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Does Economic Policy Coordination Improve Business Cycles Synchronization in WAEMU states?

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Abstract

Business cycle synchronization is a requisite for an optimal economic and monetary union. It may be improved by many factors, among them the economic policy similarities. This study examines the long run impact of economic policy coordination on business cycles synchronization (BCS) of seven West African Economic and Monetary Union (WAEMU) states over the 1995-2018 period. We approximate and measure the economic policy coordination through the quasi-correlation coefficient of the inflation rate, budgetary balance and public debt whereas business cycles synchronization is measured via the quasi-correlation coefficient of real GDP's cyclical components. After testing for cross-section dependence, unit root and cointegration, we employ the Dynamic Common Correlated Effects (DCCE) method to fit our specified Cross-Sectionally augmented Auto-Regressive Distributed Lags (CS-ARDL) model. Our findings reveal that inflation rate coordination strengthens business cycles synchronization, while budgetary balance coordination lessens the latter. Moreover, robustness check results from Cross-Sectionally Distributed Lags (CS-DL) model indicate that inflation rate coordination positively affects BCS whereas budgetary balance coordination has a negative effect on the latter, supporting our baseline results. However, we find that public debt coordination impacts on BCS remain null in all models. The paper recommends that WAEMU states rethink the convergence criteria related to the budgetary balance and public debt in order to make stronger their business cycles synchronization.

Keywords: Economic policy coordination; business cycles synchronization; cross-section dependence; CS-ARDL; DCCE; WAEMU.

JEL Classification: C23, E32, E61, O55

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1 Introduction

Business cycle synchronization is recognized as one of the major criteria for an optimal common currency area such as an economic and monetary union (Mundell, 1961; Frankel & Rose, 1998; Bunyan, Duffy, Filis, & Tingbani, 2020).For this reason, many studies have over the decades taken keen interest in identifying their sources (Frankel & Rose, 1998; Imbs, 2004; Baxter & Kouparitsas, 2005; Beck, 2019; Zouri, 2020). Indeed, identifying factors that drive business cycles synchronization will help regional economic communities adopt policies that strengthen them. Beside trade and financial integration, economic policy coordination is seen as an important factor that could make closer business cycles synchronization in the long term (Shin & Wang, 2005; Rana, 2007; Duval, Cheng, Oh, Saraf, & Seneviratne, 2014; Sethapramote, 2015; Bunyan et al., 2020).

In the West African Economic and Monetary Union (WAEMU), economic policy coordination is carried out according to the convergence criteria, Stability, Growth and Solidarity Pact (SGP) which came into force in 2000. This pact intends to encourage the nominal convergence of key macroeconomic variables such as inflation, budgetary deficit, public debt (Combey & Mally, 2010; Nubukpo, 2012). Thereby, the SGP imposes countries to keep their annual inflation rate below 3 percent, primary budget deficit to gross domestic product (GDP) ratio equal or higher than 0 percent and public debt to GDP ratio below 70 percent. It is expected that once these countries achieve this nominal convergence, they may experience more synchronized business cycles. In turn, this will help them create a solid and durable environment in which the common monetary policy and the fiscal policy coordination will be beneficial to all member countries (Nubukpo, 2012; Mariotto, 2022).

Theoretically, the economic policy coordination effects on business cycles sync are ambiguous. The nature of these effects depends on the monetary and fiscal policies pro-cyclicality (or counter-cyclicality), and the transmission of foreign shocks in each country (Bayoumi & Eichengreen, 1992; Furceri, 2009; Sly & Weber, 2023). The economic policy coordination may affect business cycles synchronization via the macroeconomic convergence (Fleming, 1971; Lambertini & Rovelli, 2003; Steinbach, 2014). It is expected that the implementation of similar economic policies across countries allows them to eliminate the asymmetry of policy responses and to share symmetric (or common) shocks. If countries share common shocks, the monetary and fiscal policy setting would be either counter cyclical or pro-cyclical in each country. The consequence of conducting such similar policies encourage countries to reduce their heterogeneity in terms of inflation, economic growth, fiscal deficit and public debt so as to experience more synchronized business cycles (De Grauwe, 1996; Bunyan et al., 2020).

However, the economic policies coordination makes business cycles asynchronous when countries lack discipline to converge towards predefined economic targets (Fatás & Mihov, 2003; Darvas, Rose, Szapáry, Rigobon, & Reichlin, 2005; Antonakakis & Tondl, 2014, 2014). For instance, when some countries increase their fiscal deficit without facing persistent negative shock, they help to create difference in fiscal deficit among member countries. This may induce to idiosyncratic fiscal shock that favors the divergence in business cycles correlation.

