa_1   Tan_1   Uga_1   Trend
      {t-value}   {-1.4}   {-6.4}   {-0.5}   {-3.2}   1       {0.7}

alpha, the loadings on the cointegrating vectors:
      alpha[][0]
      DBur      0.0565
                {3.5}
      DKen      0.0159
                {0.9}
      DRwa      0.0304
                {5.2}
      DTan      0.0478
                {3.2}
      DUga      -0.0557
      {t-value}   {-2.4}

```

All signs in alpha and beta indicated that there exist somewhat of overall convergence, as all coefficient have the right sign and point at error correction. However, the exchange rate of Rwanda and Burundi are not significant in the cointegration relationship and can probably be excluded. However, the removal of the two countries together is rejected at the 10% significance level.

Table 21: Tests of restrictions

```

TESTS OF RESTRICTIONS
Tests of variable exclusion:
Test of Bur_1:      Chi^2(1) = 1.5289 [0.2163]
Test of Ken_1:     Chi^2(1) = 6.5315 [0.0106]*
Test of Rwa_1:     Chi^2(1) = 0.15568 [0.6932]
Test of Tan_1:     Chi^2(1) = 6.0614 [0.0138]*
Test of Uga_1:     Chi^2(1) = 20.679 [0.0000]**
Test of Trend:     Chi^2(1) = 0.41107 [0.5214]

```

Since the Rwandan and Burundian exchange rate moves most “trend-like”, the best option is to exclude the trend as including both could somewhat suffer from multicollinearity. Taking out the trend from the co-space means that the DETERMINSITC trends among the exchange rates is similar and cancels out. Restricting the deterministic solely an unrestricted constant gives following results:

Table 22: Estimated matrices alfa and beta

```

beta', the normalized cointegrating vectors:
      CVec(1)      Bur_1      Ken_1      Rwa_1      Tan_1      Uga_1
      {t-value}    {-1.2}     {-6.5}    {-1.1}    {-5.2}
                                     1

alpha, the loadings on the cointegrating vectors:
      alpha[][0]
      DBur      0.0554
                {3.4}
      DKen      0.0134
                {0.8}
      DRwa      0.0309
                {5.3}
      DTan      0.0439
                {3.0}
      DUga      -0.0599
      {t-value} {-2.5}

```

Again, it appears as if Kenya is least error correcting. Restricting the corresponding alpha coefficient to 0 cannot be rejected with a p-value of 0.46:

Table 23: Estimated matrices alfa and beta, with restrictions

```

beta', the normalized cointegrating vectors:
      CVec(1)      Bur_1      Ken_1      Rwa_1      Tan_1      Uga_1
      {t-value}    {-1.2}     {-6.0}    {-1.2}    {-5.1}
                                     1

alpha, the loadings on the cointegrating vectors:
      alpha[][0]
      DBur      0.0539
                {3.4}
      DKen      0
      DRwa      0.0301
                {5.4}
      DTan      0.0416
                {2.9}
      DUga      -0.0605
      {t-value} {-2.8}

```

We have estimated the reaction of nominal exchange rates in EAC to one unit change in Kenyan shilling exchange rate with USD. Results are presented in the figure below. A unit shock to Kenya exchange rate seems to affect Tanzania and Uganda in a similar way, while Rwanda and Burundi appear to withstand that shock. It could be that exchange rate management in those 2 countries are the underlying reason.

If the sample is restricted from 2005 on, there is still strong evidence for one cointegration relationship. However, shock response seems to have improved, even though Burundi and Rwanda still show the weakest response which again seems to be well reasoned with their exchange rate management.

