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Is there a SADC Business Cycle: Evidence from a Dynamic Factor Model[†]

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Abstract

Countries that adopt a common currency automatically relinquish their monetary policy autonomy. Therefore, it is imperative for countries wanting to join a currency union to ensure that business cycles are synchronized; in order to ensure symmetric propagation of monetary policy. Put differently, countries with asynchronised business cycle requires country-specific policies to stabilize their economies. Thus, we assess business cycle synchronisation as an indicator for the aptness of the SADC region to adopt a single currency in 2018 as proposed. We rely on a dynamic factor model which assumes that business cycle is driven by two orthogonal factors, that is a regional and idiosyncratic factors. In line with existing literature, our findings suggest that SADC as whole is not ready to form a currency union. However, CMA countries appear to be driven by a common factor thus they do not necessarily require country specific policies. Our study therefore concludes that CMA countries be used as a pilot project for SADC currency union.

JEL Classification: C11; C32; E32; F02

1. Introduction

Countries that are successfully executing trade and economic liberalization are experiencing high levels of economic growth and improved living standards. Therefore, in her strive to eradicate poverty and promote economic growth African union (AU) made it their goal to form a monetary union followed by a single currency for the whole continent of Africa (Tipoy, 2015). Therefore fostering trade, and economic liberalization in the African continent. Building from the AU's goal, the Southern Africa Development Community[1] (SADC) decided to establish a monetary union by 2016 and followed by the launch of a single currency in 2018. The plan to form a monetary union and establishing a single currency in the SADC area not only aims to reduce poverty but it also aims to reduce heterogeneity among SADC economies. Simply put, it aims to achieve convergence in economic growth among SADC member states (Tipoy, 2015).

It is generally accepted that regional unification through the elimination of barriers to trade and coordination of policies that would otherwise segment the market; and allowing free labour and capital movement not only leads to equalization of factor prices but also lead to convergence of economic structures and growth (Krugman, 1990). Contrary to what the SADC region seeks to achieve Romer (1986) argue that the unification of countries may lead to regional and geographical heterogeneity because of factors of production will be shifted and be concentrated in more developed countries due to returns to scale and scope (Backus et al., 1992). However, Solow (1956) holds a different view which lends support to the aims of the SADC area; that integration will automatically lead to convergence under free movement of factors of production and international diffusion of technical know-how (see, Frankel and Rose).

Following the seminal work of Mundell (1961) and the issues experienced in the Euro Zone an enormous amount if literature has been devoted onto the assessment of the readiness of countries to form a monetary unions and forgoing their monetary policy sovereignty. To highlight some contributions both international and in the SADC area, (Tipoy, 2015; Kumo, 2011, Zerihum et al., 2014) all find that SADC as whole is not yet ready to form a monetary union.

[1] SADC consists of Angola, Botswana, Democratic Republic of Congo, Lesotho, Madagascar, Mozambique, Mauritius, Malawi, Namibia, Seychelles, Swaziland, Tanzania, South Africa, Zambia, and Zimbabwe

The formation of a single currency should not be based only on political advantages of a single country u but it should be based on economic costs and benefits as well. Put differently, the costs of forming a monetary union should be outweighed by the benefits of forming a monetary union (Mundell, 1961). Therefore in order to eschew a formation of a monetary union which is only based on political considerations the theory of optimal currency areas (OCA) by Mundell (1961, Kenen, 1963 amongst others) put some conditions that countries need to adhere in order to form a successful monetary union. The OCA puts business cycle synchronisation as a necessary and a primary condition for forming a monetary union (Faia, 2007). Therefore, this study employs real GDP to assess the aptness of SADC member states to form a monetary union. If business cycles are synchronized it means that member states do not necessarily require country-specific exchange and monetary policies (Masson and Pattillo, 2005). However if they are not synchronized it means that countries need country-specific policies in order to deal with economic disturbances. Hence they are not ready to adopt a single monetary policy or to form a monetary union.

Our finding suggests that albeit SADC as a whole is not ready to adopt a common monetary policy but some member countries appear to be good candidates for a monetary union. Countries that belong to a common monetary area (CMA) appear to be good candidates for a monetary union and this is in line with existing studies (Tipoy, 2015 and Buigut and Valev, 2005).