Several empirical studies have analyzed the effects of monetary and fiscal policies coordination on business cycles synchronization in integrated areas. A wide part of these studies has approximated the fiscal policy coordination by the fiscal deficit and public debt to gross domestic product (GDP) ratio coordination, and the monetary policy coordination by the inflation rates and interest rates coordination. Some authors have

analyzed the effects of fiscal deficit coordination on business cycles synchronization and found that the fiscal deficit coordination improves business cycles synchronization (Furceri, 2009; Crespo-Cuaresma, Pfaffermayr, Amador, & Keppel, 2011; Bunyan et al., 2020; Beck, 2022).

However, other authors found that the fiscal deficit coordination impedes business cycles synchronization (Antonakakis & Tondl, 2014; Lukmanova & Tondl, 2017). A fringe of authors rather considered public debt to GDP ratio coordination and examined its effects on business cycles synchronization (Lukmanova & Tondl, 2017; Bunyan et al., 2020). They found that public debt to GDP ratio coordination hinders business cycles synchronization. Furthermore, studies have investigated the impact of monetary policy coordination on business cycles synchronization. These studies found that monetary policy coordination positively affects business cycles synchronization (Sethapramote, 2015; Papageorgiou, Michaelides, & Tsionas, 2016; Odry & Mestre, 2021). On the other hand, some works found that monetary policy coordination leads to business cycles divergence (Beck, 2022).

This paper aims to examine the long run impact of economic policy coordination on business cycles synchronization in seven WAEMU states over the period from 1995 to 2018. To achieve this aim, we employ the CS-ARDL model, which we estimate using the Dynamic Common Correlated Effects technique. We find mixed empirical results. We find that inflation rate coordination improves business cycles sync while budgetary balance coordination lessens the latter. However, we find that public debt coordination does not impact on BCS in the long run.

Unlike previous studies, the present paper contributes to the existing literature by paying particular attention to the cross-sectional dependence issue in its empirical procedures such as unit root and cointegration tests as well as the estimation method. Indeed, many studies from econometrics and economics point out the existence of some geographical and common factors that may create interdependence relationships between countries and neglecting them in empirical procedures may result in biased and inconsistent estimates (Pesaran, Shin, & Smith, 1999; Anselin, Florax, & Rey, 2013; Chudik & Pesaran, 2015). Further, this paper contributes to the existing literature by filling the lack of studies that have specially assessed the long run impact of economic policy coordination on business cycles synchronization for WAEMU states as a currency area.

The remainder of the paper is structured as follows. Section 2 reviews previous studies. Section 3 presents empirical model and estimation strategy while section 4 describes data and variables. Section 5, then presents and discusses the empirical results. Finally, section 6 concludes the paper with some policy recommendations.

2 Review of the Literature

Two (or several) business cycles are synchronized when they are positively interdependent or their phases of expansion and recession coincide (Cerqueira & Martins, 2009; Cerqueira, 2013; Duval et al., 2014). This business cycles synchronization is emphasized by many factors including economic policy coordination that encourages countries to move their key macroeconomic indicators towards convergence. Theoretically, the sign of the link between economic policy coordination and business cycles sync is ambiguous as it depends on the counter-cyclicality (or pro-cyclicality) of the budgetary and monetary policies, and the transmission of foreign shock in each country (Barro & Gordon, 1983; Dixit & Lambertini, 2003; Bayoumi & Eichengreen, 1992; Furceri, 2009; Steinbach, 2014; Beck, 2019). Thus, economic policy coordination may positively affect business cycles synchronization through macroeconomic convergence (Steinbach, 2014; Elachhab, 2010; Antonakakis & Tondl, 2014). The latter enables countries to harmonize their economic structure in terms of economic growth, budget deficit, public debt, inflation etc., thereby enhance their business cycle synchronization in the long term.

Furthermore, macroeconomic convergence may improve business cycle synchronization via its efficiency and distributional effects (Steinherr, 1985; De Grauwe, 1996). According to these authors, the efficiency effect allows the formation of stable economic area with high macroeconomic performance while the distributional effect plays a key role in reducing the gap between rich and poor countries. Moreover, economic policy coordination may positively affect business cycle synchronization by making economic policy similar across countries (Fleming, 1971; Lambertini & Rovelli, 2003; Steinbach, 2014). This similarity of economic policies allows them to share symmetric shocks, and therefore to eliminate policy asymmetry responses.

However, economic policy coordination can make business cycles asynchronous when countries lack economic discipline (or are fiscally irresponsible) to converge towards predefined economic targets (De Grauwe, 2009; Fatás & Mihov, 2003; Darvas et al., 2005; Antonakakis & Tondl, 2014). Indeed, the existence of the rescue principle among membership in regional economic agreements and particularly the flexibility of rules that govern the coordination should encourage some countries to adopt a fiscally irresponsible behavior exceeding the allowed limit of budget deficits. If these countries adopt this fiscally irresponsible behavior in the absence of any persistent negative shock, they create idiosyncratic fiscal shocks. The latter induces difference in budget deficits among countries that favors the divergence of their business cycles. Nevertheless, if they adopt this fiscally irresponsible behavior after receiving a persistent negative shock, even if their budget deficits diverge partially, their business cycles remain synchronized in the long run. This may be explained by the fact that they run an expansionary fiscal policy to off-set the adverse effects of the negative shock on their business cycles (Fatás & Mihov, 2003; Darvas et al., 2005).