Figure 7: EAC exchange rates reaction to one unit change in Kenya shilling exchange rate

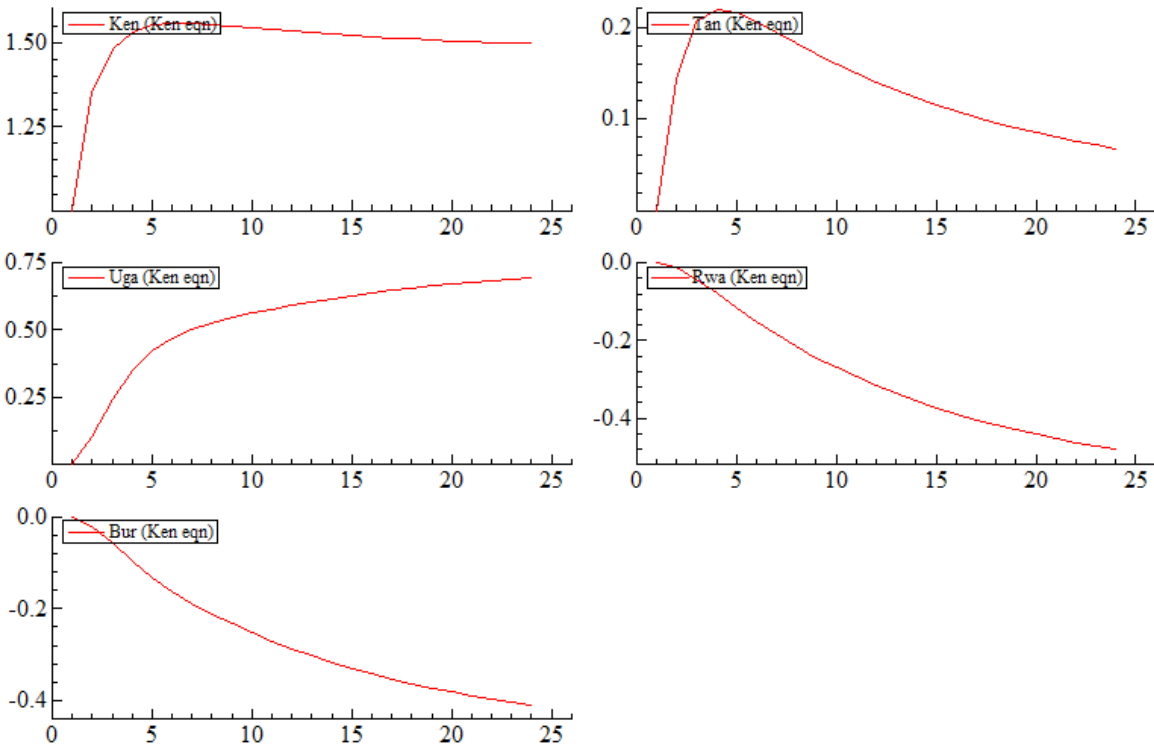
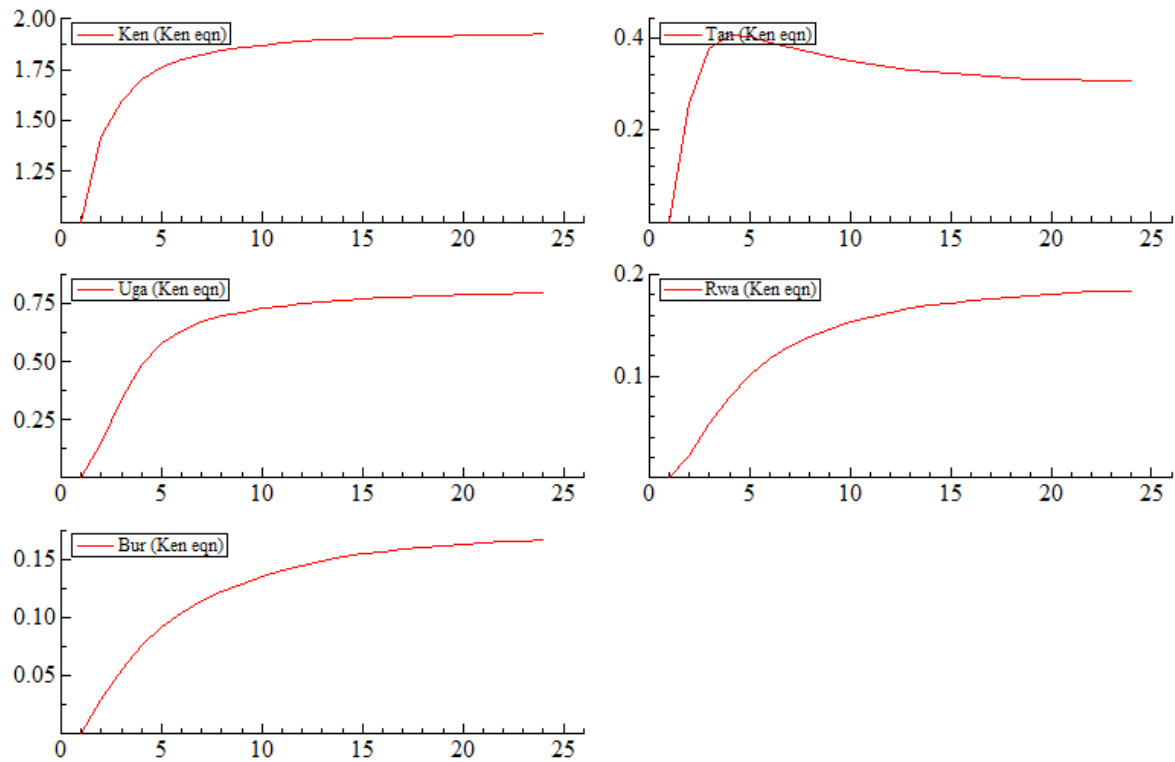
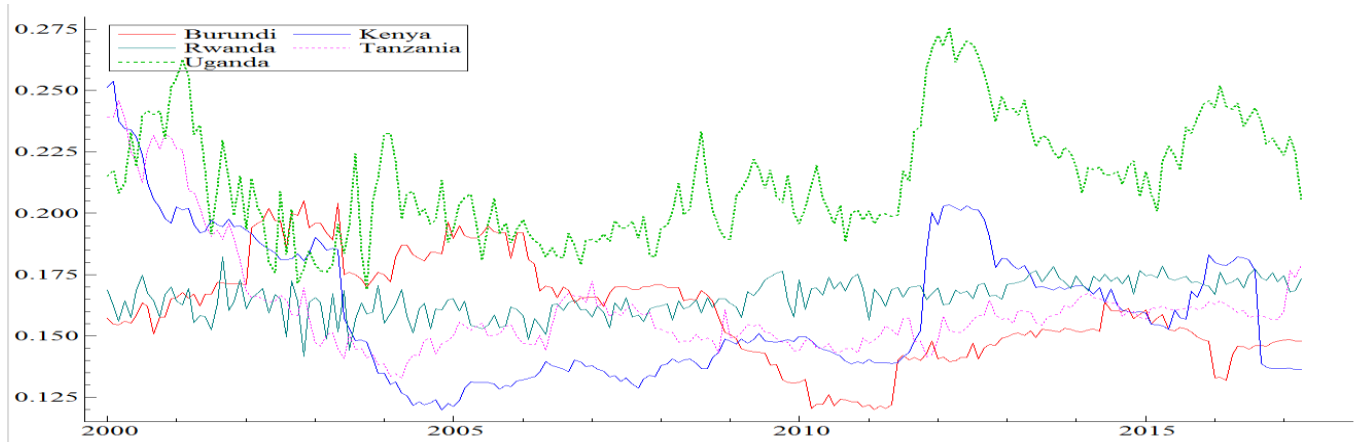


Figure 8: EAC exchange rates reaction to one unit change in Kenya shilling exchange rate (sample starting in 2005)



4.3.6 Analysis – Lending rates

Lending rates are provided by the national banks and the sample covers the period from January 2000 to April 2017. The data is depicted in the figure below and show that lending rates in Uganda is much higher than in the other countries. However, movement among Kenya and Uganda lending rates appears similar.