The rest of the paper is structured as follows. Section 2 reviews related literature while section 3 provides a concise description of econometric framework and data sources; section 4 present the discussion of the finding followed by conclusion and policy recommendations in section 5.

2. Review of Related Work

Over the past years Africa, particularly SADC region has made remarkably endeavours toward becoming a unified economic union. Barriers on boarders have been removed and a number of policies have been put in place in order to ensure a fully integrated market for goods and services. The removal of barriers and harmonization of policies follows calls from academics and policy makers that Africa appears disjointed and poorly unified, therefore hindering growth in the region. It imperative to increase integration in order to foster economic growth in the region Bala, 2011). However, SADC faces many challenges in integrating economies, inter alia the SADC integration arose from political agenda rather than economic agenda (McCarthy, 2002 and Bala, 2011). Hence, the proposed monetary union and single central bank has

received enormous amount of attention from academics; assessing if the formation of a monetary union and a single currency conforms to the conditions put forward by Mundell (1961). Mundell (1961) in his theory of optimal currency area puts business cycle synchronisation as one of the conditions that should be met in order to form a successful common currency area (Frankel and Rose, 1997; Moneta and Ruffer, 2009).

The extent of business cycle correlation matters because countries with unique business cycles will ultimately lose their stabilizing tool if they join the monetary union. Put differently, countries experiencing expansionary phase on their business cycle may require contractionary monetary policy in order to circumvent inflationary pressures, whereas countries experiencing contractionary phase of their business cycle in order fuel growth may require expansionary monetary policy (Gogas, 2013; Barhoumi et al., 2013). Hence, countries with closely related business cycles are more likely to- and it becomes beneficial for them to- be part of the union (Frankel and Rose, 1997). Furthermore, weak business cycle chronology can result to asymmetric propagation of monetary policy for union member whilst stronger business cycle synchronisation should lower likelihood of asymmetric transmission (Gogas, 2013 and Altavilla, 2004 overall, there is large evidence that business cycles in Europe and in developing countries has increased, however evidence is still scant in Africa particularly in the of SADC region (Bala, 2011). Assessing convergence in real output in the case of SADC Tipoy (2015) found that SADC do not conform to the OCA criterion and hence it is not yet ready to adopt a single currency. Contrary to Tipoy (2015) Zerihum et al. (2014) found that some but not all countries in the SADC region indeed conform to the criteria for OCA and thus those who appears to synchronized can come together to form a monetary union. Overall a single monetary policy will not be optimum for all members of the SADC.

3. Econometric Framework

3.1. The Dynamic Factor Modelling

In the literature there has been a consensus that business cycle synchronisation is key to a successful adoption of a single currency (Moneta and Ruffer, 2009; Mundell, 1961; Gogas, 2013 and Zerihum et al., 2014, among others). Put differently, the existence of common shocks that drives business cycles in different economies wanting to form a currency union is imperative. (Camacho and Perez-Quiros, 2006) argue that if such common shocks exists and account for a large portion of variances of growth rates for individual economies, forming currency union should not be expensive. Although a consensus has been reached on the

imperativeness of analyzing business cycle comovement for a successful union, there has not been a consensus on how to successfully measure business cycle comovement and hence, a number approaches have been brought forward.

Baxter and Stockman (1989) and Backus et al., (1992) rely on basic correlation to analyse business cycle synchronisation. Monfort et al., (2003) and Moneta and Ruffer (2009) criticize basic correlation on two grounds. Firstly, simple correlation fails to isolate idiosyncratic shocks from common shocks. Secondly, basic correlation analysis fails to capture the tenacity of common oscillations. Given the drawbacks of basic correlation analysis an enormous amount of energy have been invested into searching and developing new methods of assessing business cycle synchronisation. Some studies have found dynamic factor model to be more efficient in macroeconomic data analysis (Barhoumi et al., 2013; Geweke, 1977; Geweke and Singleton, 1980). Amongst other Bordo and Helbling (2003) apply static factor model which is closely related to a dynamic factor model. A model is said to be static when the lags are set to zero. However, Moneta and Ruffer (2009) argue that the static factor models have significant limitation for macroeconomic analysis. Static factor model does not permit for a direct relationship between the lags of factors and the observed variable. Put differently, static factor model assume that the relationship between factors and the variables i.e. GDP in this case, is linear with invariable weight overtime (Bai and Wang, 2012 and Barhoumi et al., 2013). Therefore, dynamic factor models were introduced and Forni et al., (2000) argue that indeed, factor models should be dynamic rather than being static; especially when utilised to answer business cycle questions, since business cycles are generally dynamic questions (see, Moneta and Ruffer, 2009 and Kose et al., 2003, among others).