Many studies have been empirically examined the link between the economic policy coordination and business cycles synchronization in regional economic communities. These studies focus more on the effects of monetary and fiscal policies coordination on business cycles synchronization. For instance, Darvas et al. (2005) and Furceri (2009) analyze the impact of fiscal policy convergence on business cycle synchronization for the Organization for Economic Cooperation and Development (OECD) and European countries. Using pooled OLS, fixed effects, random effects and instrumental variables methods, they find that countries with similar budget deficits tend to have more synchronized business cycles than other ones. Crespo-Cuaresma et al. (2011) examine the link between fiscal policy coordination and business cycles synchronization in the European Union (EU) over the 1995-2008 period. Using panel data techniques, they find that fiscal policy

coordination improves business cycles synchronization.

Similarly, Antonakakis and Tondl (2014) study the effects of economic policy coordination on business cycles synchronization in EU over the period 1995-2012. Using a simultaneous equation model for panel data, they find that the lack of fiscal discipline among EU countries impedes their business cycles synchronization. In other words, authors show that EU countries with divergent fiscal deficits tend to have asynchronized business cycles. Lukmanova and Tondl (2017) employ a simultaneous equation approach for panel data to examine the effects of macroeconomic imbalances on business cycles sync in Eurozone. Authors use quarterly data over the 2002-2012 period and show that divergence in fiscal deficits and public debt level in EU hinder business cycles synchronization.

Moreover, using quarterly data for the Association of South-East Asian Nations (ASEAN) from 2000 to 2012, Sethapramote (2015) examines the effect of economic policy linkages on business cycles synchronization. Based on panel regressions, the author finds that monetary policy linkages enhance business cycles correlation. Papageorgiou et al. (2016) investigate the determinants of business cycles synchronization in Eurozone over the period 1995-2012. Using an autoregressive distributed lags model, the study shows evidence of a significant and positive effect of monetary policy coordination on business cycles synchronization in this area. In much the same way, Odry and Mestre (2021) study the impact of common monetary policy on business cycles synchronization in Eurozone between 2000 and 2018. They use panel data techniques to show that common monetary policy has a long run positive effect on business cycles. Bataka and Maï Assan Chedi (2022), included monetary policy similarity as a control variable when studying the business cycles sync effects of globalization for sub-Saharan African countries over the 1980-2018 period. Using panel data techniques, the study find that monetary policy similarity improves business cycles synchronization. Finally, Beck (2022) investigates the link between macroeconomic policy coordination and business cycles synchronization in Europe. Using a dynamic panel data model, the findings reveal that the monetary policy coordination leads to business cycle divergence.

3 Empirical model and diagnostic tests

To empirically examine the impacts of economic policy coordination on business cycles synchronization in seven WAEMU states, we specify below a panel model following previous studies Frankel and Rose (1998); Imbs (2004); Duval et al. (2014); Sethapramote (2015); Papageorgiou et al. (2016); Cesa-Bianchi, Imbs, and Saleheen (2019); Zouri (2020):

$$bsc_{ijt} = \mu_i + \sum_{k=0}^{1} \gamma_{ik} bcs_{ijt-k} + \sum_{k=0}^{1} \beta_{ik} epc_{ijt-k} + \sum_{k=0}^{1} \alpha_{ik} X_{ijt-k} + \epsilon_{ijt} \quad (1)$$

where i and j denote country i and country pair j respectively; t is time period; bsc_{ijt} and epc_{ijt} are respectively business cycles synchronization and economic policy coordination between countries i and j at time t; X_{ijt} is a k-dimensional column vector of the control variables including globalization ($glob_{ijt}$) and economic specialization (es_{ijt}); μ_i, γ_{ik}, β_{ik}, α_{ik} are parameters to be estimated ; ϵ_{ijt} are the error term that can be serially and cross-sectionally correlated.

Before estimating the model (1) above, we first implement the cross-sectional dependence test for variables so as to verify whether they exhibit cross-section dependence. It is crucial to go through this step

because many studies from spatial and traditional econometrics (LeSage & Pace, 2009; Anselin et al., 2013; Pesaran, 2006, 2021; Chudik & Pesaran, 2015) point out the existence of geographic factors (e.g., proximity) and common factors (e.g., economic similarity, policy similarity, symmetric shock, social networks connection etc.) that may create interdependence relationships between different countries. These interdependence relationships are so-called cross-sectional (or spatial) dependence and are often observed for many macroeconomic variables. According to, Bailey, Kapetanios, and Pesaran (2016), and Hoechle (2007) contends that previous studies that neglected cross-sectional (or spatial) dependence in their empirical procedures suffered likely from omitted variables bias, and therefore obtained biased and inconsistent estimates.