In addition to the co movement between lending rates in Kenya and Uganda, lending rates in Rwanda have been quite stable around 16 % over the years and their inclusion in the model distorts the analysis. Thus, in this section we restrict our analysis to the three countries, Kenya, Tanzania and Uganda. The Akaike criterion suggests 4 lags which again is confirmed by a likelihood ratio test. While excluding the trend is not rejected, seasonal dummies are required.

The trace test indicates one cointegration relationship and this confirms the previous findings on other variables of the existence of partial convergence.

Conclusion and Policy recommendations

EAC Partner States are in the implementation process of the protocol on the Establishment of the East African Community Monetary Union (EAMU) signed in November 2013. It is expected that by 2024, a common currency will be in use in the EAC. However, the use of a common currency has its own benefits and costs. The main benefits of monetary union derive from the elimination of the transaction costs of exchanging currencies and the elimination of exchange-rate volatility while the main costs of monetary union are those attributable to the inability of monetary authorities of the individual countries to use country-specific monetary policies and the exchange rate as an instrument of macroeconomic adjustment in response to shocks.

Thus, the benefits and costs arising from the establishment of monetary union depend on the structural characteristics of the economies concerned. While endogenous theory suggests that a common currency can promote trade and growth and that countries then could become more similar in a currency union than before joining currency union, recent studies show a much smaller trade impact of monetary union, particularly in developing countries. This reinforces the importance of meeting optimum currency criteria (OCA) as prerequisite for forming a currency union. The basic point of the OCA theory is that countries or regions exposed to symmetric shocks, or possessing mechanisms for the absorption of asymmetric shocks, may find it optimal to adopt a common currency.

The main objective of this paper was to investigate the readiness of East African Community countries for a monetary union by extending the period of study used by other researchers, to cover recent periods when progress in policy coordination and implementation of common market protocols was achieved.

First, we have assessed recent trends in the indicators pertaining to performance convergence criteria before analyzing other relevant factors as per the Optimum Currency Area (OCA) theory such as economic structure, trade interdependence and business cycles. Second, we have used different empirical techniques to identify possible convergence in EAC economies.

The general conclusion is that despite some similarities in the structures of EAC economies, country-specific shocks have been prevalent with economies in the EAC remaining susceptible to asymmetric shocks. In addition, empirical analysis pointed out partial convergence among different macro-economic variables used to assess the readiness of EAC countries for a monetary union. It may be advisable for the region, to fully implement the common market and customs union protocol, harmonize policies and increase inter regional trade before adopting a common currency. Adoption of a common currency before reaching a good level of convergence may be more damaging to EAC countries. It will be key for the EAC to continue to direct efforts to designing and establishing adequate mechanisms that can help member countries adjust to future shocks once the monetary union is consolidated.

There exists significant differences in structure of economies, which explains why countries are facing asymmetric shocks. This calls for a sufficient period of preparation before the establishment of EAMU. A fast track process would lead to considerable costs for EAC countries. The euro's success has stimulated interest in monetary unions in other regions. However, it took many years for the EMU to be established, despite less fiscal problems and credible institutions with competent bureaucracies that cooperated closely for more than 50 years. Building of effective institutions for enforcing fiscal discipline and enabling macroeconomic surveillance, structural reforms, development of necessary regional infrastructures and policy harmonization that would enhance business cycle management are essential in EAC before the adoption of a common currency.

An inspection of the EAC member countries' performance since 2000, relative to the convergence criteria, reveals variations among countries. The cross-country standard deviation of EAC countries' inflation rates show some convergence in inflation rates during the recent period but some picks were observed in some countries indicating how the five countries were differently affected by shocks, particularly the food prices shocks and external shocks. In addition, standard deviations have indicated important volatility in some countries.