Therefore, in this study we employ the dynamic factor model to assess business cycle synchronisation in the SADC region. Our approach assumes that the n-dimensional (n = 14) stationary process Yit, i = 1,2 … , n (real GDP) can be decomposed into two orthogonal unobservable components (Monfort et al., 2003; Moneta and Ruffer, 2009 and van Nieuwenhuyze, 2006). The unobserved components are regional factors Ftwhich are common to all countries in the region and idiosyncratic factors eit which are factors that are country-specific but are allowed to be propagated across countries. It is imperative to note that although the latent factor affects all countries simultaneously, it impact is heterogeneous across countries and therefore is captured by country specific factor loading. Our dynamic factor approach is specified as;

$$Yt = \varphi itFt + eit \quad (1)$$

In Kalman filtering language equation 1 is referred to as a system of (14 × 1) measurement equations Gregory, Head and Raynauld (1997) and equation 2 is a transition equation.

$$Ft = \chi tFt{-}1 + \cdots \chi pFt{-}p + \eta t \quad (2)$$

Where Ft is (k × 1) vector of factors, $\varphi t$is a (n × k) vector of factor loadings, or coefficients measuring countries is sensitiveness to common factors. χt Is a (k × k) matrix of $V(P)$ coefficients. et And ηt are error terms. In our model, the influence of country-specific factors is embedded in et (Stock and Watson, 2010). Further, we assume that $et \backsim (0, \mathbb{Q}t)$ where $\mathbb{Q}t$ is a (n × n) diagonal covariance matrix, and $\eta t \sim N(0, \mathfrak{V}t)$ where $\mathfrak{V}t$ is a (k × k) covariance matrix. The country-specific factors are assumed to be uncorrelated with the error term of the factors $Et\eta t'{-}k = 0$ at all leads and lags. In classic factor model country-specific components are assumed to be uncorrelated with each, which their limits their usefulness (Stock and Watson, 2010 and van Nieuwenhuyze, 2006). Thus, our approach allows country-specific factors to be weakly and cross-sectional correlated to some degree (Forni, Hallin, Lippi and Reichlin, 2001).

3.2. Data and Business Cycle Definition

Europe appears to be leading with studies that assess the synchronisation of business cycles. However, these studies often present conflicting results (see, de Haan, Inklaar and Jong-A-Pin, 2007). The conflict in their findings could owe to differences in methodologies applied to construct business cycles and diverging methods of assessing business cycle synchronisation (Altavilla, 2004).

In the literature quarterly GDP and Monthly data on industrial production (IP) are the two variables important variables that are often used. To capture high-frequency fluctuations annual data are less favorably thus monthly and quarterly data are usually employed. Unfortunately, for SADC region high frequency data is rarely available and therefore we are compelled to employ annual GDP data covering the period of 19882014. The selection of time period is based on the availability of data. Employing IP data to measure business cycle synchronisation would have assisted in ensuring robustness of our results however data is not available for all countries involved in this study. Moreover, owing to unavailability of data Angola has been excluded from the analysis. The data has been collected from the World Bank's world development indicators database.

There are two definitions of business cycles, classical business cycle (Burns and Mitchell, 1946) and growth (or deviation) cycle. Recent studies often use the latter as opposed to the former. The former (i.e. classical) explain business cycle in terms of absolute rise and fall of economic activity. Deviation cycle looks at the deviation of GDP growth from the trend (Altavilla, 2004). The reasons why scholars usually prefer the deviation cycle are twofold; firstly, because most economies are growing overtime classical recession are less frequent relative to growth cycle recession (de Haan et al., 2007). Secondly, most econometric (parametric) techniques require series to be stationary which is often found in growth cycles. For the above mentioned reasons we follow de Haan et al., (2007) and De Haan, Inklaar and Sleijpen (2002) by employing the deviation cycle definition.