In this paper, we diagnose the cross-sectional dependence making use of the tests by Pesaran (2015, 2021) and Bailey et al. (2016). The former allows to detect the presence of cross-sectional dependence and computes under the null hypothesis of weakly cross-sectional dependence the standard normal distributed CD-statistic and associated p-value, using the pairwise correlation coefficients of residuals from individual regression while the latter estimates the exponent of cross-sectional dependence as a constant (alpha) which ranges between 0 and 1. Thus, there is weak cross-sectional dependence if $0 \leq \alpha < 1$ and strong cross-sectional dependence if $1/2 \leq \alpha \leq 1$ Chudik, Pesaran, and Tosetti (2011); Pesaran (2015); Bailey et al. (2016); Ditzen (2021).

The cross-sectional dependence is strongly present in our variables (Table A1 in the appendix). This means there are common factors that required to be taken into account in our model specification in order to avoid the omitted variables bias, and therefore spurious inferences (Pesaran, 2006; Sarafidis & Wansbeek, 2012; Chudik et al., 2011; Chudik & Pesaran, 2015; Ditzen, 2021). So, we tackle this strong cross-sectional dependence issue by augmenting model(1) with the level and lagged cross-section averages of dependent and independent variables similar to Pesaran (2006) and Chudik and Pesaran (2015). This technique is advantageous because it is simple to implement and robust to a wide range of data generating processes and lower biased than the principal components method (Chudik & Pesaran, 2015; Westerlund & Urbain, 2015; Everaert & De Groote, 2016). Finally, we rewrite the equation 1 above into CS-model as:

$$bsc_{ijt} = \mu_i + \sum_{k=0}^{1} \gamma_{ik} bcs_{ijt-k} + \sum_{k=0}^{1} \beta_{ik} epc_{ijt-k} + \sum_{k=0}^{1} \alpha'_{ik} X_{ijt-k} + \sum_{k=0}^{1} \eta'_{ik} \bar{Z}_{t-k} + \epsilon_{ijt} \tag{2}$$

Where $\bar{Z}_t = (\bar{bpc_t}, \bar{epc_t}, \bar{X}_t)$ is a k-dimensional column vector of the cross-sectional averages of dependent and independent variables and η'_{ik} are the associated coefficients.

We fit our empirical model 2 following some further econometric procedures such as unit root and cointegration tests. At first, we examine the integration order of the variables in order to know whether the model 2 can be used for the long-run analysis. For this purpose, we use the CS-ARDL approach as it is applicable regardless of whether variables are integrated of different order (I(0) and I(1)), or whether they are exogenous or endogenous (Pesaran & Smith, 1995; Pesaran et al., 1999). Given the presence of cross-section dependence in our data set, we check the integration order of the variables using unit root test by Pesaran (2007) because it outperforms the first-generation unit root tests in this context (Hurlin & Mignon, 2007; Pesaran, 2006). Results from this test (Table A2 in the appendix) show that variables are either I(0), or I(1), meaning that the long-run analysis is appealing for this paper. To this end, it is important to verify the long run relationship between variables and test it via the Pesaran (2021) bounds test to cointegration instead of the tests by Westerlund (2007) and Pedroni (2001) that require all variables to be integrated of

first order (I (1)). Then, we used one lag length to account for feedback effects among variables, applying the parsimony principle since the time dimension used in this paper is not sufficiently large. Finally, we apply the dynamic common correlated effects (DCCE) method to estimate our CS-ARDL model presented by equation (2) above. This method proposed by Chudik and Pesaran (2015) and Ditzen (2021) provides two variants of DCCE estimator: DCCE-mean group and DCCE-pooled mean group. The latter estimator is more suitable than the former for this paper since our variables are cointegrated. Indeed, the DCCE-pooled mean group constrains long run parameters to be homogeneous and leaves short run coefficients to vary across cross-section units (Pesaran et al., 1999).

Although, to check for robustness of our baseline results, we make use of Cross-Sectionally Distributed Lags model (CS-DL). It provides an advantage because it is less sensitive to small sample bias than CS-ARDL (Ditzen, 2021). We then duplicate the previously used methodology to fit our CS-DL model. This means that we employ one lag length for variables and DCCE-PMG technique.