On the criteria of holding foreign-exchange reserves covering at least 4.5 months of imports, the assessment show that only Uganda complies with the criteria with foreign reserves covering

exactly 4.5 months of imports on average in the period 2010 and 2016. This shows that EAC countries are vulnerable to external shocks with negative impact on macroeconomic stability.

Different research show that lower levels of reserves are only needed in countries with good institutions and policies (IMF, 2011).

As policy recommendation, EAC countries will need efficient policies and institutional framework which help to clearly identify responsibilities, ensure good governance and accountability in the way that reserves are managed effectively and efficiently to meet country's needs, in addition, to further develop and diversify their economies.

The assessment indicated that in EAC countries, overall fiscal and external deficits are sizeable, mostly reflecting large infrastructure spending and associated capital goods imports. Data show that fiscal convergence is an area where EAC countries still have considerable challenges. Indeed, complying with fiscal convergence criteria is not easy considering the macroeconomic context of EAC countries. EAC countries are developing economies with significant need for investment and development spending. In addition, the countries face significant macroeconomic shocks, such as terms-of-trade shocks from international commodity prices and agricultural productivity shocks from weather as well as international aid shock. Furthermore, these shocks affect EAC countries differently.

As policy recommendation, EAC countries will need to agree to explicit, binding fiscal convergence commitments as prerequisites and ongoing commitments for the viability of EAMU. In addition, to the commitment to fiscal discipline, there is a need for the establishment of institution or strong mechanism for enforcement and ensuring compliance by all countries. In the monetary union protocol, it is provided for the establishment the institution responsible for surveillance, compliance and enforcement. It can be recommended to fast-track its implementation. In addition, the institution has to be independent from any political pressure. Independence may involve the personnel selection process, the EAC enforcement agency's budget and the enforcement mechanism.

EAC can borrow from the existing experience about the establishment of mechanisms to ensure fiscal discipline. History demonstrates that several approaches have been tried to ensure fiscal discipline in monetary unions but all struggled through various periods. These include centralized enforcement (e.g., EMU and WAEMU since 1999), surveillance and persuasion (e.g., ECCU and CEMAC), and decentralized enforcement (e.g., USA).

One method is to legally renounce bailouts. Unfortunately, this is difficult in practice. If State A member of a monetary union is about to deny its debt, its creditors may be spread throughout the monetary union. Failing to bail out State A could cause a contagion affecting the rest of the monetary union. Despite the Maastricht Treaty's "no-bailout" clause, 27 Greece and Ireland received bailouts because for a monetary union where countries are more integrated, costs of not bailing out a country may eventually exceed the costs of bailing out that country.

A second method is to create a firm, categorical rule banning deficits and debt beyond a certain level. To ban behavior, the sanctions must be prohibitive. This approach has advantages because violations are easy to identify and are uniformly punished. Unfortunately, these rules are also difficult to implement in the context of a monetary union particularly during periods of economic hardship. The rule would harm a population that is already struggling, unwisely prevent sound economic policies and in an integrated monetary union, the costs may spill over and affect other member states. As such, the rule is likely to face severe political resistance.

A third method might be enforcement with a more flexible, multifactor balancing test. This rule would allow the judge of excessive deficits to consider a country's circumstances to determine the economic merits and demerits of a particular deficit. However, the biggest challenge is that such rules rely heavily on the judge's subjective opinions. Subjective criteria lead to disagreement among countries and the outcome may still result in punishing a country that is struggling economically. The original East African Currency Board, which was in place from 1960 to 1966 is a good case about challenges associated to this approach. By 1964 both Tanzania and Uganda had reached their borrowing limits and wanted to raise the limits to borrow more after the Kenya's approval. This situation contributed to dissolve the monetary union within six years of independence.