Various filtering techniques could be used to isolate cycle from trend. The simplest method is first differencing (Baxter and King, 1999). However, the shortcoming of first differencing is that it decompose output into trend and cycle at the costs of shifting peaks and troughs and large volatility. De Haan et al., (2007) argue that cross-country comparison the shift in peaks and trough should not be a problem because the shift is the same for all countries in question. Hence, to over this short-coming we employ the most used filtering technique, Hodrick-Prescott filter due to Hodrick and Prescott (1997).

3.3.Unit Root Tests

The dynamic factor model requires that series be stationary. Hence, the test developed by Phillips and Perron (1988), (PP, henceforth) and the augmented Dickey-Fuller test (ADF, henceforth) are the formal tests utilised in this study to assess properties of the data. The choice to select PP among other competing unit root tests is that PP test is robust for a range of serial autocorrelation and time-endogenous heteroscedasticities (Phillips and Perron, 1988 and Cheng and Lai, 1997). PP does not explicitly deal with the serial correlation from the test regression. However, it tackles heteroscedasticity in εt and serial correlation by modifying the t-statistics (Phillips and Perron, 1988). The test regression for the PP is as follows;

$$\Delta Y_t = \boldsymbol{B_t} + \theta Y_{t-1} + \varepsilon_t \qquad (3)$$

Where Δ is a difference operator, Y is the observed real GDP and $\boldsymbol{B_t}$ is a vector of deterministic variables (which may consist of idiosyncratic intercept and the trend) and εt is a white noise.

For robustness purposes, we utilise the augmented Dickey-Fuller test (ADF) for unit root in addition to the PP test. The ADF tests the null hypothesis that series Y_t (real GDP) has a unit

root against the alternative hypothesis that Y_t is stationary. The ADF test is carried out by estimating the following equation;

$$\Delta Y_t + \boldsymbol{D_t} + \phi Y_{t-1} + \sum_{j=1}^{p} \psi_j \Delta Y_{t-j} + v_t \quad (4)$$

Where $\boldsymbol{Dt}$ is a deterministic component which may contain constant and linear trend, Δ is a difference operator and vt is a white noise process. The issue of serial correlation is dealt with by the introduction of the differenced lags of the observed variable. If p is too small test is more likely to be biased since serial correlation will remain in the errors. On the other hand if p is too large it reduces the degrees of freedom therefore the power of the test (Ng and Perron, 1995 and Walters and Hassler,). Hence, we utilise Schwarz automatic lag length selection to select the optimal amount of lags required to deal with serial correlation.

Albeit PP and ADF do not differ too much (Chang and Park, 2002), PP has one major advantage relative to its ADF counterpart. As it can be observed from the test regressions that the ADF requires one to have knowledge or at least specify the lag length but PP does not require the specification of the lag length owing to the fact that serial correlation is not dealt with directly from the test regression.

3.4. Preliminary

As mentioned in section 3.1 and 3.2 that the dynamic factor model requires our series to be stationary. Section 3.3 also outlined formal tests that we use to assess the properties of the data. Due to space considerations, we do not report unit root results at levels. All our series appeared to be nonstationary at levels. Therefore, to render to the stationarity condition we differenced the data and re-tested for unit root. We find series to be (1) process that is stationary after first differencing. Table 2 and 3 display findings from Phillips and Perron and the augmented Dickey-Fuller unit root tests, respectively.

As a preliminary exercise we appraise pairwise correlation among SADC members' real GDP (see Table 1). Baxter and Stockman (1989) applied correlation analysis to assess the degree of business cycle synchronisation, as discussed in section 3, this framework has received enormous amount of criticism. In the literature, there has been not been an agreement on the appropriate level of correlation, Furceri and Karras (2008) accept correlation of 0.45 or high while Moneta and Ruffer (2009), Hallett and Richter (2008), Girardin (2004) accepts correlation ranging between 0.30 and 0.50. Allegret and Essaadi (2011) accept correlation

that is at least 0.5. In this study, we follow Hallett and Richter (2008) we only accept correlation coefficient that is at least 0.3. Pairs with at least 0.4 correlation coefficient are highlighted in table 1. Basically, correlation analysis suggests that there is low correlation among SADC business cycles and in some cases the correlation is negative. This basically suggests that business cycle synchronisation is very poor in the SADC region, (Bayoumi and Ostry, 1997).