4 Data and variable measurements

4.1 Data

The study uses yearly data from seven WAEMU countries (Table A3 in the appendix) over the 1995-2018 period. Variables description and data sources are reported in table A7 in the appendix. The real gross domestic product, economic growth rates, inflation rates, and economic sectors' added values data come from World Development Indicators whereas government debt to GDP ratio are obtained from Global Debt database. It indicates that the budgetary balance to GDP ratio from BCEAO' Statistic Yearbooks 2010 and 2018 and the KOF global index comes from KOF Swiss Economic Institute (KSEI) database. Table A4 in the appendix also presents summary statistic of the variables and indicates the latter are so dispersed since their standard deviations are so high.

4.2 Variable measurements

4.2.1 Dependent variable

Business cycles synchronization (*bcs*): Similar to Abiad, Furceri, Kalemli-Ozcan, and Pescatori (2013), we measure the business cycles synchronization using the quasi-correlation coefficient. We use the quasi-correlation coefficient instead of the Pearson correlation coefficient, because it allows a dynamic measure of correlation. It also takes into account, simultaneously, the central tendency and dispersion characteristics (Abiad et al., 2013; Duval et al., 2014). We follow Burns and Mitchell (1946) and Frankel and Rose (1998) to approximate countries' aggregate market economic activity by their real GDP. We then use the Hodrick and Prescott (1997) filter (HP filter) to extract cyclical components of real GDP from what we obtained from the quasi-correlation coefficients. The business cycle synchronization between two countries i and j at time t is computed as follows:

$$bcs_{ijt} = \frac{(c_{it} - \overline{c_i}) \times (c_{jt} - \overline{c_j})}{\delta(c_i) \times \delta(c_j)} \tag{3}$$

Where c_{it}, c_i are real GDP cyclical components of countries i and j at time t; $\overline{c_i}$ and $\overline{c_j}$, $\delta(c_i)$ and $\delta(c_j)$, represent, respectively, means and standard deviations of these cyclical components for countries i and j.

4.2.2 Independent variables

Economic policy coordination variables

We employ three economic policy variables. These include inflation rates, budgetary balance to GDP ratio and government debt to GDP ratio. All these variables are subjected to coordination in WAEMU countries in the Stability and Growth Pact framework. Also, several empirical studies Shin and Wang (2005); Rana (2007); Duval et al. (2014); Sethapramote (2015); Papageorgiou et al. (2016) have used these variables to compute economic policy coordination indicators.

A. *Inflation rate coordination variable*

We use monetary policy coordination as a proxy to economic policy coordination, following the work by Shin and Wang (2005), and Rana (2007). We measure it by applying the quasi-correlation coefficient of countries' inflation rates. So, monetary policy coordination between two countries i and j is given by the formula below:

$$inflat_{ijt} = \frac{(\pi_{it} - \overline{\pi_i}) \times (\pi_{it} - \overline{\pi_j})}{\delta(\pi_i) \times \delta(\pi_j)} \tag{4}$$

Where π_{it}, π_{jt} are inflation rates of countries i and j at time t; $\delta(\pi_i)$, $\delta(\pi_j)$ denote, respectively, means and standard errors of inflation rates for countries i and j. The higher the indicator, the stronger is the monetary policy coordination.

B. Budgetary balance coordination variable

We follow previous studies such as those of Rana (2007) and Duval et al. (2014) to approximate economic policy coordination by fiscal policy coordination. We use the quasi-correlation coefficient of the budgetary balance to GDP ratio to measure our fiscal policy coordination variable. The latter is formulated as follows:

$$bbal_{ijt} = \frac{(bb_{it} - \bar{b}_i) \times (bb_{jt} - \bar{b}_j)}{\delta(bb_i) \times \delta(bb_j)} \tag{5}$$

Where bb_{it}, bb_{jt} denote, respectively, budgetary balances to GDP ratio of countries i and j at time t; $\bar{b}_i$, $\bar{b}_j$ and $\delta(bb_i)$, $\delta(bb_j)$ are respectively means and standard deviations of these budgetary balances to GDP ratio of countries i and j.

C. Government debt coordination variable

We also use government debt coordination as proxy to economic policy coordination. We measure this variable using the quasi-correlation coefficient of government debt to GDP ratio. This measure is determined by the formula below:

$$gdebt_{ijt} = \frac{(gd_{it} - \bar{gd_i}) \times (gd_{jt} - \bar{gd_j})}{\delta(gd_i) \times \delta(gd_j)} \tag{6}$$

Where gd_{it}, gd_{jt} represent, respectively, government debt to GDP ratio of countries i and j at time t ; $\bar{gd_i}$, $\bar{gd_j}$ and $\delta(gd_i)$, $\delta(gd_j)$ are respectively means and standard deviations of these government debt to GDP ratio of countries i and j.