The monetary affairs committee (MAC) of EAC Central Bank Governors has achieved important results in terms of harmonizing monetary and exchange rate policy formulation and implementation as well as financial sector stability and development. Important achievements are also recorded in payment system development and harmonization as well as in the financial system stability and development. However, the absence of any agreed rules and enforcement mechanism poses challenges to the implementation of decisions by Governors as well as decisions by other committees of the community. Indeed, policy coordination becomes problematic in the absence of a rule-based framework which engenders discipline among members and reduces the risk of bad policies. The recent euro zone debt crisis is a good example of weak enforced rules and inadequate policy coordination. The lack of firm commitment to implement decisions taken by different regional committees to fast-track the implementation of EAMU protocol due to more focus on relative national gains and sovereignty is one of the big challenges in the journey towards full regional integration.

Unfortunately, the establishment of institutions to support the implementation of EAMU protocol has been delayed due to lack of clear commitment by partner states. The East African Monetary Union was supposed to be established in 2015, but end 2017 the bill for its establishment is not yet ratified by competent authorities. The experience of European Monetary Union show that the European Monetary Institution (EMI) played a crucial role in the establishment of the monetary union by spearheading the harmonisation of policies, monitoring and convergence criteria, standardisation of the statistical procedures and conducting of relevant studies.

As recommendation, it is very urgent to fast track the establishment of the East African monetary Institute (EAMI) so as to benefit from the crucial role it would play.

Partial convergence in inflation and exchange rates implies that the EAC countries need significant adjustments to align their monetary policies and to allow a period of monetary policy coordination to foster convergence that will improve the chances of a sustainable currency union. The transition to a monetary union is an important medium-to-long term goal for the EAC. In preparation, these countries have the opportunity to consider aspects of their economies that function as an effective conduit for monetary policy.

One of key developments in EAC countries' monetary sectors is the increasingly unstable money demand function which is also one feature that is hampering the effectiveness of monetary policy. Accordingly, EAC countries are considering moving away from monetary targeting towards a more price based monetary policy framework along the lines of inflation targeting (IT).

Specifically, the framework would change to one that uses inflation expectations as the nominal anchor, rather than monetary aggregates. The move to IT raises a number of issues; in particular, whether the EAC countries satisfy certain preconditions for successful use of an IT framework. These include an independent central bank (such as instrument independence and a lack of fiscal dominance), a healthy financial system (including deep debt markets and a robust transmission mechanism), a sound technical infrastructure (including having forecasting capabilities and access to relatively high-quality economic data) and an economic structure that does not weaken the potency of monetary policy (such as low sensitivity to exchange rate or commodity price movements). Although, most IT countries did not meet these conditions prior to adopting the framework but did rapidly improve in these areas after the framework was implemented (Batini et al. 2005). We have seen how EAC countries have challenges about meeting fiscal convergence criteria. In line with important budget deficits experienced in EAC countries, fiscal policy put pressures on monetary policy creating the issue of fiscal dominance.

As policy recommendation, it is important for EAC partner state central banks to fast track the coordination and harmonization of the monetary and exchange rate policies during the transition to the Monetary Union. Focus may be on following actions:

- Adoption of a price based Monetary Policy Frameworks in all EAC countries by 2018. This will require to continue with efforts to develop the interbank market through the improvement of banking sector liquidity management;
- Modelling and forecasting technical working group on the Forecasting and Policy Analysis System (FPAS). This is very important, because the new framework is more forward looking.

- Design and implement a common exchange rate Mechanism (as per IMF classification of currencies). As recommended by MAC meetings, Rwanda and Burundi will have to adopt a more flexible exchange rate mechanism;
- Efforts to enhance monetary policy transmission mechanisms in transition to price based monetary policy framework are needed to ensure the effectiveness of the single monetary policy after adoption of common currency.

Despite the relatively large volume of trade among the EAC countries, significant challenges to monetary integration remain, including the following: (i) low per capita income levels, resulting in internal markets of limited sizes; (ii) the concentration on primary-commodity exports for most countries; (iii) limited transportation facilities and large distances between population centers; and, (iv) relatively-high shares of informal trade because of permeable borders. In the process of enhancing regional integration through the increase of inter-regional trade, it is important to fully implement the common market and customs union protocols.