Table 1 Correlation analysis for real GDP Growth

	MOZ	SYC	LSO	MDG	MWI	MUS	NAM	SWZ	ZAF	ZWE	TZA	ZMB	ZAR	BWA
MOZ	1													
SYC	0.061	1												
LSO	-0.222	0.185*	1											
MDG	0.064*	0.029*	0.255*	1										
MWI	0.145*	-0.008	-0.245	-0.001	1									
MUS	-0.242*	0.140*	0.396*	-0.258	0.051	1								
NAM	-0.162*	0.021	0.021*	-0.030	0.030	0.108	1							
SWZ	-0.219*	0.303*	0.208	0.130*	0.069*	**0.319***	-0.192	1						
ZAF	**0.435***	0.018*	-0.130*	0.320*	0.048	-0.133	0.167*	-0.198*	1					
ZWE	0.233	0.389*	0.141	-0.240	-0.013	-0.043	-0.135	0.177*	-0.193	1				
TZA	0.177*	-0.067	-0.156*	0.167*	-0.260*	-0.273*	0.253*	0.027*	**0.479***	-0.125*	1			
ZMB	0.311*	-0.042	-0.085	0.178*	**0.550***	-0.263	0.133	-0.344*	**0.355***	-0.181	**0.598**	1		
ZAR	0.218	-0.100	-0.046*	0.151	0.221*	-0.449*	**0.369***	-0.233	**0.488***	-0.084*	**0.766***	**0.561***	1	
BWA	0.017*	**0.421***	0.127*	0.123*	0.099	-0.022	0.292	**0.342***	**0.366***	0.026*	0.089	-0.078	0.121*	1

(*) represents 5% level of significance

Source: Author(s) own computation

Table 2: Phillips-Perron unit root test at first differences

	Constant Only		Constant & Trend	
Country	**t-statistics**	**p-value**	**t-statistics**	**p-value**
Botswana	-3.249	0.023**	-4.888	0.001***
DRC	-2.662	0.088*	-2.726	0.231
Lesotho	-7.749	0.000***	-11.513	0.000***
Madagascar	-7.030	0.000***	-7.162	0.000***
Mozambique	-3.645	0.010**	-4.369	0.007***
Mauritius	-5.620	0.000***	-5.546	0.000***
Malawi	-8.231	0.000***	-8.119	0.000***
Namibia	-4.133	0.002***	-5.627	0.000***
Swaziland	-4.760	0.000***	-5.185	0.000***
Seychelles	-5.903	0.000***	-6.019	0.000***
Tanzania	-2.378	0.157	-3.521	0.058*
South Africa	-4.745	0.000***	-4.697	0.002***
Zambia	-6.166	0.000***	-7.355	0.000***
Zimbabwe	-4.060	0.002***	-4.203	0.009***

***, **, * denote 1%, 5% & 10% levels of significance, respectively.

Table 1: Augmented Dickey-Fuller unit root test at first differences

	Constant Only		Constant & Trend	
Country	**t-statistics**	**p-value**	**t-statistics**	**p-value**
Botswana	-3.277	0.021**	-4.987	0.001***
DRC	-2.720	0.078*	-2.796	0.205
Lesotho	-4.850	0.000***	-4.986	0.001***
Madagascar	-6.996	0.000***	-7.009	0.000***
Mozambique	-3.562	0.012**	-4.210	0.011**
Mauritius	-5.592	0.000***	-5.514	0.000***
Malawi	-8.292	0.000***	-8.201	0.000***
Namibia	-4.182	0.002***	-5.288	0.000***
Swaziland	-4.770	0.000***	-5.165	0.000***
Seychelles	-5.959	0.000***	-5.993	0.000***
Tanzania	-1.204	0.654	-3.521	0.058*
South Africa	-4.864	0.000***	-4.803	0.001***
Zambia	-2.539	0.113	-7.407	0.000***
Zimbabwe	-4.060	0.002***	-4.203	0.009***

***, **, * denote 1%, 5% & 10% levels of significance, respectively.

Source: Authors' own computation from the sample

Given the results from unit root test, we can therefore proceed to estimating the dynamic factor model using the differenced GDP in the subsequent section.

4. Empirical Findings

4.1.Do Business Cycles Co-Move in the SADC Region?