4.2.3 Control variables

We use globalization and economic specialization variables as our control variables. Following the study by Gygli, Haelg, Potrafke, and Sturm (2019), we use the overall KOF globalization index to measure globalization variable as it is a comprehensive measure of globalization, that encompasses and summarizes its economic, social and political dimensions as well as its de facto and de jure aspects in a single variable. So, we measure our bilateral globalization variables through the quasi-correlation coefficient of KOF globalization index as follows:

$$glob_{ijt} = \frac{(glob_{it} - \bar{glob_i}) \times (glob_{jt} - \bar{glob_j})}{\delta(glob_i) \times \delta(glob_j)} \tag{7}$$

Where $glob_{it}$,$glob_{jt}$ are KOF globalization index of countries i and j at time t; $\bar{glob_i}$ $\bar{glob_j}$, and $\delta(glob_i)$,$\delta(glob_j)$ are respectively means and standard deviation of these indices of countries i and j. A higher and positive value of this indicator means that the trade and financial flows, spread of ideas, people and diffusion of government policies are deepened between countries.

In addition, we use economic specialization as a proxy for intra-industry trade. Indeed, the globalization index above is mainly seen as proxies to trade and financial integration which partially focus on inter-industry trade by leaving unaccounted for the intra-industry trade. Yet, economic literature predicts that inter- and intra-industry trade drive the business cycles sync differently with opposite effects (Rana, 2007; Frankel & Rose, 1998; Imbs, 2004). We apply the Krugman (1992) index to measure our economic specialization variable as Imbs (2004) and Cerqueira and Martins (2009). Thus, the economic specialization index between two countries i and j at time t is given by the following formula:

$$es_{ijt} = \sum_{p=1}^{3} |SAV_{ipt} - SAV_{jpt}| \tag{8}$$

Where SAV_{ipt}, SAV_{jpt} are economic sectors' added values of countries i and j at time t. The small value of this indicator means that countries have similar economic structures (or production structures) that lead them to experience intensive intra-industry trade.

5 Empirical results and discussions

5.1 Test results

This sub-section discusses pre- and post-estimation test results. We start with Table A1 that presents the cross-sectional dependence test results. This table shows in its two first columns the (Pesaran, 2015, 2021) test results that indicate that variables exhibit the presence of cross-sectional dependence at 1 percent significance level because all p-values are close to zero. It then reports in its two latter columns the Bailey et al. (2016) test results that show that all the alphas are close to unity (1) and significant at 5 percent level, meaning that variables exhibit strong cross-section dependence. Table A2 also presents the results of unit root test by Pesaran (2007) which indicate that the economic specialization variable is difference stationary, and the remainder of variables are level stationary because corresponding absolute values of CIPS-statistic are larger than the absolute critical values (-2.23 and -273) at 1 percent level. Further, Table A5 in the appendix reports the results for the Pesaran, Shin, and Smith (2001) bounds test to cointegration. These results suggest rejection of the null hypothesis of no cointegration among variables at 5 percent level of significance as the corresponding F-statistics are larger than the upper bonds, meaning that variables are cointegrated of order one (I(1)).

Before estimating our empirical models, we have diagnosed the multicollinearity issue that can arise among variables. We do this through the pair-wise correlation coefficients matrix (Table A6 in the appendix). In most cases, this matrix shows that coefficients are significant at the 10 percent level and remain lower than 0.5 value, leading to reject the assumption of multicollinearity among variables. Therefore, all the variables can be included together in the regression model with no issues of collinearity. Moreover, the post-estimation test results are reported in Table 1. The latter indicates that residuals are independent at 1% level, meaning that CSD has been effectively handled. This table also shows that the speed adjustment term is negative and statistically significant at 1% level, validating the existence of error correction mechanism among variables.

5.2 Long run impact of economic policy coordination on business cycles sync

Table 1 below reports the long run impact of economic policy coordination on business cycle synchronization. Column (1) assesses the impact of all economic policy coordination variables while column (2), (3) and (4) quantify separately the impact of monetary and fiscal policies coordination. In column (1), the coefficient associated with monetary policy coordination variable is positive and statistically significant at percent level. This means that monetary policy coordination positively affects business cycles synchronization. This implies that, a one point decrease in annual inflation rates coordination may increase business cycle synchronization by 0.57 point on average in WAEMU countries. Now, we consider column (2) that assesses the impact of monetary policy coordination, regardless of the fiscal policy coordination. The result corroborates the previous findings, indicating a positive impact of inflation rates coordination on business cycles sync. It reveals that any increase of one point in inflation rates coordination result in rising of business cycles sync by about 0.45 point on average. These results confirm the above exposed theorical literature, according to which monetary policy coordination and business cycles sync nexus depends on the nature of cyclicality of monetary policy in each country. These findings are in line with those of Papageorgiou et al. (2016) and Odry and Mestre (2021) who found that monetary policy coordination has a positive effect on