As policy recommendation, to achieve greater intraregional trade and structural similarity and hence shock synchronization, barriers to trade within EAC need to be completely eliminated while common policies toward the outside of the EAC should be adopted. The region's trade agenda therefore has a wider scope than just reducing intraregional tariff barriers. Its current primary focus is on removing structural – mostly non-trade – barriers to competitiveness and trade. Besides its traditional objectives (removing quotas and tariffs), trade policy of the EAC thus now strives to strengthen the members "soft" and "hard" infrastructure so as to enable them to leverage their relative comparative advantages. The focus on relative comparative advantages would also help diversify the EAC product mix and could enhance the scope for intraregional trade along the value chains.

Another important issue is the measurement of convergence criteria. Because these criteria have to have a legal force and used as criteria for admission to the monetary union or sanctioning member countries that fail to meet the criteria, a strong emphasis has to be placed on the quality and cross-country comparability of the statistics used to compile the indicators. Therefore,

statistical standards aligned with international statistical reporting requirements are needed and statistics must be transparent and suitable for a wide range of analyses and public purposes.

Thus, statistical programs must be strong and the infrastructure must be in place well before a proposed monetary union can be formally established. There is a strong rationale for very early development of statistical systems in the monetary union-building process.

The experience of EMU show that members of the EU manage a high degree of periodicity and timeliness for their statistics enabling rapid policy responses, and a degree of certainty among policymakers since they have a good understanding of current economic conditions. During the period of financial turmoil, when economic conditions are changing rapidly, and there is wide uncertainty about the management of the economy and of the financial sector in particular, the availability of accurate, timely, and reliable economic data becomes critical.

The IMF launched a number of data initiatives as part of its new emphasis on designing, implementing, and monitoring observance of a range of standards and codes. The SDDS and GDDS were launched and prescribe levels of timeliness, coverage, and periodicity for a wide range of macroeconomic indicators, including those covered in the convergence criteria.

With the support of IMF EAC countries have achieved significant progress in ensuring good quality of data, particular monetary and financial data. But important challenges remain on the periodicity and availability of data but also on the quality of economic and fiscal data.

In their last meeting, held in September 2017, EAC central banks' Governors noted that measurement of some indicators used to assess convergence criteria needs to be harmonized for comparability purpose (MAC, 2017). The ongoing process of harmonization and standardization of measurement standards and laws relating to production, analysis and dissemination of statistics need to be fast tracked by the Sectoral Council of Fiscal and economic affairs. It is also important to fast track establishment of an institution responsible for statistics as provided for in EAMU protocol.

The assessment in this paper was based on recent experience while planning for the establishing of a monetary union is a forward-looking assessment. We have observed what appears to be long-term structural differences, however, they may rapidly disappear in the run up to the establishment of the monetary union.

Moreover, the observed asymmetric shocks could be policy-induced rather than exogenous. In that case loss of policy independence as member of monetary union may not always necessarily be costly.

However, EAC countries will still likely continue to be exposed to these shocks for some time, requiring policy responses. Going forward, as highlighted by the experience in other currency unions, it will be key for the EAC to continue to direct efforts to designing and putting in place adequate mechanisms that can help member countries to adjust to future shocks once the monetary union is consolidated. This includes the usual measures to mitigate costs of common monetary policy such as labor and capital mobility, price, and wage flexibility, as well as various risk-sharing mechanisms, including fiscal. These measures should be agreed among member countries before the introduction of the single currency to reduce risks and signal early commitment to macroeconomic stability.

As earlier highlighted, this will be possible if countries agreed and strictly commit to rules and enforcement mechanism for the implementation of different actions. Firm commitment, discipline among members and reduction of the risk of bad policies are results of rule- based framework.

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