Countries that form a currency union without having their business cycles synchronised are more likely to face negative consequences (Tavlas, 2008). Therefore, the assessment of business cycle synchronisation has decisive policy implications. This section provides analysis of business cycle synchronisation for the SADC region.

We employ a dynamic factor model to ascertain the suitability of SADC countries to adopt a common currency. Following Tipoy (2015) we divide SADC countries into three income groups. Level 1 income countries comprises of Lesotho, Swaziland, and Zambia. Level 2 income countries consists of Madagascar, Malawi, Mozambique, Tanzania, Democratic Republic of Congo, and Zimbabwe and level 3 income countries, comprises of Botswana, Mauritius, Namibia, Seychelles, and South Africa. Table 3 displays results from three different income levels. Table 3 suggests that regional common factor is highly persistent in explaining business cycle. Our measures of persistence, $Ft-1$ and $Ft-2$ are statistically significant. A common factor is significant in all level 1 income group members except for Zambia, where we find that business cycle is solely driven by country-specific factors. In Swaziland business cycle is driven by both the common factor and the country-specific component, whereas in Lesotho our findings suggest that idiosyncratic component is not a significant driver of business cycle.

There are a number of plausible justification for the significance of a common factor driving business cycle in both Lesotho and Swaziland. Both Lesotho and Swaziland belongs to the common currency area (CMA) formerly known as Rand Monetary Area (RMA) which initially comprised of South Africa, Botswana, Lesotho, Namibia, and Swaziland.

The currency union was formally established in 1974, however, Botswana exited the union in 1975 (Masha, Wang, Shiromo and Harris, 2007). *Inter alia* this could explain the existence of a common factor in level 1 income countries except for Zambia which is not part of CMA.

Table 3: Dynamic factor model-Income classified

Table 3A: SADC Level 1 Income Countries

Coef.	Lesotho	Swaziland	Zambia
F	-0.0598***	0.01119*	0,0019
	(0.0063)	(0,0064)	(0,0059)
a	0,0002	0.0024***	0.0029***
	(0,0064)	(0,0111)	(0.0063)
$Ft-1$	-0.3594***		
	(0,1197)		
$Ft-2$	-0.6524***		
	(0,1264)		

Table 3B: SADC Level 2 Income Countries

	Madagascar	Malawi	Mozambique	Tanzania	DRC	Zimbabwe
F	-0,0028	0,0023	0.0144**	0,0002	0,0001	0.01278**
	(0,0040)	(0,0050)	(0,0686)	(0,0010)	(0,0019)	(0,0061)
a	0.0047***	0.0076***	0.0014**	0.0003***	0.0013***	0.0053***
	(0,0013)	(0,0021)	(0,0006)	(0,0001)	(0,0003)	(0,0016)
$Ft-1$	-1.4145***					
	(0,0975)					
$Ft-2$	-0.9257***					
	(0,0884)					

Table 3C: SADC Level 3 Income Countries

	Botswana	Mauritius	Namibia	Seychelles	South Africa
F	0,0109	0.0086	0.0298***	-0,0044	0,0039**
	(0,0079)	(0,0037)	(0,0367)	(0,0081)	(0,0039)
a	0.0026***	0.0005***	0.0001	0.0028***	0.0006***
	(0,0006)	(0,0001)	(0,0009)	(0,0007)	(0.0001)
$Ft-1$	-0.5053**				
	(0,1643)				
$Ft-2$	-0.3001*				
	(0,1611)				

*****, **, *** denote 1%, 5% & 10% levels of significance, respectively. Reported in parenthesis are standard errors.

In 1986, the Trilateral Monetary agreement among Swaziland, South Africa, and Lesotho came into existence; which saw CMA being established. The agreement provides a framework for monetary policy and exchange rate policy for these countries (Wang *et al.*, 2007 and Tavlas, 2008). In generally this agreement should lead to the minimisation of asymmetric shocks within these countries or rather should encourage business cycle synchronisation among these countries. Secondly, Lesotho and Swaziland have similar production and export structures. Agriculture is an important production and export structure for these economies (Wang et al., 2007). In the literature, industrial structure similarity has been found amongst other things to be play an essential role for business cycle chronology (Imbs, 1998; Krugman, 1993). Countries with similar production structures experience common industry-specific shocks which in turn leads to higher output comovement relative to countries with dissimilar structures (Clark and Wincoop, 2001). Kalemli-Ozcan et al., (1999) provides evidence that industrial similarity is indeed associated with higher output correlation. They find that highly specialised states in the U.S. are less synchronise with aggregate U.S GDP growth.