Table 1: Econometric estimates of CS-ARDL and CS-DL models

Variables	CS-ARDL (1)	CS-ARDL (2)	CS-ARDL (3)	CS-ARD (4)	CS-DL (5)
adj. term	-0.830**	-0.888***	-0.8357***	-0.912***	
	(0.000)	(0.000)	(0.000)	(0.000)	
$inflat_{ij}$	0.571**	0.451**			0.546**
	(0.027)	(0.037)			(0.003)
$bbal_{ij}$	-0.378**		-0.471**		-0.221*
	(0.023)		(0.001)		(0.074)
$gdebt_{ij}$	0.678			0.071	-0.147
	(0.172)			(0.612)	(0.160)
$glob_{ij}$	-1.243	-0.237	-0.836**	-0.790*	-0.002
	(0.020)	(0.497)	(0.079)	(0.090)	(0.986)
es_{ij}	-0.021	0.0354**	-0.016	0.003	0.013
	(0.575)	(0.061)	(0.465)	(0.907)	(0.238)
Observations	1078	1078	1078	1078	1078
Nbre of group	49	49	49	49	49
CD-stat	3.28	-1.090	0.010	0.93	1.04
P-value (CD)	0.001	0.277	0.992	0.353	0.296

Notes: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; () are p-values associated with the coefficients; P-value (CD) is probability value associated with cross-sectional dependence test applied on residuals.

business cycles synchronization. We explain ours finding by the fact that keeping annual inflation rate below 3% serves equitably WAEMU countries, despite their different financial needs. So, it allows countries to grow together without creating gaps between them.

We focus on the long-run impact of budgetary balance coordination on BCS that is reported in column (1) and (3). In column (1), the coefficient associated with this variable is negative and significant at 1% level. This result supports that budgetary balance coordination negatively affects business cycles synchronization. In other words, an increase of one (1) point in budgetary balance coordination will decrease business cycles by about -0.37 point in WAEMU countries, ceteris paribus. We then consider result reported in column (3) that assesses the impact of budgetary balance coordination, regardless of the monetary policy and public debt coordination. Results show that budgetary balance coordination negatively affects business cycles synchronization at 1% level of significance. Any increase of one (1) point in budgetary balance coordination may lead to decrease business cycles synchronization by about -0.47 point. These findings are in accordance with economic literature which shows that the budgetary balance and business cycles synchronization relationship depends on the nature of fiscal policy cyclicality in each country. Empirically, our findings are in line with those of Antonakakis and Tondl (2014), Lukmanova and Tondl (2017) that contended that

divergences in fiscal deficits tend to make business cycles asynchronous over time. We explain our results by the fact that the slight difference in countries budget deficits, even if they are close, produces noticeable cumulative effects among countries, in long run. So, this slight difference in fiscal policy effects may create a gap between countries, by accenting their economic activities divergence. We note that coefficients related to public debt-to-GDP ratio coordination are not statistically significant. These results indicate that these variables do not affect business cycles sync in WAEMU countries, in the long run.

To check for robustness of our baseline findings reported in column (1), we replicate the DCCE-PMG approach to fit a CS-DL model as alternative to CS-ARDL model. Results are reported in column (6). They indicate that inflation rates coordination has a significant and positive impact on BCS whereas they support a significant and negative impact of budgetary balance coordination on the latter. However, results reveal that public debt coordination has no impact on BCS. Robustness check results support our baseline findings providing the same conclusion. This means that our baseline results are reliable and robust and can be used for policy recommendation.

6 Conclusion and policy recommendations

This study aimed at analyzing the effects of economic policy coordination on business cycles synchronization, using annual data from 1995 to 2018, in a panel of seven WAEMU countries. We measured business cycles synchronization and economic policy coordination through the quasi-correlation coefficients of the cyclical components of countries' real GDP, inflation rates, budgetary deficits to GDP ratio and public debt to GDP ratio respectively. Contrary to previous studies, this paper paid particular attention to cross-section dependence. It used second-generation panel data tools to test the existence and extent of cross-sectional dependence, unit root and cointegration among variables. Furthermore, it applied a CS-ARDL (1,1,1) model which is fitted by the Dynamic Common Correlated Effects approach. This estimation approach makes it possible to take into account cross-sectional dependence by including cross-section averages of level and lagged variables. We found mixed outcomes from estimated CS-ARDL (1,1,1). In the long run, annual inflation rates coordination toughens business cycles synchronization in WAEMU countries. However, budgetary balance coordination undermines business cycles synchronization while public debt coordination had no impact on the latter in WAEMU countries.