Table 3B presents estimate for level 2 income countries. Only Zimbabwe and Mozambique are affected by regional common factor in this group. Our findings suggest that business cycle in Zimbabwe and Mozambique are driven by both country-specific and regional factors. However, for the rest of the group, our estimates suggest that business cycles are driven by idiosyncratic factors. Put differently, common factors are not significant drivers of business cycles in DRC, Madagascar, Malawi and Tanzania. Therefore, the costs of using common monetary policy in these countries is high since they are faced with shocks that are unique to each individual and thus they require individual monetary policy to respond. Table 3C displays result for level 3 income countries. In level 3 income group only two countries, i.e. South Africa and Namibia have their business cycles driven by a common factor; and in the case of Namibia country specific component appears not to be a significant driver of their business cycle. Similar to level 2 income group, business cycles for the rest of level 3 income group members are significantly explained by country-specific factors. The lack of common factor affecting business cycles in the level 2 and level 3 income groups necessitates for country specific exchange rate and monetary policy and thus make it very costly for these countries to be part of the currency union.

Table 4: SADC Countries with common factors

Coefficient	Lesotho	South Africa	Mozambique	Namibia	Swaziland	Zimbabwe
F	0.0080*	0.0220***	-0,0016	0.0115**	0.0112*	0,0098
	(0,0043)	(0,0027)	(0,0014)	(0,0049)	(0,0068)	(0,0123)
a	0.0007***	0.0014***	0.0057***	0.0009***	0.0019***	0.0065***
	(0,0001)	(0,0024)	(0,0014)	(0,0002)	(0,0004)	(0,0016)
$Ft-1$	-0.5395*** (0,1682)					
$Ft-2$	-0,2836 (0,1744)					

***, **, * denotes 1%, 5% & 10% levels of significance. In parenthesis are the standard errors.

From table 3, we take and group together countries which we find that regional common factor significantly drives their business cycles, and we therefore run a dynamic factor model for a new group in order to obtain countries which can consider forming a currency union in the SADC region. Table 4 report findings for new group which consists of selected countries from all income levels. Our findings in table 4 concur with previous studies (see, Masson and Pattillo, 2005 and Jenkins and Thomas, 1996 among others) they suggest that based on the criteria of business cycle synchronisation SADC as whole is not yet ready to adopt a common currency . We therefore believe that the choice of econometric technique employed in this study did not influence the findings. Table 4 suggests that South Africa, Lesotho, Namibia and Swaziland (SA-LNS) business cycles are driven by both regional common factor and idiosyncratic factors. However, idiosyncratic factor are less pronounced relative to regional factors. F_{t-1} which we use as a measure of persistence of common factors is statistically significant at all conventional levels of significance, implying that common factors are more persistent in explaining business cycles for the countries included in table 4. The main message from table 4 is that contrast to existing literature common monetary area (CMA) countries including do comply with the condition of business cycle synchronisation outlined in the theory of OCA. These results close resemble findings by Buigut and Valev (2006). They found that CMA countries including Mozambique and Zambia do satisfy the requirement of business cycle synchronisation. Our findings are very interesting for policy-makers because the existence of a common factor driving business cycle fluctuations implies that national policies

may not be effective to counteract business cycle disturbances. Rather, a regional policy is needed. Put differently, endeavours by individual countries to stabilise their economies may not be successfully if common factors explain large variance of business cycles; there should be a policy coordination in the countries with synchronised business cycles (Canavo, Ciccarelli and Ortega, 2007).