We draw lessons from these empirical results, to propose some recommendations to WAEMU governments. At first, if countries want to improve their business cycles synchronization, they should reconsider their economic policy coordination as a whole. They must revise the budgetary balance coordination as it impedes business cycles synchronization. They should put in place measures to reduce the small differences in their budget deficits. By doing so, the marginal cumulative effects of fiscal policy cannot be henceforth a source of their economic activities asynchronization, in the long run. We also advise governments to reconsider the threshold of public debt to GDP ratio of 70% because it does not seem to be an optimal debt burden suitable for all WAEMU countries. Besides, many empirical studies carried out in WAEMU area Croi and Diaw (2020), show that the optimal threshold of public debt burden is lower than 70% of nominal GDP. Although, countries seem to be on the good path regarding inflation rates coordination as the target of 3% serves union members equally. These recommendations will help WAEMU countries to increase their business cycles synchronization which is a requirement condition to minimize costs associated with relinquishment of national economic policies to benefit of common policies.

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Appendices

Table A1: Cross-sectional dependence test results

Variables	CD-stat	P-value (CD)	Alpha	CI [95%]
bcs_{ij}	70.467***	0.000	0.939**	[0.774 ; 1.104]
$inflat_{ij}$	146.593***	0.000	1.00**	[0.852 ; 1.158]
$bbal_{ij}$	9.134***	0.000	0.534**	[0.455 ; 0.644]
$gdebt_{ij}$	65.581***	0.000	0.990**	[0.947 ; 1.033]
$glob_{ij}$	149.314***	0.000	1.00**	[0.895 ; 1.151]
es_{ij}	10.361***	0.000	0.959**	[0.086 ; 1.113]

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$, respectively.

Table A2: Results for unit root test

	Level	Level	First diff.	First diff.
	Intercept	Intercept & trend	Intercept	Intercept & trend
Variables	CIPS-stat	CIPS-stat	CIPS-stat	CIPS-stat
bcs_{ij}	-3.391***	-3.624***		
$inflat_{ij}$	-5.536***	-5.715***		
$bbal_{ij}$	-4.181***	-4.300***		
$gdebt_{ij}$	-2.768***	-2.789***		
$glob_{ij}$	-2.735***	-2.992***		
es_{ij}	-1.384	-2.109	-4.028***	-4.173***

Notes: *** $p < 0.01$; Critical values at 1% level for both intercept and intercept & trend models are -2.23 and -2.73.

Table A3: List of countries used as sample

WAEMU countries
Benin
Burkina Faso
Ivory Coast
Mali
Niger
Senegal
Togo

Table A4: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
bcs_{ij}	1176	.422	1.3355	-1.9789	8.2421
$inflat_{ij}$	1176	.7902	1.9561	-1.644	15.8329
$bbal_{ij}$	1176	.1972	1.2449	-6.4834	22.2257
$gdebt_{ij}$	1176	.6276	.9927	-2.3898	6.372
$glob_{ij}$	1176	.9331	.8238	-.0408	5.4628
es_{ij}	1176	18.6843	12.9739	0	57.1111

Source : Author computation;
Note: all variables are measured as bilateral

Table A5: Bounds test to cointegration results

	Test statistic	Critical value bounds	
Variables	F-stat	I(0)	I(1)
bcs_{ij}, $inflat_{ij}$, $bbal_{ij}$, $gdebt_{ij}$, $glob_{ij}$, es_{ij}	90.7471	2.3900**	3.3800**
bcs_{ij}, $inflat_{ij}$, $glob_{ij}$, es_{ij}	127.2527	2.7900**	3.6700**
bcs_{ij}, $bbal_{ij}$, $glob_{ij}$, es_{ij}	128.6989	2.7900**	3.6700**
bcs_{ij}, $gdebt_{ij}$, $glob_{ij}$, es_{ij}	122.2022	2.7900**	3.6700**

Notes: ** $p < 0.05$; F-stat(K=k) is Fisher statistic for bounds test executed on model 1, 2, 3 and 4 respectively.

Table A6: Pairwise correlations matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)
(1) bcs_{ij}	1.000					
(2) $inflat_{ij}$	-0.026	1.000				
(3) $bbal_{ij}$	0.035	-0.018	1.000			
(4) $gdebt_{ij}$	-0.038	0.301*	-0.021	1.000		
(5) $glob_{ij}$	0.104*	0.135*	0.118*	0.362*	1.000	
(6) es_{ij}	-0.060*	-0.047	-0.142*	-0.142*	0.028	1.000

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

Table A7: Variable definition and sources

Variables	Definitions	Sources
bcs_{ij}	business cycles synchronization	World Developement Indicators (WDI)
$inflat_{ij}$	inflation rate coordination	WDI
$bbal_{ij}$	budgetary deficit coordination	Global Debt database
$gdebt_{ij}$	government debt coordination	BCEAO database
$glob_{ij}$	overall globalization	KOF Swiss Economic Institute
es_{ij}	economic policy similarity	WDI

Source: Author