The idea that globalisation leads to intensely synchronised business cycles through increased trade ties has become popular in the business cycle literature (Kim, 1995 and de Haan, 2008). However, Krugman (1990) embraces a contradicting view; He argues that globalisation may lead to local production being more specialised therefore leading to the dominance of industry-specific shocks, which transforms into country specific shocks rather than regional shocks. The dominance of industry-specific shocks eventually leads to business cycle asynchronisation rather than synchronisation. Our findings in table 3 and 4 suggests that although policies that would otherwise segment the SADC market have been harmonised and trade has increased in the region, business cycles remain vulnerable to country-specific shocks. We believe that the reason for the lack of synchronisation in the SADC region is due to the fact that countries are sovereign states thus may not necessarily react homogenously to common shocks therefore constituting differences in business cycles, (Wynne and Koo, 2000). Further, the dominance of idiosyncratic factors could be due to differences in the composition of national production (Wayne and Koo, 2000 and Debrun, Masson and Pattillo, 2010). Overall, we argue that SADC countries are excessively heterogeneous on numerous grounds to permit for viable monetary/single currency unions. This is evident in our findings (see, table 3 and 4) country specific factors are a significant drivers of business cycles thus SADC is not an optimal currency area yet. Countries in the SADC region belong to more than one economic union, therefore, the overlapping objectives in different unions may be one the reasons why their business cycle are not synchronised.

4.2. Implications of the Study

According to Tavlas (2008) analysis of business cycle chronology carries essential policy implications. In that respect, this section discuss implications from our findings reported in section 4.1. Contrast to existing studies our findings suggest that SADC as whole is too heterogeneous hence forming a currency union at this stage would not yield desired results. However, there are some countries that appear to have common elements which permit them

to consider forming a currency union. Our findings suggest that SA-LNS business cycles are driven by a common factor hence they can have one monetary policy and a single currency. It is interesting to note that Namibia, Lesotho, Swaziland (LNS) have strong linkages with South Africa. Put differently, monetary policy in LNS countries is largely swayed by South Africa. South African rand is legal tender in LNS countries these countries can easily migrate to South African rand (ZAR) without having many difficulties. Given that LNS countries are already using ZAR as a legal tender we foresee no problem in substituting domestic currencies with the ZAR. In simply terms our findings suggest that SADC as a whole is not an optimal currency area but CMA countries appear to be synchronised, thus they tend to face symmetric shocks which could be addressed by a single monetary policy (Hitaj, Kolerus and Zdzienicka, 2013).

5. Conclusion and Policy Recommendations

The dangers of entering into a common currency without having met all the necessary conditions have been evident in the Euro area (Krugman 2012). Put differently, conforming to the conditions put forward by Mundell (1961) in his theory of optimal currency area is a key to a successfully implementation of a common currency area. This has been evident in the issues facing Greece; which joined the union with asynchronous business cycle. Simply put, Greece entered into a union with their business cycle being detached from the rest of the members of the Euro. Therefore, as SADC plans to establish a monetary union this year (2016) and thus, launch a single currency in (2018), it is imperative to ensure that it is ready to do so, or to ascertain whether it does meet the conditions put forward by the theory of OCA or not. Thus, avoiding the catastrophe that has been experienced by some of the European countries.

In this we study therefore assessed business cycle synchronisation in the SADC region, excluding Angola whose data was not available. We commence grouping countries into 3 income detachments and thus estimate dynamic factor models for each income level. We found that in level 1 income group, only Lesotho and Swaziland had their business cycles significantly determined by both common the regional factor and idiosyncratic factors. On level 2 income group it was only Mozambique and Zimbabwe who had their business cycles driven by both common factors and individual factors, and lastly in level 3 income only South Africa and Namibia had their business cycles explained by a common factor. We therefore grouped those countries whose business cycles appeared to be driven by common factors and re-estimated a dynamic factor model for a new group.

Contrast to existing evidence, our findings suggests that there is little business cycle synchronisation in the SADC. This is also evident from correlation analysis of GDP reported in table 1. Therefore based on the criteria of business cycle chronology SADC region is not ready for a currency union. However, CMA countries can consider coming together to form a monetary union. This evidence concurs with the findings by Buigut and Valev (2005). Buigut and Valev (2005) found that CMA countries including Mozambique and Zambia can be on the same union based on the business cycle criteria. Our findings have serious implications for policy makers. Firstly, they suggest that instead of rushing into the establishment of a monetary union; authorities should invest their energies in synchronizing business cycles for SADC member. Secondly, we argue that CMA countries could be used as a pilot project.

From our study the take the main message is that SADC is not ready for a currency union yet; hence the timeframe put forward by authorities should be revised and the launch of the single currency should be revised as well.

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